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Evolving the Common Agricultural Policy for Tomorrow's Challenges

Cécile Détang-Dessendre, Hervé Guyomard, editors

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Foreword

Since its creation, the evolution of the Common Agricultural Policy (CAP) has entailed continuous adaptation to the challenges of agriculture and food. This is why throughout its history the CAP has attempted above all to respond to the threat of scarcity by pooling the risks between Member States (MS), and then to respond to the conditions of abundance. Other challenges have been subsequently added; for example, the volatility of agricultural prices, which, as they rise, penalise the most modest populations and, as they decline, penalise the incomes of farmers.

Indeed, it has remained essential to ensure the sustainability of this abundance above all other considerations. New questions were therefore addressed to European decision-makers: How do we adapt agriculture to climate change and enable it to cope with the growing world population? How do we reduce the environmental impacts of agriculture and livestock farming? How do we consume less energy and water, alongside a reduced loss of raw materials? How do we encourage the improvement of nutritional, taste, and health quality of the food supply? These questions became all the more relevant as new "consumer-citizens" have emerged, urging the agricultural and agri-food sectors to take their expectations into account in terms of quality, transparency, greenhouse gas emissions, and damage to biodiversity.

By placing the fight against climate change at the heart of the new European Commission's action through the implementation of the European Green Deal, President of the European Commission, Ursula von der Leyen, seeks to breathe new life into the European project. This ambition is separated into eight major objectives, one of which explicitly targets agricultural and food issues within the framework of both the Farm to Fork Strategy and the European Biodiversity Strategy by 2030. European decision-makers have a powerful tool at their disposal for this strategy: the CAP. Thus, it will be necessary to once again consider how to adapt the CAP to meet the challenges of the transition in agriculture and food without overlooking the question of its financing, which has become increasingly problematic with public budgets stretched over several competing priorities. Both the COVID-19 crisis and the war in Ukraine reinforce to us the strategic nature of food sovereignty for Europe and for all countries around the world.

Within this context, this book is the result of a cycle of seminars that I initiated, in agreement with the French Ministry of Agriculture and Food, and led by Cécile Detang-Dessendre and Hervé Guyomard in 2017-2018. The seminars brought together many scientists from the French National Institute for Agriculture, Food and Environment (INRAE), but also academic partners who provided useful input into the discussions, and ministerial stakeholders who made it possible to include the scientists' work in the ongoing debates on the shape of the future CAP.

Special thanks are due to the representatives of Trinity College from Dublin University, *Notre Europe-Institut Jacques Delors*, the *Centre d'Etudes Prospectives et d'Informations* (CEPII), the

European Commission, *France Stratégie* and the services of the French Ministry of Agriculture and Food, in particular its Directorate General of Economic and Environmental Performance of Enterprises (DGPE) and its Directorate General of Education and Research (DGER).

The following pages are not primarily concerned with the post-2020 CAP reform, although the proposals are presented and commented on in the Conclusion, and with the Green Deal, although the Conclusion discusses the compatibility of policy recommendations formulated in this book with the latter. In the same way, the book is not primarily concerned with the impacts of the COVID-19 crisis and the war in Ukraine on European agriculture. On the basis of an analysis of the main challenges facing European agriculture and the public policies that govern it, the purpose of this book is to provide a framework for assessing the strengths and weaknesses of the current measures, and to propose public economy measures for implementation.

Based on research from several disciplines, notably economics, agronomy, zootechnics, and ecology, conducted within INRAE and its scientific partners, this book presents the challenges facing agriculture, agri-food, food and rural territories, proposes a critical analysis of how they are taken into account by the CAP and other public policies, and deduces normative recommendations for public actors as well as the need for new research. It thus aims to provide support for the development of public policies based on a range of scientific productions and expertise.

I hope you enjoy your reading.

Philippe Mauguin, President and CEO, INRAE May 17th, 2022

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Introductory Remarks

Cécile Détang-Dessendre, Hervé Guyomard

This book was conceived of and written before both the COVID-19 pandemic and the war in Ukraine impact the world. A global health crisis such as the COVID-19 requires first and foremost a response to the emergency by guaranteeing the health of the population and ensuring their vital needs, particularly for food. Food needs can be affected *via* a direct impact on food availability (supply shock), the demand for food products (demand shock) and, as a result, prices. In the longer term, the economic consequences of such a crisis can also impact both supply by reducing food production, processing and distribution capacities, and demand by reducing purchasing power and income and therefore access to food. Naturally, the most disadvantaged populations are those most exposed to these risks, both at the country level and at the level of households and individuals within a given country. In a context where the global state of food security was already of concern before the COVID-19 crisis, the 2021 edition of the State of Food Security and Nutrition in the word (FAO *et al.*, 2021) points out that in 2020 hunger dramatically increased in both absolute and proportional terms: "some 9.9 percent of all people are estimated to have been undernourished last year, up from 8.4 percent in 2019".[1] It is feared that this state will -worsen under the direct effect of the pandemic and its induced effects, and, probably even more importantly in this regard, as a result of the economic recession that it has generated (CSA-HPLE, 2020). These issues are today exacerbated by the war in Ukraine and its consequences on world and regional food security in a context where agricultural prices were already on the rise following the post COVID-19 economic recovery (Glauber and Laborde, 2022; Berkhout *et al.*, 2022).

Within this context, many people are calling for greater food sovereignty for nations, though without specifying precisely what this defines, and for less constraint on agricultural supply. However, there are also many voices warning of the danger of turning inwards and closing borders in a context where the security of food supplies in many countries of the world crucially depends on the import of agri-food products and where it is illusory, particularly given their demographics and natural constraints, such as climate, arable land, water availability, etc., to significantly reduce dependence on agri-food imports.[2] Finding the right balance between these two concerns is both complicated and delicate. As far as the European Union (EU) is concerned, it should be remembered that it is both the first world importer of agri-food products and the first world exporter. In the same way, the climate and environmental urgency

1. https://www.who.int/news/item/12-07-2021-un-report-pandemic-year-marked-by-spike-in-world-hunger.
2. This can be illustrated by the situation in North African and Middle Eastern countries (Le Mouël and Schmitt, 2017).

does not allow the necessary transition of agricultural and food systems to be delayed while recognizing potential trade-offs with other sustainability dimensions. Do the COVID-19 crisis and the Russia's invasion of Ukraine call into question the analysis developed throughout this book of what the CAP should be? We will naturally leave this for the reader to judge. From our point of view, the recommendations remain valid, and are even strengthened. In particular, the proposed orientations aim to reduce the ecological footprint of European agriculture and to promote safer and more balanced food systems, while ensuring that sustainability and competitiveness are not compromised. Beyond their intrinsic benefits in terms of the environment, health, and nutrition, the proposed reorientations of the CAP could indeed have a triple additional benefit: first, by reducing the risks of global health shocks, in particular by improving the state of biodiversity (the decline of which is a recognized factor in the increase in the occurrence of epidemics); second, by reducing the consequences of these shocks when they occur by improving the health of populations through less reliance on chemical inputs, and less calorific and more diversified diets (Détang-Dessendre *et al.*, 2020); and third, by diminishing the dependence of European agriculture to imported fossil fuels (directly and indirectly through mineral fertilizers needs).

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This book is partly the result of a series of seminars on the Common Agricultural Policy (CAP) and its future organized from September 2017 to December 2018 at INRA, which then became INRAE in January 2020. The two coordinators of the book and the authors of the different chapters warmly thank the participants in this series of seminars for their presentations, suggestions, and involvement, all of which have greatly improved the content quality. More specifically, they would like to thank the staff of the French Ministry of Agriculture and Food for their introductory and concluding remarks at each seminar. These remarks allowed the analytical, prospective, and normative work of the scientists to be included in the ongoing debates on this date on the future of the CAP. They also thank Pierre Bascou of the European Commission who took his time to explain with great skill and patience the rationality and content of the legislative proposals of June 2018 for the future CAP; Marjorie Jaouen of *Notre Europe - Institut Jacques Delors* who was able to simplify the history of the European Cohesion Policy, and Philippe Faverdin of INRAE who greatly improved the content of Chapter 10 on "The CAP, animal production and consumption of animal products". They would like to thank their many colleagues, French and foreign, and public and private partners for their research works and the many informal exchanges that have fed into the debate, sometimes over several decades. These colleagues and partners are too numerous to list, at the risk of forgetting some. The coordinators and authors of the chapters nevertheless remain solely responsible for the contents. Our thanks are also extended to INRAE for its ongoing support, without which it would not have been possible to produce this book, and to éditions Quæ for their professionalism and patience. Finally, many thanks to Sara Crompton-Meade for her careful proofreading of the English and Maëva Guyomard for her help on the conclusion.

General Introduction

Cécile Détang-Dessendre, Hervé Guyomard

The Common Agricultural Policy (CAP) was created in 1962, five years after the signing of the Treaty on the Functioning of the European Union (TFEU) on 25 March 1957.[3] In the aftermath of the Second World War, the main objective of the CAP was to increase agricultural production and modernize agricultural structures in a European Community composed of six Member States (MS) and with a large deficit in agricultural and agri-food products. Agriculture is the largest single expenditure item in the European Union (EU), which now has 27 MS, after the United Kingdom's (UK) exit from the EU and is the area in which European integration has advanced the most.

Having remained largely unaltered for three decades, the CAP was comprehensively reformed in 1992 with the so-called MacSharry reform (named after Ray MacSharry who was the European Commissioner for Agriculture in office at the time). Since then, the CAP has undergone permanent reforms at a rate of (at least) every seven years, which is in line with revisions of the EU's multi-annual financial frameworks and changes in the European Commission (EC) and the European Commissioner for Agriculture. The pace has also been accelerated with the so-called mid-term reviews.

The process of CAP reform has therefore been ongoing for more than 25 years. To date, it has followed clear guidelines, which can be summarized as follows:

- A gradual reduction in direct producer price support measures for agriculture (public purchases from agricultural producers at guaranteed prices above world prices; export subsidies to bridge the gap between domestic and international prices; and, conversely, the imposition of tariffs to bring prices on entry into the EU to levels equal to or even higher than domestic prices); and
- Compensation for induced income losses through direct aid to agricultural producers; direct aid in the course of reforms increasingly disconnected from product choices and levels (decoupling process); and direct aid increasingly conditional on compliance with increasing requirements for the protection of natural resources and the environment (cross-compliance and the greening process of the current CAP).

3. The TFEU is often referred to as the Treaty of Rome, after the city in which it was signed. In practice, the Treaty of Rome corresponds to two treaties: the Treaty establishing the European Economic Community (EEC) and the Treaty establishing the European Atomic Energy Community (EAEC, also known as Euratom). Within the framework of the EEC, the six founding countries (Belgium, France, Italy, Luxembourg, the Netherlands, and the Federal Republic of Germany) undertook to create a customs union but without envisaging a monetary union at that time.

Measures that are more specific complete the picture targeting specific support for certain products, production methods, or specific local conditions. Among others, some target Organic Farming (OF), young farmers, or specific investments. Other measures provide aid to farmers in less-favoured areas or aid to compensate for the additional costs of adopting more environmentally friendly practices.

The CAP and the economy

The 1992 reform of the CAP was initially a response to an external constraint to allow the successful conclusion of the multilateral agricultural negotiations of the 1994 Uruguay Round of the General Agreement on Tariffs and Trade, also known as GATT, and the compatibility of the future CAP with this agreement (Guyomard *et al.*, 1992). The path taken at that time (that is, the decoupling of the agricultural income support policy) is the same that is followed today, even though the global context has changed markedly, with the rise of new agricultural export (Argentina, Brazil) and import (China) players; the failure of the multilateral negotiations of the Doha Round at the World Trade Organization (WTO);[4] the multiplication of bilateral trade agreements; and more recently, the unilateral setting of customs duties by certain countries in a climate of (at least latent) trade warfare. For completeness, it should also be noted that the European agricultural sector is facing new and significant economic challenges that it is struggling to meet: first, fluctuations in agricultural prices and incomes in an EU that is less protected by customs duties today than it was previously (even if these remain significant for several products and non-tariff protection still exists); and second, difficulties in creating value in the context of a saturated domestic food market and in distributing the value created in a balanced way between the different actors of the production, processing, and distribution chains.

The economic aspects of the CAP and European agriculture are the subject of the first part of this book. Following a brief history of the CAP from its origins to the present day in Chapter 1, Chapter 2 deals with the question of the dependence of farm incomes on CAP support, and Chapter 3 examines agricultural employment dynamics. Chapter 4 covers trade aspects and the competitiveness of European agriculture on the international scene. Chapter 5 examines the distribution of value, and Chapter 6 discusses the crisis and risk management instruments.

The CAP, environment and health

Following the MacSharry reform of 1992, the reforms made in 1999, 2003, 2008, and 2013 responded to a twofold internal logic; first, of a more balanced distribution of CAP aid between MS and between farms within the same country; and second, of a reduction in the adverse effects of agriculture on natural resources and the environment. Despite the increased inclusion of environmental objectives and instruments in the CAP since 1992,

4. The WTO succeeded the GATT in 1996, and the Doha Round succeeded the Uruguay Round. Officially launched in November 2001, the Doha Round was supposed to last only three years and was therefore supposed to be completed by the end of 2004.

and despite the efforts made by the actors involved, it must be said that progress is not in evidence and that the environmental quality of European agro-systems continues to deteriorate (Hart and Bas-Defossez, 2018; Dupraz and Guyomard, 2019). This regrettable statement is partly linked to the progress of knowledge and the resulting upward assessment of environmental nuisances. However, the failure of the environmental component of the CAP is primarily due to the modest budgetary resources allocated, the insufficient effectiveness of the implemented instruments, and/or the contrary incentives induced by other CAP measures.

The environmental aspects of the CAP and European agriculture are addressed in the first two chapters of the second part of this book. Chapter 7 focuses more specifically on global environmental goods, such as climate change mitigation and biodiversity preservation. Chapter 8 focuses on support for the transition to more environmentally sustainable agricultural systems and practices.

The environmental issue is twinned with a human health issue. The latter includes two dimensions. The agricultural and agri-food sectors and the policies that influence them have a potential impact on health in terms of both the production of agricultural goods, more specifically production methods, and the consumption of food products, more specifically consumer choices (EPHA, 2016). A first transmission channel encompasses several dimensions related to the use of chemical inputs that can directly impact the health of users and their living environments, the development of antibiotic resistance in connection with the use of antibiotics in livestock farming, and environmental pollution associated with the excessive use of mineral and/or organic fertilizers, the insufficiently controlled use of pesticides, or the excessive emission of harmful pollutants. This first channel of transmission also includes the contribution of agricultural systems to climate change and the degradation of biodiversity, insofar as these two public bads also have negative effects on human health. This first channel clearly corresponds to a double penalty, as the negative effects on health and the environment accumulate. The public policy measures to be implemented follow the same logic found in both Chapters 7 and 8 under the heading of increased environmental protection coupled with an additional health benefit.

The second transmission channel is on the food consumption side. It includes the three dimensions of food safety, nutritional quality, and food security as assessed from the two perspectives of undernutrition and overnutrition, at the level of the population as a whole as well as at the level of individuals and households. In the EU today, the issues of overnutrition, overweight and obesity rates and their negative effects on health are among the most hotly debated, and raise a necessary query as to the possible responsibility of the CAP. The question of extending the CAP to nutritional aspects as part of a move towards a Common Agricultural and Food Policy, which some have called for (see, for example, Fresco and Pope, 2016), is discussed in Chapter 9. This issue requires specific treatment, not least because corrective instruments must first act on demand. They are therefore distinct from those acting on supply, as described in Chapters 7 and 8.

The last chapter of this second part of the book deals with breeding. Animal production and the consumption of animal products are under increasing criticisms of various kinds related

to environmental protection, public health, and farm animal welfare (see, for example, FAO, 2006; Godfray *et al.*, 2018). However, livestock and animal products can also provide positive benefits and services. These include maintaining agricultural activity in areas not suitable for crops; storing carbon, preserving biodiversity, and improving water quality in and through grasslands (especially when grasslands are long-lived and grazed); maintaining and nurturing open and diverse landscapes; and providing quality protein (see, for example, Rosner *et al.*, 2016). In this dual context, Chapter 10 questions the legitimacy and effectiveness of the CAP measures targeting livestock farms and animal sectors.

The CAP, rural development and innovation

In addition to the economic, environmental, and health dimensions, the CAP also aims to promote the development of rural areas, especially since the 1999 reform, which introduced the two-pillar structure of this policy. Pillar 1, which is entirely financed by European resources, groups together measures to support agricultural markets and incomes, and represents the bulk of the CAP budget (around 75%). Pillar 2, co-financed by MS and occasionally by regional authorities, is officially referred to as "rural development". This term is considered to be inappropriate insofar as its primary target is agriculture as part of a wide range of measures covering areas as varied as farm investments, farmer training, environmental protection in agricultural ecosystems, and support for OF. The second pillar's bias in favour of agriculture raises questions as to the place of agriculture in the development of rural territories, the role of agricultural policy in this development, and more generally, the coherence of the different public policies at work in rural territories, including the questions of appropriate spatial levels of intervention and governance. These aspects are the subject of the first chapter of the third part of the book (Chapter 11).

The second chapter of this third part deals with innovation; a cross-cutting theme that is not an objective in itself but which should be mobilized in service of the other objectives of the CAP. Chapter 12 therefore focuses on research and innovation as essential factors in the necessary transition of European agriculture towards greater economic, environmental, social, and health sustainability. In particular, we examine the role that the CAP should play in a context where agricultural knowledge and innovation systems (AKIS) remain largely the prerogative of MS, even if these systems are supported by the CAP or other European policies.

Concluding chapter

As a synthesis of the lessons learned from the various thematic chapters, the Conclusion more specifically addresses three aspects: first, an analysis of the global coherence of our recommendations, including in terms of their links with other policies than the CAP; second, a reading of our recommendations in the light of the ambition and objectives of the European Green Deal for agriculture and food; and third, a critical reading of the June 2021 agreement for the 2023-2027 CAP.

Typical structure of a chapter

With the exception of Chapter 1, which provides a brief history of the CAP, and the concluding chapter, the various chapters are therefore thematic. As far as possible, they are organized according to the same structure. They begin with a description of the issue in the form of an inventory, and continue with a presentation of how the issue has been taken into account within the CAP to date and, if relevant, in other public policies. Then, they propose a critical analysis of this consideration on the basis of state-of-the-art of research. This positive analysis enables public policy recommendations to be formulated from a normative perspective. Where appropriate, the discussion is extended beyond the issue of compatibility (or conversely, incompatibility) between instruments addressing distinct issues that are easy (or more difficult) to reconcile. The chapters are consistent in their structure and development but are nevertheless autonomous and can therefore be read independently.

An analysis of public economics

Even if the disciplines and skills mobilized in this book cover a broad spectrum, including the different sub-disciplines of economics, other human and social sciences, agronomy, zootechnics, and ecology, the general framework of analysis is that of public economics (Laffont, 1988; Varian, 1992).[5] This economic sub-discipline studies the rationale for public intervention and the effects, whether intentional or not, of this intervention. Its scope is both positive (to explain) and normative (to recommend).

Under certain conditions, the competitive market for private property is a Pareto efficient organization for the allocation of goods and resources;[6] that is, an allocation between agents such that it is not possible to improve the satisfaction of one individual without at least deteriorating that of another. Still, under certain conditions (though not necessarily the same ones), any Pareto efficient allocation can be achieved by a competitive equilibrium of private property; in other words, it is possible to decentralize the Pareto optimum through prices. These two propositions are the two fundamental theorems of welfare economics underlying the "liberal ideology" (Laffont, 1988). Extended to several trading economies, they also form the basis for trade liberalization that improves the welfare of countries participating in trade by exploiting (relative to an autarkic regime) the arbitrage gains that can be achieved through the mobility of goods and/or factors of production (see, for example, De Melo and Grether, 1997). Nevertheless, within a country, some industries and/or types of consumers benefit from trade, while others lose out.

At this point, it is appropriate to examine the conditions of validity of these two theorems, in other words to make explicit what is behind the expression "under certain conditions",

5. As part of the work known as «fiscal federalism», it also analyses the optimal geographic levels of public intervention (Oates, 1972).

6.Of Italian origin, Vilfredo Pareto (1848-1923) was a sociologist and an economist. He wrote several major contributions in economics, including a course on political economy (1896) and a textbook on political economy (1909).

because failure to comply with these conditions legitimizes the intervention of the public authorities. The two theorems assume, first, that competition is pure and perfect and that no agent, producer and/or consumer is in a position to exercise market power and dictate all or part of the formation of prices. The theorems also assume that there is a complete set of markets, which is a particularly strong assumption when inter-temporal and uncertainty are taken into account, making it difficult to rely on a complete set of futures[7] and contingent markets.[8] This is likely to be impossible in the case of information asymmetries[9] and transaction costs (Salanié, 2000). They also make the strong assumption that there are neither externalities nor public goods.[10] Finally, the conditions of validity of the second theorem particularly prohibit any form of increasing returns in production.[11]

When the conditions for validation of the two welfare theorems are not satisfied, which is the case for agriculture, it is highly unlikely that the competitive equilibrium of private property is Pareto optimal. This non-optimality paves the way for public intervention to restore the said optimality. In other words, the existence of market failures (uncompetitive markets, market incompleteness, non-convexity of consumption and/or production patterns, externalities, and public goods) legitimizes public intervention. The question then arises as to how such intervention should be designed to be effective, or at least how to be as effective as possible. This analytical grid is used throughout this book both to justify the objectives of the CAP and to define the instruments to be implemented in order to achieve these objectives at the lowest possible cost.

7. A futures market allows an individual to buy or sell an asset at a given period of time at a predefined price. Applied to agriculture, futures markets allow farmers to hedge against price fluctuations and sell their production at a predetermined price.

8. Suppose there are only two states of nature defined by good *versus* bad weather. If there are two contingent markets, one for good weather and one for bad weather, the competitive equilibrium of private property is optimal in the Pareto sense. If this is not the case, this balance is generally sub-optim*al*.

9. Information asymmetry corresponds to a situation in which the different agents, sellers and/or buyers operating on the same market do not have the same information. Adverse selection is an *ex ante* information asymmetry that occurs when, for example, sellers of a good overestimate the quality of the good sold because buyers only imperfectly observe this quality. Moral hazard is a situation of *ex post* information asymmetry when, for example, it is difficult to anticipate the behaviour of buyers after the purchase (e.g., in the case of the insurance market, where the insured may take fewer precautions after taking out an insurance policy).

10. An external effect corresponds to an indirect effect of a consumer's consumption activity or a producer's production activity on other agents: the effect is created by an agent other than the one who is affected and does not pass through the price system. Public goods are an example of a consumption externality of a particular type corresponding to the case where all individuals must consume the same quantity of the good. Specifically, a good is said to be public if its use by one agent does not prevent its use by other agents. A public good is global (respectively, local) if the externality concerns a geographically extended population (respectively, limited to a circumscribed territory).

11. Production returns are increasing if the average cost of production decreases when the quantity produced increases.

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1. A Brief History of the CAP

Vincent Chatellier, Cécile Détang-Dessendre, Hervé Guyomard

The CAP is almost 60 years old. Although the three principles adopted at the Stresa Conference in 1958 (single market, Community preference, and financial solidarity) remain valid, the CAP has undergone substantial changes particularly since 1992. These adjustments are in relation to the objectives and even more so the economic instruments in use.

The economic instruments originally used (namely, guaranteed domestic prices above world prices, export subsidies and import tariffs) served to insulate the EU internal market from global competition (Bureau and Thoyer, 2014). European agricultural production has thus been able to develop rapidly, sheltered from international price fluctuations by exploiting the technological and biological advances made possible by mechanization, plant and animal breeding, and the use of inputs purchased off-farm (such as mineral fertilizers, synthetic pesticides, compound feeds, veterinary drugs, etc.). The expansion and modernization of farms have also played a major role, at the cost however of a reduction in their number and ultimately in agricultural employment. From the mid-1970s onwards, agricultural production in the supported and protected sectors increased more rapidly than that of domestic consumption. As a direct consequence, an accumulation of surpluses became more and more costly to manage by means of various devices such as public storage, export subsidies, or measures to encourage domestic consumption. These imbalances led the European authorities to introduce tools to control domestic agricultural supply in the milk sector (milk quotas in 1984) and the cereals sector (co-responsibility levy in 1986, maximum guaranteed quantities in 1988). On the international markets, the development of European Union (EU) agri-food exports was increasingly criticized by less interventionist competitors (or those who were supposed to be).

Under the pressure of the agricultural negotiations of the Uruguay Round of the General Agreement on Tariffs and Trade[12] (1986-1994), the CAP underwent an in-depth reform in 1992. This took the form of new measures to control supply through a compulsory set-aside of agricultural land and a reduction in the guaranteed prices for cereals, beef, and veal with these price reductions compensated by direct aids. In the course of the successive reforms of the CAP that followed, these reductions in guaranteed prices were extended to several products

12. Better known by its acronym, GATT, for General Agreement on Tariffs and Trade.

with the compensatory aids gradually disconnected from product choices and levels so as to comply with the international commitments accepted under the Uruguay Round (decoupling process). The arrangements for granting aid have since given rise to (and continue to give rise to) lively debates and these arrangements still account for the majority of the budgetary support granted to European farmers. These debates are made all the more complex by the fact that each Member State (MS) has considerable leeway in their application, in the name of subsidiarity, as regards the implementation of decoupled direct aid and, more generally, of the various provisions of the CAP. At the heart of the debates on the reforms that followed the 1992 reform (including the Agenda 2000 reform in 1999, the Luxembourg Agreement in 2003, the CAP Health Check in 2008, and the Ciolos reform in 2013) is the CAP's environmental ambition and the economic instruments to achieve this ambition. The preparation of the post-2020 CAP was no exception in this respect, with the future of direct aid and the effectiveness of measures targeted at environmental protection still at the heart of discussions.

The aim of this chapter is to present the main stages in the evolution of the CAP from its origin to the present day. It is not intended to provide a detailed and exhaustive presentation of the various amendments adopted (indeed, a dedicated work, even a very voluminous one, would not suffice) but it more modestly reviews the key developments that make it possible to understand the logic of the changes and to position the current debates within an historical process that should be kept in mind.

The chapter is composed of five sections: the first section deals with the creation of the CAP, its context, objectives, principles, and implementation; the second recalls the first dysfunctions of the CAP, from the mid-1970s to the 1992 reform; the third section deals with the 1992 reform, which is undoubtedly the most profound rupture to have occurred; the fourth presents the reforms that have taken place since 1999; and the fifth section summarizes the lessons of this unfinished process of reform in order to highlight the issues at stake for the CAP of tomorrow and after tomorrow.

The origins of the CAP

In the aftermath of the Second World War, Europe's influence on the international stage where the United States (US) and the Soviet Union were at odds was weak. The European continent had to rebuild its entire economy. In the agricultural sector, the productivity of land and labour was limited and mechanization was poorly developed. Production structures were small and obsolete. The European population was suffering from food shortages requiring for example the use of rationing tickets in France until 1 December 1949.

As early as 1947, European countries received economic and financial assistance from the United States under the European Recovery Programme, better known as the Marshall Plan.[13] Through this plan, the US also sought to contain the spread of communism on the European continent and to secure markets for its exports. In addition to investments to modernize

13. This plan was signed on 20 September 1947 by 16 European countries, joined by the Federal Republic of Germany in 1949.

European economies including in the agricultural sector, US aid (in the form of cash grants, in-kind donations, and loans) was used to buy the goods that were essential to restart the European economies. This aid totalled US$13 billion (about US$150 billion in present value), with half going to the United Kingdom (UK) and France. This plan enabled the start of the modernization process of agricultural economies in Western European countries, and in particular their mechanization (thanks notably to the dispersal of tractors manufactured in the US). At the same time, European countries adopted additional measures to restart their economies. For example, in 1946, France introduced a status for tenant farming[14] and created the *Institut National de la Recherche Agronomique* (INRA).[15]

Following the European Coal and Steel Community (ECSC), which began in 1951, the creation of the European Economic Community (EEC) a few years later marked the beginning of the CAP with the signature of the Treaty of Rome on 25 March 1957. At that time, it brought together six European countries: Belgium, France, Italy, Luxembourg, the Netherlands, and the Federal Republic of Germany. Its aim was to promote economic and social progress by eliminating intra-European barriers within the framework of a customs union with a common external tariff and by allowing the free movement of goods, persons, capital, and services on the one hand and the harmonization of national economic policies in the fields of agriculture, transport, trade, and competition on the other.

Article 39 of the Treaty of Rome defines the five objectives assigned to the CAP. These are: first, to increase agricultural productivity by promoting technical progress that will ensure the rational development of agricultural production and the optimum utilization of production factors, in particular the labour force; second, to ensure a fair standard of living for the agricultural community, in particular by increasing the individual incomes of those working in agriculture; third, to stabilize markets; fourth, to ensure the security of supply for European consumers; and lastly, to ensure reasonable prices in supplies for consumers.

Pursuant to Article 43 of the Treaty, the first EEC Agricultural Conference was held in Stresa, Italy, from 3 to 12 July 1958. The three founding principles of the CAP were established; namely, market unity (free agricultural trade between MS), Community preference (common customs duties imposed on imports from non-European third countries), and financial solidarity (revenue and expenditure pooled within a common budget). These three principles are still valid today and make the CAP the most integrated European policy.

The economic instruments for implementation were still to be defined. There was consensus on the need to encourage the development of European agricultural production by guaranteeing producer prices. Support therefore took the form of public purchases at guaranteed prices fixed annually as soon as European market prices were lower than these guaranteed prices. This price support had to be supplemented by border mechanisms in order to be operation*al*. To keep domestic prices above world prices, imports from non-European third

14. Tenancy and sharecropping are two types of rural leases that differ in the remuneration of the landowner: in the case of tenancy, the landowner receives a rent of a predetermined amount; in the case of sharecropping, he/she receives a share of the farm's production.
15. National Institute for Agronomic Research.

countries had to be limited: this was achieved by means of customs duties on entry into the European market with these duties varying over time (that is, they were adjusted in line with world prices so as to always ensure effective protection of the European market). In order to dispose of potential surpluses on the international markets, European prices had to be brought back in line with world price levels: this was accomplished by granting export subsidies, which were also variable and therefore even higher (resp., lower) than the differences between domestic and world prices were large (resp., small).[16]

At the beginning of the 1960s, 21 Common Market Organizations (CMO) covering different agricultural products were established. Each CMO had a basic regulation specifying the detailed rules for public intervention on the markets, the payment of production and/or storage aid, and the possible control of production (production quotas), as well as production and marketing standards and trade arrangements with third countries. These 21 CMOs can be grouped into four categories. The first category (by far the most important as it covered around 70% of production) was based on a model of guaranteed prices, import duties, and export subsidies. This category covered cereals, sugar, beef, butter, and skimmed milk, among others. In the case of pig meat, certain fruit and vegetables, and table wine, intervention was mainly in the form of private storage aid. The second category covered about 20% of production (poultry, eggs, flowers, and certain fruit and vegetables) and included only border measures. The third category applied to productions, for which the EU had undertaken, in the context of the GATT multilateral negotiations, not to change import duties: the processors of oilseeds, protein crops[17] and cotton received direct aid to compensate for the differences between internal and world prices and to encourage the use of domestic seeds rather than foreign seeds. Finally, the fourth category, which was marginal, concerned small production areas (hemp, hops, flax, etc.) and these areas were encouraged by a flat-rate aid.

The first CAP failures

Until the mid-1970s, the CAP was an unquestionable success given its initial objectives. The increased productivity of the land and labour made it possible to increase domestic production and ensure the security of supply for European consumers. Since then, the EU has gradually moved from being a net importer of agricultural and agri-food products from temperate zones to being a net exporter, despite successive enlargements to countries that were most often net importers.[18] The successful and ongoing stabilization of European agricultural markets

16. In European jargon, variable import duties were called variable levies and variable export subsidies were called export refunds.

17. Oilseeds (rapeseed, soybean, sunflower, etc.) are oil-rich plants used for food, energy or industrial purposes: the residues from extraction are oilcakes, which are rich in protein and mainly used to feed livestock. Protein crops (beans, lupin, protein peas, etc.) are grown for their protein-rich seeds used for animal feed (or human food). Oilseeds and protein crops make up oil-protein crops.

18. Originally composed of six Member States (MS), the EU grew to nine MS in 1973 (to include Denmark, Ireland and the United Kingdom), to 10 in 1981 (Greece), to 12 in 1986 (Spain and Portugal), to 15 in 1995 (Austria, Finland and Sweden), to 25 in 2004 (Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia), to 27 in 2007 (Bulgaria and Romania) and to 28 in 2013 (Croatia).

is also a credit to the CAP. As for domestic consumer prices, they were certainly higher than world prices but have nevertheless followed (though with some delay) the downward trend of world prices in real terms: farmers, therefore, distributed more to consumers than total factor productivity gains they achieved, a situation that was not without a negative impact on the evolution of agricultural incomes. Finally, European food has rapidly become and still is today one of the safest and most diversified in terms of health (though it is a situation that should not hide the occasional crises).

Nevertheless, in December 1968, the Mansholt memorandum (Sicco Mansholt was the Commissioner for Agriculture at the time) stated that the CAP had reached certain limits: a victim so to speak of its success (Petit and Viallon, 1970). CAP agricultural expenditure was increasing inexorably without any improvement in farm incomes. Mansholt proposed to withdraw five million hectares of arable land[19] from production and to accelerate the restructuring of the sector since the smallest structures were doomed to disappear. The Mansholt plan was strongly contested by the farming profession with the Brussels demonstration of 23 March 1971 bringing 100,000 farmers together to protest the plan. Several of the proposed provisions were abandoned and the plan was reduced to three European directives adopted in 1972. These directives were much less ambitious and concerned the modernization of farms, the cessation of farming activities, and the training of farmers.

More generally, several drawbacks in the structure and in the running of the original CAP appeared from the mid-1970s onwards and became more significant in the 1980s. They can be summarized as follows:

- The CAP failed to stem the downward trend in real farm incomes. Nevertheless, inter-annual fluctuations in incomes were greatly reduced for farms specialized in products that fully benefited from the CAP (mainly cereals, sugar beet, milk, and beef);
- The rapid increase in the agricultural budget expenditure was a direct consequence of the transition from a deficit to a surplus situation. The surpluses could only be disposed of to third countries through increasing export subsidies. The cost of the CAP was therefore increasing as a result of the threefold expenditure on storage, the disposal of surpluses with refunds, and even the destruction of surpluses. The problem was not only that this expenditure was increasing but also and perhaps above all that the original CAP instruments were not able to counteract this growth. The European authorities attempted to control expenditure more effectively through a series of one-off corrective measures but without calling into question the philosophy of the original CAP: a co-responsibility levy paid by milk producers (1977); a mechanism for reducing the public guarantee leading to a reduction in prices and/or aid in the event of overproduction (1981); the limitation of aid expenditure on oilseeds (1986); and a reduction in the period during which public purchases at guaranteed prices were possible for cereals (1986-87). The introduction of milk quotas in 1984 remains the most emblematic corrective measure, using production quotas to limit the benefit of guaranteed prices to predetermined volumes of milk with any overrun of the quota leading to a heavy taxation on deliveries. They were introduced despite opposition from the farming profession.

19. Land that can be ploughed or cultivated (from the Latin *arabilis*: ploughable).

Initially intended to apply for a few years, they were only abolished more than 30 years later in 2015; once more turning against the opinion of the majority of agricultural professionals;
• Support[20] was unevenly distributed among producers (at the expense of the smallest structures), among production types (to the detriment of Mediterranean products), and among countries (to the detriment of the Southern European countries that joined the EU in the 1980s);
• The CAP gradually emerged as having negative impacts on natural resources and the environment. Guaranteed producer prices reinforced the interest in intensifying agricultural practices; that is, seeking the highest partial productivity of the land by increasing the use of irrigation, mineral fertilizers and/or crop protection products, converting areas still under grass to croplands or maximizing the number of animals per unit area. This is in the context of the scarcity of the land factor in many European regions and therefore with strong competition for its use; and
• The last drawback is extern*al*. It is of the utmost importance as it has largely dictate the shape of the first major reform of the CAP in 1992 and subsequent reforms. In concrete terms, this last drawback is linked to the dissatisfaction of agricultural and agri-food exporting countries and firstly, the US and the Cairns Group countries.[21] These countries considered that the CAP allowed the EU to compete unfairly on international markets and thus to gain international market share at their expense. The focus was not only on export refunds, but also on other CAP instruments as long as they encouraged production. This so-called "trade-distorting" situation led to the US making the liberalization of agricultural policies a central issue of the Uruguay Round.

The 1992 reform

Far from liberalizing European agricultural markets and abolishing public intervention in favour of European farmers, the 1992 CAP reform was, nevertheless, a significant breakthrough. It inaugurated the process of replacing a policy of price support at the expense of consumers by a policy of support *via* direct aids at the expense of taxpayers; a process, which would then spread over several future reforms.

The 1992 reform had two main objectives: to better control agricultural budget expenditure and to enable the EU to accept an agricultural agreement in the Uruguay Round, an agreement whose main lines were beginning to emerge (for example, through a reduction of trade barriers and the limitation of internal measures as long as they encouraged production). The path chosen was one of stricter control of supply and above all of bringing European and international prices closer together. This second provision made it possible to accept without any real damage a reduction in import customs duties on the European market and

20. The support to be considered is the total support composed of support through prices charged to the consumer on the one hand and of support through direct aids charged to the taxpayer on the other hand.
21. Created in the Australian city of Cairns in 1986, just before the launch of the Uruguay Round, the Cairns Group brought together 19 agricultural and agri-food exporting countries in favour of agricultural trade liberalization, including South Africa, Argentina, Australia, Canada, and New Zealand, as well as several Asian countries (Indonesia, Malaysia, Thailand, etc.).

export subsidies on non-European countries. Two years later, both provisions would allow the EU to sign the Uruguay Round Agreement on Agriculture by obtaining an exemption from reduction commitments for its new domestic support policy (Guyomard *et al.*, 1992).

It was therefore decided to reduce the guaranteed prices for cereals (-30%) and beef (-15%), and to reduce by more than half the possibilities for public purchase of beef at guaranteed prices (from 750,000 tonnes in 1993 to 350,000 tonnes in 1997). Direct aids were granted to the affected farmers up to an upper limit defined at the level of each MS. These aids were calculated on the basis of hectares (cereals) or livestock (beef) in order to fully offset the negative impact of the fall in guaranteed prices on incomes. In the case of cereals and oilseed crops, compensatory aid per hectare was therefore fixed at higher levels in areas where pre-reform yields per hectare were higher. The European authorities explicitly acknowledged that crop producers were more negatively affected in these areas but on the other hand did not seek to respond to the criticism of an unequal distribution of support (to the detriment of the smallest structures measured in terms of the number of hectares). For their part, supply control measures took several forms: the extension of milk quotas; an obligation to freeze a certain percentage of cereal and oil-protein crop land; the granting of compensatory beef premiums within the limit of loading thresholds corresponding to maximum numbers of animals per hectare; and the payment of additional aid for more extensive livestock farming practices (measured by fewer animals per hectare) and/or for the afforestation of agricultural land.

The first paradox of the 1992 CAP reform is that it automatically led to an increase in budgetary expenditure with part of the price support being replaced by direct aid measures. However, this expenditure is currently more predictable. Since the compensation of price reductions by direct aid is (theoretically) total, support to European agriculture (whether paid by the consumer or the taxpayer) does not decrease (or only very little due to supply control measures).

An ongoing process of reform

Since 1992, the CAP has moved from one reform to the next. The successive enlargement of the EU has altered the historical political balances that have prevailed within a smaller economic Union and above all have considerably increased the diversity of European agriculture with the entry of countries where farming populations are still large, production structures are small and obsolete, and the technical and economic performance of farms is often weak. The ongoing process of reform is therefore understood in part by the gradual implementation of the CAP instruments among newcomers, whose understandable desire is that EU membership should offer them benefits as quickly as possible from the same provisions as those offered to member countries for a longer time. It is also explained by the difficulties faced in taking up new challenges, particularly environmental ones. Part of the solution will be to offer the MS even more flexibility in the national implementation of the CAP by increasingly applying the principle of subsidiarity.

1999: Agenda 2000 reform

The so-called "Agenda 2000" reform adopted in March 1999 is a further step in the same direction as that taken in 1992 (Desquilbet *et al.*, 1999). It continues the reduction of guaranteed prices for cereals (-15% in two steps) and beef (-20% in three steps) and extends this reduction to guaranteed prices for butter and skim milk powder (but only from 2005-2006). It maintains the set-aside rate for cereal and oilseed areas at 10%, limits public purchases of beef to a "safety net", and extends milk quotas once again. A major difference compared with 1992 is that compensation for price reductions through direct aid (still based on hectares or numbers of livestock) is now only partial due to budgetary constraints. The reform introduces the principle of eco-conditionality for direct aid; that is, making the granting of direct aid conditional on compliance with environmental criteria while leaving each MS free to implement it. This provision will be seldom applied.

Budgetary constraints have also led to the structuring of the CAP into two distinct pillars: the first centred on markets and farm incomes; and the second on rural development. While expenditure under the first pillar is fully financed by the European budget, expenditure under the second pillar is co-financed by the countries and/or regions. The wording of the second pillar (that is, "rural development") is misleading as its target remains agriculture with only three measures being more general in scope (village renewal, the development of craft and tourism activities, and essential services for people in rural areas). The Rural Development Regulation (RDR) is a menu of 22 measures from which MS choose those they wish to apply, with the exception of the compulsory Agri-Environmental Measures (AEMs). AEMs are multi-annual contracts that compensate agricultural producers for the additional costs and/or loss of profit resulting from the adoption of more environmentally friendly farming practices. In addition to the AEMs, the most notable measures of the RDR are payments to farmers in less-favoured areas or in areas with natural constraints, investment aid, setting up support measures, and retirement incentives.

2003: Luxembourg Agreement

The 2003 reform took place in the dual context of: first, the agricultural negotiations of the Doha Round[22] of the World Trade Organization (WTO), which started in 2001 and whose rapid conclusion was anticipated at the time; and second, the enlargement of the EU to include the Central and Eastern European Countries (CEECs), which occurred in 2004 and 2007 (Butault *et al.*, 2003). Direct aid under the first pillar is now decoupled; it is disconnected from product choices and volumes, at least in theory (Guyomard *et al.*, 2007). Their payment is conditional on compliance with regulations relating to the environment and human, animal and plant health, as well as the maintenance of Good Agricultural and Environmental Conditions (GAECs).

The decoupling of agricultural income support is implemented through the instrument of the Single Farm Payment (SFP), which replaces compensatory direct aids. The modalities for implementing SFPs are defined in such a way as to allow their international classification

22. The creation of the WTO on 1 January 1995 was a major outcome of the Uruguay Round.

in the WTO Green Box (measures authorized without limit at the WTO). Compensatory aids, on the other hand, were placed in the Blue Box. SFPs remain based on hectares that are no longer those of the current year but those of an historical period, corresponding to the three years of 2000, 2001, and 2002. The MS are given considerable flexibility in terms of the date of implementation (from 2005, 2006, or 2007), the intensity of decoupling (total or only partial, with the maintenance of aid coupled to certain productions), and the geographical scope of application (at national or regional level).

The reform strengthens the second pillar, which is endowed with increased financial resources through a transfer of funds from the first pillar. Nevertheless, these resources remain significantly lower than those of the first pillar (around 10% and 90%, respectively). This second pillar is enriched by new measures including product certification and farm upgrading.

2008: CAP Health Check

CAP reforms after 2003 are more difficult to summarize, not because they follow a different path but because they include provisions designed to give MS even greater room for manoeuvre to enable them to achieve a greater internal “buy-in” of these reforms. Some speak of "CAP *à la carte*" to refer to the changes that at least in theory aim to make the CAP simpler, more flexible, and greener.

As part of the desired simplification, the reform adopted in November 2008 (better known as the CAP Health Check) resulted in the adoption of a single regulation, with 198 articles replacing 41 acts totalling more than 600 articles. The legal arsenal of the CAP was now structured into four main acts dealing with the single CMO,[23] the direct aid scheme, rural development, and financing, respectively.

The key measures of the Health Check relate to the following: first, the removal of the set-aside conditions in a context marked by the 2007-2008 surge in world agricultural prices and the development of first-generation biofuels produced from crops that can also be used for food purposes; second, the abolition of milk quotas from 1 January 2015, with the definition of a transitional period during which the authorized volumes are gradually increased (the so-called "soft landing" process); third, an increase in the rate of compulsory modulation applied to decoupled payments to supplement the second pillar; fourth, an increase in the rate of the decoupling of first pillar direct aid; and finally, an invitation to further harmonize the amounts of decoupled direct aid paid per hectare both between countries and between farms within the same country or region (Chatellier and Guyomard, 2011).

2013: Ciolos reform

After three years of intense negotiations orchestrated by the Agriculture Commissioner, Dacian Ciolos (2010-2014), a new reform of the CAP was decided upon in June 2013 (Bureau and Mahé, 2013; Swinnen, 2015).

23. The single CMO replaces the 21 pre-existing CMOs, the creation of which was approved by the European Ministers of Agriculture on 21 June 2007.

The reform maintained the two-pillar structure of the CAP and offered more room for national manoeuvre. It did not impose a further reduction in guaranteed prices as European prices were (for most products) closely aligned with world prices at the time. It abolished sugar quotas as of 1 January 2017. Above all, it defined a new organization of direct aid under the first pillar within the framework of a tiered system that included (European Commission, 2013):

- A basic payment per hectare;
- A green payment, covering 30% of the envelope of direct payments allocated to each MS, paid per hectare on the condition that three environmental criteria were met: first, minimum crop diversification; second, the maintenance of permanent grassland; and third, the maintenance of a minimum percentage of areas of ecological interest (wetlands, wooded areas, hedgerows, etc.);
- An optional specific payment in favour of young farmers, in the form of a top-up payment within the limit of 2% of the first pillar budget envelope;
- An additional payment to farms located in areas with natural constraints at the choice of the MS and within the limit of 5% of the envelope;
- A coupled support to specific productions at the choice of the MS and within the limit of 12% of the envelope; and
- Finally, each MS was permitted to introduce a redistributive payment by increasing the unit amounts of aid paid on the first hectares by means of a levy on the basic payment up to a maximum of 30% of the envelope.

For the sake of simplification, the reform introduced an alternative system for smaller producers in the form of a single aid. In order to increase the social legitimacy of the first pillar while its environmental legitimacy was sought through the greening, aid was reserved for active farmers only. Last, MS could decide on a maximum amount of first pillar aid per farm (capping) and a scheme for reducing it according to the economic size of the farms (degressivity).[24]

The agricultural and to a lesser extent forestry bias of the second pillar was maintained. With a view to increasing efficiency six priorities for action were defined, only one of which is non-sectoral in scope. These six priorities are: first, knowledge transfer and innovation in agriculture, forestry and rural areas; second, the viability and competitiveness of all types of agriculture in all regions and the sustainable management of forests; third,

the organization of agri-food chains and risk management in agriculture; fourth, the protection of agricultural and forest ecosystems; fifth, the efficient use of resources and the reduction of greenhouse gas emissions in agriculture, food and forestry; and last, social inclusion, poverty reduction, and economic development in rural areas.

What form will the CAP take after 2020?

Though the ink on the Ciolos reform is barely dry, discussions on the future CAP have already begun. It is within the framework of these discussions that the European Commission has

24. An optional provision, which very few MS have mobilized to date.

presented its legislative proposals for the post-2020 CAP, which can be summarized using three key terms: simplification, increased subsidiarity, and increased environmental ambition (European Commission, 2018).

The first two aims are sought within the framework of a new model of governance and division of tasks between the European and national levels. The EU defines the common framework; in particular, the objectives, the set of instruments that can be used to achieve them, and the indicators of success at the European level. This common framework is deployed in each MS through the definition of a National Strategic Plan (NSP). On the basis of the identification of national needs, the MS select the priority objectives and the most appropriate instruments, and then propose monitoring milestones and success indicators at the national and (sometimes) regional levels. In terms of the environmental ambition, this would be increased by means of the following: first, through the strengthening of cross-compliance, which more or less integrates the three former greening measures (now abolished); second, through the implementation within the first pillar of a new instrument known as the "eco-scheme", aimed at encouraging the adoption of more environmentally and climate friendly farming practices to go beyond cross-compliance and that would not have previously been taken into account within the framework of the Agri-Environmental and Climate Measures (AECMs) of the second pillar (which remain largely unchanged); and third, by means of modalities that compel each MS to devote the required budgetary resources and to provide the possibility of going beyond these mandatory minima (by strongly endowing the eco-scheme, transferring resources from the first pillar to the second, etc.).

While subsidiarity is evident, it is far from clear that these proposals are a simplification with all levels of governance (European, national, and regional) and all transaction costs (both public and private) taken into account. The same applies to the increased climate and environmental ambition: the lessons of the past cast doubt on this since the argument of a loss of intra-European competitiveness could lead a majority of MS (encouraged by their farmers) to opt for a status quo at best or a lesser environmental and climate ambition at worst (Bureau, 2018; Guyomard *et al.*, 2020). We will analyse in more detail the June 2021 Agreement for the 2023-2027 CAP, more specifically its compatibility with our recommendations and its capacity to contribute to the European Green Deal ambition.

An unfinished process of reform

What can we learn from the unfinished process of reform that has been underway since 1992? Essentially, we have a guideline even if this may have been obscured by multiple (extremely) technical details and a set of devices that were adopted only to limit the adverse effects for established producers who had previously benefitted most from the CAP.

This guideline is the substitution of a support policy through prices with a policy of support through direct aid, the latter being progressively more and more disconnected from product choices and levels (the decoupling process) and conditional on compliance with increased environmental and climate requirements (the cross-compliance process). With this

substitution and decoupling almost complete (with the exception of coupled payments to certain sectors), the question arises as to the path to be followed beyond 2020 and in the longer term.

What kind of future exists for decoupled aid in a context where its distribution between countries and between producers remains unequal (weak social legitimacy) and where its environmental impact is neutral at best, even taking into account the overall conditionality that is too weak to have much of a positive impact on the environment (weak environmental legitimacy)? This future also should take into account the fact that for a high number of farms direct aids from the first pillar represent a significant share (sometimes more than 100%) of farm incomes: this makes their replacement, let alone their suppression, impossible to imagine without providing for a transition phase to allow the existing structures to adapt to the new rules of the game that will be required.

European agriculture continues to face considerable challenges that it has not yet been able to manage effectively:

- The globalization of agricultural economies and the emergence of new players on the international scene that are both demanding that European agriculture be competitive, all the more so as the multilateral discipline of the WTO is being replaced by bilateral agreements;
- The value creation by farmers and its conservation at the farm level in a context of domination by actors downstream of the latter (as well as upstream);
- The increase in risks of all kinds (climatic, health, economic, etc.) and the means to deal with them, both *ex ante* (the resilience of agricultural and food systems in the face of these risks) and *ex post* (the effectiveness of public and/or private risk management systems);
- The environmental sustainability of European agriculture, while agro-ecosystems continue to deteriorate, despite the corrective, binding measures (cross-compliance) and/or incentives (AECMs), which have so far appeared to be (clearly) insufficient;
- The contribution of agriculture to the economic and social development of rural areas and the coherence between agricultural policy and other territorial and regional development policies in a context where farmers today represent only a very small minority of the population in many rural areas and where these areas above all need a supply of public and private services of equal quality to that of more urbanized areas;
- The renewal of generational engagement in agriculture, in a context where 31% of the EU agricultural population is over 65 years of age, and 25% is between 55 and 64 years of age (European Commission, 2017); and
- The "new" demands and fears within European society, with all of its diversity: in relation to local products, animal welfare, the safety of bio-technological innovations, and questions about the health risks of the excessive consumption of meat products or ultra-processed products, etc.

These various issues will be discussed in the following chapters of this book.

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Part I

The CAP and the Economy

Introduction

Cécile Détang-Dessendre, Hervé Guyomard

The original objectives of the CAP as defined by Article 39 of the Treaty of Rome gave priority to the economic aspects with the following intention: to increase agricultural productivity by developing technical progress and ensuring optimum use of the factors of production, in particular labour; to ensure a fair standard of living for the agricultural community; to stabilize markets; to guarantee the security of supply; and to ensure reasonable prices for consumers. These economic objectives remain today, even though the formulations have since changed and additional objectives added, including economic ones. For example, the legislative proposals for the post-2020 CAP include three specific objectives focused on the economy: first, to promote sustainable farm incomes and resilience in the European Union (EU) in order to enhance food security; second, to improve the adaptation to market needs and increase competitiveness, including through a stronger focus on research, technology, and digitization; and third, to improve the position of farmers in the value chain (European Commission, 2018). It is mainly in terms of the instruments mobilized to serve these economic objectives that the CAP has significantly evolved (see Chapter 1). Export subsidies have been withdrawn. Guaranteed producer prices and customs duties have been considerably reduced. The instruments serving the economic objectives of the CAP today are decoupled direct aid, direct aid coupled with certain productions, sectoral modernization and structuring programmes, crisis and risk management tools, and investment support and aid for specific production systems, such as Organic Farming (OF).

The first part of this book focuses on the economic aspects of the CAP, targeting farm incomes (Chapter 2), employment (Chapter 3), trade (Chapter 4), the distribution of value between the different actors in the agri-food chains (Chapter 5), and *ex post* crisis and risk management (Chapter 6).[25]

The CAP and farm incomes

Chapter 2 focuses on a primary objective of the CAP that has remained unchanged despite successive reforms; namely, agricultural income support. More specifically, it addresses four key issues: first, the reality of the dependence of agricultural income on budgetary support, in particular on decoupled direct aid from the first pillar; second, the effectiveness of this decoupled aid relative to other instruments of agricultural income support; third, the

25. Aspects relating to *ex ante* risk management through the implementation of practices and production systems to better address these risks are discussed in Chapter 8 on the agro-ecological transition of European agricultural and agri-food systems.

distribution of decoupled aid between farms according to their economic dimension and their productive specialization (in the context of the many who claim that this distribution is too unequal and/or too inequitable);[26] and last, the legitimacy of including an explicit objective of agricultural income support in the CAP. This chapter also provides an opportunity to highlight the numerous ambiguities that lie behind the somewhat misleadingly simple expression of "agricultural incomes".

The CAP and agricultural employment

Employment in the agricultural sector has been constantly declining in all MS as the result of a decrease in the number of farmers not adequately compensated by salaried employment. Moreover, the farming population is ageing: in 2016, more than the half of the EU farmers were over 55 years old. The CAP has historically supported the transformation of agricultural structures for a more productive European agriculture, encouraging the enlargement of farms, investments, and the optimal use of resources, in particular labour. The current situation calls into question a system that would tend towards an agricultural sector "without farmers", while social and environmental issues bring people back to the heart of the European agricultural system.

The evolution of agricultural structures and employment in the EU was reviewed in the first section of this chapter. The second section focuses on the main tools of the CAP 2014-2020 and national policies of MS that influence agricultural employment. The impacts of budgetary supports from the first and second pillars are discussed as well as aids to encourage young farmers and supports for agroecological practices. Concerning national schemes, two main domains likely to have an effect on employment are considered: access to land, and fiscal and social measures. The third section presents recommendations for a more ambitious CAP concerning employment in agriculture, to engage young people in considering the agricultural sector as a career opportunity, and to support labour-intensive practices.

The CAP and international trade

For a long time, European agriculture has been sheltered from fluctuations in world markets and prices, with tariff and non-tariff barriers to limit imports and the granting of export subsidies, which by bridging the gaps between domestic and international prices has allowed surpluses to be disposed of at world prices in non-European third countries. The multilateral discipline of the World Trade Organisation (WTO) codified in the Uruguay Round Agreement on Agriculture signed in 1994 in Marrakesh led to the gradual elimination of agricultural

26. Thus, for example, the (French) Court of Auditors judges the distribution of direct aid under the first pillar to be «very unequal [in France], based on past historical situations», noting that in 2015, «10% of beneficiaries received less than EUR 128 per hectare of decoupled direct aid while at the other end of the distribution, 10% of beneficiaries received more than EUR 315 per hectare». It adds that the «effects [are] at best uncertain on income, on the economy of farms and on the environment» (Court of Auditors, 2018).

export subsidies and to the discipline of entry protection instruments, without, however, moving towards their cancellation. The Doha Round, which was initiated in 2001 and was theoretically supposed to last three years, is still not closed. Its outcome is highly uncertain, particularly due to deep-rooted disagreements on the agricultural component (Bellmann *et al.*, 2012). In practice, multilateralism has now given way to bilateralism, which is reflected in the multiplication of bilateral agreements in which agriculture is very often an obstacle.

In this context, Chapter 4 begins by tracing the main developments in European agri-food trade with non-European countries, both for exports and imports. Far from being the fortress often denounced, the factual analysis shows that the EU is simultaneously the world's largest exporter of agricultural and agri-food products and the largest importer. It also shows that both exports and imports tend to grow. Nevertheless, this overall picture deserves to be nuanced according to the products, their destinations, or their origins. In a second section, Chapter 4 provides a retrospective analysis of the consequences of the Uruguay Round Agreement on Agriculture for European agriculture and questions the impact of the current failure of multilateralism. The last section then looks at the place of agriculture in the bilateral agreements negotiated and/or prepared by the EU.

The CAP and value sharing

Chapter 5 focuses on the issue of the distribution of value between the different actors of the agri-food chains.

The work conducted by the Observatory of Food Price Formation and Margins (*Observatoire de la Formation des Prix et des Marges*)[27] enables the value of French food consumption to be expressed as the sum of the added values distributed throughout the different branches of the national economy (the remuneration of primary production factors in these branches) and values transferred abroad (the imports of intermediate and final goods), to which taxes on inputs and consumption must be added. In 2014, out of EUR100 of food expenditure, the value added captured by the agricultural branch was only EUR6.5. The other added values accounted for the greater share (that is, EUR58.6) broken down as follows: EUR15.4 in shops, EUR14.4 in services, EUR13.7 in restaurants, EUR11.9 in food processing industries, and EUR3.2 in other industries. Imports accounted for EUR25.1 and taxes for EUR9.8 (*Observatoire de la formation des prix et des marges des produits alimentaires*, 2018). Monitoring this breakdown over the long term is only possible by considering food expenditure, excluding catering expenditure. On this basis, in France, the weight of agriculture, fisheries, and aquaculture has decreased by more than 35% between 1999 and 2009, followed by a sharp increase in 2010, and since then, it has remained around a level 25% lower than in 1999. This decline in the share of value added in the primary sector has benefited imports and, to a lesser extent, trade, while the relative imports of services and industries are declining.[28]

27. https://observatoire-prixmarges.franceagrimer.fr.
28. To the best of our knowledge, there is no work available at the EU and MS levels that would allow us to compare the French situation with that of its neighbouring countries.

In a general way, two main factors explain the distribution of value between the different actors in the food chain and its evolution over time. First, the lengthening of the food chain, from the agricultural producer to the final consumer, induced by the development of processed products and the increased incorporation of services leads to a decrease in the share of wealth belonging to the agricultural sector. The less industrial processing of products and the shortening of distribution channels, in particular through the development of on-farm processing and short supply chains, whether local (sales on the farm, at local markets or distributors) or not (internet), are developments likely to counteract this first structural factor that is unfavourable to the agricultural sector. The second element relates to the relationship between the prices of finished products and the prices of agricultural products. These relationships are the direct result of market structures and mechanisms, both of which are influenced by public policies; not only by the CAP but also and perhaps above all by competition law. Market structures and their regulations determine the balance of power between actors. It must therefore be acknowledged that the economic, technical, and financial concentration of firms downstream of farms puts the latter in a weaker position in any trade negotiations. Nevertheless, the rules of competition (which can be seen as the counterpart and safeguard of the free movement of goods) are there to prevent excessive concentrations, abuses of dominant positions, or cartels. The CAP rules on the fixing of agricultural prices and the organization of agricultural producers can also have an impact on price relations.

Chapter 5 then returns to the difficult reconciliation of two major European policies, the CAP and competition policy, which both directly influence the distribution of value along the food chain.

The CAP and crisis and risk management

There is growing instability in agricultural markets, prices, and incomes at the global and European levels under the influence of climatic, health, economic, and political factors. The EU is now much less protected from international market and price fluctuations in the context of the globalization of agricultural economies and the dismantling of the EU policy of guaranteed prices for agricultural producers, export subsidies, and import tariffs. Agricultural income crisis situations are increasing within the EU albeit in different ways depending on countries, products, and production systems. To address this situation, the CAP has recently developed a set of tools for *ex post* crisis and risk management.

After a brief history of the measures used to deal with crises and risks since the origins of the CAP, Chapter 6 describes the tools currently available for this purpose. With the exception of the crisis reserve mechanism, which belongs to the first pillar, specifically dedicated tools come under the second pillar, such as support for investments in disaster prevention and adaptation, subsidies for mutual funds, and insurance premiums.[29] These European measures are supplemented by national tax instruments designed to encourage precautionary

29. Direct aid under the first pillar also helps to stabilize farm incomes, as it corresponds to a certain transfer that does not fluctuate according to market and price conditions.

savings or income levelling over time. At the European level, there are also some remaining market management instruments, such as public storage or public aid for private storage. These instruments are certainly at much lower levels today than they were three decades ago but may still be activated in an increased and prolonged manner. Finally, at EU or MS levels, exceptional interventions are always possible (such as, aid for the voluntary reduction of volumes produced, public reimbursement of loan repayments, etc.), as was the case during the livestock crisis in 2015 and 2016 (Mahé and Bureau, 2016). Generally speaking, the *ex post* crisis and risk management "toolbox" of the current CAP is based on the theoretical recommendations of public economics, distinguishing risks according to their frequency and intensity, and modulating public intervention according to these two parameters (OECD, 2009).

This "toolbox" is currently under-utilized, and it is important to understand why this is the case. Beyond the declarations of principle made by the actors, it is particularly important to analyze the determinants of agricultural producers' behaviour in the face of risks, and to assess whether *ad hoc* political interventions by European and/or national authorities are significant obstacles to the development of private, public, and public-private *ex post* risk management tools. More generally, crisis and risk management should be thought of holistically, by taking into account all public and private systems, including those specifically dedicated to crisis and risk management and those that have indirect impacts on them and/or their consequences. This would avoid crowding out effects (that is, the low attractiveness of one instrument simply because of the existence of another) and redundancies between public and private instruments.

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2. The CAP and Farm Incomes

Vincent Chatellier, Hervé Guyomard

Farmers in the various Member States (MS) of the European Union (EU) receive the CAP budgetary support from European resources supplemented by national and regional resources. EU funds are the most important. Over the budget period 2014-2020, they amounted to EUR58 billion annually, or 37% of the total EU budget. The successive reforms of the CAP implemented since 1992 have led to the replacement of price support at the expense of the consumer by support *via* direct aid funded by the taxpayer (see Chapter 1). This substitution, however, does not mean that price support is zero today, notably because tariff and non-tariff protection remains in place on entry to the EU market (see Chapters 1 and 3).[30]

This chapter focuses on support for European agriculture and its farmers. It is organized into three sections. The first section, which is descriptive in nature, makes it possible to position total support for European agriculture relative to its competitors, and to characterize the temporal evolution of the various forms of this support. The second section reviews the criticism often made of a (too) inequitable distribution of support that favours western European MS to the detriment of southern and eastern MS, and the largest farms at the expense of the smallest types of farming structures. The third section questions the links between budgetary support and agricultural income. More specifically, we seek to shed light on the following: first, the effectiveness of different instruments of agricultural income support, notably the instrument of decoupled direct aids (aids that are disconnected from product choices and volumes); second, the dependence of agricultural income on budgetary support (in particular, decoupled direct aids); and third, the legitimacy of explicitly including an objective and an instrument of agricultural income support in the CAP. The analysis of this third question serves as a conclusion to this chapter.

30. This protection has the effect, all other things being equal, of reducing imports, which in turn leads to an increase in domestic prices that benefit European producers.

Support for European agriculture and its farmers

Overview of support for European agriculture and its competitors

The Organisation for Economic Co-operation and Development (OECD) has defined a method for measuring and comparing the support granted to agriculture in the member countries of the organisation (OECD, 2010). We are more specifically interested in the Producer Support Estimate (PSE), which includes services of general interest provided to agriculture (collective infrastructures and investments in knowledge) and gross transfers from taxpayers and consumers to agricultural producers.[31]

Over the three years 2015-2017, the annual PSE of all 36 OECD countries is equal to US$228 billion: with a PSE of US$95 billion, the EU is in first place, far ahead of Japan (US$40 billion) and the United States (US$38 billion); while at the bottom of the rankings are Canada (US$4 billion), Australia (US$786 million) and New Zealand (US$155 million). Outside of the OECD, China's annual PSE (US$224 billion) is more than twice that of the EU, while those of Russia (US$10 billion) and Brazil (US$4 billion) are significantly lower.

In order to reflect the evolution of the forms of support granted to farmers, the PSE can be broken down into sub-indices. The first, which is historically the most important (70% of the PSE in 1995-97 in the OECD), brings together support granted for the production of commodities (that is, market price support and payments for production). This first sub-index has fallen sharply in the EU in the context of successive CAP reforms, which have brought European and world prices closer together: from US$71 billion in 1995-1997 when it accounted for 61% of the PSE, it fell to US$20 billion in 2015-2017 when it accounted for only 21% of the PSE. A second sub-index is now in first place with decoupled payments, which accounted for 42% of the PSE in 2015-2017. These correspond to transfers from taxpayers to agricultural producers resulting from measures based on areas under cultivation, number of animals, receipts and/or income of a past period.

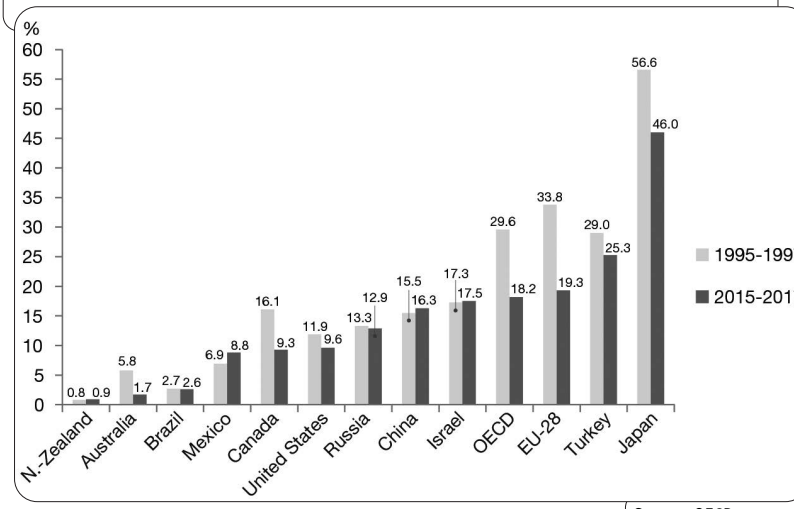
Inter-country variability in the size of the agricultural sector is taken into account by expressing the PSE as a percentage of the value of gross agricultural receipts. On the basis of the percentage PSE, Japan is in first place with a PSE of 46.0% on average in 2015-2017, far ahead of Turkey (25.3%) and the EU (19.3%). The percentage PSE of the US (9.6%) is half that of the EU. Those of Australia (1.7%) and New Zealand (0.9%) are very low. The substantial decrease in the PSE as a percentage of the OECD area over the last two decades (from

31. Like any indicator, ESP is not without its critics. For example, the estimation of price support for certain products is all the more fragile when the world market is narrow and/or when international prices are influenced by the exports of only a few countries; this is the case, for example, for dairy products whose world prices are closely dependent on New Zealand and European exports and the policies that affect them (Doyon *et al.,* 2003). In spite of flaws that question even their usefulness in a comparative perspective between countries (Gohin and Levert, 2006), the PSEs calculated by the OECD have the merit of being based on a unified methodological framework that allows both temporal comparisons (the evolution over time of a country's indicator) and spatial comparisons (comparisons between countries).

29.6% in 1995-1997 to 18.2% in 2015-2017) should be highlighted, largely due to the decline in European and Japanese indicators as a result of the agricultural policy reforms implemented in both areas (Figure 2.1).

The OECD notes that successive reforms of the CAP have had two main beneficial effects (OECD, 2018). The first is a significant drop in the overall level of support measured as a proportion of gross agricultural receipts (PSE in %); the second is an improvement in the composition of support, in the sense that an increasing share of support is no longer linked to actual production in the current period. The increase in the share of support that is not tied to a given type of production, or even to any production, provides farmers with greater flexibility to respond to market price signals and to make production choices that are not influenced by government intervention. Nevertheless, in several agricultural sectors, the prices paid to European producers remain higher than world prices (for example, beef). Overall, in the EU, trade-distorting forms of support still account for a quarter of the PSE as a percentage, indicating that, according to the OECD, there is still scope for further market orientation.

Figure 2.1. Estimated producer support as a percentage of gross farm receipts (Producer Subsidy Equivalent in %) in several OECD and non-OECD countries, 1995-1997 and 2015-2017.



Source: OECD.

Budgetary support for European agriculture

Starting with the Delors I package of 1988, which aimed to better control total EU expenditure and improve the conduct of the annual budgetary procedure, greater budgetary discipline has been implemented on a seven-year multi-annual basis. Since then, the EU's Financial Perspectives have set out the EU's foreseeable expenditure by its main priorities. Within this general framework, the growth rate for agricultural guarantees has been limited to 74%

of the annual growth rate of the European Gross National Product (GNP). This decision has greatly contributed to decrease the share of resources allocated to the CAP, in terms of both the total EU budget and its GNP.

The total EU budget for the period 2014-2020 amounts to EUR1,080 billion, or 1.03% of the EU GNP. The share of this budget devoted to the CAP is 37%, which represents EUR408 billion (EUR313 billion for the first pillar and EUR95 billion for the second). This is much lower than in the mid-1980s when agricultural expenditure accounted for more than 60% of the total EU budget.

Figure 2.2 shows the evolution of the CAP budget and its distribution between the different measures over a long period, from the early 1980s to the present. The amounts are expressed in current euros without taking account of inflation, which has been significantly higher in the past than in more recent years (before the war in Ukraine). They are calculated for an increasingly wider geographical scope in view of the (ongoing) successive enlargement of the EU. They correspond only to European resources, and therefore do not include the expenditure provided by the MS and their regions, in particular, the national and regional co-financing of the second pillar expenditure. Over and above the already mentioned reduction in the CAP budget, expressed as a percentage of EU GNP (from 65% in 1992[32] to around 35% in 2020), Figure 2.2 shows the profound transformation of the CAP's instruments since 1992.

Export subsidies, which accounted for half of the CAP expenditure in 1980 and peaked at EUR10 billion in the years 1987-1993, are at zero today. They began to decline following the 1992 cut in guaranteed prices, which had the mechanical effect of reducing their unit amounts. They continued to fall with successive reductions in guaranteed prices. Since 2013, the European authorities have no longer used them, and they were officially abolished at the end of 2015 as part of the commitments accepted at the World Trade Organization (WTO) Ministerial Conference in Nairobi.

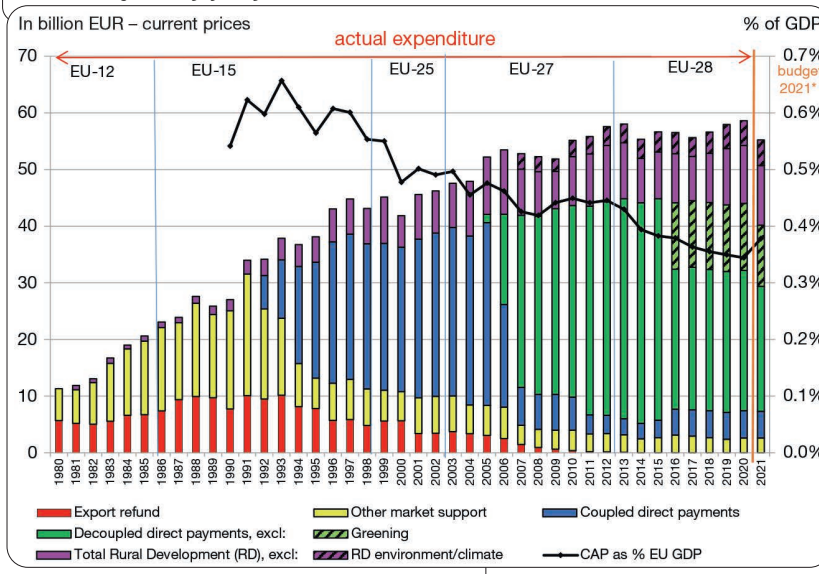
Other market expenses followed a similar path. They are of various kinds, including the cost of public stocks (and possibly the cost of their destruction), aid for private storage, programmes to support the consumption of dairy products, fruit and vegetables, etc. The European Commission is also considering several other measures to support the market development. The corresponding expenditure, which accounted for two-thirds of the CAP expenditure in 1991 (approximately EUR20 billion), has fallen as successive CAP reforms have weakened the intervention direct mechanisms in the form of price guarantees, public storage and private storage aid. They now amount to approximately EUR3 billion, mainly in the form of support for structuring, marketing and consumption in the vineyards and wine production (34%), the fruit and vegetables sector (33%), and the dairy sector (16%).

Income support direct aids have since taken a radically different path. Almost non-existent before 1992, they accounted for 70% of the CAP budget in 2017. They were granted as coupled

32. Tracing the share of CAP expenditure in EU GNP prior to 1992 is not of great interest since prior to that date, support was mainly provided by the consumer through guaranteed prices and its two corollaries, import duties and export subsidies (see Chapter 1). This does not mean that expenditure was zero as storage costs, export subsidies, etc. had to be paid.

Figure 2.2. Evolution of the CAP budget and its structure between 1980 and 2027, in millions of current euros (left-hand axis) and as a percentage of Gross Domestic Product (right-hand axis).

2021: budget amounts, coupled direct payments including POSEI and SAI direct payment component and Annex I Regulation 1305/2013.



Source: European Commission, DG AGRI.

support until 2005 when they were then gradually decoupled. The decoupling is not total, so that income support is now provided through both decoupled and coupled aids, the former being significantly high (EUR35.3 billion and EUR5.7 billion, respectively, in 2017). The granting of decoupled and coupled aids is conditional on compliance with regulations and directives and the maintenance of Good Agricultural and Environmental Conditions (GAEC). In addition, since 2015, 30% of decoupled support is granted only if farmers comply with three greening measures targeted at environmental protection; that is, the diversification of arable crops, the maintenance of permanent grassland and retaining a minimum percentage of areas of ecological interest. These three greening measures will be integrated into the general cross-compliance in the 2023-2027 CAP (now called conditionality). Coupled aid, up to a maximum of 13% of the direct aid envelope allocated to each MS, can be introduced at the choice of the MS within the framework of a European menu setting out the eligible productions. At the EU level, the sectors benefiting most from such coupled support are ruminant livestock; that is, cattle production (in 2016, 41% of coupled support in 24 MS), milk production (20% in 22 MS) and sheep and goat production (12% in 19 MS). The plant sectors benefit much less from coupled support: 10% for plant proteins, 5% for fruit and vegetables, 4% for sugar, etc. The 2013 CAP reform, applied as of 1 January 2015, ended the

downward trend in coupled support that was originally dictated by international considerations (that is, compliance with the 1996 Uruguay Round Agricultural Agreement (URAA) that still applies today because of the failure to conclude the Doha Round).

The European funds allocated to the second pillar of the CAP amount to EUR14.3 billion in 2017.[33] This figure represents 24% of the total cost of the CAP, which is barely higher than the share at the beginning of the 2000s. The second pillar measures are numerous and are applied in various ways according to countries and/or regions. Moreover, they have evolved over time (see Chapter 11). Under the 2014-2020 programming period, they cover six priorities: first, promoting knowledge transfer and innovation; second, strengthening farm viability and competitiveness; third, promoting the organization of the food chain; fourth, restoring, preserving and enhancing the value of ecosystems linked to agriculture and forestry; fifth, encouraging resource efficiency and supporting the transition to a low-carbon and climate-resilient economy; and sixth, promoting social integration, poverty reduction and economic development in rural areas. At least 30% of the funding must be devoted to measures related to the environment and climate change, and at least 5% to the LEADER programme, which aims to support pilot projects in rural areas.

Is the distribution of the CAP budgetary support (too) unequal?

Assessing the equal *versus* unequal nature of the distribution of the CAP budgetary support can be undertaken at MS, production and/or farm level. These scales are intertwined in the sense that, for example, a farm may receive higher support because it specializes in more supported productions, and/or is located in a MS with a higher budget allocation, and/or is located in a region considered to be disadvantaged.

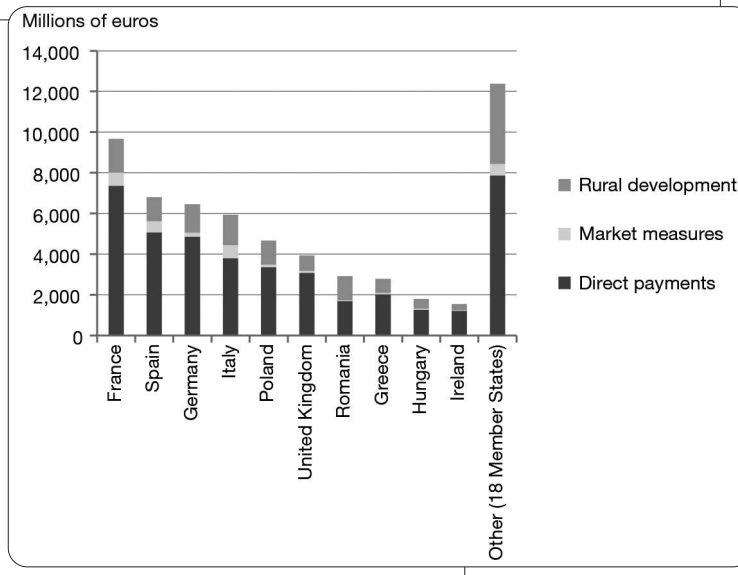
Distribution of the CAP budget between Member States

The distribution of the CAP budget between MS depends on several factors; in particular, the size of agricultural areas and the number of cattle heads (because direct aids under the first pillar have historically been calculated on the basis of these production factors), agricultural specialization (because some productions were, before decoupling was applied, more supported than others), and the partial productivity of the land (because the amounts of direct aid per hectare were defined on the basis of historical reference yields, which were often regionalized). Although additional measures have been adopted to gradually rebalance national budget allocations in favour of the least endowed MS (the so-called process of external convergence), differences between countries remain significant (Figure 2.3).

As the leading European country in terms of final agricultural production (16.8% of the European total in 2017), France is the largest beneficiary of the CAP budget (16.4%). The top 10 MS receive 79% of the CAP budget, while they produce 78% of the EU's final production.

33. This amount does not include the sums allocated by the MS for co-financing under the second pillar, which amounted to more than €8.5 billion in 2017.

Figure 2.3. Distribution of the CAP budget in the different MS in 2017 (in millions of euros according to the nature of expenditure: direct payments, market measures and second pillar measures).



Source: European Commission, DG AGRI.

At the other end of the scale, the lowest 10 MS receive 6% of the funds, producing only 4.8% of the EU's final agricultural output.

This hierarchy changes profoundly when the CAP budgetary support to the different MS is related to their final agricultural production. The three least supported MS are then the Netherlands (3%),[34] Belgium (8%) and Denmark (9%): these countries, to a large extent, specialize in agricultural production that is only minimally supported by the CAP (horticulture, market gardening, pigs, poultry, etc.). The most supported countries (between 20% and 25%) are the Baltic countries (Estonia, Latvia, and Lithuania), the Czech Republic, Bulgaria and Greece. France, Germany, the UK, and Spain are close to the European average of 14%.

Distribution of first pillar direct aid between farms

The distribution of the CAP budgetary support can also be analysed by considering the payment amounts received by the different categories of farms differentiated according to their production specialization and their size, which is measured in terms of the number of

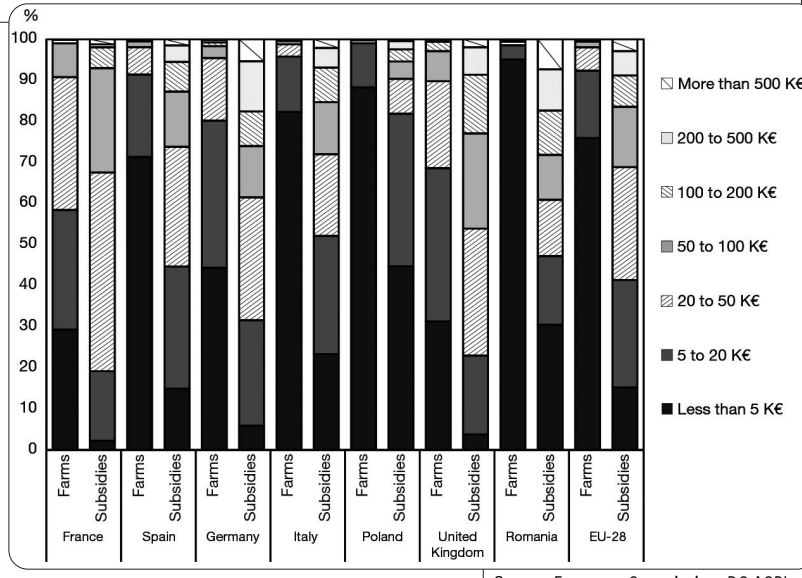
34. This percentage means that the CAP budgetary support for Dutch farms is equal to 3% of Dutch final agricultural production in 2017.

hectares, turnover or income. In view of their absolute and relative weight, attention is hereafter focused on the distribution of decoupled and coupled direct aids under the first pillar.

A total of EUR41.5 billion in direct aid was allocated to 6.5 million beneficiaries in 2017; that is, EUR6,384 per beneficiary. Of these 6.5 million, 4.9 million small beneficiaries (76%) received less than EUR5,000 (Figure 2.4). These small beneficiaries were the most numerous in Poland (1.2 million), Romania (802,000), Italy (693,000), and Greece (523,000). At the other end, about 10,000 beneficiaries received more than EUR200,000 each. These large beneficiaries are mainly from Germany (24%), the Czech Republic (10%) and Spain, Hungary, and the UK (8% in each MS).

Figure 2.4. Distribution of the beneficiaries of CAP direct aids (left-hand column) and distribution of CAP direct aids by amounts received per beneficiary farm in 2017 (right-hand column), in % for different MS and the EU-28.

Reading: Almost 30% of French farms receive less than EUR5,000 in direct aid (left-hand column); where direct aid of less than EUR5,000 represents 3% of the French budgetary envelope (right-hand column).



Source: European Commission, DG AGRI.

The distribution of first pillar aid is uneven. In 2015, 20% of farms within the EU received 80% of this aid (European Commission, 2018). This ratio has remained constant for several years, despite the measures introduced to correct it. For example, the 2013 CAP reform includes the compulsory reduction of part of the direct aids (basic payment entitlements), but under conditions that are so lenient that almost all of the units are unaffected by the measure. It also includes the possibility of degressivity (additional reductions in direct

aid, which are increasing with the amounts of direct aid received), and a capping (setting maximum amounts of direct aid per holding). Both provisions are optional, at the discretion of the MS (European Commission, 2016a). In total, the amounts affected by compulsory reduction, degressivity and capping are very modest: EUR98 million in 2015 and even less in 2016, EUR79 million (European Commission, 2018). Finally, the 2013 reform includes the possibility (once again at the MS choice) of implementing a redistributive payment *via* a levy on aid received on hectares exceeding a certain threshold for reallocation to hectares below this threshold (European Commission, 2016b). The theoretical reallocation can be high, in particular because the redistributive payment can affect up to 30% of the first pillar budget envelope. In practice, this is far from being the case. To summarize, it should be noted that the MS have not taken advantage of the opportunity offered by the 2013 CAP reform to make the distribution of aid less unequ*al*.[35]

The inter-farm distribution of direct aid under the first pillar follows that of land, since 20% of the largest beneficiaries receive 80% of the aid and 20% of the largest farms in terms of the number of hectares own or rent 80% of the agricultural area. This correlation means that a distribution of direct aids on a flat-rate basis (a single amount per hectare) would be as concentrated as the current distribution (European Commission, 2018).

If the distribution of direct aid under the first pillar is unequal (that is, benefiting a farm more because it has a large surface area), is it nevertheless unfair, or indeed, *too* unfair? While equality implies giving each farm or each farmer the same budgetary support, equity refers to a distribution of budgetary support to agricultural producers according to their needs. This question requires us to challenge the objectives pursued by means of direct aid. Whether direct aids are decoupled or coupled, their primary objective is the support of agricultural incomes, since the environmental cross-compliance of their granting (including for greening) cannot be realistically put forward as justification for environmental protection, even if it can contribute to it (cf. Part II). The unfairness of the distribution of direct aid can therefore only be assessed in the light of the distribution of farm incomes. This is the subject of the following section, which goes beyond the simple comparison of the distribution of direct aid and agricultural income by also analysing the levels of agricultural income in relation to those of other socio-professional categories, given that this question of inequity arises both within the agricultural sector (between farmers) and in relation to the rest of European society.

Should the CAP support farm incomes?

The question of the legitimacy of agricultural income support by the CAP can be approached from at least two angles: first, that of farm income levels relative to those of other socio-pro-

35. In the specific case of France, Chatellier (2018) illustrates the high level of sensitivity of the distribution of first pillar direct aid to the methods of the implementation of the redistributive payment, degressivity and capping according to thresholds, exemptions, targeting of the funds thus collected, etc. The analysis clearly shows that, if they so wish, MS have all the leeway they need to significantly change the current distribution of first pillar budgetary support.

fessional categories; and second, that of the inter-farm distribution of farm income. Before specifically addressing this question, we reiterate why decoupled direct aids are an effective instrument for supporting agricultural income and highlight the effect of direct aid on agricultural incomes.

Are decoupled aids an effective instrument for supporting farm incomes?

Within the theoretical framework of public economics, supporting farm incomes in any given country corresponds to an additional redistributive constraint in the programme of maximizing national welfare. The attainment of this objective must therefore be sought by using the instrument (or the set of instruments) that have minimal (if possible, zero) effects on the allocation of resources (the factors of production). In theory, we should use lump-sum transfers; in practice, we should use instruments that are as close as possible to lump sum transfers, in the sense that they affect resource allocation, production and trade to the smallest extent possible. Supporting agricultural income through decoupled direct aids (that is, disconnected from production choices and levels) is (theoretically) justified by maximizing the transfer thus made to farmers. At the same time, these aids make it possible to minimize the distorting effects on trade, hence their classification in the Green Box of measures authorised without limit at the WTO (Gohin *et al.,* 1999; Guyomard *et al.,* 2007).

Analytical and empirical work developed by the OECD (Dewbre *et al.,* 2001; Dewbre and Short, 2002) shows that direct aid per hectare appears to be more effective than aid coupled to the product or to a guaranteed producer price, both of which are themselves more effective than direct aid based on a variable input, such as mineral fertilizers. Moreover, direct aid based on hectares in an historical reference period would be more effective than direct aid based on hectares in the current period.

Of course, this comparison is only valid for the instruments considered and within the analytical framework used, which assumes in particular that there is pure and perfect competition in all markets (no economic actor can influence prices through the exercise of market power), that there are no uncertainties, and that expectations are rational (actors make the best use of all available information to make their predictions). Moreover, the analytical framework of these researches measures farm income by the sole remuneration of the land factor under the assumption that the latter is the only input owned by farmers. It is therefore not possible to use this analytical frame to consider the question of the ultimate beneficiary of the transfer, more specifically, the issues concerning its distribution between the owners of the labour, land and capital factors.

In practice, decoupled direct aids can have effects on transfer efficiency, production and trade *via* four main transmission channels (OECD, 2001):

• In an uncertain world, they can have an impact on production choices and levels for reasons related to the producers' attitudes to risk (*via,* for example, an insurance effect due to reduced income variability);

• Through an income effect, they can influence the labour supply and demand decisions of farm households;
• They can influence the farmer's investment decisions by allowing easier and increased access to credit at better rates, by increasing equity and reducing debt;
• Producers can anticipate that the historical basis on which the aids are based may be revalued upwards in the future.

Of course, these different effects also exist when income support is granted in the form of product-linked aid, guaranteed producer prices or aid based on variable inputs. The question then to be asked is in relation to the orders of magnitude of these effects according to the instruments; a question that can only be addressed on an empirical case-by-case basis. From the studies already conducted on these points, it should be noted that the distortionary effects listed above would be reasonably modest, with the possible exception of the insurance effect (Andersson, 2004), as long as the support is granted in a decoupled form. Nevertheless, there are still too few studies that (similar to that developed by Hennessy, 1998) break down the impacts of different income support policies into its various components.

Decoupled aids account for a significant share of average farm incomes

The weight of direct aid from the two pillars of the CAP within agricultural incomes is estimated by using statistical information from the Farm Accountancy Data Network (FADN).[36] The figures presented below correspond to annual averages calculated over five years (2012-2016), so that the results are not overly affected by the variability of input and output prices.

A European farm (EU-28) receives an average of EUR11,300 in direct aid (Table 2.1). This average masks wide disparities between MS ranging from a minimum of EUR1,700 in Romania to a maximum of EUR39,700 in the UK. In general, the amounts are significantly lower in the eastern and southern European MS than in the western European countries. By agricultural work unit (AWU), the amount totals EUR7,400 at the European level, again with a high variability between countries according to a hierarchy that is not so different from that established on the basis of the amounts received per holding. In relation to the Utilized Agricultural Area (UAA), the amount received is EUR335 per hectare at the European level; this time with a significantly different hierarchy between countries.

At the European level, direct aids represent on average 16% of the value of agricultural production and 63% of farm income (before tax). The weight of aid in this income indicator varies greatly between countries, from 28% in the Netherlands to 109% in the United Kingdom. This inter-country variability is compounded by a disparity between farms according to their production types. The weight of aid is thus extremely low in horticultural (8% at the European

36. The European FADN is a sample of around 80,000 holdings representing a population of 4.8 million units accounting for almost 95% of European agricultural production. The smallest structures below a minimum economic size threshold set at the level of each MS are not taken into account. For more details, see: https://ec.europa.eu/info/food-farming-fisheries/farming/facts-and-figures/farms-farming-and-innovation/structures-and-economics/economics/fadn_en.

level), wine-growing (11%) and on pig and poultry farms (28%): the budgetary support allocated to these orientations is not linked to their main agricultural productions, but to other productions implemented jointly (crops and livestock) and/or to second pillar measures. The weight of direct aids in income reaches 54% on olive farms, 62% on dairy farms and 73% on sheep and goat farms. This weight is even higher, above 100%, on farms specializing in cereal and oilseed crops (106%) and in beef and veal production (126%).

For a given production sector, the amount of direct aid received per agricultural holding (and per job) increases with the economic dimension of the holding. We take the example of the 650,000 cereal and oilseed farms in the FADN sample. Each farm in this group receives on average EUR17,900 in direct aid, which represents 106% of their income. However, the 7,400 largest units, which have a standard gross output (SGO)[37] of more than EUR500,000, receive 15 times as much direct aid (EUR271,000). They have an income of EUR222,100, which is significantly higher than the average. However, they are also more dependent on direct aid, which represents 122% of their income. This example shows that the high-income levels of cereal and oilseed farms largely reflect the fact that direct aids are not (or not sufficiently) degressive and/or capped per farm and/or per job. It raises the question of the targeting of the CAP support, more specifically of decoupled direct aid. This first question is linked to a second related to the choice of the indicator or indicators used to measure agricultural incomes.

Should the CAP include an objective and an instrument to support farm incomes?

Assessing the fairness of the living standards of farmers and other socio-professional categories first raises the question of measuring the standard of living of farmers from the perspective of an inter-sectoral and intra-sectoral comparison.

Measuring farmers' incomes and living standards

Concerning the measurement of agricultural incomes, it is clear that the available statistical tools are currently inadequate. The European Court of Auditors (ECA) considers that "no representative data are available on the disposable income of farm households, which would facilitate assessing the achievement of the treaty objective of ensuring a fair standard of living for farmers. Furthermore, there is no reliable system to allow comparisons to be made between agricultural incomes and those in other sectors of the economy, which could justify EU income support for farmers" (ECA, 2016).[38] The European Commission acknowledges this when it responds, saying that "individual indicators and tools have stronger and weaker points, however the overall system provides the best possible balance between the information needs and the related costs and administrative burdens (ECA, 2016). Nevertheless,

37. The SGO describes the production potential of agricultural holdings on the basis of an *a priori* valuation, using fixed coefficients, of crop areas and herds of animals. The SGO is expressed in euros. The contribution of each crop and each herd to a farm's SO makes it possible to classify any farm in a given farming type, according to its main production(s).

38. The same observation was made as early as 2003 (ECA, 2004). For a similarly critical analysis applied to the French case, see Bureau (2018).

Table 2.1 Importance of direct aids from the two pillars of the CAP in farm incomes in several MS and in the EU-28 (annual averages 2012-2016, in euros and in %).

	Per farm	Per agricultural employment (AWU)	Per hectare of land (UAA)	As a % of the value of production	As a % of farm income (before tax)
France	29,400	14,400	340	15	88
Germany	35,500	15,900	403	14	87
Italy	8,000	6,200	422	12	28
Spain	10,800	7,300	247	18	43
United Kingdom	39,700	18,500	247	16	109
The Netherlands	18,600	6,700	508	4	28
Poland	5,600	3,400	302	20	64
Romania	1,700	1,500	188	15	35
Greece	6,500	6,000	657	28	60
Denmark	36,000	20,700	368	8	ns
Ireland	19,300	16,300	391	29	80
Hungary	16,700	10,500	342	23	86
Belgium	24,100	11,700	475	9	43
EU-28	11,300	7,400	335	16	63

Reading: Ranking of countries according to their decreasing contribution to EU final agricultural production, AWU: Average Work Unit; UAA: Utilized Agricultural Area. Source: Authors' elaboration from European Commission, DG AGRI, European FADN.

it rejects the conclusion that the effectiveness of the CAP with regard to the objective of agricultural income support could not be assessed on the basis of income from agricultural activity alone, noting that data on income from agricultural activity are representative and that it is appropriate to use these data to assess the performance of the CAP measures used to support farmers' incomes.

At this stage, it is worth establishing some more precise definitions. Two perennial sources can be used to measure agricultural incomes: first, the Economic Accounts for Agriculture (EAA) at the macroeconomic level; and second, the FADN at the microeconomic level (Hill and Dylan-Bradley, 2015; ECA, 2016).

The EAA allow the income of primary factors of production to be calculated; that is, labour (family and wage-labour), capital and land. The so-called 'agricultural business income' is derived by subtracting the remuneration paid to employees, rent on land and the balance between interest payable and receivable. This farm business income can be used to pay for the factors of production owned by the farm itself; that is, the work of family members, owned

capital and owned land. Both indicators (the income of primary production factors and agricultural business income) include all forms of budgetary support, whether of European, national and/or regional origin. This inclusion limits their relevance when it comes to assessing the macroeconomic effectiveness of the CAP alone, with regard to the objective of agricultural income support. In relation to AWUs (total for primary factor income, self-employed for farm business income), these two indicators are used to compare farm incomes with those of other socio-professional categories. This comparison nevertheless poses difficulties, particularly because of the uncertainties involved in measuring agricultural working hours (ECA, 2016; Bureau, 2018). Finally, the EAA do not take account of the income of agricultural households from activities that are not strictly agricultural, whether they mobilize the resources of the farm or they are undertaken outside of it. The EAA, therefore, do not permit an assessment of the disposable income of agricultural households and, consequently, their standard of living.

The same is true for FADN. The microeconomic indicators constructed on the basis of the FADN suffer from shortcomings inherent in the population covered by the sample (with the exclusion of the smallest structures), in the construction of the indicators and in the scope of the activities taken into account. Thus, comparing the distribution of farm incomes on the basis of gross farm value added (the difference between the value of production including aid and intermediate consumption) or net farm value added (the gross farm value added less depreciation) means not taking into account land rents or bank interest. Furthermore, other incomes from activities related to agriculture areas imperfectly reported, unrepresentative and not comparable between MS (ECA, 2016). In summary, the FADN cannot provide comprehensive and robust information on farm households' disposable incomes and living standards.

More generally, the question of the wealth (or poverty) of farmers relative to other socio-professional categories is challenging to investigate, for at least three reasons. First, farm income calculated over a single year says nothing (whichever indicator is used) about the process of capital accumulation that takes place within the farm enterprise and whose future beneficiary is the farmer. Second, the value of agricultural land, which often forms a significant part of the accumulated capital mentioned above, is increasing in most MS. Third, farm households often benefit from advantages that are not included in the various measures of farm income even though they contribute to improved living standards (such as access to low-cost food through self-consumption, low housing costs, the imputation of certain expenses to the farm), whereas the associated services also benefit the household. In contrast, farmers' standards of living can be negatively affected by difficult access to public (education, health, etc.) and private (internet, cultural leisure, etc.) services, in addition to the possible isolation experienced, with equally negative consequences.

The accumulation of assets, particularly professional assets, is important in agriculture (for the illustration of a French case, see Bessière *et al.,* 2011). This accumulation is a delayed income that responds to the two reasons of precaution (to cover oneself against the risk of fluctuating current incomes) and foresight (to face the modest pensions). In France, the wealth survey of 2014-2015 shows that the average gross wealth of an agricultural household

amounts to EUR1.04 million, an amount almost four times higher than the average gross wealth of the French population as a whole (EUR269,100).[39] As with current income, this average figure masks major disparities between farmers: it is over EUR1.71 million for the 10% of farmers with the highest incomes but less than EUR172,600 for the 10% with the lowest incomes (Ferrante *et al.,* 2016).

The conclusion is therefore striking: there is an urgent need to develop, at both the EU and MS levels, a statistical system that will make it possible to assess the reality of incomes, living standards and assets of agricultural households.

Should decoupled direct aids be maintained?

Beyond the shortcomings of the statistical information system and the difficulties in assessing and comparing the incomes and living standards of farm households, the explicit objective of supporting income from agricultural activity is questioned on the basis of three main arguments (see, for example, Saint-Paul, 2007). First, there is no justification for redistributing income to households based on their sector of activity rather than on their standard of living. Second, low-income farmers must benefit from collective solidarity as poor people, not as farmers. Some authors go even further by stressing that this redistribution must be implemented at the MS level to take into account local specificities. Thus, according to Thibault and Cherbonnier (2015), "there is no reason for this to be done through a European budget". Finally, some question the very existence of the CAP given the urgency of other European issues that may be considered of greater importance.[40]

Despite the limitations of statistical tools, it nevertheless appears that the income from the agricultural activity of a large number of farms depends on CAP budgetary support, more specifically, on decoupled direct aids. This dependence implies that the reorientation of these aids towards objectives other than agricultural income support alone can only be implemented in a progressive and programmed manner. There is, however, the risk (and the history of more than 25 years of CAP reforms is a reminder of this) that defending the advantages acquired will lead to the transitional phase, which must necessarily be limited in time, not lasting forever (thus becoming a never-ending story). The European and national authorities must therefore show real political courage. It has been demonstrated that international pressure has been able to act as a catalyst, through the Uruguay Round multilateral agricultural negotiations, to initiate the almost-completed process of bringing European and world prices closer together. Thus, the environmental and health issues to be resolved, as relayed by society, can also be the catalyst for significant changes in the CAP in order for it to be genuinely focused on the ecological transition of agricultural and agri-food systems and in this context, on correcting market failures (numerous in agriculture) and providing public goods linked to environmental protection and public health concerns.

39. The gross wealth of French farm households is mainly professional (64%).

40. Depla (2019) thus considers that the CAP «no longer has any *raison d'être*, since the markets provide quality food for Europe without any problem», and that it prevents, through the budget it mobilizes, any European policy for the protection of heritage (report written a few days after the fire at Notre-Dame de Paris Cathedral, 15 April 2019).

Such a reorientation does not mean that the income of the lowest-income farming households should not be supported. It should take the form of a minimum income covering basic needs, the level of which should be set at national or even regional levels (a minimum income whose difficulties of definition and implementation must not be underestimated). If it is not possible to rely sufficiently on collective solidarity in all MS, this reduction in agricultural poverty could be an explicit objective of the CAP. In spite of methodological limitations that mean that it is not possible to speak of causalities but only of correlations, recent work by the World Bank suggests a positive link between the CAP and poverty reduction and the creation of more highly paid agricultural jobs. However, there remain significant differences between MS, depending on their position in the process of structural transformation of their economies (World Bank, 2018).[41] Beyond the granting of a minimum income in the agricultural sector, this work suggests that it is important to differentiate the relative importance of the CAP objectives and the instruments targeted at economic and social objectives in function of MS. In the lowest-income countries and regions of the EU, priority must be given to establishing the basic conditions, without which there can be no prosperous agricultural sector (transport and storage infrastructure, market structuring, producer organisation, effective advice, etc.). This recommendation can be extended to new forms of agriculture, which are grouped together under the unifying term of agro-ecological agriculture (see Chapter 8), and to renewed forms of processing, marketing and the distribution of agricultural products (on-farm processing and sales, short and local supply chains, etc.). In all of these situations, there is a powerful requirement to correct market failures and to increase the provision of public goods.

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41. In a stylized way, the World Bank describes the structural transformation of an economy using three characteristics: a viable and labour-intensive agricultural sector (so as to reduce agricultural poverty); a rapidly growing manufacturing sector that uses the best technologies and skills (so as to absorb excess agricultural labour); and a service sector that provides skilled and remunerative employment when wage growth makes some labour-intensive manufacturing industries less competitive (World Bank, 2018).

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3. The CAP and Agricultural Employment

Cécile Détang-Dessendre, Jean-Noël Depeyrot, Laurent Piet

The decline in the number of agricultural workers is a situation shared by all European countries. The number of agricultural work units (AWU) has decreased by 13% over the last 10 years to reach 9 million in the EU-28 in 2019. Two phenomena are contributing to this evolution: first, the number of farmers has been constantly declining throughout the European Union (EU); and second, this population is ageing: in 2016, more than half of EU farmers were over 55 years old and therefore likely to have retired or to do so soon. On the other hand, the share of salaried employment is increasing in a large majority of Member States (MS), without compensating for the decrease in the number of farmers.

This situation is the result of a profound transformation within the agricultural production sector, initially sought and supported by both the CAP and national agricultural policies. Indeed, if Article 39 of the Treaty of Rome does refer to work (see Chapter 1), it is a question of increasing agricultural productivity and encouraging the optimal use of production factors and in particular labour. The CAP must also ensure a fair standard of living for the agricultural population. The measures put in place thus aim to modernize the agricultural sector by reducing the number of people working in agriculture while, at the same time, improving their level of professionalism. In 1968, the Mansholt Plan proposed an ambitious roadmap that would have led to the departure of 5 million farmers from the EU-6 and the redistribution of land that was freed up, so as to increase the agricultural area of the remaining farms and enable them to modernize; in particular, by making mechanization more profitable. Measures in favour of training and professional retraining were also proposed. Even if the ambitions were revised downwards following the negative reactions of the agricultural profession, the plan finally implemented concerned modernization, farm exit and training. In fact, between 1966 and 1987, the number of active farmers (farmers and employees) fell from 3 to 1.4 million in France and from 2.3 to 0.8 million in Germany.[42] European economies then had to manage the integration of this workforce into other sectors of economic activity (Petit and Viallon, 1970).

At the turn of the century, the EU set human capital as the cornerstone of its ambition. The meeting of the European Council in Lisbon in March 2000 set a new 10-year objective; specifically, to make the EU "the most competitive and dynamic knowledge-based economy in the

42. https://ec.europa.eu/eurostat/documents/3217494/5625703/KS-27-00-742-FR.PDF.pdf/5f915075-2c4e-4a04-b465-ee6455528df5?t=1414770155000.

world, capable of sustainable economic growth with more and better jobs and greater social cohesion".[43] Positioning the CAP to serve this ambition required a significant transformation and the provision of substantial funds for training, innovation and job creation for rural areas in difficulty. The Agenda 2000 reform of the CAP and the introduction of the second pillar dedicated to rural development were to contribute to the realization of this strategy for growth and employment. The co-financing of the second pillar by MS has provided a strong national component, and thus has introduced potential heterogeneity between MS. In practice (see Chapter 11), the EU's so-called rural development policy essentially provides instruments in favour of agriculture (Lataste *et al.*, 2012), even if – as the reforms progress – rural employment issues are gradually being included on the agenda.

The renewal of farmer generations is one of the nine specific objectives of the future CAP post-2020: "The proposals for a future CAP provide a policy framework, which, together with national instruments, will support young people setting up in farming, while creating good working and living conditions in rural areas".[44] According to a recent Report by the European Economic and Social Committee (2019), the main constraints on the renewal of the labour force in farming (by either slowing down departures or undermining the attractiveness of the agricultural sector to young people) relate to the following: first, the issue of income parity between agricultural activity and other sectors of the economy; second, the complexity and administrative burden of accessing the various CAP aids; third, the high level of production standards in the EU compared to most non-EU countries; fourth, the financing of investments and cash flow; fifth, access to land; sixth, the low level of agricultural pensions or even the absence of an appropriate pension scheme; and last, the constraints of rural life. Despite its growing importance, neither wage labour nor the issues surrounding it are explicitly on the agenda of the 2023-2027 CAP.

The first section of this chapter reviews the evolution of agricultural structures and employment in the EU. The second section presents the main tools of the CAP 2014-2020 and of national policies that can influence agricultural employment in both quantity and quality and may thus contribute to meeting the challenges of renewing the agricultural workforce. Potential reforms that could support this ambition are presented in the third section.

Dynamics and challenges of the evolution of agricultural jobs and structures in the EU

With 8.2 million people working in agriculture, hunting and related services in 2019, direct agricultural employment now accounts for 3.6% of total employment in the EU-27 (Eurostat, 2021). However, there are wide disparities between MS, as the share of agricultural employment in total employment is over 19% in Romania, 11% in Greece, 9% in Poland and 6.5% in Bulgaria, compared with 1.8% in the Netherlands, 1.3% in Sweden, 0.9% in the UK and 0.8% in Belgium. To these direct jobs should be added indirect jobs (the labour force in industries

43. https://www.europarl.europa.eu/summits/lis1_fr.htm#1.
44. https://commission.europa.eu/food-farming-fisheries_en.

and services located upstream and downstream of farms) and induced jobs (jobs generated by the spending of households employed in the direct and indirect sectors); however, their estimation is difficult with this information not currently available at EU level.

The long-term trend towards a decline in the number of farms and farm workers in European countries continued in the early years of this century and was particularly significant in the most recent MS to join the EU (Figure 3.1). The number of European farms fell by 4.2 million between 2005 and 2016 (-28.6% or -3.0% per year), to just under 10.5 million farms. This restructuring took place with a virtually constant total agricultural area (+0.18% or +0.02% per year), leading, on average, to a significant increase in the size of farms. The average farm area thus increased from 11.8 to 16.6 hectares (+40.3% or +3.1% per year) between 2005 and 2016.

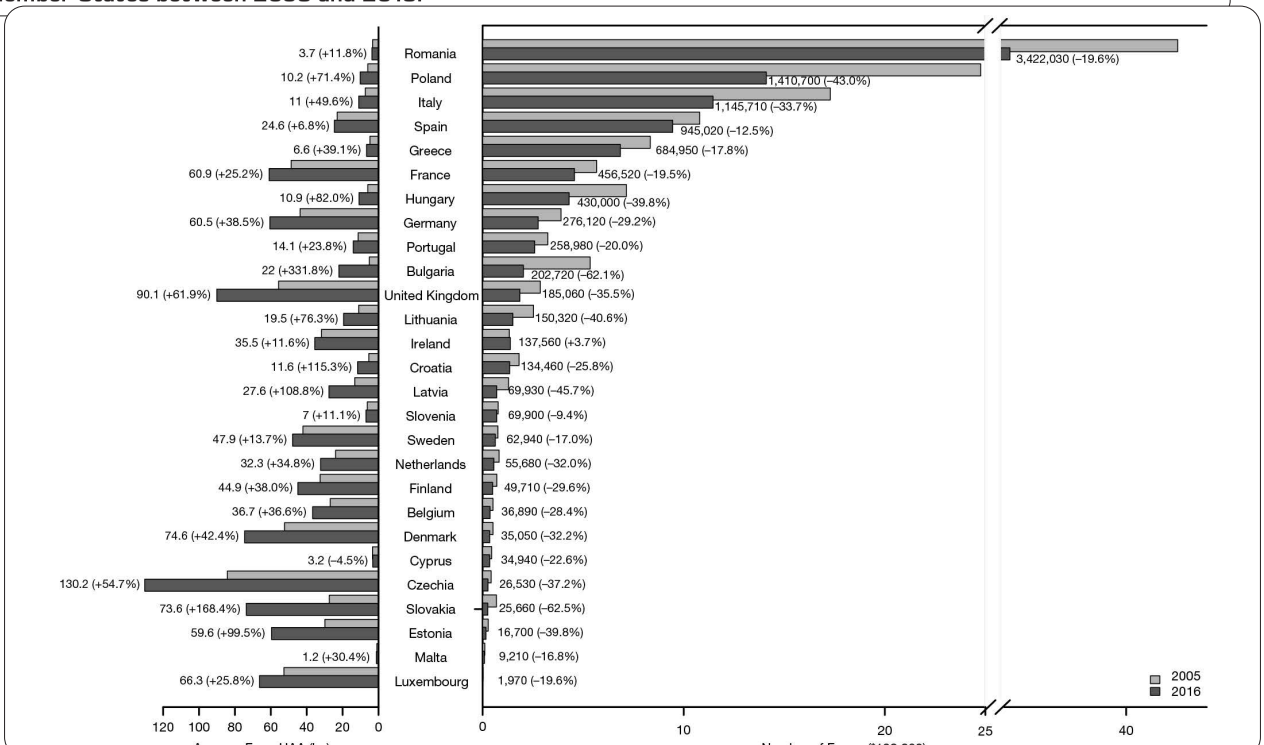
At the same time, the labour force directly mobilized by farms has also steadily decreased, losing more than 400,000 AWUs at the EU-28 level between 2013 and 2016 (-4.2% or -1.4% per year), reaching 9.1 million AWUs in 2016. These developments are part of a classic substitution of labour by capital, which is essentially buildings and equipment within the agricultural sector. Over this three-year period alone, the fixed assets of European farms have increased by 7% (+2.3% per year according to 2021 FADN data[45]). This phenomenon is even more marked in the medium term, with the fixed capital of European farms having increased by 40.5% between 2004 and 2018 (+2.5% per year).

Male and female farmers are an ageing group, with insufficient numbers of new entrants to cover departures and, in many cases, late retirements. Almost 58% of European farms are now managed by farmers over 55 years of age (Eurostat, 2021).[46] However, these farms are smaller than others using only 43% of the European Utilized Agricultural Area (UAA). Figure 3.2 reveals contrasting situations within the EU, between countries such as Cyprus and Portugal where the proportion of farms with a manager aged over 55 in 2016 exceeded 75%, and others, such as Germany, Poland, Finland, or Austria, where this proportion was "only" 40%, without a clear-cut distinction between Western and Central and Eastern Europe. The first two MS providing agricultural labour themselves present widely contrasting situations, with 67% of the farms in Romania being in such a position, compared with 38% in Poland. In all MS except Slovakia and Germany, these farms represent a smaller share of the national UAA than their proportion in number because they are smaller than those managed by younger farmers.

In most countries, agricultural demography therefore makes the question of the renewal of producers a major issue for the next decade. However, it is not easy to quantify this renewal precisely because the European statistical information system does not provide data on the cessations of activity on the one hand (whether they are due to retirement or to early exit) or the settlement of new farmers on the other. Indeed, the only statistics available are those on the total number of holdings and active persons, which simply allow for the calculation of net changes. An alternative way of approaching this question is to examine the age pyramid

45. https://agridata.ec.europa.eu/extensions/FarmEconomyFocus/FADNDatabase.html.
46. https://ec.europa.eu/eurostat/fr/web/products-datasets/-/TAG00029.

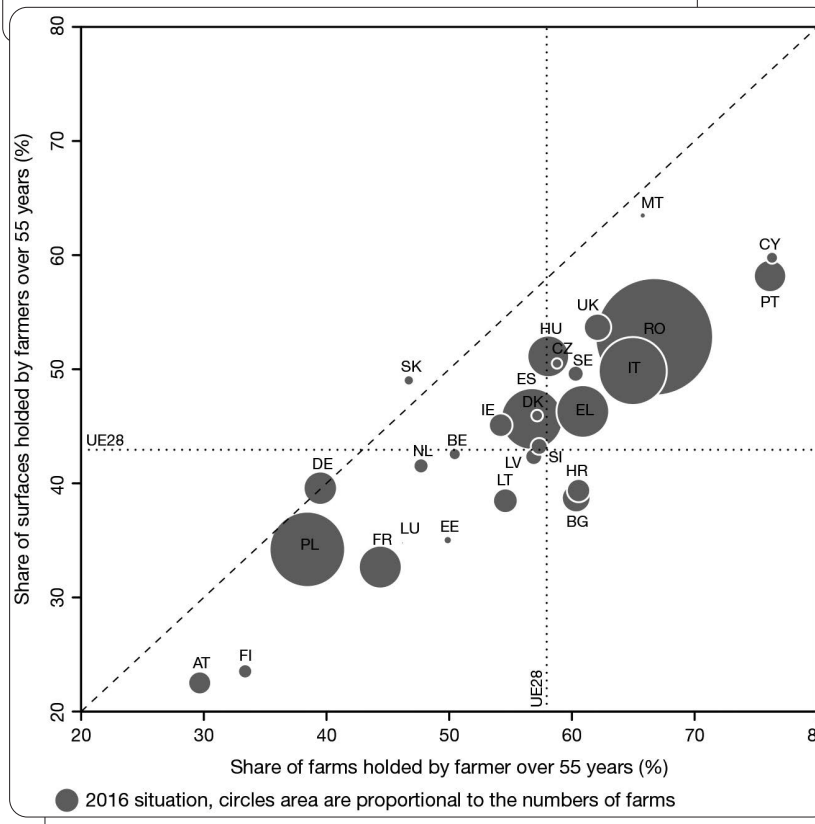
Figure 3.1. Evolution of the number of farms and average Utilized Agricultural Area (UAA) in the different European Member States between 2005 and 2016.



Source: Authors' processing from Eurostat data.

of in-place farmers under the assumption that departures are mainly due to retirement and that arrivals are mainly made up of farmers under the age of 40. It emerges that the proportion of farms with a head under 40 years of age defines a roughly similar ranking of MS, with the countries with the lowest (respectively, highest) proportion being roughly the same as those with the highest (respectively, lowest) proportion of age 55+ farmers.

Figure 3.2. Share of farms and area held by farmers over age 55 in 2016 in the different European Member States.



Source: Authors' processing from Eurostat data.

It should nevertheless be noted that farmers may leave the sector before retirement age. This process, which is difficult to document at the European level, has been highlighted in France through an analysis of individual trajectories. Thus, in 2015, 30% of exits from the social security scheme for non-salaried agricultural workers concerned people aged 55 or younger (Mahé *et al.*, 2019a). These early exits represented 3.2% of farmers between the age of 25 and 55. Generally speaking, these early departures are more frequent in regions with low agricultural production potential, for farms that are specialized crops other than viticulture (market gardening, horticulture, and arboriculture) and in less capital-intensive livestock sectors (sheep and goats, poultry, beekeeping). The question of renewal therefore arises beyond the age of the farmers, and with a different level of acuteness according to production sectors.

Finally, between 2005 and 2020, most European countries experienced both a decline in the total agricultural labour force and an increase in the share of wage labour (Figure 3.3). Although the number of salaried agricultural workers has increased, compensating for a small share of the departure of farmers, and going hand-in-hand with the enlargement of farms from the point of view of the organization of work, European agriculture essentially remains a family-based industry. Indeed, in all European countries, with the notable exception of Denmark, Estonia, the Czech Republic and Slovakia, the agricultural workforce is still predominantly, and often overwhelmingly, self-employed.

European and national agricultural policies and the evolution of agricultural employment

The historic decline in agricultural employment is a direct result of the structural transformation of the sector, sought and supported by the CAP at its inception, and leading to a very high number of exits from agriculture by small-scale farmers. The measures put in place at the time supported the exits from the agricultural sector, which included measures supporting early departures. At the same time, support for modernization and mechanization has encouraged capital-labour substitution on farms remaining in operation (Agrosynergie-GEIE, 2013). Finally, the enlargement of farms has also undoubtedly led to a more structured organization of work (less dependent on family work) and to the development of salaried work.

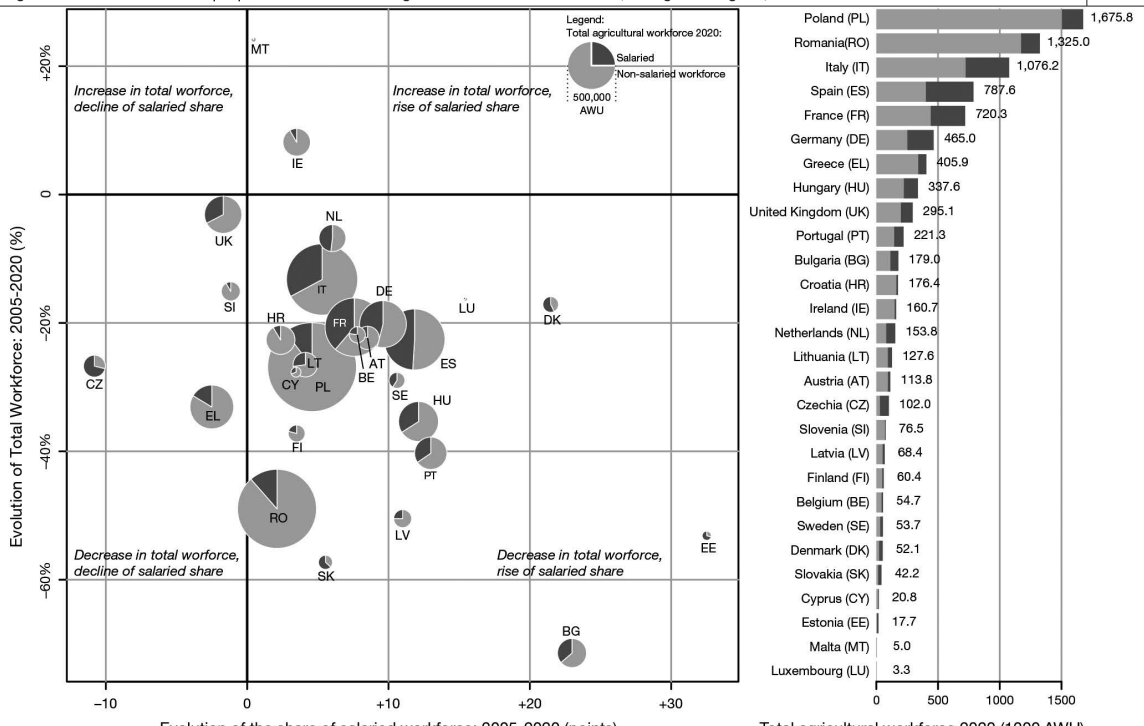
The 2008 CAP Health Check indicated a shift in the policy objectives, making clear the need to strengthen the agricultural economy and employment (see Chapter 1). However, the number of farms in the EU-28 fell from 12.25 million in 2010 to 10.4 million in 2016, an effective decrease of 15%. The continuing decline in agricultural employment, with more people leaving the sector than entering it and the ageing of the non-salaried workforce, has led the EU to specifically address the issue of the renewal of farmer generations. This is despite the fact that for some MS (particularly those in Central and Eastern Europe), the issue of the departure of older farmers who are established on small farming areas and who may not be particularly efficient, is still necessary with a view to improving the sector's economic performance. By "generational renewal", the EU does not only mean reducing the average age of farmers; rather, it also intends to "give a new generation of highly qualified young farmers the means to take full advantage of technologies to support sustainable agricultural practices in Europe".[47]

As the statistics presented in the first section show, agricultural employment is multifaceted, from the farm manager to the seasonal worker, *via* the permanent agricultural employee on an open-ended contract or the employee of an agricultural work company. The CAP measures that have targeted and/or are targeting work in agriculture have mainly concerned self-employed workers, their income, and their relationship to land. Agricultural employees, long considered as "landless farmers" (Pharo, 1982), have been excluded from the scope of the CAP. Then, its impacts on salaried work are indirect.

47. https://enrd.ec.europa.eu/enrd-thematic-work/generational-renewal_fr.

Figure 3.3. Agricultural labour force by Member State and status in 2020, and 2005-2020 changes.

Reading note: Pie chart areas are proportional to the total agricultural workforce in 2020 (see right histogram).



Source: Authors' processing from Eurostat data.

Is the 2014-2020 CAP more favourable to agricultural employment than previous policies?

The 2014-2020 CAP includes measures that can have an impact on employment via different channels: measures that target income support for farmers and therefore indirectly maintain existing farmers; measures that directly target employment by encouraging new farmers to set up and take over; and measures that, by supporting some more or less labour-intensive specific practices, can also have an indirect impact on the level of employment (without distinguishing between status).

Budgetary support from the first pillar of the CAP

By supporting farm incomes (see Chapter 2), first pillar instruments can limit the cessation of activities by the least profitable farms (the smallest and/or least competitive). While this may already have been the case with coupled subsidies before 2003, the decoupling of aid would have had a negative effect on employment (Powel *et al.*, 2016; Gohin and Latruffe, 2006) by encouraging investment, the enlargement of structures and the search for economies of scale. For the World Bank (2018), this restructuring has made it possible to increase the viability of the remaining farms and thus to improve the standard of living of agricultural workers. On the other hand, for Garonne *et al.* (2019), "[...] on average, CAP subsidies reduce the outflow of labor from agriculture, but the effect is almost entirely due to decoupled Pillar I payments. Coupled Pillar I payments have no impact on reducing labor outflow from agriculture, i.e., on preserving jobs in agriculture".

Some measures, by targeting income support for specific farms, can be considered to be explicitly aimed at preserving, or even increasing, agricultural employment. In the first pillar, these are, in particular, the redistributive payment and the degressivity of aid.

The redistributive payment scheme was introduced as part of the 2013 CAP reform, making it possible to allocate a top-up of decoupled direct aid to the first hectares of the farm, which is a means of redistributing part of the support to the smallest structures (EC, 2019). This optional measure for MS provides the possibility of allocating up to 30% of the first pillar envelope, either on the first 30 hectares or up to the national average farm size if this is greater than 30 hectares. Only 10 MS (Wallonia in Belgium, Bulgaria, France, Germany, Hungary, Lithuania, Poland, Portugal, Romania, and Wales in the UK) have implemented this mechanism, but without ever reaching the maximum possible 30% of the direct payments' envelope. The redistributive effect has remained modest in the end. The limit of the first 30 hectares was retained by the majority of countries. France chose a 52-hectare ceiling with an initial envelope of 5% of direct payments in 2015, which was then increased to 10% after the initial objective of reaching 20% from 2018 was abandoned (Chatellier, 2020). Germany retained a ceiling of 46 hectares (with a first step at 30 hectares) and Wales a ceiling of 54 hectares, but in both cases for much more limited budgets, with 7% and 2.7%, respectively, of their first pillar envelope. Finally, Lithuania went the furthest with 15% of the first pillar envelope on the first 30 hectares.

The degressivity of decoupled subsidies and their capping are possible above a threshold of EUR150,000 per farm, with the recognition of "transparency" in the case of partnerships[48] and the possibility of subtracting salaries directly linked to agricultural activities (European Commission, 2016b). The introduction of the redistributive payment scheme makes this optional; six (France, Germany, Hungary, Lithuania, Romania, and Wallonia) of the 10 MS concerned have used this derogation to avoid degressivity and capping. Of the other 22 MS, 15 have applied the minimum reduction of amounts by 5% and nine have capped payments above different amounts, either totally or in a progressive manner.

Hanson (2021) estimated the significant effects of the two measures (redistributive payment and degressivity) on 31 MS or regions, the first measure having a more redistributive effect than the second. In the case of France, Chatellier (2020) showed that if the envelope devoted to the redistribution to the first 52 hectares was increased to 20%, the redistributive effect would nevertheless remain relatively limited (+6% of aid received by the more than 100,000 farms of less than 50 hectares, and a loss of 6% for the 6,500 farms of more than 300 hectares).

This redistributive payment represents an inflection of the political intention in relation to past measures, such as area-based coupled or decoupled payments (even if the areas taken into account correspond to a historical base period), or even older guaranteed prices, which may have encouraged the search for economies of size and capital-labour substitution. Garrone *et al.* (2019) showed that over the period 2004-2014 coupled aid had no effect on agricultural employment (salaried or not), both at the EU-27 level and by distinguishing between the EU-15 and the new MS. By contrast, decoupled payments would have reduced the outflow from the agricultural sector. It can be assumed that the redistributive payment mechanism should reinforce these effects and thus be favourable to agricultural employment. However, the national implementation methods strongly condition the effective redistributive character. Indeed, all farms benefit from this redistributive payment up to the nationally defined ceiling, and not only those whose size is below the threshold. Therefore, even larger farms can benefit from the measure despite the discount on the basic payment induced by the implementation of this measure (since the transfer is made with a constant total budget). Laroche-Dupraz and Piet (2018) showed that in France, the redistributive payment benefits structures of up to 100 hectares (i.e., approximately twice the ceiling), which raises the question of the effective targeting of this type of measure.

Support from the CAP second pillar for farms in Less Favoured Areas

In the second pillar of the CAP, direct income support mainly takes the form of payments for areas facing natural or specific constraints. This is a measure aimed at compensating farms in areas where the income earned is lower due to more difficult production conditions than elsewhere for equivalent activities. Giannakis and Bruggeman (2015) estimate that MS with a large proportion of their agricultural land in such less-favoured areas (LFAs) usually have economically less-efficient farms than the rest of the EU. Established as early as 1976, the budget for this form of support is now the largest share of the European Agricultural Fund for

48. Each partner of the company is considered as an individual farmer for the calculation of the ceilings.

Rural Development (EAFRD), accounting for more than 25% of the fund's cumulative expenditure between 2014 and 2019 (European Commission, 2020).[49] For Giannakis and Bruggeman (2015), it is important that such compensatory measures be maintained in order to increase farm incomes, and to avoid the abandonment of farmland and the depopulation of rural areas in the countries concerned through the maintenance of agricultural activity.

Research works that have sought to evaluate the impact of this second pillar measure on agricultural employment during the 2009-2013 programming period have led to mixed conclusions. Dupraz and Latruffe (2015) find that in France, the measure has had a positive impact on the quantity of family and salaried labour on farms specializing in arable crops. However, the authors recognize that, on the one hand, aid granted in LFAs represents only a very small part of the total support received by the farms studied and that, on the other hand, their results are less robust for this type of subsidy than for decoupled, coupled and agri-environmental subsidies. Furthermore, Petrick and Zier (2011) find that aid granted to farms in LFAs in three *Länder* of the former East Germany has a marginal zero impact on employment. Again, however, with less than 3.5% of total direct aid received on average over the seven years studied, LFA support represents a very small part of the total support received by farms in the regions considered. According to Garrone *et al.* (2019), support for LFAs does not have a significant effect on employment in the 210 regions of the EU 27 they analyse when taken altogether. However, this support would reduce the outflow from the sector in the MS that joined the EU after 2004.

Aid to encourage young people to set up in agricultural business

Support for the installation of young non-salaried farmers (defined as those starting their agricultural activity at less than 40 years of age as head or partner of a farm), implemented within the framework of the CAP since the 1980s now takes the form of specific income support under the first pillar on the one hand, and of installation aids granted under the second pillar on the other.

Under the first pillar, the introduction of a 25% top-up to the basic payment over the first five years of activity with an area ceiling is compulsory for the MS. The latter can define some of implementation modalities[50] and the total budget allocated to this supplement must not exceed 2% of the national envelope of the first pillar (European Court of Auditors (ECA), 2017). The average area eligible for this young farmer support differs widely, from 34 hectares in France to 90 hectares in Spain or Italy. The total envelope devoted to this measure over the 2014-2020 programming period amounts to EUR2.62 billion. Given the variability of the amounts involved and the differences in the importance of the agricultural sector between MS,

49. Since the 2013 CAP reform, MS can also devote up to 5% of first pillar direct aid to income support for farms in areas with natural or specific constraints. Only two MS have actually made this choice, but they devote a much lower share than the maximum allowed; i.e., 0.3% in Denmark and 1.6% in Slovenia (European Commission, 2019). Other MS such as France have instead chosen to transfer part of their budget from the first to the second pillar in order to strengthen the support granted to farms in less-favoured areas, or to integrate other former measures into it.

50. The Regulation allows MS to opt for a flat rate amount independent of the size of the farm. Only Luxembourg has chosen this option.

four countries (France, Italy, Spain, and Poland) concentrate more than 50% of the European aid deployed in favour of young people via this mechanism (European Commission, 2016a).

Several schemes concern young farmers within the second pillar, but almost 80% of the amounts are for business start-up aid for young farmers. This aid, which is granted as a lump sum and/or as an interest rate rebate, is limited to a maximum of EUR70,000 per farm and falls under priority 2 of the second pillar entitled "Farm viability and competitiveness - Facilitation of the entry of adequately skilled farmers into the agricultural sector and generational renewal". This is an optional measure for MS, and 92 out of 118 rural development programmes in 24 out of 28 MS actually implement the measure. The national schemes implemented vary widely, with six regions devoting more than 10% of their second pillar budget to installation aid (Finland Mainland, Brittany and Burgundy in France, Emilia-Romagna in Italy, Flanders in the Netherlands, Navarra in Spain), while nine devote less than 1% (Zagata *et al.*, 2017). Overall, the four MS with the largest budgets for these programmes are again France, Spain, Poland, and Italy. A second important measure is investment support, for which young farmers receive a 20% bonus (ECA, 2017). Eligibility conditions yet again vary between national programmes, particularly with regard to the size of the farm or the level of training required. In total, the ECA reports that the EU budget for supporting young farmers under the second pillar is expected to be EUR3.8 billion over the 2014-2020 programming period (ECA, 2017). This amount is slightly higher than the EUR3.2 billion in the 2007-2013 programming period.

The top-up premium granted to young farmers under the first pillar is intended to compensate for any financial difficulties they may encounter at the start of their farming endeavours. However, the audit work carried out by the European Commission in 2011 does not allow for the existence of such difficulties to be denied or confirmed, nor does it allow the impact of these measures on the survival of farms to be assessed, still less on the rate of installation (European Commission, 2011). Indeed, as this aid is granted only to young people who already have land to activate basic payment rights, it does not make it possible to promote initial access to land, which is one of the obstacles to setting up (see below). Similarly, the beneficiaries are not accompanied by any training requirements. This observation by the European Commission is based on evaluation work carried out in Belgium (Flanders) and Germany (Altmark) using a simulation model, and is confirmed by interviews with local experts. This work concludes that the effect of the payment for young farmers is limited (Vigani *et al.*, 2020). O'Toole and Hennessy (2015) argue, however, that in Ireland, decoupled aid loosens credit constraints, especially when they are strong, as is very often the case for young farmers.

The effectiveness of the young help scheme in the second pillar is also assessed as moderate. Case studies reviewed by Zagata *et al.* (2017) show that this aid helps young farmers in capitalizing on and financing succession schemes. In the same way, the ECA emphasizes the relevance and consistency of the programmes audited: they support the most qualified young people, those without agricultural family background and setting up in LFAs. However, Zagata *et al.* (2017) note that these programmes struggle to effectively support young farmers to achieve a level of competitiveness that will allow them to generate sufficient income.

The ECA points out the risk that aid is sometimes granted to young people who in fact only play a marginal role on the recipient farms. It also deplores the real effectiveness of the programmes is difficult to assess. According to the Court, the EU has not equipped itself with sufficient means to do so, particularly with regard to the effectiveness of the contribution of this aid to the renewal of generations. Zagata *et al.* (2017) note that in some countries (such as Bulgaria) a significant proportion of the young people assisted under a given programme left the sector in the programming period that followed.

Second pillar support for more labour-intensive practices

Agri-Environment and Climate measures (AECMs) are instruments of the second pillar used to compensate for the loss of income or additional costs when farmers implement more environmentally friendly practices (see Introduction to Part II). Support for the diversification of activities is also included in the second pillar. This involves promoting on-farm processing, on-farm tourism, hospitality activities, etc. In the case of France, Dupraz and Latruffe (2015) show that AECM payments received between 1995 and 2007 would have had a positive impact on salaried employment. In contrast, Petrick and Zier (2012) show a non-significant impact of this second pillar measure on employment in 69 counties in Eastern Germany.

Guillou *et al.* (2013) and Guyomard *et al.* (2017) highlight the positive link between the implementation of agro-ecological practices on farms and their labour demands. Using the environmental performance indicators developed by Kirsch (2017) in the French case, Midler *et al.* (2019) show that the correlation between environmental performance and employment depends on the type of farming: it is positive for dairy farms but negative for arable farms. In addition, this work lists no less than 13 studies on different developed countries (within Europe and in the US), which conclude that Organic Farming (OF) systems are more labour-intensive, with vastly different levels of labour intensity depending on the country and the production type. This link is due, in particular, to more labour-intensive practices (mechanical and/or manual weeding, soil maintenance) and to a more frequent involvement in activities of diversification and short supply chains. In their own analysis of France, Midler *et al.* (2019) obtain the same results: there are more jobs in OF but with differences according to production and region, with OF viticulture, for example, being more labour-intensive than other OF production. This work, without directly addressing the relationship between the CAP and employment, supports a potential effect of one on the other: by supporting more environmentally friendly and labour intensive practices, the CAP would indirectly support employment.

National schemes

In addition to the measures of the two pillars of the CAP described so far, national measures are likely to have direct or indirect effects on the volume of agricultural employment, the status of workers and the nature of the activities carried out. Two kinds of national measures can be distinguished: first, regulations affecting access to land for existing and prospective farmers; and second, fiscal and/or social measures conferring specific regulatory, economic or financial conditions on the exercise of agricultural activity.

Land regulations, employment and settlement

Zondag *et al.* (2016) show that access to land is a major concern shared by young Europeans wishing to set up in agriculture, ahead of issues of access to finance and support. The mechanisms for regulating land exchanges, whether by sale or lease, do not generally consist of funding allocated to a particular actor in the sector, but rather of regulations and/or ad-hoc institutions. Although France appears to be the MS with the highest degree of regulation of access to land, as it implements the most measures of this type (Swinnen *et al.*, 2013; Swinnen *et al.*, 2016), schemes with similar objectives also exist in several other MS.

Some of these measures consist of imposing constraints on the quality of persons (natural and/or legal) who can acquire land. These conditions may relate to nationality and/or professional qualifications, which *de facto* limit access to the farming profession. For example, in Poland, the purchase of land by individuals who are not Polish citizens or from the European Economic Area (EU plus Iceland, Lichtenstein, Norway and Switzerland) requires prior authorization from the Ministry of the Interior, whereas renting land is not subject to any nationality restrictions. Similarly, in Hungary since 2013, the acquisition of land by legal persons is not permitted and natural persons must meet three criteria to be able to acquire land: first, they must be Hungarian citizens or citizens of another MS; second, they must have an agricultural or forestry professional qualification or, failing that, at least three years of professional experience in the agricultural field; and finally, they must farm the land themselves. In Lithuania, a potential buyer must have an agricultural education, or have worked as an individual farmer for at least one year on a farm of at least one hectare in size, or be a legal person whose income must be derived by at least half from agricultural activity on at least one hectare for at least one year. In Germany, the local administration of *das Land* can refuse a sale or lease if the purchaser is not a farmer, without, at the same time, any measures regulating access to the farming profession. Most of these measures are primarily motivated by the fight against what is perceived as a possible land grab by non-agricultural (industrial, financial, etc.) and/or foreign actors, and not directly by an explicit employment objective. Nevertheless, these measures can be seen as an obstacle to setting up a farming enterprise, and therefore to agricultural employment, since they limit access to the profession. Conversely, they can also be seen as favouring domestic employment over foreign investment and furthermore as improving the level of qualifications of new farmers thus leading to the professionalization of the sector.

Other measures aim to define orders of priority between candidates for the acquisition or rental of land in particular through the establishment of rights of pre-emption, which must be successively exhausted before a non-priority suitor can take up a position. Such measures make it possible to favour certain forms of agriculture, such as family farming (in most MS), or to limit the fragmentation of farm structures by favouring the purchase or rental by neighbours (in Lithuania or Italy, for example). Thus, in most cases, transactions are not subject to any restrictions if they are carried out for the benefit of a family member who will farm the land him/herself. In Poland, the emphasis on the family model goes further as land can be acquired in priority by another farm as long as it is itself family-owned and exploits

less than 300 hectares. Such a measure is certainly not favourable to the installation of new farmers but it does allow for the enlargement of family structures to be favoured (to the detriment of other forms of farming). Notably, the objective here is not so much to directly favour employment as to promote one model of farming over others.

In some MS, public structures or those with a public service mission also benefit (under certain conditions but often with a high degree of priority) from the right of pre-empting land for regulating the market. This is the case, for example, for the *Sociétés d'aménagement foncier et d'établissement rural* (SAFER) in France, the *Landgesellschaften* (non-profit rural development companies) in Germany, the *Vlaamse Landmaatschappij* land agency in Belgian Flanders, the Institute for Studies, Research and Information on the Agricultural and Food Market (ISMEA) in Italy, or the *Agencja Nieruchomości Rolnych* (Agricultural Property Agency) in Poland on the private land market. In general, such institutions must then hand over the acquired land according to more-or-less formalized guidelines. These priorities often include the installation of young farmers (the precise definition of the latter being generally consistent with that adopted for the measures of the second pillar of the CAP; see above), and the limitation of enlargements deemed "excessive" (the thresholds taken into account in this case vary from one MS to another, from one region to another, and even from one production type to another). The combination of the pre-emption right and the targeting of retrocessions thus make it possible to exclude candidates who do not meet the national criteria in terms of agricultural structure orientation and, on the contrary, to favour those who do meet them but who would not have been solvent without intervention. Here again, it is not a question of meeting explicit employment objectives, but rather of favouring some farm models deemed more desirable because they are more virtuous in terms of certain criteria.

Where land is already rented at the time of sale it can often be acquired as a priority by the existing farmer. While this ensures as much productive continuity as possible by securing the position of the incumbent tenant, there is no guarantee that it will promote employment or asset renew*al*. Rather than supporting the situation of the incumbent farmer, the available land could have been used to set up one or more new farmers or to consolidate the activity of neighbouring perhaps more labour-intensive farms. Finally, the regulation of the conditions for giving leave to the tenant farmer (as in Belgium or France) is most often aimed at favouring the takeover of land within the family again supporting a particular model of agriculture, whereas the regulation of land prices (as in France or Germany) is aimed at allowing access to land to as many people as possible, and not only to the most solvent, by limiting speculation and excessive price increases.

In contrast to the abundant evaluations of the effects of the CAP, there is little academic work aimed at measuring the impacts of the various measures just described and, to our knowledge, none quantifies such impacts, particularly in terms of employment and installation.

Fiscal and social provisions, employment and installation

The second set of measures consists of the differential treatment of the agricultural sector compared to other sectors of the economy, in terms of taxation, social benefits and/or

labour law. In most cases, the measures constitute a comparative advantage for agriculture, in that they lead the public authorities to forego revenues or to grant expenditure that is not available to other sectors.

It is beyond the scope of this chapter to exhaustively present these measures for all MS, as they are notably diverse from one country to another, often numerous, and evolve over time. However, the typology proposed by the OECD (2005) can provide a framework for analysing the main comparative advantages conferred by measures of this type. In particular, it distinguishes preferential treatment in terms of the following: first, taxes on income, profits and capital gains; second, social security contributions; third, taxes on wages and labour to which farm managers are subject as employers; fourth, taxes on wealth; and finally, taxes on goods and services produced or used as inputs. A few examples may help to illustrate some of the underlying mechanisms.

In terms of income tax, the vast majority of French farmers choose to be subject to the personal income tax system, which is more advantageous than the corporate tax system (Mahé *et al.*, 2019b). In terms of labour taxes, Polish farmers can pay their employees 80% of the legal minimum wage in the first year of employment and 90% in the second year, while in Germany certain occasional agricultural employees can, under certain conditions, benefit from the status of "mini-jobs", which allows them to benefit from a total exemption from wage contributions but requires their employer to pay an employer's surcharge (Besson and Dédinger, 2015). In terms of social protection, the spectrum of benefits covered is relatively similar in many MS (occupational accidents, occupational diseases, disability, old age, death, unemployment, and maternity) but contribution rates vary from country to country and are often specific to the agricultural sector. When they are lower than in other economic sectors, which is an advantage in the short term because the costs are lower, it is generally at the expense of less favourable social benefits, which is a disadvantage in the medium to long term. This is the case for example with pensions, which are often lower in the agricultural sector than in the general national scheme. In addition to these monetary advantages, agriculture may also be subject to differentiated treatment in terms of working conditions, with for example working hours, overtime or weekly rest periods for employees that differ from those in general labour law. Finally, in terms of input taxation, fuel for agricultural use are often less taxed or not taxed at all, and this has sometimes been the case for a considerable length of time. In this case, this may have a negative impact on employment by contributing to the development of mechanization to the detriment of the use of labour.

Although these measures are not generally considered to be part of the agricultural policy as such, they can involve large amounts of money, comparable in size to CAP subsidies. In France for example reductions in social security contributions and tax aid accounted for EUR4.1 billion in 2019; that is, 28% of all public aid to agriculture (Agreste, 2020). Here again, to the best of our knowledge, there is no academic work that quantifies the impact of such measures on employment and new settlements. However, it can be assumed that all of these derogations, rebates and specific exemptions may have both a direct and indirect impact on the family and/or salaried workforce employed by farms. These measures can be

favourable when they reduce the cost of labour and/or simplify the conditions for carrying out agricultural activity, or unfavourable if by modifying relative costs they encourage the substitution of labour by other factors of production, whether capital or the use of services, which constitutes a form of outsourcing of labour (Nguyen *et al.*, 2020). In the latter case, it is not enough to look at farms alone; a complex evaluation at the level of the whole sector is needed to measure the direct, indirect and induced impact on total jobs. Finally, these measures can have an impact on the renewal of the workforce when they modify the trade-off between continuing to work and retirement.

Public policy recommendations

In the first programming periods, the CAP supported modernization and increased labour productivity. The decoupling of farm income support has likely limited the outflow from the sector, which has nevertheless continued. With the 2015 CAP reform, various redistributive measures (such as redistributive payment, degressivity, top-up for young farmers) aimed at going further in supporting the smallest structures and young people have reinforced this limitation, however in modest proportions only. The development of employment, even if it is included in the objectives of the CAP, particularly on the 2014-2020 programming period, has not been a central concern up to now. If next programming periods follow the same general pattern, similar effects can be expected; that is, a further loss of jobs in the agricultural sector.

The income disparities between the agricultural sector and other activity sectors constitute a first constraint, which legitimizes public action in favour of the agricultural sector. Catching up, even if only relative to other sectors, would be beneficial to the renewal of the workforce (European Economic and Social Committee, 2019). A first option for greater efficiency undoubtedly lies in a more ambitious application of redistribution instruments in favour of farms with the lowest income per work unit, and of farmers who are setting up and then faced with significant costs, particularly in terms of investment. To achieve this, the 2023-2027 CAP makes the first pillar redistributive scheme compulsory: MS have to dedicate at least 10% of their envelope of first pillar direct aids to the redistributive income support tool. However, the concrete implementation of the measure is left to the discretion of the MS. A more ambitious deployment could take different forms such as: greater funding by fully mobilizing the possibility of devoting up to 30% of the first pillar aid; being more selective by lowering the number of first hectares granted or by granting the top-up only to farms whose size is actually below the threshold; and attaching conditions concerning the level of employment to the benefit of the additional support.

Similarly, specific support for small-scale farms, which often receive little support, could complement the scheme. There are two arguments in favour of this measure. First, small-scale farms specializing for example in arboriculture or market gardening receive very little support and are labour-intensive enterprises. Their development can be a lever for employment in the territories. Second, some consider the maintenance of small-scale semi-subsistence

farms to be of crucial social importance (Davidova, 2011). Others, however, consider that since most farm disappearances occur because of their low efficiency, their maintenance limits the development of the most efficient ones (Pitson *et al.*, 2020). According to the latter, the low renewal of the agricultural labour force is not a problem in itself and should rather lead to a re-examination of policies that hinder structural change in the agricultural sector. A modulation of this support, according to the expected impact on employment or services rendered, could be envisaged; for example, in terms of landscape maintenance in low-productivity areas.

The principle of the basic per-hectare payment is regularly questioned for being at best conservative, and at worst unequal (see Chapter 2; see also Bureau *et al.*, 2015). The introduction of a payment per active farmer is a proposal that has been put forward to replace the per-hectare payment. On the basis of a general equilibrium analysis using the MAGNET model, Helming and Talbeau (2018) show that the reallocation of 20% of the first pillar funds between 2014 and 2020 to the most labour-intensive farms would lead to an increase in agricultural employment in the EU-27 that would eventually be only modest (+1.6% compared with the reference scenario), with variations depending on the MS (between +5.8% in Slovakia and +0.4% in the Netherlands, with France or Sweden being just within the European average). Employment gains would be lower in the EU-15 MS than in the EU-12.

Access to land is one of the major obstacles to setting up a business, especially for those who do not set up inside the family framework. The legislator can therefore act to favour certain categories of candidates for the takeover of released land, and various avenues for this deserve to be explored. The notion of a "young" farmer (i.e., the use of a criterion based on an age limit) could be abandoned in favour of the notion of “first-time settlement”; a measure that is all the more relevant for installations outside the family framework and/or that are carried out by people not originating from the agricultural sector because they often constitute professional reconversion projects that imply a delayed installation date. Eligibility for installation aid may also no longer be based on simple size and/or income criteria but on a more global evaluation of economic, environmental and social performance, with employment being one of the components of this last dimension.

In addition to installation, some advocate genuine support for the transfer of farms; that is, the better coordination between aid for departure and aid for installation. The abandonment of early retirement programmes in the 2014-2020 programming period is considered by some to be potentially problematic, in that it would delay or even limit the renewal of generations (Hennessy, 2014; European Economic and Social Committee, 2019). Although, for the most part, these programmes have only brought forward the decision to stop working and have thus led to a sharp increase in short-term departures by means of a windfall effect without modifying long-term departure trends (Davidova, 2011; Hennessy, 2014; European Parliament, 2016), it is above all the absence of a real coherence between these programmes and installation aid that appears to have limited their usefulness and effectiveness. As recommended by Zagata *et al.* (2017), this could involve for example encouraging the release of land held by older farmers by prohibiting the cumulating of CAP aid and retirement pensions, with a complementary

reflection on the level of pensions to be conducted simultaneously. Similarly, during the 2007-2013 programming period, only a few MS made the granting of installation aid conditional on a criterion concerning the cessation of activity (ECA, 2017): in Andalusia (Spain), the applications of installation candidates were given a higher rating if they followed an early cessation of activity; and in Poland, the age difference between the transferor and the transferee was used as a criterion for evaluating applications. However, the ECA notes that in both cases the better rating of applications on the basis of these criteria was not decisive in awarding the aid as they were not sufficiently restrictive. A resumption of measures of this type in the future CAP, made stricter and accompanied by more demanding conditions in terms of the sustainability of installation projects, could therefore constitute an important lever to encourage the renewal of active farmers in the direction advocated by the European Commission.

Issues relating to salaried employment, again in terms of both quantity and quality, are largely absent from the concerns of the current CAP, which is still essentially aimed at supporting farms from the perspective of production without much more social consideration than supporting farmers' incomes. The inclusion of a "social conditionality" of CAP aid in the future is supported by more than 300 European organizations,[51] calling for the granting of aid to be conditional on compliance with rules on working hours, health and safety at work and housing for employees, in line with many of the FAO's concerns for "decent rural employment" (FAO, 2017). Such a scheme could increase the attractiveness of the agricultural sector, while protecting employers who respect employees' rights from social dumping by lower-cost employers. It must also be binding on the MS so as not to distort competition between them. While the European Parliament supports this proposal, the Council is not of the same view, nor is COPA-COGECA (the main farmers' association at the EU level), which is concerned that procedures will be made more cumbersome. Further work is therefore needed to discuss the benefits in terms of attractiveness and fairness for employees in different sectors of activity in relation to the costs that such a proposal might generate.

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4. The CAP and International Trade

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International agri-food trade[52] has grown strongly over the last 50 years at an average annual rate close to 4%. Despite this sustained growth, the share of raw and processed agricultural goods in international merchandise trade has declined from 57% in 1900, to 30% in 1960, and to only 9% in 2017 (Claquin, 2017). The development of agri-food trade is being achieved through an increase in the number of countries involved, the diversification of the types of products traded, and the rise of large multinational companies (Gaigné *et al.*, 2015; Rainelli, 2015). These trade exchanges include raw products (cereals, soybeans, etc.) and increasingly frequently processed products, themselves often resulting from complex production assembly (the combination of different raw materials drawn from various geographical areas). They make it possible to cover the food needs of populations in countries where agricultural resources are insufficient, and to meet the expectations of consumers who benefit from a more diversified diet. On the other hand, this trade contributes to reinforce the homogenization of national and regional food models even if strong cultural resistance remains.

The European Union (EU) plays an important role in the international trade of agri-food products. It is the world's largest exporter and importer. After the Second World War, the EU managed to rapidly develop its agricultural production and to become self-sufficient in many agri-food products (at least for products of temperate zones), thanks to technical progress and the protective measures of the CAP. The application of variable import levies (that is, taxes imposed on imported products), which vary in amount depending on international prices have made it possible to protect the European agricultural market from international competition over several decades (see Chapter 1). Starting with the Uruguay Round Agreement on Agriculture (URAA) signed in 1994, these variable levies were transformed into fixed customs duties that the signatory countries undertook to reduce. On the export side, the granting of export refunds (that is, direct aid to European exporters to bridge the gap between EU and international prices) has helped the disposal of EU agri-food products on world markets. In accordance with the commitments accepted within the framework of the World Trade Organization (WTO), export subsidies were abandoned from 2013 onwards, in a context where the fall in guaranteed prices that occurred during the successive reforms of the CAP made it easier to put this decision into practice (Bureau and Thoyer, 2014).

52. Agri-food products include raw and processed agricultural products, beverages and fish.

Since 1994, international trade in agri-food products has been regulated by the URAA. In the early 2000s, the launch of a new round of WTO negotiations (the Doha Round) heralded the adoption of new multilateral trade liberalization measures. However, this has not eventuated. The Doha Round of negotiations reached an impasse and this has led to the proliferation of bilateral trade agreements around the world, including between the EU and several non-EU partners.

Within this general context, this chapter is divided into four sections: the first provides a synthetic analysis of the evolution of European trade in agri-food products; the second presents the URAA and how it has played a role in the design of the CAP and its reforms since 1992; the third section discusses the rise of bilateral agreements; and the fourth questions the future of the WTO and the potential protective role of this organization and multilateralism for the future of the CAP.

European agri-food trade

The EU's place in the international agri-food trade is not only a result of its trade policies, although these are important. While customs duties, import tariff quotas,[53] non-tariff import measures, more-or-less direct and disguised export subsidies and direct aid to farmers all have some influence on the relative position of countries engaged in international trade, many other factors also come into play. A country's agri-food commercial positioning also depends on the balance between on the one hand its population (domestic food needs) and on the other its dotation in natural production factors (agricultural land available, water resources, etc.), plus the productivity of its soil. In 2018, the 28 Member States (MS) of the EU were required to feed 512 million inhabitants, with 172 million hectares of Utilized Agricultural Area (UAA). At the same time, the US had 408 million hectares for 327 million inhabitants. In contrast, Japan had only five million hectares for 126 million inhabitants. Many other factors play a role, including production costs, the structuring of agricultural and food chains, productive specialization, and logistical efficiency.

Exports, imports and trade balance

The EU is the world's largest exporter of agri-food products with a value of EUR136.8 billion exported in 2017 (Table 4.1); very close to that of the United States (US) and about twice that of China and Brazil. European exports of agri-food products have increased significantly in recent years, averaging EUR63.6 billion per year in 2000-2009 and EUR116.7 billion in 2010-2016 (in current euros). They concern, first, crop production (48% of the total in 2017, mainly cereals), then animal production (28%, mainly dairy products and pig meat/pork), beverages (21%), and fish (3%).

On the import side, the EU is also the world leader (EUR137 billion in 2017), just ahead of the US (EUR136 billion), and well ahead of China (EUR85 billion) and Japan (EUR63 billion).

53. Import tariff quotas fix, for a given product, the quantities of that product that a country may import at lower customs duties than those applied to the volumes imported in excess of those quotas.

Table 4.1. EU external trade in agri-food products between 2000 and 2017 by product category (current EUR billion per year).

	Exports			Imports			Trade balance		
	2000-2009	2010-2016	2017	2000-2009	2010-2016	2017	2000-2009	2010-2016	2017
Animal production	15.05	29.82	37.93	7.22	8.82	8.91	7.83	21.00	29.01
- Dairy products	9.09	17.56	22.08	1.40	1.49	1.59	7.70	16.08	20.49
- Cattle industry	0.58	1.45	2.14	1.30	1.82	1.87	- 0.71	-0.37	0.27
- Sheep and goat sector	0.03	0.25	0.43	0.96	1.05	0.99	- 0.92	-0.79	-0.56
- Hog/pig industry	2.95	5.96	7.81	0.09	0.07	0.07	2.85	5.90	7.74
- Poultry business	1.16	2.24	2.35	1.38	2.22	2.06	- 0.21	0.02	0.29
- Other animal productions	1.23	2.35	3.11	2.09	2.18	2.33	- 0.87	0.17	0.78
Crop production	31.80	58.89	65.88	56.09	87.60	100.48	-24.29	-28.71	-34.61
- Cereals and preparations	6.88	14.23	14.84	3.59	5.84	7.11	3.28	8.39	7.72
- Oilseeds	1.17	2.55	3.29	5.85	9.31	10.51	-4.67	-6.76	-7.22
- Sugar	1.85	1.91	2.46	1.76	2.45	2.13	0.09	-0.55	0.33
- Horticulture	1.40	1.98	2.30	1.31	1.61	1.73	0.09	0.37	0.57
- Edible fruits	1.68	3.48	3.10	10.67	15.80	19.27	- 8.99	-12.31	-16.17
- Vegetables and preparations	4.04	7.07	8.57	6.45	9.09	10.6	- 2.41	-2.02	-2.02
- Coffee, tea and cocoa	2.87	6.15	7.37	8.23	15.85	17.95	- 5.36	-9.70	-10.59
- Other crops	11.91	21.52	23.95	18.23	27.65	31.18	- 6.32	-6.13	-7.23
Drinks	14.50	24.18	28.56	4.05	5.29	5.77	10.45	18.89	22.79
Fish	2.30	3.88	4.48	13.89	20.02	21.91	- 11.59	-16.13	-17.43
Total	63.66w	116.77	136.84	81.27	121.73	137.07	- 17.61	-4.95	-0.23

Source: Comext / INRAE - UMR Smart.

This joint first-place position (for imports and exports) is a reminder that for a given geographical area a high level of exports can go hand-in-hand with a high level of imports for many reasons. First, the types of products traded are not the same (for example, the EU imports tropical fruits and exports dairy products); second, consumers, particularly in developed countries, seek to diversify the products they buy, including for seemingly comparable goods (for example, a wine from South Africa, California or Chile may be preferred to a wine produced nearby for reasons of taste, novelty or exoticism, irrespective of price and quality considerations); and third, raw products may be imported by one country and then re-shipped to another after one (or more) transformation(s). The European imports of agri-food products are overwhelmingly plant products (73%): specifically, exotic products (coffee, tea, cocoa), fruit, vegetables, and oilseeds. The European imports of animal products are much lower, both in terms of total imports (7%) and relative to the export figures for the same products (more than four times higher). Imports of fish (16%) are higher than those of animal products (implying land-based products). Imports of beverages are modest (4%).

The EU agri-food balance is now close to neutral (see the last row of Table 4.1). It improved between the decade 2000-2009 and 2017 (+EUR17.4 billion) despite a deterioration in the balance for crop production (-EUR10.3 billion) and fish (-EUR5.8 billion). This improvement is therefore due to the good performance of the animal sectors (+EUR21.2 billion, mainly in the form of dairy products and pig meat/pork) and beverages (+EUR12.3 billion). This trade balance in value (current euros) may vary from one year to the next, without however resulting in equivalent changes in volumes. Indeed the volatility of world prices, which has increased since 2008, interferes with the levels of exports and imports and in a variable manner depending on the products concerned and the productive specializations on the positioning of countries engaged in international agri-food trade. Beyond the economic performance of its agri-food sectors *per se*, the relative position of the EU on external markets is partly linked to the evolution of monetary parities (over the last 15 years, the EUR/US$ exchange rate has fluctuated within a range of 1.1 to 1.5). It is also due to the temporary production difficulties encountered in traditionally competing exporting countries (droughts, epizootic diseases, etc.) and to the more (or less) sustained purchasing dynamics of importing countries.

Main trading partners

The EU's trading partners in agri-food products are numerous, in terms of both imports and exports (Table 4.2).

The EU's agri-food trade deficit with South America is extremely large (-EUR26.7 billion in 2017); mainly found in trade with Brazil and Argentina with exports of soybeans, meat and tropical fruit to the EU. The balance is also negative with Central America (-EUR3.7 billion) and with Oceania (-EUR1.8 billion); especially with New Zealand, which exports sheep meat and dairy products (butter). While the EU's total agri-food balance is in deficit with Africa (-EUR2.5 billion), the situation varies from one country to another. It is positive with Algeria

(which buys mainly cereals and milk powder) and Egypt (although this country buys its cereals mainly from Russia). It is negative with Ivory Coast, which exports cocoa and cashewnuts. The 54 African countries account for 12% of the EU's agri-food exports, equivalent to the total EU exports to China alone.

The EU's agri-food trade balance with the Near and Middle East countries is positive (+EUR12.5 billion) and growing significantly. This mainly concerns Saudi Arabia, the United Arab Emirates, Israel, and Lebanon. The balance has also turned positive with Asian countries, moving from an annual deficit of –EUR1.6 billion over the period 2000-2009 to a surplus of +EUR8.5 billion in 2017, mainly due to the rapid increase in Chinese imports (dairy products and pig meat/pork) and historical trade links with Japan. However, the EU's balance is negative with Indonesia (mainly exporting coffee, spices, and palm oil), Vietnam (mainly exporting frozen shrimps, coffee, tea, and spices) and India (a country with little presence on international markets in terms of production and consumption). The balance is also positive and improving with North America (+EUR10.2 billion in 2017); with the US in particular. EU exports to this country are often high value-added products (wines, spirits, cheese), while imports are primarily oilseeds, fruit, and beverages. Canada, with whom bilateral trade negotiations are now hotly debated under the Comprehensive Economic and Trade Agreement (CETA), represents 2.5% of EU agri-food exports and 1.9% of EU imports. Among the non-EU countries within the European zone, the trade balance is negative with Ukraine (-EUR3.7 billion), which mainly exports cereals, oilseeds, and poultry meat, and with Norway (-EUR1.3 billion), which almost exclusively exports fish. In addition to Switzerland (+EUR4.5 billion in 2017), the EU has historically had a positive agri-food balance with Russia, but this has deteriorated significantly since the application in 2014 of an embargo on several agri-food products (Chatellier *et al.,* 2018).

EU agri-food exports to third countries are in value terms three times lower than intra-Community trade. The creation of the EU, its successive enlargements, the CAP, and the improvement of logistics infrastructure have all favoured the development of intra-Community trade.

In total, combining intra-EU and extra-EU trade, the top five MS exporting agri-food products are (in descending order of importance) the Netherlands, Germany, France, Spain, and Belgium (Table 4.3). In terms of the trade balance, the Netherlands is in first place (+EUR30 billion in 2017), far ahead of Poland, Spain, and France. Despite the development of certain sectors (pig meat/pork and milk), Germany remains a country with a deficit in agri-food products (-EUR11 billion). The United Kingdom (UK) – today out of the EU – is the European country with the largest deficit in absolute terms (-EUR26 billion).

The Brexit negotiations have raised the question of the UK's agri-food supply sources into the future, and the place to be occupied by the EU-27 MS (Vicart, 2017).

Table 4.2. Evolution of EU trade in agri-food products by destination (exports) or origin (imports), between 2000 and 2017 (current EUR billion).

	Exports			Imports			Trade balance		
	2000-2009	2010-2016	2017	2000-2009	2010-2016	2017	2000-2009	2010-2016	2017
Europe (non-EU countries)	16.97	29.54	29.89	12.22	22.56	28.43	4.75	6.99	1.46
- Russia	5.59	9.08	6.42	1.06	1.79	1.92	4.53	7.29	4.50
- Switzerland	4.63	7.29	8.27	2.02	4.17	4.55	2.61	3.11	3.71
- Norway	1.95	3.89	4.46	2.78	5.21	7.05	-0.83	-1.32	-2.59
- Ukraine	0.91	1.82	1.86	1.09	3.49	5.52	-0.18	-1.67	-3.66
Northern America	13.68	19.48	24.84	9.81	13.12	14.60	3.87	6.36	10.24
- United States	11.73	16.37	21.29	7.83	10.29	11.57	3.90	6.08	9.72
- Canada	1.87	2.98	3.43	1.71	2.46	2.56	0.16	0.52	0.87
Central America, Caribbean	1.73	2.62	3.40	3.97	5.53	7.16	-2.24	-2.92	-3.76
South America	1.74	3.30	3.77	21.98	30.41	30.48	-20.24	-27.11	-26.71
- Argentina	0.12	0.18	0.27	5.50	6.37	6.21	-5.38	-6.19	-5.94
- Brazil	0.66	1.52	1.50	10.04	13.20	11.82	-9.38	-11.69	-10.33
Africa	8.24	16.70	16.56	12.52	17.45	19.04	-4.28	-0.75	-2.47
- Algeria	1.40	2.93	2.42	0.04	0.08	0.11	1.36	2.84	2.30
- Egypt	0.73	1.78	1.46	0.46	0.80	0.89	0.27	0.99	0.57
- Morocco	0.75	1.49	1.58	1.62	2.36	2.61	-0.87	-0.86	-1.03
- Ivory Coast	0.28	0.53	0.59	1.73	2.67	3.71	-1.45	-2.14	-3.12
Near and Middle East	5.64	12.36	14.48	1.95	1.98	1.94	3.69	10.37	12.54

	Exports			Imports			Trade balance		
	2000-2009	2010-2016	2017	2000-2009	2010-2016	2017	2000-2009	2010-2016	2017
- Saudi Arabia	1.55	3.53	3.98	0.01	0.03	0.07	1.54	3.50	3.91
- United Arab Emirates	1.01	2.40	2.91	0.20	0.15	0.08	0.81	2.25	2.83
Asia	12.24	28.02	37.63	13.92	25.04	29.11	-1.68	2.99	8.52
- China and Hong Kong	2.83	11.7	16.31	3.57	6.25	6.86	-0.75	5.45	9.46
- Japan	4.30	5.28	6.41	0.17	0.24	0.34	4.14	5.04	6.07
- India	0.23	0.55	0.86	1.78	3.42	4.05	-1.55	-2.87	-3.19
- Indonesia	0.32	0.62	0.75	2.08	4.36	5.54	-1.76	-3.74	-4.80
Oceania	1.50	3.06	4.10	4.52	5.14	5.80	- 3.01	- 2.07	-1.70
- Australia	1.15	2.41	3.22	1.89	2.00	2.45	-0.74	0.41	0.77
- New Zealand	0.16	0.35	0.53	2.17	2.36	2.39	-2.01	-2.01	-1.86
Total	63.66	116.77	136.84	81.27	121.73	137.07	-17.61	-4.95	-0.23

Source: Comext / INRAE - UMR Smart. Note: In each zone, countries are ranked in descending order of importance of the European agri-food balance in 2017.

Table 4.3. Intra-EU and extra-EU external trade in agri-foodstuffs of European Member Sates between 2000 and 2017 (current billion euro).

	Exports			Imports			Trade balance		
	2000-2009	2010-2016	2017	2000-2009	2010-2016	2017	2000-2009	2010-2016	2017
The Netherlands	46.9	70.7	93.5	28.4	46.4	63.6	18.5	24.3	29.9
Germany	39.3	63.8	73.7	51.0	74.4	85.3	-11.7	-10.6	-11.6
France	41.4	55.4	60.1	33.7	47.1	54.0	7.7	8.3	6.1
Spain	23.1	36.4	41.7	21.7	29.3	34.0	1.5	7.1	7.7
Belgium	23.3	33.5	40.5	21.4	30.4	35.5	1.9	3.1	4.9
Italy	21.3	32.4	38.7	30.0	39.8	41.9	-8.7	-7.4	-3.2
Poland	6.9	18.8	27.6	6.2	14.1	19.3	0.7	4.8	8.3
United Kingdom	17.3	23.5	26.6	37.1	49.0	53.0	-19.7	-25.6	-26.4
Denmark	13.8	17.1	18.8	8.0	11.2	13.1	5.8	5.9	5.7
Ireland	8.0	10.3	13.4	4.8	7.1	8.8	3.1	3.1	4.6
Other (18) EU MS	31.3	63.4	77.0	47.4	80.0	95.0	-16.1	-16.5	-18.0

Source: Comext / INRAE - UMR Smart. Ranking of countries in descending order of exports in 2017.

The CAP and multilateral trade rules

In the aftermath of the Second World War, a group of countries committed themselves to regulating world trade in order to prevent the recurrence of protectionist policies and their retaliatory outbidding, which had been shown to have played a major aggravating role in the economic crisis of the 1930s. A General Agreement on Tariffs and Trade (GATT) was signed on 30 October 1947 by 23 countries (Rainelli, 1993). Its objective was to promote trade liberalization by lowering import tariffs, non-tariff import barriers, and export subsidies. The Agreement also aimed to lower prices for consumers, make better use of various factors in the production process, and promote employment in sectors in which countries had a comparative advantage. Several rounds of negotiations have taken place since then: the first were within the GATT framework, that is, the Dillon Round (which began in 1960), then the Kennedy Round (1963), the Tokyo Round (1973), and the Uruguay Round (which ran from 1986 to 1994). The WTO succeeded the GATT in January 1995, and within this framework, a new round called the Doha Round was opened in 2001: this was supposed to last for three years; however it has still not closed and its outcome remains more than uncertain.

Over the period 1947-1986, agriculture was not formally excluded from any multilateral trade agreements that may have been signed. It nevertheless benefited from exemptions or derogations from the general discipline. These allowed, for example, the subsidization of exports of agri-food products in the event of overproduction. In the EU, these export subsidies became very costly as early as the mid-1980s (see Chapter 1). Conversely, they made it possible for the EU to strengthen and even gain market share at the expense of other exporting countries that did not use this trade weapon (or they used it less) and that were also faced with the induced fall in international prices. It was against this background of trade tensions that the US wanted to subject agriculture to the GATT multilateral discipline during the Uruguay Round. Beginning in August 1986, the US was followed by a group of countries regrouped in the Cairns Group.[54] After eight years of difficult negotiations, the Uruguay Round led to the signing of the Marrakech Agreements in April 1994, which included a specific agreement on agriculture (WTO, 2017). The GATT then gave way to a permanent structure, the WTO, whose secretariat is responsible for enforcing the agreements. To this end, the WTO benefits from an effective mechanism called the Dispute Settlement Body (DSB), whose arbitration decisions are binding for the signatory countries.[55]

54. Named after the Australian city in which this international organization was founded, which today includes 19 countries: Argentina, Australia, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Guatemala, Indonesia, New Zealand, Malaysia, Pakistan, Paraguay, Peru, Philippines, South Africa, Thailand, and Uruguay. This group includes major agri-food exporting countries, both developed (Australia and New Zealand) and developing (Argentina and Brazil). It is nevertheless a heterogeneous group (economic size, level of development, agri-food products traded). Several countries of the Cairns Group have significant agricultural policies.

55. The settlement of trade disputes is one of the main activities of the WTO. A dispute arises when a WTO member country believes that another member country is violating a WTO agreement or commitment. Since 1995, more than 500 disputes have been submitted to the WTO and more than 350 rulings have been issued.

The URAA has had a major impact on the path of reform taken during the 1992 CAP reform. Even if internal EU constraints (budgetary drift, stock accumulation, environmental damage, etc.) also influenced the choices made, the URAA played a catalytic role (Guyomard *et al.*, 1992). This led the European authorities to choose the path to align European and world prices more closely together; a choice that has made it possible to cope under better conditions with lower customs duties and export subsidies. One of the main achievements of the URAA has been the establishment of a framework for addressing barriers and distortions to trade in the three areas of government intervention; that is, domestic support, export subsidies, and market access (a dimension that includes tariff and non-tariff barriers). In all three areas, binding rules have been established as to what can and cannot be done in agricultural and trade policy (OECD, 2001).

Internal support

Under domestic support, WTO member countries commit themselves to reducing production and trade-distorting support. In the URAA, all domestic support measures deemed to have distorting effects are classified as part of the Amber Box. The support thus classified is capped, with the commitment of a country or group of countries being monitored through the calculation of its Aggregate Measurement of Support (AMS). This specifically includes market price support (measured as the difference between domestic administered prices and average world prices in a reference period multiplied by the quantities produced) and support granted in the form of direct payments to agricultural producers when these payments are based on production, areas, or animals in the current period. This is not the case for other domestic support, such as support disconnected from production levels and production factors as well as support linked to environmental protection. These other aids, grouped together in the Green Box, are authorized without limits. A third box, the Blue Box, played a key role for the CAP, at least before the implementation of the decoupling of direct aids from the first pillar as undertaken from 2006. The URAA specifies that any support that would normally fall under the Amber Box can be classified in the Blue Box if it obliges farmers to limit their levels of production. This is the case for compensatory payments granted within the framework of the 1992 CAP reform.

The different CAP reforms implemented since 1992 have led to an almost total dismantling of guaranteed prices and direct aid linked to the volumes produced (see Chapter 1). Today, direct aids under the first pillar are (with the exception of aids that remain coupled to certain productions) considered sufficiently decoupled to be notified in the Green Box. In addition, the EU has negotiated a generous ceiling of EUR72.3 billion for its AMS. This amount is much lower than the notified Amber Box support (EUR7.1 billion in 2018). Even when cumulating Amber Box support with residual Blue Box support and risk management support (EUR15 billion euros in total), the EU has considerable leeway for domestic support (Bureau, 2017). The WTO discipline on domestic support is not binding for the EU.

Export subsidies

Under the URAA, export subsidies are subject to reduction commitments, which are expressed in terms of both the volumes of subsidized exports and the budgetary expenditure allocated

to them. These commitments include all forms of export subsidies not only direct subsidies but also indirect subsidies; such as, the sales of stocks of agricultural products that are held for non-commercial purposes at a price lower than the price of these products on the domestic market, the measures aimed at reducing the costs of marketing exports, or the subsidies for domestic transport.[56]

Subsidies on agri-food exports, which in the EU amounted to up to EUR10 billion per year in the early 1990s, have had major consequences. They granted the EU access to external markets that would not otherwise have been possible, including in developing countries where European products were artificially so competitive that they may have discouraged domestic agricultural production. They also enabled European agricultural prices to be supported by artificially ensuring outlets for domestic agricultural production (other than through the free play of market forces). They delayed the adaptation of European economic actors (agricultural producers and agri-food companies) in the direction of a better balance between supply and demand (some actors were excessively specialized in production eligible for subsidies), with the direct consequence of increasing budget expenditure.

The successive reforms of the CAP since 1992 have included reductions in export subsidies. Barring exceptional cases in times of crisis, the EU has not used this instrument since 2013. The progressive alignment of European prices on international prices in several sectors (cereals, wine and spirits, dairy products, pig meat/pork) makes it possible to develop European exports without export subsidies. This is more difficult to achieve in other sectors (beef and poultry meat), where European competitiveness is lower relative to that of other world exporters.

Market access

The EU is often accused by other exporting countries of strongly protecting its agricultural production sector, an accusation that sometimes earns it the name "Fortress Europe". This reputation is now ingrained in the minds of some US, Australian and New Zealand negotiators. Since the URAA, however, the EU has modified the protection mechanisms for entering the European market and the application of customs duties is not systematic, particularly with regard to many developing countries. As the world's leading importer of agri-food products (see above), the EU has facilitated access to its internal market for many countries and many agri-food products,[57] while maintaining protection for agricultural or agri-food products considered to be the most sensitive to external competition.

The URAA resulted in a fundamental change from a situation where a multitude of tariff and non-tariff measures hindered trade in agri-food products to a regime where protection was provided by bound tariffs subject to a reduction obligation. In the case of the EU, this resulted in particular in the abandonment of variable levies that allowed import taxes to be adjusted

56. https://www.wto.org/french/tratop_f/agric_f/ag_intro04_export_f.htm.
57. Spoerer (2010) has thus shown that the protectionist effects of the CAP may have been higher during the first decades of its implementation (compared to previous national protectionist measures), but that these protectionist effects had already declined by the 1980s, a decline that was confirmed in the 1992 CAP reform and the 1994 URAA.

to fluctuations in world prices (to increase when world prices were depressed; to decrease when they were high) and thus to maintain constant tariff protection irrespective of world price levels. Bound tariffs are formally deposited in the WTO. A country cannot increase them without the agreement of all other WTO members. The URAA also required the maintenance of existing import flows and a minimum opening of domestic markets in the form of a certain percentage of the latter. These two provisions resulted in the introduction of numerous tariff quotas; quotas within which imports are made at lower (often zero) tariff rates.

Each member country of the WTO must grant the other member countries of the organization the same conditions of access to its market. This so-called Most-Favoured-Nation (MFN) obligation can be misleading because imports can be made on more advantageous terms with lower customs duties than MFN duties. This can be achieved through bilateral trade agreements in which two countries reciprocally grant each other more advantageous tariffs than MFN. It can also be the case when a developed country grants (without reciprocity) tariff preferences to less developed countries. Moreover, this time conversely, many countries have negotiated higher tariff ceilings than the applied tariffs at the WTO in order to maintain the possibility of increasing the latter, while respecting their multilateral commitments (Fontagné and Laborde, 2006).

In this general context, the EU offers relatively easy access to its internal market, depending on the supplier countries and product categories. Bound tariffs on imports of agri-food products are on average 17%, which is significantly higher than the average rate applied to industrial products. This average masks significant differences between products. While 775 out of 1,764 tariff lines have zero or minimal tariffs, 8% have tariffs above 50% (Nègre, 2019). Zero or low tariffs cover a wide variety of products, such as coffee, cocoa, and tropical fruit, but also soybeans and processed products. Tariff peaks target dairy products, beef, cereals, and sugar, which are the primary products that can compete more directly with European agricultural products.

In addition, the EU grants preferential regimes to agri-food exports from many countries. Virtually all developing countries can thus export to the EU at a reduced tariff under the Generalised System of Preferences (GSP).[58] Preferences that are even more generous can be granted if these countries engage in environmental or human rights actions. However, the GSP does not cover all agricultural products. Within developing countries, the Least Developed Countries (LDCs)[59] enjoy free and unlimited access to the European market, without customs duties or quotas, within the framework of the GSP's "Everything but Arms"

58. Contrary to popular belief, there is no official WTO definition of "developing" *versus* "developed" countries. Members themselves announce that they are either developing or developed countries. Other WTO members can challenge a country's decision to use the provisions for developing countries at the WTO. The fact that a WTO member declares itself to be a developing country does not automatically mean that it will benefit from the unilateral preference systems of certain developed countries, such as the GSP. It is the country granting the preferences that lists the developing countries entitled to them. For more details, see: https://www.wto.org/french/tratop_f/devel_f/d1who_f.htm.

59. The group of LDCs established in 1971 by the Economic and Social Council of the United Nations now comprises 47 countries in «difficulty», 33 in Africa, nine in Asia, four in Oceania and one in the Caribbean. These countries are the «weakest and poorest» in the international community.

initiative (Bureau *et al.,* 2005). Virtually all African, Caribbean and South Pacific island countries have access to the EU market at zero or very low duties under the so-called Economic Partnership Agreements (EPA). An increasing number of countries have signed free trade agreements with the EU, which grants them preferential access to the European market (and *vice versa*), but these agreements often exclude agricultural products. Finally, imports at low customs duties are carried out within the framework of tariff quotas benefiting many countries, including Brazil and the US for several agricultural products. Overall, it should be noted that European protectionism is low for a large majority of developing countries. In particular, the EU is the largest export market for LDCs. Nevertheless, the low tariffs faced by these countries should not hide the fact that they face non-tariff barriers, particularly in the sanitary and phytosanitary fields.

Non-tariff provisions are becoming increasingly important both in general (trade conditions) and in preferential arrangements and bilateral agreements. This is reflected in the inclusion of standardized inspection procedures, the simplification of administrative controls and the delegation of certification. While being consistent with the provisions of the WTO Agreement on Sanitary and Phyto-Sanitary Measures (SPS Agreement), these provisions are likely to facilitate trade without changing European standards *per se*. Trade issues are of the utmost importance. Indeed, numerous empirical studies show that the most important barriers to trade in agri-food products today result from standards and regulations, and not from customs duties (Disdier *et al.,* 2008; Anders and Caswell, 2009; Murina and Nicita, 2017). This subject is politically extremely sensitive as illustrated by the debates on bilateral agreements with Canada, the Mercosur, or the US.

From multilateralism to bilateralism

In 2017, 33% of the EU's agri-food exports and over 40% of its agri-food imports were carried out under bilateral trade agreements (European Commission, 2018). This is despite the fact that the EU has not historically been a proponent of the bilateral approach. It has long stated its preference for multilateralism, even going so far as to declare a moratorium (from 1999 to 2006) on the opening of new bilateral negotiations. The signing of bilateral agreements, which are mainly commercially motivated, dates only from the early 2000s, with Mexico (2000) and Chile (2003). Agriculture is a sensitive area in the bilateral trade agreements signed by the EU: this was true in earlier years when the EU was developing such agreements with the countries on the Southern shores of the Mediterranean, and it remains true today as the EU concludes (or seeks to conclude) such agreements with more important trading partners in worldwide agri-food markets. These new agreements target both developing and developed countries.

The stalemate of the Doha Round multilateral negotiations and the proliferation of bilateral free trade agreements around the world prompted the European authorities to change their position from the mid-2000s onwards, giving priority to the conclusion of new bilateral trade agreements including with countries that may pose a greater threat to European agricultural production. The opening of negotiations with the countries of the Association of Southeast Asian Nations (ASEAN) in 2007, Canada in 2009 and the US in 2013 is symptomatic of this

change of strategy. The more recent opening of negotiations with Australia and New Zealand pushes the logic of bilateralism to its limits, the most notable achievements of which (to date) are the free trade agreements signed by the EU with Canada (October 2016) and the founding countries of Mercosur[60] (June 2019). The effects of the CETA on European agricultural markets have so far been limited including for beef and veal, as the open tariff quotas have been infrequently used by Canadian exporters. The EU-Mercosur agreement includes EU import tariff quotas for sensitive agri-food products. In the case of beef and poultry meat, these quotas are lower than the volumes imported by the EU in recent years. In the case of sugar, the agreement cancels tariffs within the existing tariff quota. It is likely that for ethanol additional competition could be strongest. However the effect could also be limited: if ethanol is used to make biofuel (bioethanol), which is by far the largest outlet for ethanol, the open quota represents only 3.6% of European consumption; in a context where European ethanol imports from Mercosur countries currently account for just under 3% of this consumption, the additional competition is expected to be around 1% of this consumption. In total, these so-called sensitive European agricultural products should therefore be relatively unaffected by the EU-Mercosur agreement, an agreement that also meaningfully improves market access for European wines and cheeses, following the example of the bilateral trade agreement signed by the EU in February 2019 with Japan (the world's fourth largest importer of agri-food products). As is the case with the CETA, the agreement with Mercosur is accompanied by strong protests within the EU, particularly with regard to the possible negative effects on agriculture (within the EU) and on the environment (in the Mercosur countries and, by extension, for the planet as a whole, insofar as biodiversity losses and increases in greenhouse gas emissions are global public threats; see Chapter 7). Its ratification by the governments of the various European MS is far from being achieved. As for the draft agreement between the EU and the US, known by the acronyms TAFTA (Trans-Atlantic Free Trade Agreement) or TTIP (Transatlantic Trade and Investment Partnership), it has been at a standstill for several years, not only because of the unilateral actions of the former US President (Donald Trump), but also because European MS are demanding sectoral derogations, particularly in the field of agriculture. Nevertheless, in June 2019, the two parties agreed to relaunch the negotiations.[61]

Until the early 2000s, agriculture was only marginally included in the agreements that the EU was then forging with the countries on the Southern shores of the Mediterranean; neighbouring countries that enjoy comparative advantages and high export potential in certain agricultural sectors, particularly for fruit and vegetables. More products have been covered by the new agreements. They offer in most cases an effective tariff preference for 50-80% of the non-zero MFN tariff lines. Tariff concessions are mostly implemented within tariff quotas in order to limit (control) import volumes. They are higher for agricultural products

60. Economic Community of South America created in 1991 by four countries (Argentina, Brazil, Paraguay and Uruguay), later joined by Bolivia and Venezuela. Other South American countries are also associated. It is essentially a customs union.

61. https://www.europarl.europa.eu/news/en/headlines/world/20190214STO26415/eu-us-trade-talks-the-issues-at-stake.

that are initially less protected (wine, oilseeds, processed products) and less generous for other products (cereals, sugar, animal products). Moreover, even when tariff opening appears advantageous for third countries, some obstacles remain. This is the case for example for fruit and vegetables with an almost systematic application of calendar restrictions on exports to the EU. In general, EU tariff preferences for many fruits and vegetables are granted on the basis of preferential quotas defined each month, including reference prices and negotiations on the possibility of carrying over the quotas from one month to the next (Emlinger *et al.,* 2010).

Nearly half of EU agri-food imports benefiting from bilateral tariff liberalisation are fruit (fresh grapes from Chile, Peru and South Africa, raisins from Turkey, bananas from African, Caribbean and Pacific (ACP) countries, pineapples from Costa Rica), vegetables (avocados from Peru, South Africa, Chile and Israel, beans from Morocco, Kenya, and Egypt), and fruit, vegetable, and nut preparations. Food preparations are in second place, mainly benefiting Switzerland, Turkey, and Israel. The main products benefiting from a bilateral tariff reduction are bananas from Colombia, Costa Rica, and Peru, followed by hazelnuts from Turkey. Other products are other fruit and vegetables from a larger number of countries. Bilaterally negotiated zero-duty tariff quotas cover a wider range of countries and products including sugar (Serbia), cereals (two-thirds as wheat from Ukraine and one-quarter as maize from Ukraine), meat (half as chicken meat from Chile or Ukraine), and wine (three-quarters from South Africa).[62]

To summarize, it should be noted that the bilateral trade agreements signed to date by the EU have put pressure on European production, particularly when this production is not highly competitive on world markets and/or is still heavily protected on entry into the EU (fruit, vegetables, beef). Nevertheless, they have had little impact on the main EU productions as they are excluded or remain protected under import quotas that limit the preferences negotiated bilaterally (sugar, cereals, dairy products, meat). As a result, despite their recent proliferation, these bilateral agreements have played only a minor role in the various CAP reforms implemented since the early 2000s, *a fortiori* before that date. This situation is unlikely to radically change in the coming years evidenced by the absence of any explicit and meaningful reference to the EU's bilateral trade agreements in the European Commission's proposals for the post-2020 CAP and in the June 2021 CAP reform agreement for 2023-2027.

Multilateralism at the service of the CAP?

The multilateral discipline implemented through the URAA and the WTO, notably its DSB, marks a major turning point in the global governance of agriculture. It has made it possible to move from a logic of bilateral power relations to a logic of multilateral compromises governed by independent arbitration based on rules of law. While the EU has been able to benefit from these arbitrations, it has also met with some disadvantages. The dispute over the ban on hormonal growth promoters in cattle production has received considerable

62. Analysis based on 2014 figures; for more details see European Commission (2015).

media attention (Dangy, 2015). In 1997, the DSB found that the EU was in violation of its WTO commitments. The Appellate Body then ruled in favour of the EU by concluding that a WTO member country's choice to protect its consumers took precedence over international standards. The EU lost arbitrations: for example, on the legitimacy of preferential rights on bananas imported from the former colonies of several MS or on the fact that selling sugar produced at the world price over and above the quantities produced at higher prices under production quotas constituted a cross-subsidy (to the sugar production outside the quotas). In both cases, the DSB ruling led the EU to reform the Common Market Organisations (CMOs) for bananas and sugar, respectively.

Today, the very existence of the WTO is under threat, for reasons that are by no means limited to agricultural considerations. Some states believe that multilateral disciplines impose constraints that violate the sovereignty of countries, without having succeeded in imposing on emerging countries (first and foremost on China) a significant opening of their domestic markets and putting an ending to unfair practices in terms of foreign investment and intellectual property. Many countries deplore the fact that WTO agreements only address a small part of current and ongoing trade problems, which allows for effective forms of protectionism to persist, particularly in emerging countries. In addition to these grievances, there are also complaints that the impact of global trade on inequality or the environment is not sufficiently taken into account (Jean *et al.*, 2018). Finally, it remains to see whether the February 2022 Russia's invasion of Ukraine could fundamentally change the rules of globalization and lead to increased economic sovereignty of nations.

In agriculture, the URAA helps to regulate direct payments to farmers, import tariff protection and export subsidies. It does not limit export restrictions, which are used extensively by India and China and cause world prices to soar in the event of poor harvests. The same is true for agrofuel policies that support domestic agricultural prices in the EU, but also in Brazil or the US. Finally, the failure of the Doha Round of negotiations means that it has not been possible to update multilateral trade discipline while simultaneously taking new issues into account, particularly environmental and fiscal ones.

It is, however, in the EU's clear interest (and indeed in the interests of any country) to defend multilateralism, including in the agricultural field; otherwise there is a risk of being unilaterally attacked by other "less virtuous" actors (US, Brazil, etc.) without any effective possibility of settling disputes other than through power relations. In June 2018, the US imposed customs duties on Spanish table olives, mainly on the grounds that the CAP direct aids (although classified as Green Box at the WTO) allowed these olives to be sold on the US market below their production cost. By following this path, the US could tomorrow potentially accuse the EU of distorting competition on all European agricultural products benefiting from decoupled direct aids (Berthelot, 2018). On 25 January 2019, the EU initiated a WTO procedure against the US to challenge the introduction of anti-dumping taxes on Spanish olives. Through this action, it seeks to more generally defend the decoupled aids that represent the bulk of the CAP budget (see Chapter 2). It remains to be seen whether recourse to a weakened WTO still allows multilateral discipline to be enforced.

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5. The CAP and the Distribution of Value

Claire Chambolle, Stéphane Turolla

In 2017, the European Commission launched a public consultation on how to make the food supply chain more equitable. This consultation was based on the shared observation that the value created in the supply chains is not evenly distributed between the different levels within the food chain, "in particular due to differences in bargaining power between smaller, more vulnerable actors, including farmers and small firms, and their more economically powerful and highly concentrated trading partners".[63] These same concerns led the French executive to organize, again in 2017, the so-called *Etats Généraux de l'Alimentation* (General States of Food).[64]

This issue of power imbalances within the food chain is not new. However, for many years, the agricultural sector has been able to protect itself from the bargaining power of the food industry because of the price support system introduced by the CAP, at least for a number of products such as cereals, milk or beef. However, since the 1990s, successive reforms of the CAP have led to a gradual shift from guaranteed prices to direct payments to farmers (see Chapter 1) and tensions over value sharing in the food chain have been rekindled. In a weak position in relation to their main buyers, European agricultural producers have faced increasing difficulties since these reforms and are now demanding a fairer valuation of their production.

Schematically, the distribution of value along the food chain depends on the relative weight (size, number, product positioning, etc.) of the economic actors involved at each level. In economic terms, the bargaining power qualifies the capacity of each party to grant itself a larger (or smaller) share of the total profit. Although at the heart of current debates, this notion remains complex and difficult to measure. Three paths of action are essential to solving this issue: first, identifying the determinants of the sharing of power to understand the state of imbalances within food chains; second, critically reviewing the actions implemented by public authorities to combat these imbalances; and last, proposing effective public policy measures to remedy them.

The objective of this chapter is to present the main reasons that lead to an unequal distribution of value within the food chain. In particular, we focus on the purchasing power exercised by food retailers, given their key role in the marketing of food products in the European Union (EU). The first section also discusses the actions taken by agricultural producers to better value their production and thus to counterbalance the power of the downstream sector.

63. https://agriculture.ec.europa.eu/common-agricultural-policy/agri-food-supply-chain_en.
64. https://agriculture.gouv.fr/alimagri-les-etats-generaux-de-lalimentation.

The second section describes the various mechanisms put in place by the CAP to combat imbalances within the food chains and the tensions that these mechanisms have led to with regard to competition law. The third section discusses the various avenues of reform that could be implemented at the European level in order to pursue this attempt to restore the balance of power within the food chain.

Determinants of the sharing of power within the food chain

An ever-increasing number of intermediaries

An agricultural product can be sold to the end consumer either in its raw form (fruit and vegetables, eggs) or as processed product (ready-made meals, yoghurts). The manufacturing process may involve several stages: the first processing stage (slaughter, dairy, milling); the second processing stage (delicatessen products, canned fruits and vegetables, pastries); and even a number of deconstruction and recombination phases, giving rise to highly processed products (ready-made meals, breakfast cereals, seafood products[65]).

Over the past 50 years, consumption patterns have changed dramatically.[66] In an effort to reduce the time spent preparing meals and driven by a need for convenience, households have been spending an increasing share of their food expenditure on processed products to the detriment of the purchase of raw or minimally processed products.[67] These changes in food practices have steadily reduced the share of the value of agricultural production in food consumption.[68] Far from being the central element in the preparation methods of food processors, agricultural raw materials are now often deconstructed and then reassembled with other ingredients, such as additives or other preservatives, giving rise to what are commonly known as "formulations". Thus, the more the products are processed, the more the weight of agricultural raw materials decreases when determining the final price, thereby limiting the value of the raw agricultural product.

Together with changes in food production patterns, changes in distribution patterns have also affected the organization of the food chain. Today, many distribution channels coexist; such as mass retailing, traditional shops, short local channels (markets, fairs, etc.), direct sales, distance selling, etc. Over the years, mass distribution *via* the supermarket industry has become a key component. In the majority of European Member States (MS), it accounts for at least 70% of the food retail market share, far ahead of the share of specialized food stores (Table 5.1).[69]

65. Fish that is dried, smoked, marinated, and as spreads.
66. For a detailed presentation of changes in food consumption patterns over the last 50 years in France, see Insee (2015).
67. Since 1990, purchases of processed products in France have grown four times faster than purchases of all food products (Besson, 2008).
68. For example, in France, the share of agricultural production in food consumption decreased from 21.3% in 1999 to 17.5% in 2014 (Observatoire de la Formation des Prix et des Marges des Produits Alimentaires, 2018).
69. It should be noted, however, that one in five meals was eaten outside of the home in Europe in 2017 (Kantar Worldpanel, 2018). In this respect, companies in the out-of-home catering sector (public and private collective catering, fast food, restaurants, etc.) therefore play a significant role at the downstream level of the food chain and in the share of the value that ultimately falls to agricultural producers.

However, the sale of raw or processed agricultural products in large retail groups imposes strong constraints in terms of supply chain management (sourcing, certification, storage, transport, etc.). Thus, in parallel with the growth of the distribution sector, wholesalers, logistics specialists, and other certification companies have become fully-fledged players in the food chain. As such, part of the total profit of the chain goes to them, which tends to limit the residual value available to upstream producers even more.

In response to the lengthening of the food chain, many agricultural producers have adopted new forms of marketing aimed at reducing the number of intermediaries. These short supply chains cover various forms, such as direct sales on the farm, at a farmer's market or through CSA,[70] collective sales outlets grouping several farmers together, etc. Their primary purpose is to ensure a better valuation of agricultural production. A recent study by the European Parliament reveals that 15% of European agricultural producers sold at least half of their production through short supply chains (European Parliament, 2016).

Fragmented agricultural producers facing an increasingly concentrated downstream sector

The bargaining power of an actor depends mainly on its economic weight relative to that of its partner in their commercial relationship, and on the existence of credible alternatives to this relationship. These determinants are closely linked to the market structure in which the actor operates. We take the example of the food retail market to illustrate this mechanism. The larger a retailer's market share, the more negotiations with its suppliers will cover a significant part of the overall demand addressed to the market, thereby reducing the possibilities for suppliers to find a substitute for the relationship. The currently exacerbated imbalances between agricultural supply and its main buyers (collectors, processors, retailers) can thus be explained by the profound structural changes that have taken place in the various actors of the food chain.

In particular, the retail sector has changed in less than half a century from a highly atomistic market to a small oligopolistic structure.[71] Driven by reasons of external growth and mass purchasing it has undergone major merger waves over the years. In most MS, the market is dominated by a handful of pan-European retailers (Aldi, Carrefour, Lidl, Rewe, and Tesco). Accordingly, the combined market share of the top five retailers is significantly above 60% in the main European countries: in 2016, 74% in Germany, 61% in Spain, 79% in France and 68% in the United Kingdom (Kantar Worldpanel, 2018).

70. CSA stands for Community-Supported Agriculture. A CSA establishes a partnership between consumers and farmers on the basis of the distribution of food baskets composed of the products of the latter. The contract is joint because consumers have agreed to pay in advance, at «fair» prices, at least part of their purchases.

71. A market is said to be perfectly competitive when there is a high number of buyers and sellers (atomistic market) and when none of them are likely to influence equilibrium prices (sellers and buyers are said to be price takers). Conversely, when the market is composed of a small number of sellers (respectively, buyers), we speak of an oligopoly (oligopsony) and, at the extreme, a monopoly (monopsony) market when the seller (buyer) is unique.

Table 5.1. Retail market shares in several European Member States by form of sale for food products in 2012 (%).

	Belgium	Germany	Spain	France	Austria	Portugal	Sweden
Retail sale in non-specialized stores, of which:							
- General food superstores	72.27	84.44	72.39	80.21	88.95	79.29	76.54
- Department and other non-food non-specialized stores	0.41	1.45	1.41	0.11	0.61	0.78	1.09
Retail sale of food in specialized stores	14.75	11.23	21.10	12.78	7.33	18.13	17.10
Specialty non-food stores	9.36	1.48	0.82	1.03	2.19	0.50	3.28
Non-store retailing, of which:							
- Stalls and markets	1.33	0.56	1.37	3.51	0.52	1.04	0.16
- Distance selling	0.26	0.30	0.11	0.87	0.02	0.00	0.62
- Other forms	1.62	0.53	0.81	1.48	0.38	0.26	1.21
Total	100	100	100	100	100	100	100

Source: Authors' calculations from Eurostat structural business statistics. Market shares are calculated on total retail sales of food products (excluding tobacco) for the year 2012.

This concentration of distribution in the hands of a few retailers affects both retail prices and wholesale prices. With regard to consumers, by operating in a weakly competitive environment, retailers can first relax price competition between stores and exercise their market power by increasing their margins. It can thus be observed that in many European countries, retail prices increase as the market concentration increases (Ciapanna and Rondinelli, 2014; Allain *et al.,* 2017). Because of their large volumes, retailers benefit from purchasing power that allows them to obtain low prices from their suppliers. This negative relationship between purchasing power and wholesale price has led many competing retailers to join forces to collectively negotiate with suppliers and thus obtain even better purchasing conditions.

Agri-food firms have seen their bargaining power gradually decline in favour of retailers. Forced to reduce their margins in order to satisfy the growing demands of retailers both in terms of price and health requirements,[72] and faced with increased international competition (which followed on from the opening of the European market induced by the reduction of import protection in the EU and the reduction, then elimination, of export subsidies; see Chapter 4), European food firms have in turn embarked on a process of concentration. Between 1999 and 2009, the number of food firms in the EU-12 fell by 14%.[73]

The food industry mainly consists of small firms (95% of European food firms had fewer than 50 employees in 2016[74]). These companies have little influence on the supply costs of retailers. In 2016, 52% of the turnover of the European agri-food industries was generated by 1% of the largest companies (those with more than 250 employees). Some are multinational firms with a volume of sales comparable to that of retailers; this is the case, for example, of Nestlé, Danone, or Anheuser-Busch InBev. Depending on the product categories, it is not unusual for the market structures of food businesses to be as concentrated (or even more concentrated) than those of retailers: dairy products, soft drinks, or cooking oils are all examples of where the concentration of food firms exceeds that of retailers (European Commission, 2014). For these very large food companies, it is possible to negotiate on a level playing field with retailers and in return obtain a significant share of the chain's total profit.

Faced with increasingly concentrated food processing and distribution actors, the agricultural sector's fragmented composition causes it to suffer in terms of receiving benefits in the production process. Although the trend has faced a sharp fall in the number of farms over the last few decades (-24% between 2007 and 2016 in the EU-27) and an increase in their average size (+31% between 2007 and 2016 in the EU-27), there is a structural imbalance between on the one hand a large number of agricultural producers and on the other hand a limited number of buyers whose economic weight continues to grow. This imbalance is sometimes extreme at the very upstream level of the food chain; that is, between farmers and their buyers. This mainly

72. By way of illustration, EU-12 food firms have seen their profitability ratio (measured as the ratio of gross operating surplus to value added) decrease between 1997 and 2007 by 13 percentage points in the manufacturing of fruit and vegetable juices, by 9 percentage points in the case of liquid milk and butter, by 5 percentage points in the case of pasta and by 3 percentage points in the case of meat, according to Eurostat's structural business statistics.

73. Based on Eurostat structural business statistics.

74. Based on Eurostat structural business statistics.

concerns the production of perishable goods (fruit and vegetables) or heavy goods (milk), for which the constraints linked to the frequency of collection and transport conditions severely limit the market area of the agricultural producer, and therefore the number of potential buyers. Milk is an example of a fresh product that is difficult to store and requires daily collection by processors operating locally, as an oligopsony or even monopsony. Farmers are also penalized by the fragmented nature of their relations with their own suppliers of production factors. Faced with manufacturers of agricultural inputs (synthetic fertilizers, phytosanitary products, compound feed for livestock, etc.) that are undergoing intense consolidation operations, farmers do not have sufficiently strong purchasing power to counter the price increases of their inputs.

Positioned between highly concentrated upstream and downstream markets, agricultural producers are price takers, which is doubly damaging to them: their production costs increase, and the prices paid for their products are aligned as closely as possible with world prices. In this challenging situation, farmers have had no choice but to join forces to challenge structural imbalances within the food chains and limit the negotiating power of upstream and downstream players. Different forms of producer organizations (POs) coexist: cooperatives, unions of cooperatives, agricultural collective interest corporations, commercial companies, and economic interest groups. These gatherings of agricultural producers enable the mutualization of production and the coordination of marketing resources in order to counterbalance the bargaining power of buyers. In certain sectors such as milk, fruit and vegetables or wine production, cooperatives account for more than 50% of the marketing of production in the EU (Bijman *et al.,* 2012). For the great majority, these forms of horizontal organization have led to an increased sharing of value.

Agricultural production with little differentiation

The low bargaining power of agricultural producers can also be explained by the phenomenon of the homogenization of their production. The traceability and food safety requirements of processors have gradually led to standardized agricultural production at the risk of becoming simple commodities that are as homogenous as possible (cereals, milk, etc.). In the absence of product differentiation, competition between agricultural producers is reinforced.

The homogenization of agricultural production thus contributes to the weakening of farmers' bargaining power. In order to counteract this trend, farmers with the support of public authorities have set up approaches to differentiate their products so as to better promote them: production under an official sign of quality (such as, Label Rouge in France), production under an official sign of origin (such as PDO/AOC and PGI)[75], and even differentiation linked to the marketing method (for example, farm sales and short supply chains).

Imperfect price transmission

Following the successive reforms of the CAP characterized by the withdrawal of the system of guaranteed prices, the lowering of customs duties and the end of export subsidies (see

75. PDO: Protected Designation of Origin; AOC: for *Appellation d'Origine Controlée* in French or Controlled Designation of Origin; PGI: Protected Geographical Indication.

Chapter 1), farmers have been gradually confronted with the market mechanisms from which they had previously been protected. In the absence of significant bargaining power, the prices paid to farmers have fallen significantly towards world prices. To illustrate, agricultural producer prices in real terms fell by an average of nearly 50% in France over the period 1978-2005 (Butault, 2008). Moreover, this alignment with world prices has led European farmers to experience significant price variations, creating new risks.[76] The average European farmgate milk price fell by more than 24% between the second quarter of 2008 and the second quarter of 2009.[77]

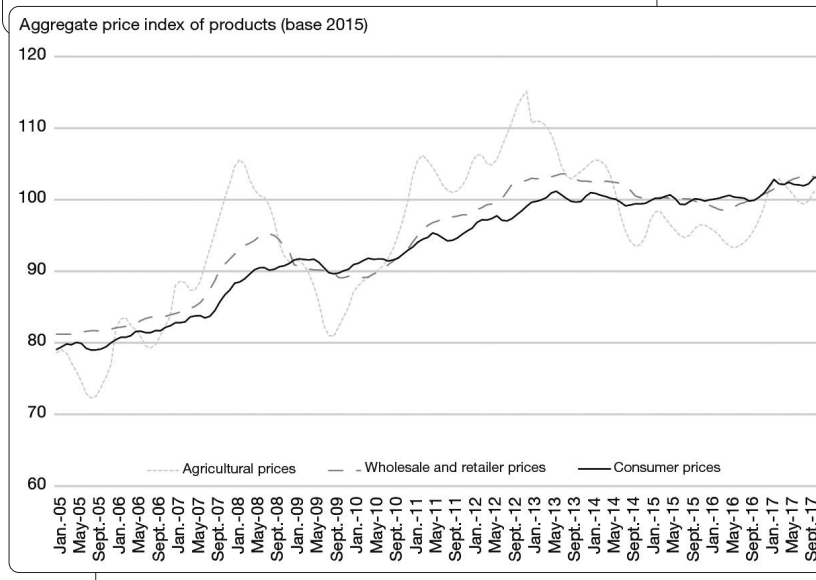
The drop in income caused by the fall in agricultural prices was only partially offset by direct aid, creating numerous tensions within the sectors. Among the grievances put forward, the downstream part of the chain was criticized for insufficiently passing on the price shocks endured by farmers. More specifically, food processors and retailers were suspected of passing on price increases to consumers more easily and quickly than price decreases. Beyond the effects on household purchasing power, these behaviours (if proven) would reinforce the imbalance in favour of the downstream part of the chain. In periods of falling agricultural commodity prices, their margins would increase due to the rigidity of consumer prices, while the income losses suffered by farmers would not be compensated for by higher consumer demand due to consumer prices that would adjust less downwards.

Figure 5.1 illustrates this point. At the top end of the chain, agricultural prices in the EU-28 are subject to significant variations, both upwards (in 2007-2008) and downwards (in 2008-2009). However, this volatility seems to be only partially reflected in wholesale and retailer prices, with the smoothing effect being more pronounced for consumer prices.

It has already been pointed out that agricultural raw materials constitute only a part (often only a minority) of the production costs of food firms, let alone retailers. Bukeviciute *et al.* (2009) thus estimate that for a large majority of MS, raw and processed agricultural products represent less than 50% of the production costs of food firms. It is therefore logical to note that the prices set by the different levels within the food chain do not evolve in a perfectly symmetrical manner. Studies that have sought to determine the amplitudes of price transmission have led to divergent conclusions. Bukeviciute *et al.* (2009) estimate that the elasticity of retail prices in relation to food firms' prices is 18% in the EU area over the period 2005-2008. This weak transmission of price changes between food firms and retailers (relative to the share of goods purchased in retailers' total costs) suggests that retailers would absorb a substantial proportion of the changes in food firms' prices by adjusting their margins (on this point, see also Ferrucci *et al.,* 2012). Conversely, Campa and Goldberg (2006), Bonnet and Réquillart (2013) and Bonnet *et al.* (2015) show that for some products retailers can pass on to consumers more than the variations in costs incurred. These results highlight the importance of vertical relationships along the supply chain in the exercise of market power, and the consequences that these relationships may have in terms of price transmission to consumers.

76. Chapter 6 sets out the mechanisms implemented by the CAP to combat market risks.
77. For a detailed analysis of the determinants of agricultural commodity volatility in the EU, see for example European Commission (2011).

Figure 5.1. Price indices along the food chain in the EU-28.



Source: Authors' calculations from Eurostat, Food Price Monitoring Tool. The agricultural commodity price index for the EU-28 is estimated from data reported by MS.

While there is the possibility that producers' price rises may be passed on more strongly (quickly) than price reductions, only a few academic studies have examined this issue in the European context and, for the most part, conclude that there is no asymmetry. Hassan and Simioni (2004) study the deviations from the long-term relationship of the time series of wholesale and retail prices in France for two vegetables: tomatoes and chicory.[78] They show that there is no difference in the amplitude of the transmission between an increase or a decrease in the purchase cost, whether the transmission is perfect or not. Moreover, in the case of imperfect transmission, price decreases appear to be passed on more quickly than increases, contradicting the initial intuition. The same observation is made at the level of the euro area countries by Bukeviciute *et al.* (2009).

Competition law and the CAP

Like all other sectors of economic activity, the agricultural sector is subject to competition law, the primary objective of which is to ensure healthy and fair competition between economic players with a view to providing consumers with a varied and affordable supply.

78. The reader should note that these products are sold in their raw form, which provides a more conducive setting in which to observe symmetrical responses.

Competition law includes a set of rules designed to prohibit the use of anti-competitive practices, such as agreements between economic operators (Article 101 TFEU[79]) or the abuse of a dominant position (Article 102[80]). Any behaviour likely to distort competition and indirectly distort prices away from the competitive equilibrium is thus prohibited. As a result, competition law has occasionally come up against a highly specific functioning of agricultural markets. Indeed, in order to stand against structural imbalances within the food chain and constrained by the respect for the objectives set by the CAP, over time the European legislator has introduced measures likely to counterbalance the power of certain actors within the food chain. While changes to the Common Market Organisations (CMOs) have sometimes been in contradiction to competition rules, the latest CMO regulation[81] (resulting from the Omnibus agreement of 13 December 2017) clarifies the rules on exceptions to competition law. First, we return to the measures implemented by the CAP to restore the balance of power in favour of farmers; and second, we highlight the (sometimes delicate) relationship between the CAP and competition law through the recent example of the chicory cartel.

Competition law and specific provisions of the CAP

In 2018, the European Commission published a report on the application of competition law in the European agricultural sector.[82] The report covers almost 170 investigations in that sector conducted by the European Commission and national competition authorities over the period 2012-2017. Among those studied, several have stressed a strong interest in agricultural producers referring to competition law in order to protect themselves against abusive practices by powerful buyers.[83] Similarly, the application of competition law has led to the condemnation of abusive practices by large producer organizations against small independent producers.[84]

In addition to the classic application of competition law to agricultural markets, which is referred to in the Commission's report, the economic regulation of the agricultural sector in the EU is specific in that it expressly provides for arrangements for an exemption from the competition rules. Article 42 of the TFEU thus specifies that "the provisions of the Chapter on competition rules shall apply to production of and trade in agricultural products only to the extent determined by the European Parliament and the Council ..., taking into account the objectives set out in Article 39 [objectives of the CAP]". In practice, the

79. Treaty on the Functioning of the European Union.
80. An abuse may be a practice of very low prices aimed at ousting a competitor or the renegotiation of a contract after it has been signed. An undertaking is in a dominant position when its market share is sufficiently strong in the market concerned, without any precise market threshold being defined.
81. Regulation (EU) No 2017/2313 of 13 December 2017.
82. http://ec.europa.eu/competition/sectors/agriculture/report_on_competition_rules_application.pdf.
83. For example, the Spanish Competition Authority has sanctioned cartel practices between major buyers in the milk sector aimed at lowering the prices paid to farmers. In France, agreements between purchasers aimed at restricting the quantities of pigs purchased have also been identified and condemned.
84. In 2016, Valio (a large Finnish dairy cooperative) was fined EUR70 million for trying to squeeze out independent competing dairies through abusively low prices.

European legislator has endeavoured to reconcile the objectives of the CAP with the rules of competition through the introduction of regulations with respect initially to the various CMOs, now to the single CMO. These successive regulations have established a set of derogations and measures only found in the agricultural sector, which aim to restore the balance of power within the vertical chain.

Contracts and market transparency

One of these mechanisms is based on the widespread use of contracts in the agricultural sector to regulate transactions between upstream and downstream (Bouamra-Mechemache *et al.*, 2015). A contract specifies the terms of exchange of a product between a seller and a buyer (quantity, quality, price, duration, discounts, rebates, services, payment terms, etc.). Its role is on the one hand to improve the coordination of decisions within the vertical chain in order to ensure better value creation resulting from the commercial relationship and to distribute the value created between the parties on the other. Contractualization in the agricultural sector has been encouraged by the European legislator in recent years, in particular because of the protection it offers the seller against short-term market reversals. The Omnibus Regulation of 17 December 2013 thus extends the possibility (already offered to MS for milk production), making the inclusion of written contracts prior to the delivery of agricultural products mandatory for all agricultural sectors. In practice, contractualization has been applied in the form of framework contracts or model contracts that make it possible to establish a benchmark of good commercial practice. Contractualization must necessarily take into account the specific constraints of each agricultural sector. Initially constrained to a duration of three years, these framework contracts have proved to be too rigid in the case of fruit and vegetables that are subject to a high temporal variability of volumes; the specific duration now adopted is one year.

The Omnibus Regulation sought to provide for the individual right of every farmer to a written contract. Refusal to draw up a written contract will therefore be considered an unfair commercial practice and prohibited. It also gave inter-branch organizations the option of establishing standard clauses for the distribution of value between farmers and their first buyers. In 2018, the European Parliament adopted directives on unfair commercial practices (including payment periods of more than 30 days for perishable products, last-minute cancellations of orders, unilateral changes to a contract, etc.) in business-to-business relations within the food supply chain. Abusing market power through the use of unfair commercial practices is now prohibited in all MS. Such practices are considered particularly detrimental to small and medium-sized operators, especially agricultural producers.

The Omnibus Regulation also includes measures to improve market transparency. The premise is that perfect and shared knowledge of the information used for decision-making throughout the chain should enable a better allocation of production factors and a more balanced distribution of value. With this in mind, inter-branch organizations are encouraged to provide their members with economic information in the form of market studies, aggregated statistical data or prospective studies. Similarly, standard clauses for the distribution of value

between farmers and their first buyers, which may be established by inter-branch organizations, are intended to promote the better transmission of market signals and to strengthen the links between producer prices and value added throughout the supply chain.[85] When actors in the food chain have to make their decisions they face uncertainties about market conditions (changes in supply and demand conditions, climatic hazards, variability of input costs, etc.), so increasing transparency can therefore improve decision making along the food chain. However, the impacts of transparency on the balance of power in the chains remain difficult to assess. The same is true for the various measures mentioned above. We return to this point again in the last section.

Consolidation of agricultural supply

From its inception, the CAP has encouraged initiatives that group farmers into Producer Organizations (POs) or Associations of Producer Organizations (APOs). Initially, agricultural producer groups were mainly seen as a means of regulating supply and stabilizing the prices of certain perishable products that suffer from severe distribution constraints when they are sold. Forced to sell immediately, agricultural producers cannot adjust their supply to the level of demand and thus reduce price variations. Faced with this problem as early as 1962 the European legislator offered competing producers (whether or not they were members of the same PO) the option of derogating from the competition rules and agreeing on the storage, processing, and distribution of agricultural products.[86] Moreover, within a PO agricultural producers are allowed to collectively fix the selling price of their production. These derogations were initially granted to four sectors (milk, beef, cereals, olive oil), with the total volumes negotiated collectively capped (Velazquez *et al.,* 2017).

At the end of the 1970s, the EU also saw producer groups as a type of organization capable of overcoming the fragmented structure of agricultural supply. Due to the constraints on productivity, technical progress, optimal use of production factors, income and market stabilization caused by too much fragmentation of supply, the legislator encouraged the development of POs and APOs in the MS through the adoption of Regulation 1360/78. POs and APOs are also seen by the European legislator as the preferred means of action to combat structural imbalances among the sectors and to counterbalance the market power of an increasingly concentrated downstream sector. They also help to improve the competitiveness of the sector by coordinating the actions of producers. Horizontal POs and APOs are thus encouraged.[87] From the same perspective, the 2017 Omnibus Regulation extends the derogation from Article 101 of the TFEU on cartels to all agricultural products. On the other hand, vertical POs or APOs linking one or more producers and a manufacturer are likely to increase the risk of dependence of the producer(s) on the manufacturer and can consequently strengthen the bargaining power downstream.

85. Competition Authority, 2018: Opinion No 18-A-04 of 3 May 2018 on the agricultural sector.
86. Article 2 of Council Regulation 26/62 of 4 April 1962 on the application of certain rules of competition to production of and trade in agricultural products.
87. A PO is said to be horizontal or, equivalently, cross-cutting when it groups only agricultural producers and their product offerings. It is said to be vertical when it links one or more farmers to a manufacturer.

Support for alternative forms of processing and marketing of agricultural products

Finally, in order to confront the unavoidable nature of mass distribution, the CAP encourages on-farm processing, direct sales or short supply chains by financially supporting these initiatives under the second pillar of the CAP. The objective is to support farmers who wish to market their (raw) production *via* alternative channels (direct sale on the farm, open-air markets, CSA, etc.) and thus ensure an *a priori* higher income than that which they are entitled to when they sell their production through a powerful intermediary (mass distribution, collective catering, wholesalers, etc.). Ensuring delivery is costly at the individual level (especially for small farms) and farmers often lack the necessary means in terms of finance, labour, logistics, and/or advertising. Thanks to the CAP, but also supported by a favourable economic situation as they meet the high expectations of European consumers, these alternative forms of processing and marketing agricultural products are now flourishing. From the same perspective, the CAP also supports the development of production under Official Signs Identifying Quality and Origin (SIQO).

The difficult relationship between competition law and the CAP: the case of the chicory cartel

While the primary objective of competition law is to ensure effective competition between economic players, the CAP aims to restore the balance of power within the agri-food sector. This tension between two sometimes extraneous objectives has given rise to ambiguities that can be illustrated by the case of the so-called chicory cartel.

In 2012, the French Competition Authority imposed a fine of nearly EUR4 million on French chicory producers for concerted practices of price and quantity fixing. The producers appealed, arguing that these practices had been put in place within the framework of PO in compliance with the operating framework authorized by the CAP and giving the right in particular to derogate from Article 101 of the TFEU condemning cartels. The Court of Appeal overturned the decision of the Competition Authority, which appealed to the Court of Cassation, arguing that these concerted practices of fixing prices and quantities should indeed be subject to Article 101 of the TFEU because they were concerted practices between POs and not within members of the same PO. The Court of Cassation asked the Court of Justice of the European Union (CJEU) to clarify the case law. In its ruling of 14 November 2017, the CJEU clearly established that practices implemented within a PO or APO (such as exchanges of strategic information, optimization of production costs, concerted action on quantities marketed, or grouped negotiations) may escape the prohibition of cartels if they are part of the very functions of the PO or APO and have been clearly and previously defined. However, the CJEU notes that "in accordance with the principle of proportionality, the practices concerned must not exceed what is strictly necessary to attain the objective(s) assigned to the PO [or APO] in question, in accordance with the rules relating to the common organisation of the market concerned". It adds that such concerted practices between several POs or APOs cannot escape the prohibition of agreements when those agreements "exceed what is necessary

for the accomplishment of the tasks assigned to the PO or APO under the CMO Regulation". On the basis of this argument, the CJEU ruled against the chicory producers.

Following this CJEU decision, the EU amended the wording of the Single CMO in 2017 to clarify the conditions for derogations under the competition rules. The Omnibus Regulation thus listed the activities that a PO must carry out in order to be recognized as such and extended to all agricultural sectors the possibility for producers within a PO or APO to derogate from Article 101 of the TFEU on cartels. However, no derogation from Article 102 of the TFEU, which penalizes abuses of a dominant position, has yet been granted to POs or APOs. It is therefore appropriate for POs or APOs with significant market shares to ensure that they do not engage in conduct that could impede effective competition. More broadly, the Omnibus Regulation clearly reaffirms that the competition rules apply to agriculture, unless otherwise noted.

Finally, both the CJEU ruling and the Omnibus Regulation have broadened and legally secured the framework for the intervention of POs and APOs. This should encourage the creation of these groups and ultimately promote a better distribution of value for the benefit of all agricultural producers.

Public policy recommendations

Recent developments in the CAP have prompted agricultural actors to review their organizational and marketing methods in order to adapt to structural downstream changes in the food chain. While the use of contractualization and grouping of supply *via* POs and APOs are currently the preferred methods used to secure a larger share of sales and ensure a better counterweight with regard to the downstream part of the food chain, other instruments can be used at the same time.

The current debates on the loss of competitiveness of the European agricultural sectors have highlighted the need for them to upgrade production methods (Bouamra-Mechemache *et al.*, 2019). The improvement of product quality from both a health and taste perspective allows a stronger differentiation of productions and thus a relaxation of price competition. This approach takes place in a context where demand for this market segment is strong, which in turn ensures greater security of sales. In this respect, the Omnibus Regulation authorizes MS to adopt binding rules to regulate the supply of SIQO products in terms of both volumes and quality criteria.[88] By ensuring better coordination of supply, production approaches under such official quality and origin signs can help to better distribute value within sectors. In order to meet the growing demand for consumer traceability, retailers are entering into commodity chain agreements, which are tripartite approaches involving producers, manufacturers and retailers on the basis of contracts and shared specifications. Beyond the expected benefits in terms of information, transparency and quality for consumers, the French Competition

88. By way of illustration, France and Italy have adopted supply management rules for several cheeses benefiting from SIQO (Article 150): Comté, Beaufort, Reblochon and Gruyère for France; Asiago, Grana Padano, Parmigiano Reggiano and Pecorino Romano for Italy. The dried ham (Article 172) and wine (Article 167) sectors are also eligible for these schemes.

Authority stresses in a 2018 opinion that these approaches are likely to generate better remuneration and guaranteed outlets for the producer, and a guarantee for the industrialist to make part of its infrastructure profitable. Such approaches should be encouraged at the European level, particularly when they are concluded with local agricultural producers (in response to the demand for locally produced food). Nevertheless, this is not without risks. The French Competition Authority urges caution in considering such approaches, stressing the risk of overdependence if one of the parties has a high market share (30%).

With a view to establishing a law to improve the functioning of markets, their efficiency and the distribution of value the European Commission is currently reflecting on the advantages and disadvantages of improving tariff transparency along the food chain. The production of trend indicators and indicators of aggregate production costs can indeed make it possible to improve decision making by the various actors of the food chain by reducing uncertainty. However, the impact of greater transparency on value sharing is ambiguous. Generally speaking, information asymmetry often allows the best informed private actor to maintain a rent and thus to benefit from asymmetry at the expense of the less informed actor (Salanié, 1997). Requiring agricultural producers to be more transparent about their production costs could therefore weaken them by destroying this rent; at the very least the possibility of this risk occurring must be taken into account. Moreover, tariff transparency may be harmful if it allows the creation of an artificially high common benchmark that could lead to maintaining high prices (Clarke, 1993; McAfee and Schwartz, 1994).

Since the purchasing power of retailers is one of the key factors in the unequal sharing of value along the food chain it is a priority to create an effective control mechanism (such as merger control), which would make it possible to slow down (or at least to monitor and discipline) the formation of purchasing alliances at both the EU and MS levels. These buying groups aim at purchasing in conjunction with one another (even though retailers remain competitors) in order to reduce supply costs. For instance, three major buying groups have been created in France since 2014: System U and Auchan formed an alliance in September, followed by Intermarché and Casino in October, and by Carrefour and Provera (Cora, Match) in December. At the European level, Asda (third largest retailer in the UK) joined the EMD central purchasing group (Casino, Markant, Euromadi, etc.) in 2016, thus creating the leading European central purchasing group. In 2018, two other purchasing alliances were formed, bringing together Auchan, Casino, Metro and Schiever (Horizon Alliance) on one side,[89] and Carrefour and Tesco on the other.

Until recently, such purchasing alliances between retailers have been relatively well perceived by public authorities, due to the priority given to the purchasing power of the end consumer.[90] The underlying reasoning was that better bargaining power of the downstream sector *vis-à-vis*

89. After three years of cooperation, the companies of the Horizon Alliance decided not to pursue their collaboration from 2022.

90. This benevolence on the part of the public authorities towards central purchasing alliances may, at least initially, appear contradictory to the desire of the same public authorities for a more balanced distribution of value for the benefit of farmers. First, it should be noted that the public authorities do not always speak with a single voice; for example, the positions within the Ministry of Agriculture are not always aligned with those in the Ministry of the Economy. Second, it will be hypothesized that this paradox may reflect a separate treatment of the two related issues of value creation and distribution.

the upstream sector should make it possible to reduce supply costs and, ultimately, retail prices by passing on these cost savings to consumers at the time of purchase. On this last point, the theoretical and empirical economic literature is unanimously sceptic*al*. The contracts between downstream and upstream sectors correspond to a complex set of wholesale unit prices and fixed discounts. Any increase in the latter will not by nature be passed on to the final price paid by the end consumer (Caprice and Rey, 2015).[91] Moreover, this same literature highlights the drawbacks of purchasing power, which can reduce upstream innovation, diminish the variety of products offered to consumers by excluding the most dependent producers and increase the risk of collusion between retailers (Inderst and Mazarotto, 2008).

In France, the Competition Authority issued an opinion on the purchasing alliances to be carried out in 2014.[92] More recently, it launched an inquiry into the new European purchasing groups finalized in 2018. The 2014 opinion stressed that the retailers involved in the three French central purchasing alliances at that date undertook to use them only in their negotiations with manufacturers of products with major national brands; that is, multinational companies. Retailers retained their independence in relation to purchases from smaller manufacturers; that is, producers of private labels, low processed products or raw agricultural products. Agricultural producers were excluded from the scope of action of these groups. This commitment could reflect the distributors' concerns not to strengthen their purchasing power towards the weakest, while raising the question of how the controls could be made more effective. In contrast to the 2014 purchasing alliances, the European buying groups created in 2018 cover the entire product range purchased by retailers, including private labels and raw agricultural products. This change in the scope of purchasing alliances is justified by the increased development of tripartite contracts that are more binding for retailers on the one hand the opportunity offered to private label manufacturers to expand internationally one the other hand. However, these developments pose a significant risk to retail suppliers by strengthening the negotiating power of the downstream end of an already unbalanced chain.

Above all, despite some limited legislative developments in some MS the lack of government control in the establishment of purchasing alliances is a cause for concern. It thus appears critical to equip competition authorities at the EU and MS levels with tools to exercise effective control over existing and future groups, and on their consequences.

Conclusion

This chapter shows that the imbalance in value sharing in the food chain is a topical issue relevant to all MS. This sharing is unfavourable to agricultural producers: the determinants are fundamentally structural, with a relatively fragmented upstream level of the chain and a highly concentrated downstream level particularly for retailers. Changes in final demand leading to

91. This is because the distributor theoretically determines the optimal resale price of a product in order to maximize its profit. This optimal price only takes into account the wholesale unit price. Unless they reach prohibitive levels, fixed costs do not play a role in this decision.
92. Competition Authority, 2015: Notice 15-A-06 of March 31, 2015, on the merger of purchasing and listing agencies in the mass distribution sector.

the increased processing of agricultural products and their homogenization have the effect of increasing the imbalance. Successive reforms of the CAP may have had an impact on the balance of power within the food chain in two opposing directions. On the one hand, the withdrawal of the system of guaranteed prices has led agricultural producers to confront the market mechanisms from which they were (until that time) protected; a development that has increased the power imbalance to the disadvantage of agricultural producers. On the other hand, in addition to the direct aid paid to farmers the CAP has introduced corrective measures aimed at restoring the balance in the sharing of value in favour of farmers; for example, by providing a framework for contractualization between the upstream and downstream actors or by encouraging producer organizations by strengthening their prerogatives. The CAP continues to have an important role to play in ensuring the continuity and completeness of these mechanisms. The latest disputes arising from the grouping together of powerful agricultural producers (at least relatively speaking) have highlighted the urgent need for the CAP and competition law to work together to achieve a better balance of power throughout the food chain.

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6. The CAP and Hazard Management

Jean Cordier, Alexandre Gohin

Numerous climatic and health hazards can disrupt agricultural production leading to changes in quantities and prices on the markets. Farmers are the first agents affected by these production hazards but all economic agents along the food chain are ultimately impacted with consequences on food cost and security. In recent years, the frequency and intensity of these hazards have been increasing. This is the case, for example, in France (CSO, 2017). Demand hazards are also multiplying with a marked intensity linked to the information relayed rapidly by the media. In addition to these physical hazards, the so-called endogenous[93] volatility of agricultural prices and markets appeared at the beginning of the 2000s, linked to financial innovations that facilitate the purchase of agricultural products with a view to diversifying financial asset portfolios. The prices of many agricultural products offered by European farmers have fluctuated considerably, from one year to the next, and even within a marketing campaign.

These various agricultural hazards qualify as crises when their probability of occurrence is poorly known and above all of exceptional magnitude (for example, the Bovine Spongiform Encephalopathy (BSE) crisis of the 1990s in the European Union (EU), better known as the "mad cow" crisis); otherwise, they qualify as risks. The management of these hazards is a long-standing issue both at the microeconomic level of firms and at the macroeconomic level of public policies. As detailed in Chapter 1, which provides a brief history of the CAP, this policy has always been justified by the desire to reduce the harmful consequences of hazards, among other objectives. In the first CAP period (1960-1990), this was mainly achieved through production price support mechanisms. For more than 25 years, successive reforms of the CAP have gradually replaced price support by direct aids to support agricultural incomes. More recently, measures that are more marginal in budgetary terms aim to develop contingency management tools (such as insurance and mutual funds).

This exposure of European agriculture to hazards of various origins is a major concern for the modern agricultural world. The possible role of public authorities in the face of these hazards is the subject of intense debate, on both the legitimacy (justification) of public intervention and the modalities of this eventual intervention. The main objective of this chapter is to provide a synthesis of these debates, based on the results of research conducted on European agriculture. This synthesis also draws on the results of research

93. See Section 1 of this Chapter 6 for the definition of an exogenous *versus* endogenous hazard.

conducted in the United States (US), a country that has been exposed to hazards for a longer period and has considerable experience in the use of crisis and risk management tools.

This chapter is organized into four sections. The first defines the context by presenting the main hazards affecting European agriculture, and the second presents the instruments for managing the hazards included in the CAP and their evolution over time. The third section synthetizes the main lessons of economic theory to analyse public intervention in the presence of hazards. The fourth section presents a set of studies that aim to evaluate and compare the impacts of different agricultural policy instruments (such as guaranteed prices, border trade measures, direct aid, risk management tools, etc.), illustrating the strong dependence of the lessons learned as to whether or not hazards are taken into account. The conclusion outlines some perspectives.

Sources and extent of the hazards affecting European agriculture

Much of the analysis focuses on two types of hazards. First, they are the price risks, which can be measured by the volatility of prices over a given period. These hazards concern not only the prices of products but also those of inputs. In addition to the price of fertilizers or animal feed, interest rates (seen as the price of "financing" investments) and exchange rates (that is, the prices of currencies in international trade) must be added. The price of land is also volatile especially when buying and selling plots of land, even though it is regulated in several Member States (MS); for example, in France, by the status of renting farmland.

Next are the production hazards, which cover the two dimensions of quantity and quality. These production hazards imply that for the same quantity of inputs used the production carried out will not be identical in volume and quality. They result mainly from climatic (hail, frost, drought, storm, etc.) and sanitary (diseases) hazards.

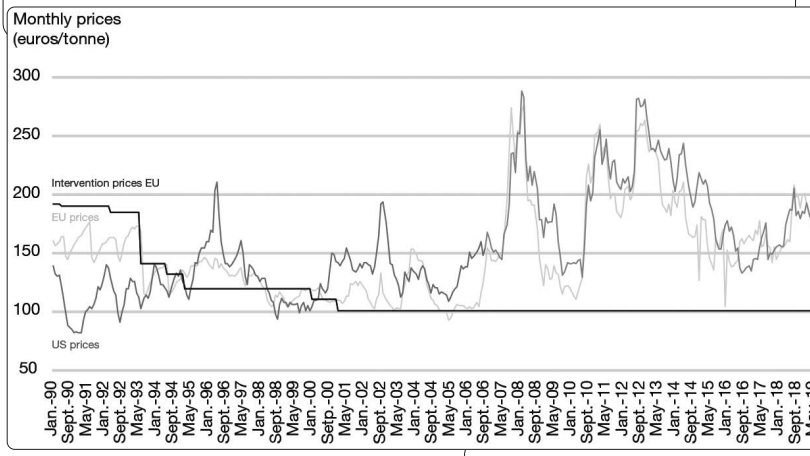
Farmers face other types of hazards, including environmental hazards related to the use of natural resources (for example, accidental soil or water pollution) or linked to the agricultural assets held by farmers (for example, a fire in farm buildings or the breakdown of farming equipment). Farmers also face hazards that affect their health, the origin of which may be directly linked to production activity; for example, when using plant protection products or handling animals. Finally, they face political or institutional hazards beyond those directly related to the CAP; for example, the closure of export markets because of political decisions or challenges that arise in the use of new technologies.

In recent years, the European agricultural sector has seen an increase in the frequency and intensity of fluctuations in price and production. A study carried out by Ecorys and Wageningen Economic Research (2017) at the request of the European Commission stresses that price risks are now more important than production risks. This can be explained in part by the evolution of the CAP, which for the most part no longer supports the market prices of cereals, sugar, dairy products, and beef and veal (see Chapter 1). For these products, the volatilities observed on European markets have come closer to those observed on world markets

(Figure 6.1 in the case of wheat). In contrast, price fluctuations in the EU have not changed significantly in the case of fruit and vegetables, white meat, and eggs, which are sectors that have historically received less support from the CAP. This report also underlines that this increased price volatility affects MS farmers producing the same goods in a reasonably similar way. This is not the case for production contingencies. There remains a strong heterogeneity of these hazards between European regions: crop yields are always more variable in Southern European regions than in Central European regions. Nevertheless, at the EU level as a whole, crop yields are now more volatile, partly due to more variable climatic conditions.

Price and production hazards combine leading to strong temporal changes in farm incomes. Incomes are more volatile for enterprises specializing in permanent crops or pig production than for mixed enterprises simultaneously producing crops and animals. On the other hand, average incomes are higher for the former suggesting a possible trade-off between the average and the variability of incomes (European Commission, 2017).

Figure 6.1. Changes in wheat market prices in the United States and wheat market and intervention prices in France between 1990 and 2013.



Source: Data from the World Bank, the European Commission (DG AGRI) and FranceAgriMer.

While these different hazards are relatively well measured, the origins of price hazards remain controversial despite decades of research. Price risk is said to be exogenous when weather or health-related events disrupt expected supply and/or demand conditions and finally alter price equilibria. In addition to this exogenous origin, there may also be endogenous randomness linked to the very functioning of the market, resulting from divergent interpretations of market information, forecasting errors or even "sheep-like" behaviour on the part of the players (that may then lead to the formation of speculative bubbles). In recent years, the financialization of markets has been at the heart of the debate (Gohin and Cordier, 2017).

This is here defined as the development of futures' positions held directly or indirectly by investment funds on commodities.[94] These funds are often blamed for increasing price volatility by taking important positions on commodity markets and by contagion from one commodity to another through index management.[95] This increase in volatility and the possible disconnection of a commodity price from its market fundamentals is called excessive volatility.

In addition to the exogenous and endogenous origins of price contingencies, political contingencies can also contribute to price fluctuations under the effect of unanticipated situations such as trade embargoes (such as the Russian food embargo in effect since August 2014) or political reactions to situations deemed to be crises (such as the sharp rise in agricultural prices in 2007 and 2008, or the Russia's invasion of Ukraine from February 2022). The sources of hazards are therefore interdependent.

The quantification of the respective shares of the three sources of price fluctuations (exogenous, endogenous, and political) is delicate, in the short, medium, and long term. Indeed, the information used by economic agents to form their expectations, which are at the source of the endogenous fluctuations, is not directly observable.

CAP hazard management instruments

Since the 1992 reform, the CAP has evolved considerably with less price support and as a result greater exposure of European farmers to potential price fluctuations. In this context, it is enlightening to recall the first reflections carried out by the European Commission on this problem of hazards in order to better understand the current measures.

As early as 2001, an initial study focused on the analysis of agricultural hazards and the traditional tools for their management; for example, the diversification of activities, financial management (borrowing and savings), contracts in the sectors, financial markets, and insurance (European Commission, 2001). On the basis of this study, a Commission communication in 2005 outlined an initial vision of an *ex post* risk management toolbox (European Commission, 2005). Three options are described "that, in combination or individually, could in time complete or partially replace Community and Member States' *ad hoc* emergency measures": a financial contribution to insurance premiums against natural disasters, support for mutual funds, and basic coverage against income crises. The Communication also developed some principles for implementation, namely application under the second pillar of the CAP and a focus on training for farmers. It suggested that a transfer of 1% of budgetary resources

94. A futures contract is a financial product that provides a commitment to buy or sell a product at a predetermined price and date. It includes an underlying natural resource (such as oil or gold, agricultural product, financial product, or currency, which the seller undertakes to sell and the buyer undertakes to buy), a term (the date on which the sale or purchase transaction is to take place) and a price (the amount at which the underlying will be sold or bought). The commitment on a security corresponds to the opening of a position. A long position is a buying position (expectation that the value will increase in the future) and a short position is a selling position (expectation that the value will decrease in the future).

95. Index management seeks to achieve a performance as close as possible to that of an index such as the CAC 40 (the index of the Paris Stock Exchange) or the Dow Jones (the index of the New York Stock Exchange, which is the oldest stock market index in the world).

from the first to the second pillar would be sufficient to set up an *ex post* risk management toolbox adapted to the associated needs. The European Commission thus did not envisage any additional expenditure other than the co-financing by countries and regions inherent in the second pillar. The training needs of farmers aimed to promote the development of futures markets, derivatives markets,[96] insurance, mutual funds, and contractualization in agriculture through an increased awareness of the hazards and their potential effects by the economic agents; first and foremost, the farmers.

This 2005 Communication is reflected in the CAP resulting from the 2008 reform, which, for the first time, includes an *ex post* risk management toolbox. This toolbox is found in the first pillar. It includes the public contribution to the climate insurance premiums and support for mutual funds targeted at compensating for production losses due to health and environmental events. The toolbox is transferred from the first pillar to the second pillar at the time of the 2014 CAP reform, involving national or even regional co-financing. It is doubly enriched on this occasion in terms of insurance and mutual funds in order to compensate for production losses on the one hand and the creation of a mutual fund to compensate for agricultural income losses on the other.

This risk management toolbox has been little used to date both in terms of the provisional budgets programmed by the various MS under their respective Rural Development Plans (RDPs) and in terms of the instruments that were put in place (Table 6.1[97]). Many MS did not mobilize any of the three tools. Of those MS that used the three tools, only Italy used all three. In total, the amounts mobilized over the period 2015-2020 would be EUR2.7 billion; 59% in Italy (out of the three instruments, but mostly in the form of subsidising insurance premiums) and 22% in France (also mostly *via* subsidising insurance premiums). Table 6.1 ignores "non-CAP" national subsidies that have historically been important in a country like Spain and explain (at least partially) the development of agricultural insurance in this country.

According to the European Commission, there are several explanations for this low utilization, with the first being that the criteria for triggering public compensation are too strict (European Commission, 2018a). These criteria were originally defined to be compatible with World Trade Organization (WTO) rules. At the time, they were too restrictive to attract the interest and participation of European farmers. During the reform of various European policies in 2017 known as the Omnibus reform package, three adjustments were introduced corresponding to the lowering of the loss thresholds to trigger compensation, the possibility of implementing an instrument to stabilize sectoral agricultural income, and the possibility of using indices to calculate agricultural income.

Other CAP measures contribute to a low use of the *ex post* risk management toolbox. These measures can be activated in crisis situations. However, the CAP does not precisely define what a crisis situation is. Guaranteed prices still exist. These support prices can still be useful

96. A derivative product or derivative contract is a financial instrument whose value fluctuates according to changes in the rate or price of an underlying, which requires little or no initial investment and which is settled at a future date.
97. See also Ecorys and Wageningen Economic Research (2017).

Table 6.1. Programmed expenditure on the three instruments of the CAP risk management toolkit over the period 2015-2020 (EUR million).

	Insurance premiums	Mutual funds	Income stabilization tool	Total	Share of European funding (%)
Belgium - Flanders	5.1	–	–	5.1	61
Croatia	56.7	–	–	56.7	85
Spain - Castilla y León	–	–	14.0	14.0	53
France	576.8	24.0	–	600.8	100
Hungary	76.5	–	18.8	95.3	83
Italy	1,396.8	97.0	97.0	1,590.8	45
Latvia	10.0	–	–	10.0	68
Lithuania	17.4	–	–	17.4	85
Malta	2.5	–	–	2.5	75
The Netherlands	54.0	–	–	54.0	50
Portugal	51.8	4.0	–	55.8	82-85
Romania	–	200.0	–	200.0	85
Total	2,247.6	325.0	129.8	2,698.8	64

Source: European Commission (2017) on the basis of MS notifications to the European Commission.

even though they are at much lower levels today than during the first CAP period 1960-1992. This was the case in 2016 for the market on skimmed milk powder, with almost a quarter of EU production withdrawn from the market for storage in intervention stocks. The latter were gradually sold on the markets, helping to smooth fluctuations in European prices. Low utilization is also due to national, fiscal, or social measures. France and the United Kingdom (UK) make frequent use of such state aids (European Commission, 2017). Finally, the previously mentioned study by Ecorys and Wageningen Economic Research (2017) emphasizes that the vast majority of MS and the agricultural unions within the MS are satisfied with a system of direct aid to support high agricultural incomes supplemented by *ad hoc* measures if a market crisis occurs. Such exceptional measures are common. Thus, in 2016, it was decided to implement voluntary reductions in milk supply and to grant additional budgetary support to deal with the consequences of the Russian embargo.[98]

What role for the public authorities?

Public authorities can mobilize different types of instruments to reduce the adverse effects of hazards and/or limit their occurrence and intensity. Any questions that arise are related to the usefulness of this intervention and its modalities. In the case of European agriculture, there is the additional question of the right level of intervention at regional, national and/or European levels in a context where the intensity of hazards varies spatially.

Numerous reports (academic, political, and professional) have been written in recent years on these recurring issues of agricultural economics. There is no consensus on policy recommendations, which range from a strong intervention in physical goods' markets to light intervention only in risk management markets. We summarize the lessons from research on the value of public intervention in the presence of hazards, based on a public economic analysis framework.

How can private actors limit price volatility and/or guard against its adverse effects?

King's Law

Agricultural supply is not highly sensitive to short-term price variations because of production delays. In the same way, food demand is not highly sensitive to price changes (Butault and Le Mouël, 2004). Consequently, any uncertainty regarding the quantities offered or demanded (due for example to a particular climatic episode or poor anticipation by agricultural producers of future demand) will lead to a strong upward or downward variation in prices and consequently in agricultural incomes. This result is known as King's Law, named after the English statistician Gregory King, who highlighted the low elasticity of food demand to price changes. Moreover, like most producers and consumers, farmers do not like risk:

98. Thus, *ex post* risk management can be carried out by *ex ante* instruments (those in the toolbox) as well as by *ex post* policies, decided on an *ad hoc* basis. The latter are detrimental to the development of the former.

indeed, they are risk averse. This aversion means that they will invest less in agricultural activity (and may even exit from the sector) relative to a risk-neutral situation. These developments and reactions are ultimately detrimental to the consumers of agricultural goods and to the economy as a whole because the volumes available will be lower on average and the prices higher on average. Since the situation is detrimental to the economy as a whole, intervention by public authorities is legitimate.

This legitimacy, based on King's law, is intuitive and logically seductive. However, it suffers from a major omission that invalidates it. Aware of these characteristics of supply and demand in agriculture, economic agents, and first and foremost farmers, will adapt their behaviour to take advantage of this situation and/or guard against its negative consequences. Two types of behaviours and non-exclusive solutions can be distinguished; on the one hand those that will reduce price volatility and on the other hand those that aim to manage, share, and/or transfer residual hazards.

Limiting price volatility

The first mechanism for limiting price volatility is private storage. The latter has always existed, as shown in the Old Testament of the Bible with Joseph's advice to the Pharaoh on the value of the storage of crops. A large body of research shows that private storage can have a stabilizing effect on prices and consequently a positive impact on the well-being of economic agents (Williams and Wright, 1991). However, private storage cannot be a panacea for two main reasons. First, the beneficial effect depends on the costs of storage whereby the higher the unit costs of storage, the lower the stabilizing effect. Second, the smoothing effect of storage reaches its limits when stocks are zero and production is low; in other words, storage can prevent prices from collapsing but not from climbing.

A second mechanism for limiting agricultural price volatility is trade between regions and countries. Indeed, the climatic variations that impact agricultural yields do not appear at the same time in the different production zones of the planet. Without trade between zones that are sensitive to climatic hazards and less sensitive zones, agricultural prices would be volatile in the former and more stable in the latter. It is precisely these price differences that will encourage economic operators to trade. The latter will have the effect of attenuating price variations in climate-sensitive regions and increasing them in less sensitive regions. Like storage, however, trade cannot be a panacea as it cannot lead to a total elimination of agricultural price volatility.

The two mechanisms of storage and trade can therefore under certain conditions reduce the volatility of agricultural prices; however, they cannot cancel it out. Residual volatility will induce damaging variability in farm incomes if farmers cannot adapt and/or cope with this volatility. To this end, farmers have several options that are the result of *ex ante* decisions (before the contingency occurs) and/or *ex post* decisions (after it occurs).

Acting before the hazard occurs

A first *ex ante* decision relates to the diversification of the farm's sources of income. This first adaptation mechanism cannot yet solve everything since as seen above the decision can lead to a lower expected income.

A second *ex ante* decision corresponds to the total or partial transfer against payment of the consequences of the contingencies to other economic actors. The main instruments of this transfer are insurance contracts and option-type financial contracts,[99] whether they are traded on organized markets (futures markets) or non-organized markets (Over-The-Counter (OTC) markets).[100] Typically, an agricultural hail insurance contract is an *ex ante* decision by a farmer to pay a premium to an insurer who will pay him compensation if a hail incident affects her (his) crops. The amounts of the premiums depend on the nature of the hazards. The lower the hazard and the more uncorrelated it is between individuals, the lower the premium charged may be. Conversely, the more the hazard is correlated between farmers, the higher the premium charged will be as insurers will then have to reinsure themselves. If this is not the case, they expose themselves to the risk of bankruptcy if an unfavourable contingency simultaneously affects all or a large part of their policyholders. Insurance is therefore better suited to non-systemic hazards, such as hail.

In the case of price fluctuations that simultaneously affect all producers in a given sector, financial contracts are regularly recommended, including by the European Commission. The different types of contracts offer the possibility of sharing or in the case of options selling the consequences of price fluctuations with investors who can potentially be more numerous in the case of futures contracts. The scientific literature presents these futures contracts and the associated options as the solution to price fluctuations. The cost of these contracts is indeed quite low and is essentially the lower return on the margin deposit[101] and the margin calls required by the clearing house to ensure that the contracts are properly executed. This solution, nevertheless, suffers from limitations. In particular, physical operators must bear a basis risk, with the basis being the spread between forward and spot prices. Additionally, the price of the product underlying the futures contract must be sufficiently volatile for the market to be sufficiently liquid; that is, including both economic agents who want to protect themselves through hedging and economic agents who want to diversify their portfolios.

Acting after the hazard has been realized

Farmers have at least two *ex post* latitudes to mitigate the consequences of residual variability. A first decision concerns productive investments. Farmers can indeed advance their investments if the prices of a season are favourable and delay them if they are unfavourable. These choices of investment dates have an impact on the productive capacity of future years. They also have a smoothing effect on taxable farm income. A second *ex post* decision concerns the volume of savings (or borrowings) and the final consumption of farm households. The latter can save part of their income when the hazard is favourable, and not save, reduce their savings, or borrow when it is unfavourable.

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99. An option is a derivative (see Footnote *96*) that establishes a contract between a buyer and a seller. The buyer of the option obtains the right (not the obligation) to buy (*call*) or sell (*put*) an underlying asset at a pre-determined price (*strike*) during a given time or on a fixed date.

100. In OTC markets, the transaction is concluded directly between the seller and the buyer (as opposed to an organized market where the transaction is carried out on an exchange). It should be noted that in this way, the consequences of contingencies can be shared with actors other than insurers or investors, such as agricultural cooperatives or landowners; a point that is often overlooked in debates.

101. Amount paid by an investor to secure its positions in the derivative markets.

To sum up, King's law, which is based on the inelasticity of food demand coupled with a rigid short-term agricultural supply, seems insufficient on its own to justify public intervention in the presence of hazards. This is because there are various market solutions that make it possible to mitigate this volatility and manage its consequences *ex ante* and *ex post*. At this stage of the analysis, the question is then: is the development of these different market solutions sufficient without public intervention, or is public intervention required to ensure sufficient development? In the second case, the induced question is: should public intervention focus on these market solutions, or should it be broader through actions on both hazard management markets and the physical markets for agricultural products? The theory of public economics offers indirect answers to these questions by underlining the fundamental role of information.

Informational and political failures

According to the theoretical insights of public economics, the situation could be improved by public intervention if market-based solutions for hazard mitigation and/or management fail or are incomplete.[102] In the first case, the full costs of the solutions are higher than the expected benefits (for example, a higher net cost of insurance than the benefits related to reducing the volatility of agricultural production, prices, and incomes). In the second case, solutions are not available or equivalently they are only available at infinite cost. In other words, public intervention is justified if it can *ex ante* improve the functioning of hazard management markets and/or if it can increase the number of such markets.

This major issue has been the subject of much research (for a synthesis see OECD, 2009). The answer is not unique as it varies according to the context, the type of hazard, whether it is a crop or livestock production, etc. Nevertheless, a common lesson is emerging linked to the role of information. Information asymmetries between economic agents, transaction costs resulting from access to this information, or the lack of information on certain hazards (described as uncertainties as opposed to risks, which correspond to hazards whose probability of occurrence is known or can be estimated) are the main failures of hazard management markets. However, even in this context of inefficient information markets, not all public intervention is automatically effective.

Three types of information failures

A first informational failure relates to information asymmetries, which can be presented as follows. An information asymmetry exists when an economic agent (for example, a farmer) knows his hazards better than an insurer does. This situation can generate two problems: moral hazard on the one hand and adverse selection on the other. Moral hazard arises when the insured changes his behaviour following the purchase of an insurance contract; for example, by making riskier production decisions. Adverse selection occurs when only those farmers who are the most exposed to hazards buy insurance contracts. If the premiums calculated by insurers are based on the entire population of farmers and not only on those

102. The General Introduction of the book explains in more detail what failing and incomplete markets mean.

who insure themselves, they may be insufficient to cover all compensation aids required in the event of a claim. To reduce the risk of bankruptcy, insurers have several levers at their disposal: increase premium levels, introduce deductibles, set up bonus-malus systems, etc. All of these solutions ultimately aim to ensure that farmers reveal the information they hold, resulting in a higher cost (or equivalently a lower effectiveness) of the insurance contract for farmers. This extra cost may cause some farmers to disregard insurance contracts when they would have done so without this extra cost.

A second informational failure is related to transaction costs resulting from information that is not easily accessible. This problem partly explains the absence of futures markets for certain agricultural products. Futures markets can indeed develop if the quality of the underlying agricultural product is homogeneous and particularly if this quality can be easily measured by safe and indisputable techniques. If this is not the case, disputes by market operators over the quality of the products delivered would quickly arise leading to high dispute settlement costs.

A third informational failure results from the absence of statistically robust information about a future random event; for example, an unknown food safety hazard, a new epidemic disease, or the robustness of a new practice or technology. The probabilities of occurrence of these random events and their magnitude are unknown. It is therefore technically impossible for insurers to write contracts to protect farmers against these hazards. The crisis situation outlined in the introduction of this chapter is part of this third informational failure.

What about the failures of public decision-makers?

These three information failures may justify public intervention targeting the hazards faced by farmers. There is no doubt that hazard management markets are incomplete in agriculture, if only because there are few futures markets and insurance does not cover all production hazards. However, these lessons from public economics theory do not translate directly into public policy recommendations, more specifically on the choice and design of instruments to be implemented. Is it necessary to intervene directly with these informational imperfections by increasing the information known to the public (for example, by developing public observatories)? Is it also necessary to act more directly on physical markets and/or incomes to resolve these informational failures and/or mitigate their negative consequences?

We now take it a step further. Do we really need public intervention at the risk of the cure being worse than the disease? This idea is very much present in the analyses of many US agricultural economists. In the aftermath of the Second World War, D.G. Johnson, a professor at the University of Chicago (who was known for his very pro-liberal views) recommended government intervention in the form of support prices (parity prices) because of insufficient information on the hazards that hindered the development of market solutions for risk management. His analyses influenced the first US agricultural laws after 1945. However, D.G. Johnson quickly changed his mind to the point of recommending that the government should no longer intervene because public policies were excessively influenced by agricultural

lobby groups (Gardner, 1996). This argument of policy failure in the face of lobbies is still very much present in agricultural debates in the US today, and it also applies to the EU. The limited development of crop insurance in France can be partly explained by the competition of public interventions for loss compensation under pressure from the actors (CSO, 2017).

In a context where political risk would ultimately be the real (main) source of the failure of hazard management markets, the recommendation would be to implement a credible policy that cannot be manipulated by economic agents so that hazard management markets can develop. This ultimately refers to the issue of the governance of agricultural policies; more specifically to the question of the composition of the governance bodies that define the objectives of these policies and the conditions for their implementation, independent of the pressures that economic actors may exert. In the European case, this amounts to studying the roles of the Council and the European Parliament on the one hand and the European Commission on the other. Work on this governance issue is rare. Mahé and Bureau (2016) are an exception by posing the problem in the framework of the post-2020 CAP. This problem of so-called political credibility is studied more at the international level, and applied for example to the management of agricultural product stocks (Gouel, 2013).

Impacts of different intervention instruments: consequences of taking hazards into account

The informational issues presented above are very rarely the focus of quantitative and/or qualitative analyses of the impacts of the CAP. The work of Cafiero *et al.* (2009) is a notable exception. It is applied to the fruit and vegetable sector in which information is less accessible (relative to other agricultural sectors). Among other solutions, this work suggests options that would be purchased by public authorities in order to initiate the development of organized financial markets and the simultaneous production of public information. In contrast, numerous quantitative works have assessed the impact on markets and farm incomes of the various CAP reforms implemented since 1992. The instruments or sets of instruments studied under this heading are gathered into three categories: first, instruments acting directly on agricultural product markets *via* public purchases at guaranteed prices, import taxes, or export subsidies; second, instruments of direct aid to support agricultural incomes; and third, instruments aimed at fostering the development of risk management markets, more specifically that of insurance. The first two categories have been analysed in both the US and the EU; the third category has been studied mainly in the US (Smith *et al.,* 2017). We now summarize the main findings of these works.

Measures acting directly on physical markets

The instruments considered here include: guaranteed prices and their corollaries in the form of public storage, import measures (customs duties, taxes, tariff quotas, non-tariff barriers, etc.), and export measures (subsidies, etc.); supply control measures (production quotas, quotas for the use of production factors such as set-aside, etc.); and measures to stimulate

demand (programmes to increase the consumption of fruit and vegetables or dairy products under the CAP, support measures for the incorporation of biofuels, etc.). Trade policy instruments have been the most studied, particularly in the context of the 1992 CAP reform, which was itself part of the Uruguay Round of multilateral negotiations.

A major result of this work is that direct public intervention in markets in one region of the world transfers instability to other regions, creating the possibility of a trade war and increased protectionism globally through the retaliatory effect of the countries thus destabilized. These studies therefore conclude that free trade (and the decoupling of income support policy; see Chapter 2) is effective. However, the analytical frameworks mobilized do not include any market failure, or even contingencies in many cases. This conclusion, which continues to be present in the most recent work of the European Commission (European Commission, 2018b), is therefore not particularly useful for our purpose.

More useful is the work of Boussard *et al.* (2006), which integrates endogenous sources of price fluctuations into the previous analytical frameworks. The endogenous sources considered correspond to anticipation errors of agricultural producers. Boussard *et al.* (2006) then show that the welfare gains from the abolition of measures acting directly on the physical markets are no longer automatic. They even recommend intervening in the form of guaranteed prices coupled with supply control in order to avoid the occurrence of chaos (anarchic market developments). By contrast, in a similar analytical framework that also considers anticipation errors, Féménia and Gohin (2013) show that gradual reforms of the CAP make it possible to avoid a worsening of anticipation errors. They deduce from this that measures acting directly on agricultural markets cannot be abruptly abolished to give actors time to learn about real market conditions and thus avoid (very) strong endogenous price fluctuations.

Impacts of direct aid

Support in the form of direct aid may also take different forms depending on whether or not it is coupled with a type of production, its volume and/or price, or a factor of production (in particular the land factor), etc. The impacts of these direct aids on agricultural markets and incomes are often assessed in comparison with those of measures acting directly on markets. The same analytical frameworks that do not incorporate market failures or even price and production hazards are often used. In this context, the results of a study conducted by the Organisation for Economic Co-operation and Development (OECD) are regularly cited to justify the decoupling of agricultural income support (OECD, 2002).

In contrast, many microeconomic studies seek to assess the impacts of different types of direct aid on individual farmers' behaviour in the presence of hazards. In particular, these studies show that the impacts on the volumes produced depend on the degree of risk aversion of farmers, as well as on their level of wealth (Féménia *et al.*, 2010). Direct aid that is deemed to be decoupled is therefore not completely decoupled.[103] These microeconomic

103. For a presentation of the channels other than the contingencies that make direct aids deemed decoupled within the meaning of the Uruguay Round Agreement on Agriculture (URAA) not fully decoupled, see Chapter 2.

evaluations are extremely useful in assessing the effects of different agricultural policy instruments in the presence of hazards. However, these evaluations do not make it possible to conclude on their effectiveness in terms of hazard management as they do not integrate the effects on consumers who benefit from the increase in volumes produced by the drop in prices, all other things being equ*al*.

Impacts of hazard management instruments

The CAP risk management toolbox is recent and still infrequently mobilized. To our knowledge, there are no macroeconomic assessments of this toolbox. Nevertheless, lessons can be drawn from the situation in the US where insurance products have been supported by the successive farm bills. This support, which was only limited in the early 1980s and has increased significantly since the 2000s, is now the primary instrument of US agricultural policy in budgetary terms. Targeted insurance products are increasingly focused on fluctuations in income and increasingly less on production risks.

The public subsidization of insurance costs is a measure that is much debated in the US. The measure has been criticized for three key reasons: first, it is said to be more a tool for supporting farm incomes than for smoothing their fluctuations; second, it has not gone hand-in-hand with a reduction in emergency aid; and third, insurers would capture part of the public subsidies to the detriment of agricultural producers.

Many microeconomic studies have sought to assess the consequences of hazard management tools on farmers' behaviour. The impacts on the use of potentially polluting chemicals have thus been analysed. The most recent econometric evaluations conclude that the impacts are limited (Claassen *et al.*, 2016). The impacts of hazard management instruments on area and production decisions and consequently on farm incomes and their variability have also been studied. The impacts depend on farmers' attitudes to risk: the more risk-averse they are, the greater the impacts. The farmers prefer public authorities to intervene through direct aid based on areas rather than through insurance subsidies (OECD, 2011). In addition to the capture of at least part of the insurance subsidies by insurers, these lead to the reorientation towards (more) risky crops, an increase in production costs (excluding subsidies), and a greater exposure to hazards (excluding insurance) so that *in fine* the net benefit of the subsidy is reduced accordingly.

This OECD analysis does not take into account the macroeconomic consequences on markets. It excludes consumer gains resulting from the increase in production induced by government subsidization of insurance. To our knowledge, only Lusk (2017) has addressed this issue for field crops in the US. He uses a market model that does not include market failures or hazards. Unsurprisingly, he concludes that insurance subsidies are inefficient because they reduce welfare. Gohin (2017) has shown the shortcomings of this work, particularly stressing that the models used for a macroeconomic evaluation must not only take into account the costs of insurance (premium subsidies, implementation costs, reinsurance costs, etc.) but also the benefits that insurance provides. Insurance programmes come into play through the payment of compensation to farmers when they are affected by a hazard. They therefore have the effect of protecting farmers when they face adverse events. This protective effect,

which is the very basis of insurance, allows farmers to produce more (relative to a scheme without insurance), and this increase in production benefits the consumer through the induced reduction in prices. Overall, Gohin (2017) shows that the gains for producers and consumers would be greater than the costs borne by taxpayers; as a result, their public legitimacy.

Conclusion

We summarize the key points raised in this chapter as follows. First, European farmers are facing hazards of various origins and these hazards are likely to increase, not only because of the virtual elimination of direct market management measures but also because of the increase in climatic hazards, epidemics, etc. Second, within the framework of the CAP, the EU has equipped itself with a risk management toolbox comprising support for insurance and mutual funds, an instrument for stabilizing agricultural incomes, and a crisis management mechanism operated on an *ad hoc* basis. Third, this toolbox is only marginally mobilized by the MS that devote limited budgetary resources to it. Fourth, farmers have several market solutions[104] to protect themselves from hazards and their consequences. The development of these market solutions nevertheless occurs against informational problems, which are in practice the main market failure that would justify public intervention. Nevertheless, research does not allow for an unambiguous conclusion as to the optimal modalities of government intervention. Questions also remain on the superiority of this intervention when the policy failures are acknowledged, with pressures of economic actors by intervening in an *ad hoc* manner.

In this context, what is the place of hazard management instruments in the CAP in the future? This is a subject of vigorous debate as the various actors from the different MS do not share the same visions. The contrasting participation of farmers in the different MS in the voluntary supply reduction programme during the 2016 dairy crisis illustrates this divergence of views. The European Commission itself considers *ex post* that the management of this crisis through this channel was not effective because the efforts of some were reduced by the laxity or opportunism of others (European Commission, 2018b). The delineation between a crisis situation requiring intervention by public authorities and a situation of more normal risks that can be managed by market solutions remains unclear.

Unfortunately, there are too few economic evaluations to help clarify these debates. In the framework of the *ex ante* impact studies of the post-2013 (European Commission, 2011) and post-2020 (European Commission, 2018b) CAP reforms, the European Commission did not use economic tools that would have enabled it to appraise the advantages and disadvantages of hazard management tools. This is a major ongoing problem (with the same questions continuing to be asked) but the lack of knowledge to guide European private and public actors persists. More generally, the link between this issue of hazard management and the other issues of the CAP requires the continuation of work aimed at overall coherence.

104. Including through the implementation of agricultural systems that are more resilient to hazards, for example by diversifying crops on the same plot of land and/or over time, by a balanced combination of crop and animal production, etc. This dimension is discussed at length in Chapter 8 on the agro-ecological transition of agricultural systems.

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Part II

The CAP, the Environment and Health

Introduction

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The first CAP programme did not include environmental objectives, let alone instruments to ensure the protection of the environment. Rather, it reflected the priority given at the time to production and economic aspects. The integration of environmental objectives and instruments into the CAP has been gradual (Dupraz and Guyomard, 2019).

Gradual integration of environmental objectives and instruments into the CAP

Payments to agricultural producers in Less-Favoured Areas (LFAs) were quickly introduced, starting in the 1970s. Their main objective was not environmental protection but income support for farmers. This was to compensate for lower incomes in these areas compared to the income of producers located in lowland areas. However, these payments were also justified by the fact that maintaining agricultural activity in LFAs was beneficial for the environment because it allowed agricultural land use to be maintained, open landscapes to be conserved, and the biodiversity associated with them to be preserved.

Agri-Environmental Measures (AEMs) corresponding to voluntary contracts that farmers could freely subscribe to were introduced from the 1980s onwards in two countries: the Netherlands and the United Kingdom (UK). These measures were generalized to all Member States (MS) at the time of the 1992 CAP reform. They were designed to encourage the adoption of more environmentally friendly practices by compensating for additional costs or loss of income. MS rapidly developed a wide range of AEM for an equally wide range of environmental targets (Uthes and Matzdorf, 2013). The 2009 CAP Health Check extended the thematic coverage of measures. In 2015, the addition of targets for reducing net greenhouse gas (GHG) emissions[105] from agriculture led to the addition of a new name for the instrument, which has since been referred to as Agri-Environmental and Climate Measures (AECMs). At the beginning of 2010, about a quarter of the agricultural area of the European Union (EU) was covered by this instrument (Table II.1).

AECMs will still be one the three climate and environment instruments of the future CAP that will be applied from 1 January 2023 over the four-year period 2023-2027.

105. Net emissions are the balance between gross emissions and the storage of carbon in soils, natural or semi-natural elements, etc.

Table II.1. Agri-Environmental and Climate Measures of the CAP 2014-2020 (French version of the European menu relating to AECMs).

Measures	Description
System AECMs at the farm scale	AECMs for field crop systems that respond to the logic of improving existing practices: • diversity of crop rotation more restrictive than greening measure-I, limitation of the possibilities of returning the same crop to a plot, limitation of phytosanitary treatments, economical management of nitrogen inputs; • aid of between EUR100 and EUR254 per hectare, depending mainly on the ambition to reduce phytosanitary treatments.
	AECMs for "predominantly livestock" or "predominantly cereal-based" mixed cropping and herbivore rearing systems that respond to a logic of maintaining and improving practices: • non-return of natural grassland, ceiling on the purchase of concentrated feed, reduction in phytosanitary treatments of crops, economical management of nitrogen inputs; • aid defined according to regional (best practices) and territorial (objectives to be achieved) parameters.
	AECMs for mixed cropping-monogastric livestock systems essentially based on AECM specifications for field crop systems with a minimum number of monogastric animals set at the regional level; aid between EUR152 and EUR234 per hectare, depending on the region.
	AECMs for grazing and pastoral systems that respond to the logic of maintaining existing practices: • maximum loading of 1,4 livestock units (LU) per hectare, no ploughing of permanent grassland and pastures, no phytosanitary treatments throughout the permanent grassland and pastures; • aid calibrated according to a scale of risk of abandonment of practices and agronomic potential of the areas, ranging from EUR58 per hectare (type 1 risk) to EUR116 per hectare (type 3 risk).
AECMs targeted on localized issues at the scale of a parcel or set of parcels	AECMs for localized issues implemented at the scale of a crop plot, or a group of plots, to respond to a relatively limited environmental issue: measures targeted in particular at the issues of preserving wetlands, biodiversity, water quality, soil or landscape.
Un-zoned AECMs	• AECMs aimed at enhancing the pollination potential of bees. • AECMs targeted on plant resource protection at risk of genetic erosion. • AECM targeted on the protection of endangered breeds.

Source: Authors' elaboration from the French Ministry of Agriculture.

The 2003 CAP reform introduced the second major instrument for environmental protection. It was then decided to make the granting of direct aid under the first pillar conditional on compliance, with, on the one hand, regulations, and directives on environmental protection and human, animal and plant health, and on the other, the use of Good Agricultural and

Environmental Conditions (GAECs), which in practice correspond to basic principles of good agricultural land management (Table II.2). Non-respect of cross-compliance led to a reduction of first pillar direct payments according to a progressive scale of up to 100% in case of the refusal of control. The greening of the CAP, introduced at the time of the 2013 reform, can be analyzed as a reinforcement of cross-compliance, even if its modalities differ since it involves making 30% of direct aid under the first pillar conditional on compliance with three criteria relating to minimum crop diversification, the maintenance of permanent grassland and the preservation of agro-ecological infrastructures such as hedgerows, wetlands, etc. (Table II.2). The exclusion of smaller structures from greening obligations means that the latter cover about 70% of the European agricultural area.

In the 2023-2027 CAP, greening measures will be suppressed but corresponding conditions will be included in cross-compliance requirements that will now be named conditionality. In addition, the future CAP will include a new instrument for the environment called eco-scheme, which, like AECMs, aims to compensate farmers for climatic and environmental efforts that go beyond minimal conditionality requirements. The conclusion of the book details the green architecture of the future CAP and proposes an analysis in light of lessons from the second part of this book.

The CAP instruments that serve the environment therefore combine both the carrot and the stick: the stick *via* cross-compliance and the greening of first pillar aids, and their reduction in the event of non-compliance; the carrot *via* the AECMs and, to a certain extent, the compensation aids granted to farmers located in disadvantaged areas. Nevertheless, the stick is not noticeably large in terms of both the constraints imposed and the penalties for non-compliance. The same is true of the carrot in particular because AECMs only allow compensation for the additional costs or loss of profit generated by the implementation of more environmentally friendly practices and systems. In other words, AECM payments do not allow remunerating farmers beyond cost increases or profit loss, and therefore do not compensate farmers in proportion to the environmental benefits they could generate by adopting more environmentally friendly farming practices and systems. Because the measures implemented are not binding enough or do not provide sufficient incentives, the continuing environmental degradation of European agro-ecosystems should come as no surprise.

Table II.2. Cross-compliance and greening of the CAP 2014-2020.

Measures	Description
Cross-compliance: Statutory Management Requirements (SMRs)	
Environment-I	Compliance with EU directives on the conservation of wild birds and habitats.
Environment-II	Compliance with the EU directive on the protection of waters against nitrate pollution.
Animal Production Health-I	Compliance with the Hygiene Package relating to animal production (keeping a livestock register, conditions of use and storage of medicines or feedstuffs, etc.).

Table II.2. Next.

Measures	Description
Animal Production Health-II	Prohibition of the use of certain substances in animal husbandry (thyrostatics; stilbenes, stilbene derivatives, their salts and esters; agonist substances; substances with an oestrogenic, androgenic or progestagenic effect).
Animal Production Health-III	Prevention, control and eradication of Transmissible Subacute Spongiform Encephalopathies (TSEs).
Animal Production Health-IV	Identification and registration of animals.
Health in Crop Production-I	Compliance with the rules on the use of plant protection products (appropriate use including compliance with labelling requirements and application of the principles of good plant protection practice).
Health in Crop Production-II	Compliance with the Hygiene package for productions of plant origin (keeping a plant protection register, compliance with product storage requirements, etc.).
Animal Welfare-I	Compliance with general European rules on animal housing conditions and husbandry methods, and specific European rules for the rearing of calves and pigs in buildings.
Cross-compliance: Good Agricultural and Environmental Conditions (GAECs)	
GAEC-I	Maintaining buffer strips along watercourses.
GAEC-II	Control of authorizations for water abstraction for irrigation purposes.
GAEC-III	Protection of groundwater against pollution caused by dangerous substances (by prohibiting their discharge into the environment).
GAEC-IV	Minimum land cover (vulnerable areas, set-aside land, areas that remain in agricultural use after grubbing up of vineyards, orchards or hop fields).
GAEC-V	Erosion control (no tillage on flooded or waterlogged plots, no ploughing between 1 December and 15 February on plots with a slope of more than 10%).
GAEC-VI	Maintenance of soil organic matter by not burning crop residues.
GAEC-VII	Maintenance of topographical features (perennial landscape elements: hedges, groves, ponds, etc.).
Greening	
Greening-I	Minimum crop diversity on arable land (three crops if the land is larger than 30 hectares, and two crops if between 20 and 30 hectares).
Greening-II	Regional monitoring of the share of permanent grassland or pasture in the total eligible area, protection of "sensitive" permanent grassland and pasture.
Greening-III	Maintenance of at least 5% of the farm's arable land in Ecological Focus Areas (EFAs) based on a list of eligible EFAS defined according to an area equivalence scale.

Source: Authors' elaboration from the European Commission and the French Ministry of Agriculture.

Environmental emergency

The report of the Intergovernmental Panel on Climate Change (IPCC) published in October 2018 shows that the EU will most likely not be able to meet the commitments made at the Paris Conference in December 2015 to combat climate change (IPCC, 2018).[106] The fact that the same can be said for the vast majority of non-EU countries should not be used as justification. Agriculture is partly responsible for this current situation as it is a major source of GHGs[107] and because GHG emissions from agriculture have tended to be generally stagnant since the beginning of the 2010 decade or have even increased in some MS after several years of decline (European Commission, 2017; Guyomard *et al.*, 2020). For their part, European agricultural ammonia emissions (3.8 million tons in 2015) account for 94% of total European ammonia emissions. They have two main origins (that is, volatilization from animal excreta and the use of synthetic nitrogen fertilizers) and are an acid pollutant of air, soil, and surface water (European Commission, 2017).

In May 2011, the EU adopted a new biodiversity strategy. The strategy set out a long-term vision for 2050[108] and an intermediate ambition for 2020.[109] It is divided into six objectives, one-third of which specifically targets agriculture (objective 3A) and forestry (objective 3B). The main aim is to strengthen the contribution of these two sectors towards maintaining and improving biodiversity through the greater integration in agricultural and forestry policies (European Commission, 2011). The focus on agriculture and forestry is reasonable because of the territorial coverage of these sectors (that is, more than two-thirds of the EU's land area, 50% of which is covered by agriculture) and the degradation of biodiversity that can be observed there. This degradation includes multiple stresses on wild bee populations and a decline in the natural pollination process; a more general decline in populations of insects and birds on farmlands; and a large proportion of grassland and wetland habitats in an "unfavourable", "poor" or "degrading" state, etc. (European Commission, 2011).

106. In 2008, the EU had set itself three so-called «3x20» targets for 2020: a 20% reduction in GHG emissions compared to 1990 levels; a 20% improvement in energy efficiency; and a 20% share of renewable energy in energy consumption. It was prepared to raise the first target to 30% if other industrialized countries accepted similar commitments, which had not been the case at the Copenhagen Climate Conference in 2009. The European authorities nevertheless invited MS to make a greater effort but this was refused by several countries including Germany and France. In 2014, the targets were revised upwards (respectively, 40%, 27%, and 27%). In 2018, the last two targets were increased again (32.5% and 32%). In December 2019, the European Commission launched the European Green Deal that aims to make the EU "the world's first climate-neutral continent by 2050" (European Commission, 2019). The European Green Deal is discussed in the conclusion of the book.

107. This is about 10% of European emissions, which are mainly in the form of methane (CH_4) and nitrous oxide (N_2O), and more marginally carbon dioxide (CO_2) but does not count the emissions of this gas associated with the manufacture of synthetic nitrogen fertilizers and changes in agricultural land use.

108. «By 2050, the European Union biodiversity and the ecosystem services it provides – its natural capital – [should be] protected, valued and appropriately restored for biodiversity's intrinsic value and for their essential contribution human well-being and economic prosperity, and so that catastrophic changes caused by the loss of biodiversity are avoided» (European Commission, 2011).

109. "Halting the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, and restoring them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss» (European Commission, 2011).

The mid-term review of this strategy unfortunately shows that progress is minimal and vey localized only (limited to certain areas). In agricultural ecosystems, no significant overall progress has been observed, while some considerable efforts are still required to reach policy goals (European Commission, 2015). This is the renewed ambition of the European Commission highlighted in the European biodiversity strategy for 2030 published in 2020 as part of the European Green Deal (European Commission, 2020).

The negative effects of agriculture on water and soil compartments are also of concern.[110] Nitrogen fertilizer inputs (mineral and organic) have been only slightly decreasing over some years, with 43% of surface waters still in an "intermediate" or "low" quality state in 2012. Phosphorus inputs and surpluses have also decreased, but at a more significant rate (-50% over the decade 2004-2013); the greatest reserves of further reductions are now in the agricultural sector. Irrigation pressures on water resources are significant in Southern European countries (65% of total uses) and potentially in an increasing number of other MS over the summer months in a context where total water demand (all uses combined) is expected to continue to grow, with climate change aggravating periods of water scarcity in certain regions. Soil erosion (mainly by water and more marginally by wind) affects 13% of arable land in the EU, particularly in the Southern European MS, in moderate to high proportions. Losses of organic matter due to the cultivation of grassland and forests are significant and rapid, while the gains generated by conversions in the opposite direction take time, sometimes several decades. Finally, the compaction of agricultural soils due to the repeated movement of heavy machinery and the passage of too many animals is difficult to assess; however one-off studies report compaction figures ranging from 11% (in Central and Eastern European countries) to 50% (in the most fertile land in the Netherlands).

An environmental emergency coupled with growing health concerns

In addition to negative effects on natural resources and the environment, agricultural practices and systems can also have wide-reaching negative health impacts. These negative impacts are linked to the use of chemicals in agriculture and primarily affect farmers and their employees. They can also affect the vicinity of application areas and the local resident population through the potential contamination of soil, water, and air and through the ingestion of contaminated food. Negative health impacts are not limited to the use of chemicals, as climate change and biodiversity loss are also causing adverse health effects.

The impacts of accidental contamination for professional users of plant protection products are well established, ranging from skin irritation to much more serious ailments such as damage to the central nervous system. The significant impact of the chronic contamination of users, their neighbours, and the population in general through the release of potentially toxic substances into the environment are of particular concern today. These effects are difficult to

110. The information in this paragraph is derived from a European Commission analysis paper prepared as part of the legislative proposals for the post-2020 CAP (European Commission, 2018).

establish with any precision for several reasons: their analysis requires long-term epidemiological studies; the quantities involved are low (even very low); and there are confounding factors (for example, farmers' exposure to ultraviolet rays, which is a recognized risk factor for the occurrence of melanoma). Nevertheless, alerts from the scientific community are increasing. For example, it has been shown that there is a positive correlation between pesticide exposure and the incidence of Parkinson's disease among farmer-users (Moisan *et al.*, 2015) and in their neighbourhoods (Kab *et al.*, 2017). Similarly, the risk of prostate cancer is significantly higher among farmers, workers in pesticide production plants and rural populations (Inserm, 2013). The presence of pesticide residues and chemical contaminants in food is also of concern. Regulatory thresholds are respected (excluding accident or fraud) though some research points to possible adverse health effects from the chronic exposure to low doses and mixtures of contaminants (the "cocktail" effect), even if the recorded doses are below regulatory limits (Lukowicz *et al.*, 2018). The health risks associated with the use of chemicals are not limited to pesticides alone. Brink and van Grinsven (2011) highlight several channels through which nitrogen and its derivatives can impact human health (*via* air pollution, excessive nitrates in drinking water, and the depletion of stratospheric ozone by nitrous oxide).[111] In the field of animal husbandry, the use of antibiotics is a risk factor for antibiotic resistance, particularly with the evolution of antibiotic-resistant bacterial strains in humans, animals, and/or the environment.

Several studies highlight the negative effects on human health of climate change to which agriculture and agri-food systems contribute. On a global scale, Costello *et al.* (2009) even consider climate change to be the first public health threat through its direct effects (such as undernourishment and malnutrition, mortality and morbidity associated with extreme events particularly heat waves, mortality and morbidity related to infectious diseases, etc.) and indirect effects (such as water availability, access to food, sea level rise, etc.). The so-called Lancet Countdown initiative, whose second report was released in 2018, identifies both the unacceptable risk that climate change poses to the current and future health of the world's population, and the fact that meeting the challenge of climate change is the greatest global health opportunity of the 21st century.[112] Similarly, the degradation of biodiversity leads to the loss of biological material and the decline of ecosystem services that are useful or even necessary (for example, pollination services) to humans for food, water and health (Drouet, 2019). As European agriculture is a net contributor to GHG emissions and responsible for part of biodiversity loss, it is possible to attribute these adverse health effects to it in proportion, even though this attribution is particularly difficult to quantify in the case of biodiversity loss. Thus, reducing GHG emissions from agriculture and restoring biodiversity in agro-ecosystems will result in a double gain in both environmental and health terms. This is in a context where the CAP and public policies, both at the European level as well as in each MS, address health issues related to agricultural production methods foremost through regulation concerning chemical uses and compliance with maximum contents in food.

111. Nitrate pollution is not only related to the application of mineral nitrogen fertilizers. Organic fertilizers of animal (manure, slurry) or plant (compost, crop residues) origin are also contributors.
112. http://www.lancetcountdown.org/.

Health concerns also linked to dietary changes

Without underestimating the importance of undernourishment in the EU (which is however moderate when compared to other parts of the world), the EU is facing what some are calling an "epidemic" of overweight and of its most chronic form of obesity. Overweight and obesity rates are the cause of a considerable number of serious diseases (Dixon, 2010). Although there are multiple explanatory factors, changing eating patterns is a key determinant. Calorie intakes are increasing in excess of daily caloric requirements (which are themselves decreasing as European societies become more sedentary) and diets are unbalanced (that is, diets that are too high in fat, sugar, salt, meat products, highly processed foods,[113] and too low in fibre, fruit and vegetables). In addition to the negative effects of overweight and obesity rates on health, unbalanced diets are responsible for several chronic diseases (for example, cardiovascular diseases, and some cancers). Corrective public policies in this area are nation*al*. They utilize the two action levers of consumer information (that is, information campaigns and labelling) and of the consumer environment (regulation of advertising, taxation, etc.). To date, too little progress has been made, especially in view of the steady increase in the number of overweight and/or obese Europeans. Within the framework of this book, this observation leads to two key issues that must be addressed; first, the potential responsibility of the CAP; and second, the enhanced effectiveness of corrective measures through an increasing inclusion of them in the objectives and instruments of the CAP in the future.

Integrating ambitious environmental and health objectives into a renewed CAP

Public support for organic farming (OF) is justified due to the potential doubling up of both environmental and health benefits (see Box II.1). More generally, the four chapters of the second part of the book aim to define the outlines of a renewed architecture for the CAP designed to serve environmental and health objectives, which must be necessarily ambitious given the magnitude of the issues at stake. Meeting these objectives effectively requires the intervention of public authorities, insofar as these are externalities and/or public goods that cannot be managed satisfactorily by markets alone.[114] This raises the question of the instruments to be used and the geographical scales of governance and financing depending on whether these externalities and public goods are global or loc*al*. Global public goods are universal and benefit all inhabitants of the planet, both present and future, and therefore require coherent public intervention on a supranational scale. Local public goods benefit the inhabitants of the territories in which they are at work; their provision requires the implementation and steering of

113. Food products including beverages, whose manufacture involves several stages and processing techniques, and which use a variety of ingredients, many of which are used exclusively by the food industry. The potential health impacts of highly processed products are the subject of very recent work (see, for example, Fiolet *et al.*, 2018, in the case of cancer risk).

114. The concepts of externalities and public goods are defined in the General Introduction, where the rationality that legitimizes government intervention in the presence of externalities and/or public goods is also discussed.

measures on a more precise territorial scale. This theoretical distinction between the global and the local comes up against the fact that in practice several external effects and public goods include both global and local characteristics. Thus, the preservation of biodiversity provides localized services in terms of, for example, crop pollination or natural protection against enemies, but also global benefits, particularly in terms of maintaining the world's biological heritage. In addition, a public good can be a pure public good (non-rival and non-excludable[115]), a common good (rival and non-excludable, such as groundwater, communal pastures, etc.) or a club good (non-rival, but easily excluded, for example by paying a fee for use or access). The tools of public intervention must consider these differences.

Within this general framework, Chapter 7 focuses on climate stability and the preservation of biodiversity; two global issues that, to date, have been insufficiently taken into account in the CAP. It defines the principles of an optimal agri-environmental policy in line with the two principles of polluter-pays and provider-gets. The practical application of these ideal principles to the two issues of first, the climate (reduction of gross GHG emissions from agriculture and increase in the carbon storage capacities of agro-ecosystems, particularly agricultural soils) and second, biodiversity (penalizing negative effects and remunerating positive effects) raises the specific issue of the indicators upon which it is possible to base public policy instruments.

Chapter 8 acknowledges the political and operational difficulties of implementing, at least immediately, the ideal public policy principles set out in Chapter 7. It proposes a critical analysis of the framework of the current CAP instruments, which combines the carrot (*via* AECMs[116]) and the stick (*via* cross-compliance[117]. On this basis, it makes recommendations aimed at improving the effectiveness and efficiency of the CAP in the service of the necessary agro-ecological transition of European agriculture. These recommendations call for political courage in setting the dividing line below which the stick (cross-compliance/conditionality) should apply and above which the carrot should reward farmers' efforts; a dividing line that, moreover, should increase over time. They also call for correcting the weaknesses of AECMs as they are currently implemented, notably by moving from an obligation of means (of farming practices) to an obligation of results (and by, at the very least, combining an obligation of means and results). This results-based approach must allow for the development of payments proportional to the environmental and health benefits generated. These Payments for Ecosystem Services (PES) could be financed by the taxpayer, and/or the intermediate and final user.

Chapter 9 focuses on the possible inclusion of objectives and instruments to combat unbalanced diets, overnutrition, and overweight and obesity rates in the CAP. In Chapters 7 and 8, the measures proposed aim to develop agricultural practices and systems that are more respectful of both the environment and health. They include little or no mention of the aspects relating to overnutrition, which in accordance with the theory of targeting public policies require to tackle the root of the problem; that is, inadequate food consumption behaviour.

115. Non-rivalry implies that the consumption of the good by a user does not lead to any reduction in consumption by other users; non-excludability means that it is impossible to exclude anyone from consuming the good. A public good that meets these two criteria is a pure public good (for example, air).
116. In the 2023-2027 CAP through AECMs and eco-scheme measures.
117. In the 2023-2027 CAP trough conditionality.

Chapter 9 offers a critical analysis of the nutritional policies implemented in the different MS, these policies being indeed mainly nation*al*. In this context, the responsibility for the past CAP and the possible role for the future CAP are discussed.

Chapter 10 presents an analysis of the previous chapters, both in Part I and Part II, for the specific case of livestock farming, particularly ruminant farming, in a context where it is increasingly criticized on environmental and health grounds, and on animal welfare issues. At the same time, however, livestock farming generates environmental services (notably grass-based livestock), is a source of nutrients that are of good nutritional quality, contributes to the diversity of the food supply, and contributes to the economic viability of a large number of rural territories in the EU, particularly those that are difficult to cultivate for climatic, topographical and/or economic reasons. The chapter will then seek to show how the CAP could encourage the minimization of negative services and the maximization of positive services. The analysis leads to the recommendation to suppress coupled aids for ruminants (such as cattle, sheep, and goats) and in return to increase the support for grassland areas, which would be differentiated according to age and grassland management methods.

Box II.1. Environmental and health impacts of Organic Farming (OF).

The area cultivated in OF in the EU-28 was equal to 12.8 million hectares in 2017. Spain (2.1 million hectares), Italy (1.9) and France (1.7) alone account for almost 45% of this area. As a share of the Utilized Agricultural Area (UAA), Austria exceeds 20%, Sweden and Estonia 15%, with the EU average at 6.2%. This share is increasing in all MS albeit at varying rates. In France, the upper limit of 2 million hectares in OF was exceeded in 2018 (7.5% of the UAA). In this country, the number of farms in OF has been multiplied by 3.6 in 15 years: 41,600 units are in OF in 2018 (+13% compared to 2017). They employ more than 14% of the agricultural workforce. Differences persist according to the main productive orientations of the farms. OF represents only 4.3% of the French arable crop area, but 12% of the area under vines, 23.3% of the area under fruit and more than 40% of the area under pulses. Even in sectors where production in OF is proportionally lower (field crops, fresh vegetables), the increase is significant (+31% in area between 2017 and 2018 for field crops). The dynamism of consumption is also noteworthy in France and in the majority of MS. However, the share of products in OF in total household consumption is less than 5% in the MS, with the exception of Luxembourg, Austria, Sweden, and Denmark where it is between 8 and 10%. The largest European consumer market is Germany (EUR10.3 billion in 2018), followed by France (EUR8.3 billion) and Italy (EUR3.6 billion).

A European regulation governs the production methods in OF. It prohibits the use of chemical inputs (mineral fertilizers and synthetic pesticides) and Genetically Modified Organisms (GMOs); it calls for the extremely limited use of antibiotics in animal husbandry and the introduction of livestock conditions that are much more respectful of animal welfare. This European regulation is set out in OF specifications. Compliance is certified by approved and independent bodies. National regulations may be stricter (more binding) than the European regulation, which may give rise to disputes among stakeholders in the MS (the rejection of the European legislation alone, which is considered

insufficient) and potential confusion for consumers. Private labels, which are even more restrictive, exist in several MS (in France, Nature & Progrès, France Bio Cohérence; in the UK, Soil Association; etc.). The CAP supports OF *via* direct aid from the second pillar, both for conversion to OF and for maintaining OF.

Organic Farming and the environment

The environmental impacts of OF are the subject of much research on both the effects of prohibited practices and the effects of recommended or induced practices due to the requirements imposed by OF production methods. This research concerns the different compartments of the environment:

• In terms of biodiversity, the negative impacts of neonicotinoids, which are a particular class of insecticides, are clearly established (Tsvetkov *et al.*, 2017). With regard to the presence of rare species, it is not so much the mode of production (that is, OF *versus* Conventional Agriculture (CA)) that plays a role, but rather the practices and diversity of semi-natural habitats. In general, assessing the effects of OF on landscapes is a difficult exercise due to, among other factors, the relatively small areas of OF. Finally, although OF prohibits the use of synthetic pesticides and thus avoids their potentially negative effects on the environment and health, it allows the use of natural pesticides that can also be harmful (for example, copper used in vineyards and market gardening; for more details, see Andrivon and Savini, 2019);

• With regard to water pollution, several experiments show that it is less costly to regulate the pollution of agricultural origin upstream, in particular by converting to OF, rather than by decontaminating the resource downstream. This upstream regulation requires a combination of favourable factors, in particular the coordination between farmers who must collectively commit to the process;

• As far as soils are concerned, OF reduces the risks of erosion and degradation, increases the levels of organic matter, and improves drought resistance. In ruminant livestock production, the increase in grazing practices in OF leads to an increase in the share of grassland and, consequently, carbon sequestration in the soils when grass is maintained for a long time (grassland and permanent pastures); and

• In terms of GHG emissions, the results are more ambiguous. On the one hand, banning the use of mineral nitrogen fertilizers reduces emissions from their manufacture and use. Moreover, the greater use of grass increases storage and thus reduces net emissions. On the other hand, the increased use of mechanization for crop weeding increases emissions due to higher fossil fuel consumption. In addition, yields are generally lower in OF than in CA. As a result, the GHG emissions balance may be unfavourable when measured per unit of product rather than per unit of area. In general, consumers who are highly engaged in the consumption of organic products will reduce the carbon footprint of their diet by their dietary changes (including in particular a lower share of meat products) rather than because of product characteristics in OF *per se* (Baudry *et al.*, 2019a).

Organic Farming and health

Beyond the environmental issues, can support for OF also be justified by health arguments?

In regions where agricultural production is intensively conducted with high pesticide use, emissions linked to the latter and their compounds to the air and water may be associated with higher incidences of certain diseases affecting farmers, their employees and

local resident populations (Moisan *et al.,* 2015; Kim *et al.,* 2017). Production methods based on a lower use of pesticides as in OF, which bans this use when pesticides are synthetic, may therefore result in lower population exposure and ultimately increased health benefits. The magnitude of this positive impact of OF has not yet been quantified with the high level of scientific rigour required, but there is evidence that the exposure levels of local populations vary significantly according to production methods and the quantities of pesticides used locally (Lammoglia *et al.,* 2017; Mamy *et al.,* 2017).

Recent research shows that individuals who are more engaged in consuming organic products have lower levels of health risks than other consumers: a lower risk of developing certain cancers (Baudry *et al.,* 2018a) and metabolic syndrome (Baudry *et al.,* 2018b), which is a syndrome corresponding to a set of physiological signs that increase the risk of type 2 diabetes, cardiovascular disease, and stroke. Other research shows that these same individuals (who consume more organic products) also consume more fruit and vegetables and fewer meat products, prepared meals, and alcoholic or sweetened beverages (Boizot-Szantai *et al*., 2017). This raises the issue of the extent to which the health gains observed among consumers most engaged in organic consumption are related to their diets (or even, more broadly, to their lifestyles) and/or to the characteristics of organic products *per se* (Baudry *et al*., 2019a):

- In terms of nutritional quality, even though some studies show differences in certain minerals (iron, magnesium), micronutrients (phenols) or polyunsaturated fatty acids in the case of meat (Lairon, 2010; Średnicka-Tober *et al*., 2016; Popa *et al*., 2019), it is not possible to systematically distinguish OF *versus* CA products in terms of their carbohydrate, protein, and vitamin content. From a nutritional perspective, it can be assumed therefore that the health benefits enjoyed by consumers most involved in the consumption of organic products are more related to healthier diets than to the nutritional quality *per se* of the organic foods consumed;
- For chemical contaminants of environmental origin present in the air or water and transmitted to agricultural products during the production process, the distinction OF *versus* CA is not decisive: the major factor explaining the variability of the observed rates is rather the proximity of anthropogenic sources of environmental pollution than the production method itself (Gonzalez *et al.,* 2019); and
- In total, the major difference between OF and CA therefore relates to the presence of pesticide residues in agricultural products, for which the differences relating to the presence of mycotoxins and microbial contamination are more ambiguous (Gomiero, 2019). This translates into significant differences in exposure to chemical contaminants (pesticide residues) present in food for consumers who are highly engaged in the consumption of organic products and for those who are not. The quantification of health gains (mortality and morbidity) induced by these lower levels of exposure remains to be precisely established (Baudry *et al*., 2019b).

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7. Two Major Issues for the CAP: Climate and Biodiversity

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Climate and biodiversity are global public goods. This means that their degradation or enhancement affects the current and future populations of the planet, regardless of the geographical origin of the degradation or enhancement. Global public goods differ from local public goods in the location of their beneficiaries. In the case of local public goods, they are within a limited geographical area determined by the location of the natural or human contributions to those goods.

Unlike private goods, public goods cannot generally be satisfactorily managed by markets alone. Their provision at the desired levels requires the intervention of public authorities, empowered with the capacity to impose a contribution on citizens. Because of the non-rivalry of consumption associated with a public good,[118] the voluntary contributions of its beneficiaries in line with the benefit to each individual are most often highly sub-optim*al*. As it is difficult, if not impossible, to exclude an individual or a firm from this benefit, the risk of the so-called free-rider behaviour (where an individual or company is not contributing to the provision of the public good) is high.

Because of their global public good characteristics, climate and biodiversity should ideally be managed by a worldwide government. In the absence of such a government, the United Nations (UN) has established international conventions, notably at the 1992 Earth Summit in Rio de Janeiro. As these conventions are not binding on economic actors, it is therefore the responsibility of the signatory countries to implement the public policies that would enable them at least in theory to respect their international commitments. With this in mind, the European Union (EU) subjected European industries that emit the most greenhouse gases (GHGs) to the European carbon dioxide (CO_2) emissions trading scheme, set up under the 1997 Kyoto Protocol. As a complementary measure, several Member States (MS) have introduced taxes on fossil fuels in proportion to their CO_2 emissions. With regard to biodiversity, the EU has in particular set up the Natura 2000 network, which aims to protect Europe's most valuable and threatened species and habitats.[119] More generally, the Maastricht Treaty

118. The characteristics that define what a public *versus* private good is, including non-rivalry *versus* rivalry, are presented in the General Introduction.
119. Habitats or species considered to be rare, heritage, or associated with legal protection status.

of 1992 stipulates that "environmental protection requirements must be integrated into the definition and implementation of the Union's policies and actions, in particular with a view to promoting sustainable development". This integration consequently applies to the first European policy, the CAP.

This chapter deals with the integration into the CAP of the objectives and instruments required to combat climate change and protect biodiversity. Although it focuses on the EU and the CAP, it is important from the outset to stress the need for a broader, more global vision particularly in view of the risks of GHG emissions transfers and/or biodiversity loss to non-European countries. It is possible to improve the climatic performance of European agriculture by reducing its ruminant herd and the associated methane and nitrous oxide emissions. However, if this reduction is more than offset by imports of animal products that are less climate-friendly, the net effect of this European action will be negative on a global scale. The same applies to biodiversity. The CAP seeks, for example, to increase European semi-natural areas[120] that are favourable to biodiversity. However, if the induced decrease in European agricultural production areas is compensated for by an increase in agricultural areas outside of the EU, the net result in terms of preserving biodiversity will be less positive and may even be negative.

The first section presents the climate change mitigation and biodiversity protection challenges facing European agriculture. The second section examines how the CAP integrates these issues into its objectives and instruments, and the final section provides recommendations for effective and coherent public intervention in these two areas.

What is at stake?

Agricultural activity impacts the climate through its GHG emissions; in particular, N_2O emissions linked to the use of nitrogen, mineral and organic fertilizers, and CH_4 emissions generated by ruminants and livestock effluents. Further, agricultural land (in particular, permanent grasslands and wooded areas) is a carbon sink, thanks to carbon sequestration in soils and biomass, in a more (or less) perennial way. Similarly, agricultural activities have major and contrasting effects on biodiversity (Hallmann *et al.*, 2017). The simplification of production systems and agricultural landscapes, the use of synthetic pesticides and veterinary drugs have significantly reduced biodiversity levels associated with agriculture. These changes also have a negative impact on the wild flora and fauna of adjacent environments particularly aquatic environments *via* trophic chains dependent on agricultural environments and the ecotoxicity of certain pollutants of agricultural origin. However, agriculture, and more specifically certain forms of agricultural production (those with little or no use of chemical inputs, based on a greater diversity of productions, and/or relying on low animal densities per area unit) can also contribute to maintaining ecologically flourishing semi-natural environments, such as hedgerows, field borders, wetlands, or high-altitude grasslands.

120. Semi-natural areas include non- or low-yielding land such as groves, hedges, grass strips, or lawns.

Land-use changes have a strong impact on net GHG emissions and biodiversity. These changes occur between different types of agricultural land use on the one hand and between agricultural and non-agricultural land uses on the other. The low profitability of European agriculture means that it is being affected by the increase in urbanized areas. The conversion of agricultural land to fallow land or forests is also, at least in part, the result of this low profitability, particularly in less-favoured areas.

The climate

According to the Intergovernmental Panel on Climate Change (IPCC) Special Report for 2018, keeping the global temperature increase below +1.5°C compared to the pre-industrial period requires achieving global carbon neutrality by 2050.[121] The 2019 report points to the responsibility of the agri-food sector and land-use patterns for global GHG emissions to achieve this go*al*. Under the Paris agreement of 2015, the EU is committed to reducing its GHG emissions by 40% by 2030 compared to 1990 levels, with a 30% reduction for the agricultural sector compared to 2005.

In 2017, GHG emissions from EU-28 agriculture were 440 million tonnes of CO_2 equivalent ($MtCO_2eq$)[122] or 10% of the EU total emissions. At that time, agriculture was the second largest emitting sector, far behind energy use (78%), which is a sector that includes transport and domestic heating, but ahead of industry (9%) and waste (3%). Agriculture's share of emissions was eight times higher than its share in European value added (Eurostat, 2019). The relative importance of agricultural GHG emissions varies greatly among MS, from over 30% in Ireland to less than 5% in Malta. These disparities reflect differences in the role of agriculture in the economies of the different EU countries, and the differentiated importance of livestock farming in their agriculture.

Gross agricultural GHG emissions consist of three gases (IPCC, 2015). More than half is methane (CH_4), a gas whose global warming potential is 28 times that of CO_2 over a 100-year horizon. Nitrous oxide (N_2O) comes second, with a global warming potential equal to 298 times that of CO_2 over 100 years. Finally, CO_2 generated by agricultural soils[123] falls well behind (Table 7.1). Agriculture is responsible for almost half of the total CH_4 EU emissions and more than 70% of N_2O EU emissions. Eighty-one percent of agricultural methane emissions come from the enteric fermentation of livestock, with the remainder from livestock manure management. Large ruminant dairy and meat cattle are by far the largest emitters of agricultural enteric methane (84%), followed by small ruminant sheep and goats (10%), then monogastric and other ruminants (6%). Seventy-two percent of agricultural N_2O emissions are soil direct emissions, due to mineral and organic nitrogen fertilization, the incorporation

121. Carbon neutrality occurs when the sequestration of CO_2 by ecosystems offsets anthropogenic GHG emissions.

122. The CO_2 equivalent of a gas other than CO_2 is the amount of CO_2 that would cause the same radiative forcing as that gas. It is calculated by applying a conversion factor, the Global Warming Potential (GWP), which depends on the time horizon considered.

123. The emissions of fossil fuel consumption by agricultural equipment are not inventoried in the agricultural sector.

of crop residues into soils, and the cultivation of hydromorphic soils rich in organic matter mainly in Northern European countries. Sixteen percent of agricultural N_2O emissions are indirect emissions associated with nitrogen (N) transfers to air and water, and 12% with the storage and handling of livestock manure. In addition to generating direct and indirect N_2O emissions, the use of synthetic nitrogen fertilizers also produces CO_2 emissions related to the energy used for their manufacture, accounted for at the industry level, which leads to an underestimation of emissions from the agricultural sector.

Table 7.1. Agricultural greenhouse gas emissions in the EU-28.

	CH_4	N_2O	CO_2	Total
Agricultural emissions in 2017 ($MtCO_2eq$) (in %)	242 (55.1)	187 (42.6)	11 (2.4)	440 (100)
Share of agricultural emissions in total EU-28 emissions in 2017 (%)	47.4	72.1	0.26	10.0
Evolution of agricultural emissions (%)				
- between 1990 and 2013	24	20	35	23
- between 2013 and 2017	+4	+4	+8	+4
- between 1990 and 2017	21	17	30	20

Source: European Environment Agency (2019).

EU-28 agricultural GHG emissions decreased by 24% between 1990 and 2013, from 554 to 423 $MtCO_2eq$ (European Environment Agency, 2019), a percentage decrease larger than that of European agricultural production. The main factors explaining this decline are the sharp reduction in cattle numbers especially in Eastern European countries following the fall of communist regimes, the improved conversion of feed to animal products, and the optimization of nitrogen fertilization practices (Eurostat, 2013). Emissions have tended to increase slightly since 2013 due to the combined effects of increases in animal numbers and nitrogen fertilization, themselves linked to the growth in animal and crop production (Eurostat, 2018). After the agricultural price boom in 2007-2008 and then their sharp decline in 2009, European agricultural production benefited from sustained prices until 2015.

Agriculture also influences net GHG emissions of the EU-28 *via* land use changes and their effects on carbon stocks. These land-use changes resulted in net emissions of about 32 $MtCO_2eq$ in 2017, an amount 30% lower than in 1990. This result includes conversions of arable land to forest or grassland, with a positive effect on soil and biomass carbon stocks, and conversions of grassland to arable land and of agricultural land to artificial areas, this time with a negative effect on carbon stocks. The second negative effect dominates the first positive effect (Table 7.2).

Table 7.2. Land-use changes in the EU-28 and impacts on net GHG emissions (2017).

	Area converted (millions of hectares)	Emissions (+)/sequestrations (-) ($MtCO_2eq$)
Conversions from various land use to		
forest	7.2	-41.5
meadows	12.9	-21.9
arable land	10.4	+46.3
urbanization	6.4	+44.6
wetlands	1.2	-4.2
Total	38.1	+31.7

Source: European Environment Agency (2019).

Biodiversity

According to the IPBES[124] Report presented on 6 May 2019, nearly one million species are threatened with extinction worldwide. An analysis of 8,688 threatened or near-threatened species on the Red List of the International Union for Conservation of Nature (IUCN) shows that the over-exploitation of wildlife and agriculture are primarily responsible for this decline in biodiversity well before climate change, whose effects on biodiversity are however much more publicized (Maxwell *et al.*, 2016).

A habitat is an area that provides suitable conditions for the life and development of animal and plant species. Agriculture endangers certain species by destroying forests and wetlands that form their habitats. Agricultural areas are themselves habitats that are more (or less) favourable to biodiversity, depending on the crops grown and the agricultural practices used. A remarkable habitat accommodates a great diversity of species including rare, protected, and/or endangered species. Extensively managed agricultural areas (with little or no use of chemical inputs, few animals per hectare) and semi-natural habitats adjacent to these areas can be remarkable habitat areas. Agricultural practices influence the quality of these areas through the diffusion of pollutants from chemical use *via* air and water.

In the EU, as in many other parts of the world, agricultural land plays a central role in the dynamics of biodiversity. Low-intensity agricultural land is often associated with high levels of biodiversity. Three main processes threaten biodiversity: first, the intensification of agricultural practices;[125] second, the abandonment of agricultural land use in less productive but biodiversity-rich areas; and third, urban sprawl (roads, business areas, housing).

124. IPBES stands for Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. This platform, created in 2012, is the equivalent for biodiversity of what the IPCC is for the climate.
125. The intensification of agricultural practices can be simply defined as the specialization in a limited number of productions (notably crops), the simplification of agricultural landscapes, the high use of chemical inputs, the high density of animals per hectare, etc. Extensification is the opposite process.

• The processes of the intensification of agricultural practices and the expansion of agricultural land are dominant in the Northern, Western and Eastern EU countries. Increasing the intensity of agricultural practices in terms of the frequency of chemical use or tillage and decreasing landscape heterogeneity are the two main factors contributing to the decline of biodiversity (Benton *et al.*, 2003). The use of pesticides is particularly damaging (Geiger *et al.*, 2010). At EU-28 level, their sales were 5.6% higher in the three years of 2014-2016 compared to the three years of 2011-2013, with contrasting trends between MS. Sales grew strongly in countries such as Bulgaria, Estonia, Finland, or Latvia, but fell sharply in countries such as Greece or Denmark (a country where pesticide use is significantly taxed). Sales increased by 6% in Germany and Italy, and by 10-12% in Spain, France, and Poland, with these five MS alone accounting for 70% of pesticide sales in 2016 (European Environment Agency, 2018).
• The disappearance of semi-natural elements (hedges, permanent grasslands, wetlands, etc.), which began in the aftermath of the Second World War, continues today. Permanent grasslands decreased by 6.4% between 1993 and 2011; more than two-thirds due to their conversion to arable crops (European Environment Agency, 2016). The enlargement of agricultural parcels of land has accompanied intensification to facilitate mechanization through the use of increasingly heavy and powerful equipment. This increase has a negative effect on biodiversity because of the associated disappearance of woodlands and field borders, which are valuable habitats for many plant and animal species (Sirami *et al.*, 2019). The impact on biodiversity of lower crop diversity in agricultural landscapes is more complex to characterize. It varies according to taxonomic groups and soil and climate contexts, most likely due to the presence of crops that require more (or less) frequent pesticide applications (Hass *et al.*, 2018).
• The gradual abandonment of marginal areas also began in the aftermath of the Second World War and continues today. It contributed 17% to the disappearance of European permanent grasslands between 1993 and 2011 (European Environment Agency, 2013). In the Southern EU, land abandonment is the main driver of biodiversity loss associated with agricultural environments (Stoate *et al.*, 2001). In the Eastern EU, the abandonment of marginal land and the cultivation of formerly fallow areas are occurring simultaneously. Although acting in opposite directions, these two processes lead to the same phenomenon: the decline of low-intensity farming systems and the associated, often high, biodiversity levels (Sanderson *et al.*, 2013). Land abandonment is also an important issue in mountainous areas.
• Urban sprawl, which is proportionally more significant in the Western European MS and on the Mediterranean shores (Levers *et al.*, 2018) is destroying agricultural areas often rich in terms of remarkable species of Community interest, including high densities of endemic species.[126] Numerous studies have shown that this urban sprawl has a negative effect on biodiversity through the large-scale homogenization of plant, insect, and bird communities (Knop, 2016). Although limited in terms of the areas concerned, urban sprawl has a significant impact on the decline of biodiversity in the EU.

126. A biological species is said to be endemic to a geographical area when it exists only in that area in a spontaneous state.

The combination of these three processes results in nearly 76% of habitats and nearly 70% of species listed in the EU Habitat and Birds Directives and associated with agriculture having an unfavourable conservation status (European Commission, 2016). Between 1990 and 2015, populations of grassland butterflies declined by 30% in 22 European countries, a decline that was also accompanied by a homogenization of communities of butterflies (Van Swaay *et al.*, 2016). Between 1980 and 2016, populations of common agricultural birds decreased by 57% in 28 European countries (PECBMS, 2018). The abundance and diversity of crop weeds have also declined since the middle of the last century (Richner *et al.*, 2015).

Contrasting effects of developments in EU agriculture on climate and biodiversity

Over the last 30 years, developments in the European agricultural sector have had contrasting effects on climate and biodiversity. Until the beginning of the decade 2010, agricultural GHG emissions decreased while biodiversity in agricultural environments was declining. Since then, agricultural GHG emissions have risen again while biodiversity has continued to decline.

The decrease in ruminant livestock (especially cattle) is the main factor in explaining the drop in gross agricultural GHG emissions, more specifically methane emissions. The decrease in nitrogen fertilization also plays a role, particularly in the form of lower N_2O emissions. These two trends contribute to reducing the negative pressure of agriculture on biodiversity. At the same time, the decrease in grazing practices and its corollaries (ploughing of grasslands, landscape simplification) have negative effects on both the climate (reduction of carbon sinks) and biodiversity. Since the beginning of the years 2010, livestock numbers and fertilization are no longer decreasing and are even slightly increasing. It thus appears that a major issue in reducing net agricultural GHG emissions and protecting biodiversity is to secure the continued downward trend in ruminant numbers while increasing grassland areas, particularly permanent grasslands.

Developments in European agriculture are also having an impact on climate and biodiversity through land-use changes outside the EU because of international trade in agricultural products. The balance can be positive if the EU exports products that are more climate- and biodiversity-friendly than substitutes produced outside the EU, or if imported goods are more virtuous for climate and biodiversity than domestic goods, after accounting for the environmental effects of transport. This appears to be the case for European livestock production (Dumont and Dupraz, 2016). Even when taking into account the associated soybean imports, European production emits less GHG and uses less land, on average, than those emitted and used by productions in the rest of the world. A decreased pressure on agricultural land is also expected to reduce the conversion of protected areas to cropland. Models can be used to assess how an increase in demand can be matched by an increase in yields and an increase in agricultural land use. Nonetheless, the outcomes of these models are very sensitive to the calibration of parameters (Gohin, 2016). Moreover, it is difficult to compare the environmental effects of products traded between countries, and even more so between continents, in a context of strong heterogeneities in agricultural systems used throughout the

world (European Environment Agency, 2019). This ambition can be achieved, at least theoretically, for the climate thanks to the unified indicator of the tonne of CO_2 equivalent. It is however much more difficult to assess the global impact of international trade on biodiversity. Indeed, there is no unified indicator that would make it possible to compare the impact of converting a hectare of permanent grassland to cropland in Normandy to that of converting a hectare of primary forest to grassland or soybean production in Brazil.

Climate and biodiversity in the CAP

Agricultural GHG emissions and the impact of agriculture on biodiversity are highly dependent on the socio-economic context, in particular the prices of agricultural products in relation to the costs of production factors. Changes in the costs of labour, energy, and material equipment also influence farmers' decisions regarding the expansion of farm size, the choice of productions, the spatial distribution of crops, the crop sequence,127 and the conversion of permanent grasslands to crops. Before 1992, the CAP had a direct impact on the agricultural prices of the main European products. Since then, successive CAP reforms have led to the almost total abandonment of direct price intervention and its replacement by direct payments based on areas and the number of animals, which are accompanied by constraints in terms of agricultural practices (see Chapter 1). We next examine the consequences of this evolution of the CAP on climate and biodiversity in European agro-ecosystems.

The CAP and the climate

Prior to 2008, climate change mitigation was not an explicit objective of the CAP. Invitations to increase the budget of the second pillar of the CAP through the transfer of resources from the first pillar and to devote a larger share of the funds from the first pillar to environmental objectives, including in terms of adaptation to climate change, appeared in 2008. However, this invitation did not translate into effective measures at that time. It is only with the 2013 reform that climate protection became an explicit objective of the CAP.128 This inclusion justified the greening of first pillar decoupled payments and the transformation of Agri-Environmental Measures (AEMs) into Agri-Environmental and Climate Measures (AECMs) within the second pillar. However, this late display of an explicit climate objective in the CAP does not mean that previous reforms of this policy were without climatic impacts.

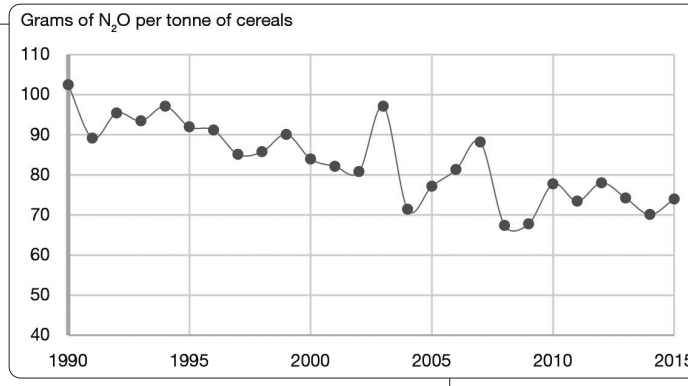
The decoupling of farm income support policy

The phasing out of agricultural price support after 1992 removed a direct incentive to use increasing amounts of chemical inputs, in particular, fertilizers. The fact that European prices were higher than world prices had previously favoured the increased use of fertilizers. However,

127. Crop sequence describes the temporal succession of crops on the same plot of land. Crop acreage describes the spatial distribution of crops on a farm at a given time.
128. Recital 37 of Regulation 1307/2013 of the European Council and Parliament of 17 December 2013; Recital 4 of Regulation 1305/2013 of the European Council and Parliament of 17 December 2013.

as the maximum profit is obtained when the last unit of fertilizer yields as much as it costs, a fall in the relative price of the agricultural product compared to that of fertilizer leads to a fall in fertilization because fertilizers are factors of production with decreasing returns.129 Between 1990 and 2005, European prices of crop productions, particularly those of cereals and oilseeds, fell while the price of fertilizer rose. The decrease in the ratio between crop production prices and fertilizer prices encouraged a more parsimonious use of fertilizers. This decrease occurred without triggering a decrease in agricultural production volumes resulting in the decrease in N_2O emissions per unit of grain over the two decades of the 1990s and 2000s (Figure 7.1).130 By capping the possibilities for organic fertilization, the 1991 Nitrates Directive is also likely to have contributed to the decrease in total nitrogen inputs and associated N_2O emissions. The end of this downward trend from the years 2000s is partly explained by the increase in the ratio of cereal prices to fertilizer prices between 2005 and 2015.

Figure 7.1. Nitrous oxide emissions per tonne of cereals in the EU-28 between 1990 and 2015 (in grams of N_2O per tonne of cereals).



Source: Authors' calculations from FAOSTAT.

Coupled payments for certain types of production

Similarly, the fall in beef guaranteed prices from 1992 onwards removed an incentive to increase cattle herds. However, the introduction of coupled payments granted according to cattle heads counteracted the beef price decrease. In practice, this amounts to subsidizing a major determinant of agricultural GHG emissions; that is, methane emissions from beef cattle.

In contrast, coupled payments for protein crops are beneficial for the climate as these crops fix atmospheric nitrogen and therefore do not require nitrogen fertilizers, which are a source of N_2O emissions when applied and of CO_2 during their manufacture. Protein crops had been growing during the two decades of the 1970s and 1980s. Although they have not completely disappeared, they have declined sharply since the 1992 reform.

129. This means that an additional unit of fertilizer induces an increasingly smaller additional output all other things being equal, that is, with constant levels of other factors of production (seeds, pesticides, etc.).
130. These same N_2O emissions per tonne of grain had increased over the previous decades.

The 2003 CAP reform reduced the budget for coupled payments. The amounts saved were integrated into the decoupled Single Farm Payment (SFP). The expected effect of the decoupling of the income support policy was a reduction in arable areas and ruminant numbers (Balkhausen *et al.*, 2008). Nevertheless, each MS was granted the freedom to dedicate a part of the first pillar's budget to support certain productions. MS mainly used this possibility to support suckler cow, sheep, and goat farming. This coupled payment reached a minimum in the 2000s to around 8% of the total envelope of first pillar direct payments. The CAP reforms of 2008 and 2013, as well as the Omnibus Regulation of 2017, widened the possibilities to implement coupled payments. The 2013 CAP reform allowed each MS to devote 8% of the first pillar envelope to coupled payments; a percentage that could rise to 13% for a MS that was already granting coupled payments and even up to 15% if the additional 2% was devoted to support protein crops. In 2014, these coupled payments represented EUR4.1 billion or 10% of first pillar direct payments. They were mobilized by two-thirds of MS essentially to support ruminant production (41% for suckler cows, 20% for dairy cows, 12% for sheep and goats), thus leaving little room for protein crops. However, 16 MS proposed a coupled payment for protein crops, amounting to 10% of the total envelope of coupled payments (European Commission, 2015).

It is difficult to assess the role that coupled payments may have played in halting the decline in ruminant heads since the beginning of the 2010s. Other factors have played a convergent role. This is the case for example of the strong world demand for dairy products, which boosted European exports of these products (Dumont and Dupraz, 2016). When they support European export productions that are relatively virtuous in terms of GHG emissions (such as dairy products), coupled payments can be seen as beneficial for climate on a global scale. They however have two major drawbacks. By supporting supply, they exert downward pressure on prices and help to maintain consumption. By subsidizing animals, which are the main source of GHG emissions in agriculture, they lower their relative price and the incentive for farmers to be more efficient. On a sample of beef cattle farms monitored over 30 years, Veysset *et al.* (2019) show that the replacement of price support by direct payments, some of which are coupled, has been accompanied by a stagnation in the productivity of all production factors except labour. They thus deduce that this replacement has not led to a reduction in GHG emissions within these farms.

Coupled payments for protein crops support the increase in areas devoted to these crops. From 2013 to 2018, European soybean areas doubled and those devoted to field peas and field beans tripled (Eurostat, 2018). Theses productions are also driven by growing domestic demand for protein-rich crop products as a substitute for animal products as well as feed for organic livestock and/or certified Genetically Modified Organism (GMO) free livestock. Although coupled payments are not the only determinant of the increase in protein crops they certainly contribute to it, as does the creation of the greening payment within the first pillar. The benefits on the carbon budget associated with this development remains to be established. The European Commission mentions yield gains of 10% for wheat when planted in sequence after a legume, yield gains that should be translated into savings in nitrogen fertilizers to evaluate the benefit in terms of saved GHG emissions (European Commission, 2018). The substitution of animal proteins by plant proteins in human diets is a second

source of mitigation. This substitution is favoured by the fall in the price of plant proteins due to the increase in their supply. This positive effect is highly likely to be cancelled and overridden by the negative effect of ruminant-coupled payments, which tend to increase GHG emissions associated with livestock farming.

Cross-compliance and the greening of decoupled direct payments

As part of the Statutory Management Requirements (SMRs), cross-compliance of direct payments targets the objective of reducing agricultural GHG emissions through the balance of nitrogen fertilization in accordance with the Nitrates Directive (see Table II-2 of the introduction to Part II). In addition, the European strategy on soil protection is the basis for several restrictions listed under Good Agricultural and Environmental Conditions (GAECs) established in 2005: minimum soil cover, no tillage in certain critical areas and at certain critical periods, and the prohibition of eco-logging.[131] These restrictions promote the maintenance of the carbon stock stored in agricultural soils.

The greening of decoupled direct payments introduced by the 2013 CAP reform goes further by making the granting of 30% of direct payments conditional on compliance with three criteria aimed at protecting climate and biodiversity (see Table II-2 of the Introduction to Part II). The fact that the smallest farms are exempt from these requirements results in the greening of decoupled direct payments covering only 70% of European agricultural land.

- Maintaining permanent grasslands is the most important greening measure for the climate. This measure aims to prevent the conversion of permanent grasslands to arable crops and/or temporary grasslands, and to avoid the carbon loss associated with this conversion. The tolerance of a conversion of up to 5% of permanent grassland areas is, however, likely to limit its beneficial effect for the climate if the other determinants of the decline in permanent grasslands persist: higher relative profitability of crops, relatively low feed costs, and difficult access to pasture due to a land structure unsuitable for increasingly large herds.
- The second greening measure focuses on the minimum diversity of arable crops. It can also lead to a better protection of soil carbon stocks if this measure results in increased soil covers through the introduction of catch crops[132] or winter crops.[133]
- The third greening measure focuses on the maintenance or the creation of Ecological Focus Areas (EFAs) on 5% of the arable land of each medium- or large-sized farm. EFAs have two potentially contrasting effects on climate. On the one hand, the replacement of a GHG-emitting land cover by a land cover that stocks carbon in the soil has a direct mitigation effect; and on the other hand, an indirect counter effect is possible if an increase in EFAs induces the displacement of production towards less favourable conditions, leading

131. An agricultural practice that consists in pulling up grasses that cover a plot of land to burn them and spread the ashes back onto the land.
132. A catch crop is established after the harvest of a main crop and before the sowing of the following crop fora shorter or longer period during which it covers the ground and reduces nitrate leaching. Catch crops can be either integrated into the soil, grazed, or harvested to feed animals.
133. In a country with a temperate climate like France, winter crops are sown before February, mainly in the preceding autumn, whereas spring crops are sown after February, usually in March or April.

to higher GHG emissions per produced unit. The European Commission highlights the direct effect including through the introduction of legumes as EFAs that fix atmospheric nitrogen. It also notes that the indirect effect is likely to be small as the measure on EFAs has not led to significant reductions in cereal areas in the EU and has had no effect on their prices (European Commission, 2017). It adds, however, that the choices made by MS regarding the implementation of the EFA measure depend more on agricultural and administrative considerations than on climate and environmental concerns. In particular, it appears that the climate objectives are poorly documented, if at all. Moreover, topographical features (ponds, ditches, hedges, isolated or aligned trees, groves, etc.) and woody formations are reportedly under-declared and therefore imperfectly protected by this measure. In concrete terms, area-based EFAs that correspond to nitrogen-fixing crops and/or catch crops[134] allow the majority of farms to fulfil minimum requirements relatively easily.

In France, Pellerin *et al.* (2014) showed that the three greening measures could promote only seven of the 26 measures they identified for reducing agricultural GHG emissions, with a mitigation potential limited to 23% of the potential across the 26 measures. Indeed, greening measures do not directly target a number of agricultural practices and systems that cause agricultural GHG emissions, in particular ruminant herds and nitrogen fertilization.

Support for Less-Favoured Areas and Agri-Environment-Climate Measures

Support for Less-Favoured Areas (LFAs), now called Areas with Natural and other specific Constraints (ANCs), and the Agri-Environment Measures (AEMs), now called the Agri-Environment-Climate Measures (AECM)[135] target both territorial and environmental issues. They cover approximately 25% of the European Utilized Agricultural Area (UAA), compared to 90% for cross-compliance and 70% for the greening payment. Climate change mitigation is not their primary purpose.

Supporting LFAs is hardly compatible with the objective of reducing agricultural GHG emissions. This is because such support aims to maintain agricultural activity in mountainous, Mediterranean and Northern European areas where technical and therefore economic performance is constrained by natural conditions. In these territories, the main alternative to agriculture is forestry. Support to LFAs contributes to maintaining extensive practices and production systems, which has a clear benefit in terms of land-use planning and biodiversity conservation but not necessarily in terms of climate change mitigation. The effect that removing the support to LFAs would have on climate change and on other economic, environmental and social dimensions is not well documented.

134. Implemented between two principal crops, catch crops are essentially fodder plants, roots (turnips, beets, etc.), or legumes (clover, vetches, etc.) used to supplement the winter rations of animals, especially cattle.

135. With the 2013 Ciolos CAP reform, the AEMs become the AECMs. They offer payments to voluntary farmers who commit themselves to implement environmentally friendly practices, usually during a five-year period. The reference to climate has not made a big difference to the proposed policy measures. We thus discuss AEMs and AECMs together.

Support to LFAs is often supplemented by so-called "mass" AEMs/AECMs applying to the same geographical areas, again with a view to supporting the incomes of beneficiary farmers.[136] This is the case for example of the basic Finnish support measures for arable crops or the grassland premium used in France between 1993 and 2014 as well as in many other MS. In France, the fact that the grass premium was integrated into the support to LFAs/ANCs during the 2013 CAP reform confirms that this measure primarily targets income support. This premium, which aimed to maintain extensive ruminant livestock farming with a high reliance on grass, did not prohibit the conversion of permanent grassland into temporary grassland. It therefore did not manage to curb the reduction in permanent grasslands in France and the soil carbon destocking linked to its conversion to temporary grasslands (Desjeux *et al.*, 2015).

The ability of AEMs/AECMs to maintain and/or change the agricultural practices they target is heterogeneous. In the French case, Chabé-Ferret and Subervie (2013) showed that between 2000 and 2006, the decrease in agricultural production prices accounted for all of the decrease in the use of mineral fertilizers and to a lesser extent the use of pesticides, with no significant difference depending on whether or not farmers had signed up for the corresponding AEMs. In contrast, however, they found a significant positive effect of AEMs on the adoption of nitrate-fixing crops and the conversion to Organic Farming (OF). AEMs/AECMs for OF conversion and OF maintenance are implemented in almost all MS. Compared to conventional agriculture, OF allows for greater carbon storage in soils and a reduction in gross GHG emissions per area unit due to the non-use of synthetic nitrogen fertilizers and greater crop diversity (catch crops, nitrogen-fixing crops, temporary grasslands, etc.). The AEMs/AECMs supporting OF are therefore reasonably climate-friendly as long as their climate effects are assessed per area unit. This is no longer necessarily the case when they are measured per unit of output; a dimension that should also be considered when judging whether or not decreases in crop yields induced by OF conversion are harmful in terms of total global GHG emissions (The Royal Society, 2009). Based on this criterion (gross GHG emissions per unit of product), OF in the EU is more efficient than conventional agriculture in the case of beef, less efficient in the case of milk and cereals, and much less efficient in the case of pig/pork production (Tuomisto *et al.*, 2012). The performance directly depends on how OF yields per area unit compare to conventional yields. These average observations mask intra-European disparities according to the climate with for example better performance of OF dairy cattle farming (in terms of GHG emissions per unit produced) in boreal climate zones (Olesen *et al.*, 2006), while OF conversion would increase GHG emissions in England and Wales (Smith *et al.*, 2019).

Outside of extensive livestock production, AEMs/AECMs most often support soil conservation practices that reduce fertilization and increase soil carbon sequestration. These climate-friendly practices also generally result in a better protection of soil biodiversity. This is the case for example with no-till farming,[137] which decreases soil disturbance but may require an increased use of herbicides to reduce weed flora, which is less efficiently controlled due to reduced ploughing.

136. "Mass" AEMs/AECMs are measures for which a large number of farmers are eligible. Their specifications contain only modest requirements, which facilitates their adoption.
137. Techniques that generally limit tillage operations.

Overall, the effects of AEMs/AECMs in terms of mitigating agricultural GHG emissions appear difficult to establish based on the partial results available. The effects seem positive when measured per unit area. They would be less positive and could even become negative if assessed per unit produced, with a high degree of variability depending on production, site, and production system.

The CAP and biodiversity

The CAP has paid increasing attention to the protection of agroecosystem biodiversity since the early 1980s. It has progressively mobilized the tools of cross-compliance, greening, and AEMs/AECMs (see the introduction to Part II). These instruments, in that order, correspond to growing ambitions in terms of biodiversity protection but to a decreasing importance in terms of budgets and surface areas. As with climate, other CAP instruments also have indirect effects on biodiversity, probably more significant than the effects of dedicated instruments.

The end of price support and the decoupling of agricultural income support

According to the same mechanisms as those described in the previous sub-section, the successive reforms of the CAP implemented since 1992 initially favoured the reduction of pesticide use by lowering European agricultural prices to be aligned with world prices. Once this transition was completed, the increase in world prices at the beginning of the 2010s led to a reversal of the trend and thus favoured the use of pesticides. In the UK,[138] for example, the use of fungicides on wheat decreased from 1996 to 2002 and then increased more markedly from 2010 onwards. In this country, insecticide use is stable and herbicide use is increasing steadily.

From 1992 to the mid-2000s, the downward adjustment of European domestic prices is likely to have been beneficial to biodiversity. This may no longer have been the case from the mid-2000s onwards as European prices for agricultural products are rising much faster than pesticide prices, whit its growth stopping at the beginning of the 2010s decade. However, changes in the prices of agricultural products and pesticides do not explain everything. For instance, herbicide use also depends on the development of no-till farming, which allows labour and energy savings in a context of increasing farm size but at the price of increased herbicide use. In addition, pesticides also have a yield stabilization effect (Serra *et al.*, 2006); an objective that is more sought after in a context of strong climatic and economic instability.

The recent growth in agricultural prices is also having an impact on agricultural land use, particularly by promoting the conversion of grasslands to arable crops. This conversion is damaging to biodiversity.

138. In the UK, pesticide use has been monitored for a long time in a detailed and consistent manner (Garthwaite *et al.*, 2016; and similar reports for previous years). This is not the case in all MS, which explains the lack of harmonized data on pesticide uses before 2011 at the overall EU-28 level.

Coupled payments for certain types of production

Coupled payments for minority crops and herds such as nitrogen-fixing crops, fodder legumes or sheep and goats has a beneficial effect on crop and animal diversity. They contribute to preserving the biodiversity of territories where these productions are developed, even more so as they are often implemented within the context of extensive practices and systems (Brady, 2011); unlike coupled payments for dominant productions in a given area as is often the case for the coupled payment for bovine.

Cross-compliance of direct payments

Environmental requirements listed under cross-compliance include SMRs and GAECs. Under the EU directives focusing on the environment, SMRs contribute to the conservation of natural habitats, wild fauna and flora, and wild birds. Cross-compliance with GAECs requires the following practices: the maintenance of buffer strips along watercourses; authorization procedures for using water for irrigation; the protection of groundwater against pollution caused by hazardous substances; a minimum level of soil cover; the limitation of erosion of agricultural soils by tillage practices; the maintenance of soil organic matter by not burning crop residues; and the maintenance of topographical features that include perennial landscape features such as hedges, groves, or ponds (see Table II-2 of the Introduction to Part II). These requirements are likely to have positive effects on biodiversity. The temporal continuity of soil cover allows corresponding areas to act as refuge and breeding ground for many species. The management of fallow land by mowing increases the diversity of microbes and arthropods, and the biological quality of the soil. The maintenance of topographical features is extremely favourable to wild fauna and flora. However, the modest penalties associated with non-compliance and the low rate of on-site inspections are two weaknesses of this instrument. A more general limitation is the low level of ambition of cross-compliance regarding the decline of permanent grasslands, the simplification of rotations, crop diversity, and agricultural landscapes, and the disappearance of hedges and banks due to the increase in plot sizes. This threefold limitation motivated the introduction of the greening payment in the 2013 CAP reform.

The greening payment

All three measures of the greening payment are likely to have positive effects on biodiversity. Simulations carried out at the European level, broken down by region and technical-economic farm types, attribute to the greening payment the increase of 2.7% in permanent grasslands and 23% in set-aside land relative to a baseline scenario without a greening payment. The greening measures are likely to have led to a very slight increase (+0.6%) in European UAA but a very slight decrease (-0.3%) in arable land (Gocht *et al.*, 2017). The greening payment may thus partly address the threats to biodiversity posed by the abandonment of agricultural land use in Eastern European MS where the increase in UAA would be greatest.

• However, the positive effects of the greening payment on biodiversity are strongly limited by a low level of ambition and the way it is currently implemented (Pe'er *et al.*, 2014). Crop diversity is the most criticized measure. Requirements in terms of crop diversity are indeed

minimal (three crops for farms of more than 30 hectares of arable land with the main crop not exceeding 75% of the arable area and the two main crops not exceeding 90% of the arable area). This allows the majority of European farms to fulfil the requirements without changing their crop diversity. In addition, several studies have questioned the use of the number of crops as a relevant indicator of biodiversity. Indeed, this number considered in isolation has no significant effect on wild biodiversity, particularly on birds or insects (Hiron *et al.*, 2015), as this effect depends more on the types of crops present in the landscape and their management. The introduction of legume crops or fallow land combined with lower levels of fertilization, and longer rotations are likely to have very positive effects on biodiversity. On the contrary, the introduction of crops produced with heavy chemical use (mineral fertilizers and synthetic pesticides) are likely to have no effect or even a negative effect on biodiversity as has been suggested in the case of pollinating insects (Hass *et al.*, 2018).

- The greening measure aimed at the maintenance of permanent grasslands is associated with a conversion tolerance of up to 5% of permanent grassland, which is likely to reduce its beneficial effect for biodiversity. Moreover, it is not automatically associated with an improvement in habitat quality. Indeed, outside sensitive areas, tillage, fertilization, and the reseeding of permanent grasslands are permitted without particular constraints. As a result, the greening measure on the maintenance of permanent grasslands is likely to have limited benefits for biodiversity.
- Finally, several studies have shown that the EFA measure is not ambitious enough. Requiring only 5% of land to be devoted to EFAs does not maintain viable populations as shown for example by the specific case of the hare in Denmark (Langhammer *et al.*, 2017). EFAs vary in nature, ranging from buffer zones and topographical elements to catch crops and nitrogen-fixing crops. Each type of EFAs is assigned a weighting factor to aggregate them and verify compliance with the requirement. The scale of weights, theoretically based on the ability of each type of EFAs to protect biodiversity, is contested by scientists. They contest in particular the high weights assigned to catch crops and nitrogen-fixing crops (Pe'er *et al.*, 2017). European farmers have sought to comply with the constraint primarily by introducing such crops on 54% of EFA-weighted areas and 70% of physical EFAs. As a result, only the 26% of physical areas in fallow land and 4% of topographical features, buffer strips, forest edges, and wooded land are likely to have significant benefits for biodiversity (European Commission, 2018). Moreover, landscape-level actions with high biodiversity benefits have very rarely been adopted by MS. Only two countries (the Netherlands and Poland) have allowed farmers to pool their efforts to create spatially contiguous EFAs that are potentially more beneficial for biodiversity.

Agri-Environment-Climate Measures

The environmental ambition of AEMs/AECMs is higher than that of cross- compliance or the greening payment. AEMs/AECMs have a positive impact on biodiversity when they target non-productive habitats such as woodlands, hedgerows, or grass strips. In contrast, the impact on biodiversity of AEMs/AECMs targeting productive areas is low, often nil (Batáry *et al.*, 2015). A large body of work also shows that AEMs/AECMs are not effective in all contexts. For example, introducing AEMs/AECMs in complex agricultural landscapes that are already rich in terms of biodiversity notably because they include significant percentages of

semi-natural elements provides little additional biodiversity protection (Batáry *et al.*, 2011). Finally, the effects vary significantly depending on the biodiversity indicators used and the groups of flora or fauna species considered. In total, the impact of AEMs/AECMs on biodiversity seems positive but limited to certain sites, and these local successes are insufficient to reverse the downward trend in biodiversity in European agro-ecosystems.

The inadequacies of previous AEMs with respect to biodiversity protection are well documented. The current AECMs of the 2014-2020 CAP may be more effective in this respect, particularly because some of them encourage the creation of consortia of farmers able to act in a spatially coordinated manner and/or because it makes it possible to apportion part of the aid for observable environmental impacts (Westerink *et al.*, 2017). Cullen *et al.* (2018) summarized the most frequent shortcomings of AEMs as follows. The multiplicity of measures proposed to agricultural producers in the same area but with multiple and often contradictory objectives leads to the dispersion of stakeholders' efforts. This spatial dispersion is futile when the objective requires a critical mass of contracting farmers and their coordination. This is the case for example as soon as the question of establishing a green and blue corridor[139] arises. The existence of adverse selection[140] means that farmers primarily commit to AECMs on areas that are least relevant with regard to environmental objective(s). In too many cases, the farming practices implemented already comply with the requirements associated with the contracted AECMs and the AECM payment is then essentially a windfall. The administrative burden becomes significant as soon as measures become more ambitious, which leads to a high share of payments received by farmers being lost in the administrative and management costs they incur.

Recommendations

This section provides a coherent set of recommendations to integrate climate and biodiversity protection more effectively and efficiently into the CAP. After a reminder of the theoretical framework of analysis (that of public economics), we explain why it is necessary to tax the harmful effects of agriculture on climate and biodiversity, and discuss the feasibility of such taxation. We then provide several recommendations to support the benefits that agriculture can have on climate and biodiversity more effectively and efficiently. Finally, we discuss the relevant geographical scale for implementing these recommendations in terms of both conception and funding of these measures based on lessons of the fiscal and environmental federalism theory.

Applying lessons from public economics to climate and biodiversity protection

In order to achieve a social optimum, public economics recommends two main courses of action: first, taxing polluting activities up to the marginal cost of the damage they cause in accordance with the Polluter Pays Principle (PPP); and second, subsidizing benefits up to

139. The green and blue corridors aim to develop a landscape structure allowing plants and animals to circulate, feed, reproduce, etc. in order to ensure the continuation of their life cycles.
140. For more details on this concept, see the General Introduction.

the level of marginal benefits in accordance with the Provider Gets Principle (PGP). Fiscal federalism investigates the advantages and disadvantages of different levels of governance of public issues according to their characteristics, which leads to opportunities for the decentralization of public policies. Environmental federalism is the branch of fiscal federalism that deals specifically with environmental issues (Oates, 2001).

Fiscal / environmental federalism

The principles of fiscal federalism call for the highest federal authority to be responsible for macroeconomic stability (currency, exchange rate, interest rate), income redistribution in favour of the poorest, and the management of global public goods. The management of local public goods can be decentralized to local authorities in order for them to adapt this management as closely as possible to the needs and preferences of residents. However, this is only true under certain conditions that aim at avoiding distortions in the profitability of private investment between different local jurisdictions by taxing the benefits derived from local public goods. By the same reasoning, environmental federalism seeks to avoid environmental dumping[141] due to local policies.

Successive developments in the green architecture of the CAP demonstrate progress in complying with the principles of fiscal and environmental federalism. Yet, addressing the maintenance of global public goods such as climate and biodiversity with second pillar measures is not coherent with these principles because these measures depend on decentralized funding and decisions. Instead, public policy tools targeting global public goods should be implemented at the EU level and fully financed by the European budget. Their inclusion in cross-compliance and the greening payment within the first pillar that is fully funded by the European budget is thus much more in line with the principles of fiscal federalism. The latter also states that local or regional authorities should manage policy instruments that exclusively target local public goods (such as water quality and landscape maintenance) within a broader policy framework to avoid environmental dumping. This is exactly what cross-compliance and the greening payment aim to achieve since all MS must respect a set of common standards. Unfortunately, the heterogeneous translations of cross-compliance and the greening payment into national regulations by each MS weaken the implementation of these principles (Dupraz *et al.*, 2019).

In the light of fiscal federalism, the main weakness of the CAP concerns the application of the subsidiarity principle, which does not distinguish between global public goods and local public goods. This allows MS and their regional authorities to use their EU CAP budget in a self-interested manner. In fact, they often use the European co-financing of AECMs to support local public goods and local agricultural development strategies. The use of European funds for these two objectives rather than global public goods reveals a flaw in the theoretical consistency of the CAP. Indeed, national and regional authorities are highly motivated to do

141. Like social dumping, environmental dumping refers here to the attitude of a public authority that seeks to increase the competitiveness of companies operating on its territory by reducing the legislative provisions (standards, taxes, etc.) aimed at protecting the environment.

so, and face no legal barriers to prevent them, in the present CAP framework. From the same perspective, respecting the greening measures related to EFAs through the implementation of catch crops and/or nitrogen-fixing crops is questionable. These two types of EFAs make it easy for European farmers to meet their obligations to the detriment of other EFAs that are more favourable to climate and biodiversity. When some MS authorize the use of pesticides on these crops to support the profitability of local sectors, this effectively constitutes environmental dumping through the implementation of differential greening conditions.

The Polluter Pays Principle and Provider Gets Principle

The CAP is far less virtuous when it comes to subsidizing environmental benefits in accordance with the PGP and, even more so by taxing pollutions in accordance with the PPP. It does not include taxes[142] aimed at reducing polluting emissions, whether they concern fertilization (which mainly affects climate) or pesticides and veterinary drugs (which mainly affect biodiversity). Although there are subsidies that *a priori* benefit the climate and/or biodiversity, these do not comply with the PGP in several respects. The three main reasons explain the non-application of both the PPP and the PGP:

- Taxation, which is only slightly harmonized at the European level, remains mainly a prerogative of each MS. A country that decides to tax its polluting emissions unilaterally would suffer from a competition distortion to its disadvantage; a situation that it tries to avoid as much as possible;
- Farmers are endowed with (implicit) rights to pollute by the various environmental standards included into cross-compliance and the greening payment. Moreover, several AEMs/AECMs subsidize the reduction of polluting inputs in disagreement with the PPP on the grounds that relative to permitted farming practices this reduction constitutes an improvement. The so-called Coase theorem states that taxing pollution or subsidizing pollution removal can be equivalent but only under certain restrictive conditions. These conditions include the absence of transaction costs and the absence of dynamic effects related to the enrichment (respectively, impoverishment) of subsidized (taxed) polluters. Because their implementation involves high transaction costs, AEMs/AECMs do not verify these conditions. Cross-compliance and greening are associated with modest obligations, low monitoring rates, and low penalties for violations. Moreover, these penalties are not proportionate to environmental damage, which therefore undermines their economic and environmental effectiveness. Cross-compliance and greening obligations stem from standards for agricultural practices. Uniformly imposing common standards on all farmers would lead to high costs for some farmers and may prevent them from exploiting market opportunities that are more remunerative than the value of the environmental damage avoided. This problem was partially solved by leaving each MS some leeway for the national implementation of EU standards. The MS have thus carried out differentiated national translations of the greening conditions by adapting

142. Penalties are nevertheless foreseen under cross-compliance and greening. They can sanction for example the destruction of permanent grasslands or non-compliance with the Nitrates Directive. However, these penalties are not proportionate to the removal of carbon from the soil and/or the intensity of fertilization.

them to the local characteristics of their agricultural sector so as not to undermine their respective competitiveness. Unfortunately, these adaptations have led to both reducing the environmental ambition and increasing the administrative burden (European Court of Auditors, 2017); and.

• The quantification of environmental damage and benefits and their agricultural determinants is difficult. Each agricultural practice affects several environmental dimensions in different ways. Symmetrically, each environmental issue involves a multiplicity of agricultural practices as well as non-agricultural determinants according to spatially and temporally heterogeneous and poorly known causalities. These uncertainties limit the possibilities of relating the economic value of damage and benefits to penalties and payments. However, this difficulty does not justify the use of payment rules that do not seek proportionality with their expected environmental effects. Today, penalties for non-compliance with cross-compliance and greening mainly depend on historical CAP direct payments. Greater crop diversity or increases in permanent grasslands are therefore not rewarded adequately. Similarly, AEM/AECM payments are based on additional costs and/or income foregone. They thus depend on prices, productions, and subsidies but not on the environmental benefits generated. Moreover, incentives to adopt a measure depend on the individual costs of adoption relative to a regional or national average of additional costs and/or income foregone. Such a basis is effective if farm incomes per hectare are negatively correlated with the environmental benefits sought.[143] For remarkable biodiversity of wetlands and upland grasslands, this correlation is most often negative. This is unfortunately not the case for carbon sequestration since the deepest soils are associated with high sequestration potential but are also the most favourable soils for arable crops and their intensive cultivation (Pellerin *et al.*, 2019). As a result, agricultural producers are encouraged to commit land with the lowest sequestration potential to AEMs/AECMs.

Below, we provide recommendations for public policies in general and the CAP in particular that favour climate and biodiversity in agricultural ecosystems. We discuss these recommendations based on data and indicators available, their articulation with other suitable public policies, and the temporal coherence of public action.

Taxing agricultural pollutions that affect climate and biodiversity

A first recommendation is to introduce a European tax on the main determinants of agricultural GHG emissions, namely nitrogen fertilization and animals.

Ideally, emissions should be taxed directly. This is however not possible because emissions cannot be observed, at least not easily and accurately. An operational solution is to assess these emissions based on easily observable determinants such as purchased

143. In relation to a payment based on the average regional foregone profit, the parcels for which the shortfall is lower than this payment are those that initially generated lower incomes per hectare because of poorer production conditions. On these plots, the payment offered exceeds the foregone profit associated with the AECM specifications: accepting this payment for these plots is profitable.

mineral fertilizers and the number of animals. In France, the climate-energy contribution is a tax applied to fuels and combustibles according to their respective emission factors and is therefore not directly related to their real emissions. The same solution can be implemented for nitrogen fertilization and animals based on emission factors used to develop national inventories (European Environment Agency, 2019).

The interest of a tax is to equalize the marginal costs of abatement[144] of one tonne of CO_2 equivalent between farmers and thus minimize the total abatement cost for a given objective of reducing agricultural GHG emissions (De Cara and Jayet, 2011). It is in the interest of each farmer to reduce their emissions as long as the amount of the tax avoided is greater than the loss of profit linked to this reduction, up to the point where the tax and the loss of profit are equ*al*.

Since damage caused by climate change is difficult to assess, the rate of the tax on the determinants of agricultural GHG emissions can be calibrated to the opportunity cost of agricultural mitigation. Indeed, what is not mitigated by agriculture will have to be mitigated by other economic sectors, and *vice versa* (De Cara and Jayet, 2011). This involves relying on the marginal abatement cost observed or calculated in other productive branches of the economy to achieve a given objective of reducing GHG emissions in these branches. This marginal abatement cost is the price observed in the EU Emissions Trading Scheme (ETS), to which the large companies with the highest GHG emissions are subject. For other sectors of the economy, it is calculated using technical-economic models to establish taxes or tutelary values[145] for carbon (Haut Conseil pour le Climat,[146] 2019). The search for economic efficiency on the scale of all European production sectors leads to equalizing the marginal costs of reducing a tonne of CO_2 equivalent between all production sectors, and not only within each sector. Nitrogen sources other than synthetic nitrogen fertilizers (i.e., symbiotic fixation and recycling) would be exempted. In the interests of the overall consistency of incentives, the coupled payment for livestock production, in particular ruminant livestock, should be removed because it provides an economic incentive in the opposite direction to the tax, more specifically to the taxation of livestock (see Chapter 10).

Similarly, a European tax on pesticides and veterinary drugs calibrated according to their ecological toxicity is also justified, this time with a view to protecting biodiversity (and health). Setting the rate of this second tax is a difficult issue due to the lack of precise and easy-to-gather references on the average and marginal damage caused by the use of these products. A pragmatic solution is to apply a rate that increases over time until biodiversity

144. The abatement cost borne by a polluting company is the loss of profit generated by the reduction in the quantity of polluting emissions. This cost increases with the quantity of polluting emissions that are reduced, usually more than proportionally. The marginal abatement cost borne by the company (i.e., the cost of reducing the last unit of pollutant emissions) therefore also increases with the quantity of pollutant emissions. Equalizing the marginal abatement costs between polluting firms avoids the economic inefficiency associated with the imposition of high profit losses for some firms, while lower-cost emission reductions are possible for others.

145. Tutelary values are used for the evaluation of public investment projects. They can be used by private actors if so desired.

146. In English, High Council for the Climate.

indicators show that the biodiversity of agricultural ecosystems has recovered. Because of the response delays of ecological processes, the decline in pesticide sales may provide an initial guide to adjusting the tax rate over time.

The administrative costs of the taxes proposed above are very low/negligible compared to those associated with payments conditional on compliance with restrictions associated with the same environmental objective such as AECM payments. This is because the taxes apply to operators such as mineral fertiliser distributors and slaughterhouse companies who already collect taxes. Transaction costs for farmers are zero, which is far from being the case with the current AEMs/AECMs, which both aim to reduce inputs and require detailed declarations of areas, herds, and/or farming practices. By avoiding these declarations, which are often difficult to establish and verify, the taxes respond at least partially to the recriminations of farmers and managing authorities against the bureaucracy and administrative burden of the CAP.

Finally, the effect of taxes on international trade must be considered and corrected if necessary. These considerations relate to induced competition distortions that disadvantage European actors who are taxed and favour foreign actors who are not. These distortions can lead to geographical shifts of the pollution from European MS to countries that would not apply an equivalent taxation scheme. Within the EU, the few MS that have imposed a significant tax on pesticides (such as Denmark) have recorded a sharp drop in pesticide use. In the absence of European harmonization, this national tax creates a competition distortion within the European market that was not acceptable to Danish farmers. This situation has led Denmark to redistribute the pesticide tax income to its farmers by means of a reduction in property tax. A similar solution is applicable to accompany the European scheme for the taxation of the determinants of agricultural GHG emissions and biodiversity loss proposed in this subsection. It would avoid the competition distortion against EU agricultural producers relative to their colleagues in non-EU countries. However, this solution has the disadvantage that taxes would not impact consumer prices because the tax effect would be neutralized upstream. The preferred solution is therefore to also tax imports at rates similar to those applied to domestic productions.

Paying for benefits to climate and biodiversity

The second recommendation is to offer higher incentive payments for permanent grassland, crop diversity, soil cover, and landscape features. From this perspective, two priorities for action are identified:

- First, proportion payments to indicators that are better correlated with soil carbon sequestration and the implementation of biodiversity-friendly agricultural practices, systems, and landscapes. This implies payments that are proportional to both to the areas targeted and the contributions of each area to environmental benefits; and
- Second, ensure the time consistency of the scheme so that public payments for climate and biodiversity are not lost because of changes in the economic context. This concerns for example the conversion of permanent grasslands to arable crops in response to a rise in cereal prices. The fact that CAP payments and obligations are currently attached to the

farmer is another problem because environmental benefits generated on a particular field may be cancelled when it is sold without the seller or the buyer having to reimburse payments received in return for the provision of these benefits.

The amount of payments per hectare should not exceed the value of the contributions of each type of land use to climate and biodiversity protection. In the case of climate, this condition implies first assessing the fluxes of carbon sequestered in soils. From this perspective, Pellerin *et al.* (2019) have compiled useful references for France and some of these references can be regionalized to better reflect the geographical heterogeneity of soils. It would be useful to produce the same references for all EU regions. The second step requires setting the value for one tonne of CO_2 equivalent sequestered. For biodiversity, calibrating the payment raises the same problems as those identified for setting the tax on pesticides and veterinary drugs. The absence of a unified indicator first requires an ordinal hierarchy of land use types to be established according to their respective contributions to biodiversity. Second, the corresponding hierarchy of payments must be sufficiently discriminating so that farmers do not shift from land use types and farming practices of high ecological value to land use and practices of lower ecological value.[147] The analysis of payments and areas contracted under existing AEMs/AECMs can provide useful indications for defining this hierarchy of payments. Finally, as for the tax on pesticides and veterinary drugs, payments must be adjusted over time according to changes in terms of land use types and practices targeted by payments, and to improved biodiversity indicators in the longer term.

Carbon sequestration and flora diversity in permanent grasslands increase with the age of the grasslands (at least until about 50 years of age). In a simplified manner, permanent grasslands could therefore benefit from increasing payments according to their size and age. In the event of the permanent grasslands being ploughed, the past sequence of payments should be repaid, which would limit the risk of wasting past public investments. Permanent grasslands located in farms subject to the greening payment within the current CAP should benefit from the payment corresponding to grassland of at least six years of age and should be subject to the obligation to reimburse the sequence of payments in the case of ploughing. This payment would more effectively compensate the cost of the tax on animals if farms have a lower livestock density.

For arable crops, payments should increase with the diversity of crops and the length of crop sequences. The choice of the most appropriate diversity indicator is an increasingly well-documented technical issue although it is still the subject of scientific controversy (Jarvis *et al.*, 2008). Even if a simple indicator such as the number of crops in a given area correlates well with some biodiversity indicators (Billeter *et al.*, 2008), many scientists prefer more elaborate indicators (Sirami *et al.*, 2019). In the case of EFAs, it would be desirable to take into account both their area, their quality and their diversity.

The CAP information system must therefore be supplemented in order to better appreciate the environmental benefits of agriculture and to align the financial support to the climate

147. For instance, relatively high payments for crop diversity compared to grassland payments may result in the conversion of permanent grasslands into arable crops of lesser ecological interest.

and biodiversity on these benefits.[148] To this end, this information system must first link payments to the actual parcels of land so that land sales or transfers do not provide an opportunity to "reset the counters". The geo-location of parcels of land is also important so that the indicators of environmental benefits best reflect the characteristics of the actual landscapes to which the farm receiving the payments contributes. It is in this respect that the CAP information system is currently the most deficient with in addition considerable heterogeneity between MS. Finally, this information system should connect with observatories gathering direct measurements of soil carbon and various biodiversity indicators in order to adjust payments over time.

Better application of the principles of fiscal and environmental federalism

Fiscal and environmental federalism implies that the European level of governance organises and finances the management of global public goods while avoiding the environmental dumping associated with the national or regional management of local public goods. European authorities should therefore implement the taxes and payments proposed in the previous two subsections. This would improve the consistency with the scale of implementation of the competition policy within the European Single Market. It would also facilitate the coordination with the EU trade policy, which is responsible for setting equivalent taxes on imports to neutralize pollution transfers. EU trade policy does not currently incorporate climate or biodiversity aspects at least not in a binding way. This integration is fiercely debated in the framework of the EU's bilateral trade agreements (see Chapter 4).

The implementation of European payments for climate and biodiversity does not exclude the introduction of additional payments by national or regional public authorities to support the provision of local public goods including a consideration of the influence of these local public goods on health. Decentralized policies may use the same bases as European payments or preferentially indicators better adapted to local issues. In all cases, fiscal federalism advocates the funding of local public goods by local beneficiary populations.

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148. The Integrated Administration and Control System (IACS) of the CAP includes: a graphical parcel register, a geo-spatialized graphical system allowing farmers to declare the uses of their parcels and the aids they apply for; a digital database for livestock declarations; and an integrated control system linking declarations, remote sensing checks, and field visits.

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8. The CAP and the Agro-Ecological Transition of European Agriculture

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The development of European agriculture has long been based on mechanization, industrial inputs, and the increase in labour productivity.[149] This involved freeing oneself as much as possible from the constraints of the environment by providing crops (by means of mineral fertilizers and irrigation) with the main nutrients and water needed for them to grow, while protecting them (using plant health products) against weeds[150] and crop pests (insects, diseases, etc.). Similarly, in the animal sector, this has been achieved by providing animals with a balanced diet via[151] compound feedstuffs and ensuring their health with veterinary medicines. At the same time, advances in plant and animal breeding have allowed a continuous increase in production potential measured by yield gains for crops, increases in litres of milk per cow or faster daily growth of animals reared for meat. This development model, often described as industrial, has made it possible to significantly increase the volumes produced and thus to guarantee the security of supply for Europeans; two central objectives of the CAP at its origin (see Chapter 1). From the early 1980s, this model rapidly showed its limits in terms of consumption of non- or slowly renewable resources and negative impacts on the environment and health (see the introduction to Part II).

It is in the context of the need to reduce the ecological footprint of agriculture that the concept of agro-ecology emerged. Defining agro-ecology in simple terms is a challenge; defining it in a single way is impossible particularly because agro-ecology is a scientific discipline, a set of agricultural practices, and a social and political movement all at the same time (Wezel *et al.*, 2009). The challenge is all the greater since agro-ecological transition (AET) is not limited to the farm scale alone; it also includes both territorial and commodity chain dimensions, and more generally that of food systems (Therond *et al.*, 2017). In the framework of this chapter, which aims to define how the CAP can facilitate the AET of European Union (EU) agriculture,

149. Ratio of agricultural production to the total amount of agricultural, family and wage labour.
150. A weed is a plant that grows in the field without having been intentionally planted there.
151. Compound feedstuffs are feed mixtures produced from various feed materials and additives tailored to the specific nutritional requirements of targeted animals.

the focus is mainly on agro-ecological practices at the scale of a farm or a set of contiguous farms. Nevertheless, the analysis also addresses the additional scales of regions, commodity chains and food systems from the perspective of coherence at these three levels.

The negative consequences of European agricultural dynamics on the environment and health are described in the introduction to Part II. The challenges of climate and biodiversity, being seen as two global public goods, are the subject of Chapter 7. The challenges for AET in European agriculture are addressed in this chapter through the design of agricultural practices and systems that would be more appropriate to follow in order to promote greater environmental and health sustainability, while highlighting the possible trade-offs with productive, economic and/or social performance. We then present the tools of the CAP currently implemented to serve the AET and, finally, our recommendations.

The challenges of the agro-ecological transition of European agriculture

What is agro-ecology?

By greatly reducing their use but without necessarily forsaking external inputs altogether, agro-ecology seeks to mobilize the ecological processes provided by nature, also known as Ecosystem Services" (ESs),[152] to reduce the consumption of non- or slowly renewable resources (fossil fuels, water, etc.) and protect the environment, while ensuring the production of agricultural goods and the economic viability of farms. These ESs are supported by the biological diversity of agricultural environments (agro-ecosystems) that should be promoted and on the biological interactions within these agro-ecosystems that should be optimized (Duru *et al.*, 2015).

Two main types of biodiversity interact within agro-ecosystems: first, planned biodiversity, which is intentionally integrated by the farmer (crop species and varieties, animal species and breeds); and second, the associated biodiversity composed of wild plants and animals. Planned biodiversity is directly dependent on farmers' decisions regarding the spatio-temporal configuration of crops and animals reared on plots and farms. Associated biodiversity also depends on the farming practices that may impact it positively or negatively (such as tillage, use of chemical inputs, irrigation, drainage, etc.), as well as on the structure of the landscape assessed in terms of the relative importance and interweaving of different cultivated and non-cultivated areas. The interactions between the different species of an agro-ecosystem can be based on competition (e.g., for water), complementarity (e.g., the coexistence of plant and animal activities on the same farm or territory), predation (e.g., the development of a predatory species to the detriment of a prey species), or beneficial

152. The Millennium Ecosystem Assessment (MEA) defines ecosystem services as the goods and services (benefits) that humans can derive from ecosystems, directly or indirectly, to ensure their well-being (MEA, 2005). A distinction is made between provisioning services such as the provision of food, regulating services such as climate stabilization, cultural services such as the maintenance of heritage, and supporting services necessary for ecosystem functioning such as nutrient cycling. The environmental services considered in this book refer to human interventions that help maintain regulating, cultural and supporting ecosystem services.

relationships for two species (e.g., mutualism, symbiosis, dilution of parasites, etc.) or only one (e.g., commensalism). Agro-ecology seeks to develop and mobilize positive interactions in order to reduce the use of chemicals and consequently their negative effects on the environment. It also aims to satisfy the productive, economic, and social dimensions in a context where there may be trade-offs; for example, between productive and environmental performance (Power, 2010).

From ecosystem services to agro-ecological practices

The works of the French assessment of ecosystems and ecosystemic services[153] devoted to agricultural ecosystems distinguishes services according to whether the beneficiaries are farmers and/or citizens (Table 8.1). The first five ESs (1, 2, 3, 4, and 5) regulate abiotic stresses[154] by providing plant cover with a soil structure favourable to root growth, reducing water deficits, and limiting nutrient deficiencies. The next three ESs (6, 7, and 8) regulate biotic stresses and thus limit production losses due to pollination deficits or the action of pests. The other four ESs (9, 10, 11, and 12) are regulating services that modulate phenomena that are detrimental to the well-being of citizens, while the so-called cultural ESs (13 and 14) provide recreational, aesthetic, and spiritual benefits.

Even though the allocation of beneficiaries can be discussed,[155] it can also be usefully mobilized to present the agro-ecological practices to be promoted in the service of the AET. Table 8.1 does not include the supply service considering that the production of agricultural goods is ultimately the result of the functioning of agricultural ecosystems. It should be noted that the first eight ES referred to as input services can be analysed as natural factors of production that make it possible to ensure the production of agricultural goods, while at the same time generating environmental benefits. While the other six ES also make it possible to achieve such benefits, the implementation of agricultural practices conducive to their provision is more difficult due to a lower direct interest for the farmer.

Tibi and Therond (2018) identify four main factors of disturbance to associated biodiversity and the ES that this biodiversity underpins: tillage, mineral and organic fertilization, crop protection, and irrigation. In contrast to conventional agricultural practices using chemicals, which strongly disturb this biodiversity, agro-ecological practices seek to minimize these disturbances. They can be implemented at the nested and complementary scales of field, cropping system[156] and landscape (Wezel *et al.*, 2014).

153. In French, EFESE for *Évaluation Française des Ecosystèmes et des Services Ecosystémiques*.
154. Abiotic factors represent all of the physico-chemical factors of an ecosystem: water, temperature, humidity, etc. They are opposed to biotic factors, which represent all of the interactions of living things with living things in a given ecosystem.
155. Thus, the ES relating to climate regulation by mitigating greenhouse gas (GHG) emissions and increasing carbon storage can also directly benefit the farmer.
156. All technical arrangements implemented on plots of land that are treated in the same way. A given cropping system is defined by the nature of the crops, their order of succession (rotation), and the technical itineraries (set of practices) applied to the different crops.

Table 8.1. Ecosystem services of agro-ecosystems.

Ecosystem services	Direct beneficiary (Indirect beneficiary)
(1) Soil structuring	Farmer
(2) Supply of mineral nitrogen to crop plants	Farmer (*Society*)
(3) Supply of other nutrients to crops	Farmer (*Society*)
(4) Storage and return of water to crops	Farmer (*Society*)
(5) Soil stabilization and erosion control	Farmer and Society
(6) Pollination of cultivated species	Farmer
(7) Weed seed control	Farmer (*Society*)
(8) Control of insect pests	Farmer (*Society*)
(9) Natural attenuation of pesticides by soils	Society
(10) Regulation of water quality with respect to nitrogen (N), phosphorus (P) and dissolved organic carbon (DOC)	Society
(11) Storage and return of blue water (*)	Society
(12) Regulating the global climate through mitigation of gross greenhouse gas emissions and carbon storage	Society
(13) Recreational potential (outdoor activities without sampling)	Society
(14) Recreational potential (outdoor activities with sampling)	Society

Source: Tibi and Therond (2018). * Blue water is the portion of water from atmospheric precipitation that flows in rivers to the sea, or is collected in lakes, aquifers, or reservoirs.

Agro-ecological practices for soil, crop, and landscape management

Replacing ploughing with simplified tillage techniques (that may go as far as no-tillage) reduces direct energy consumption and the disruption of biological activity in the soil at the potential cost of weed control problems. Fertilization alters the availability of nutrients in soils and the dynamics of the living organisms that depend on them. The main negative environmental effects of fertilization are related to the large amounts of fossil energy required to produce mineral nitrogen fertilizers and the significant leakage of nitrogen and phosphorus in gaseous or soluble forms due to unsuitable application conditions of mineral and/or organic fertilizers. The use of organic fertilizers of agricultural, urban, or industrial origin and the introduction of leguminous plants (plants that have the capacity to fix nitrogen from the air) make it possible to reduce the application of mineral fertilizers. The reasoning behind fertilization, through the use of decision support tools, makes it possible to adjust fertilizer inputs to the needs of crops by taking into account the supplies from legumes and soils. The same reasoning can be developed for irrigation through the use of irrigation management tools and the choice of varieties, species, crop acreages, and crop successions[157] that are more water efficient.

157. While the rotation describes the temporal succession of different crops on the same plot, the "crop acreage" describes the spatial distribution of crops on the different plots of a farm at a given time.

Much research suggests that room for manoeuvre can be exploited to limit the use of plant protection products without adverse effects on farm yields and economic results; see, for example, Lechênet *et al.* (2017) for an illustration in the case of field crops in France. The main agro-ecological lever is that of the spatio-temporal distribution of crops and more generally of plant cover by modifying the choice of varieties, species diversity through longer and more complex crop rotations, the introduction of intermediate cover between the harvest of one crop and the sowing of the next crop, etc.

These agro-ecological practices on the scale of the cropping system will be usefully complemented by actions on the scale of the field concerning prophylactic measures (e.g., eliminating the initial outbreaks of any pests), agronomic measures (e.g., adapting sowing dates, densities and spacing), physical control (e.g., using mechanical weeding, despite the possible increase of direct energy consumption due to the passage of machinery), or biological control.158 Agro-forestry, which combines trees and crops, improves soil quality, reduces nutrient losses and diversifies agricultural income sources at the cost of a loss of land available for crops and often an increase in working time (Rigueiro-Rodriguez *et al.*, 2009).

At the landscape level, a major lever for action is the management of the landscape matrix. The establishment of grassed strips, flowered strips, hedgerows, trees, and more generally Agro-Ecological Infrastructures (AEIs) may provide many environmental benefits; that is, the protection of biodiversity, provision of habitats and food for crop helpers and pollinators, protection against wind and water erosion, etc. The disadvantages of AEIs are that they can also provide a habitat and food for pests, reduce the area available for crops, and require cooperation between farmers and more generally between different land managers within the framework of collective landscape management (Wezel *et al.*, 2014).

Agro-ecological practices on livestock farms

Agro-ecological practices also concern livestock farming given their possible negative impacts on the environment and their primary responsibility for land use change (see Chapter 10). Five specific areas of application can be distinguished (Dumont *et al.*, 2013):

- Animal and herd health management mobilizes the adaptive capacities of animals and herds and the principles of ecology applied to host-pathogen interactions;[159]
- The reduction of external inputs is sought by increasing feed efficiencies and encouraging the use of food resources not directly valued by humans or land-use patterns that do not compete with human food or forests;
- The reduction of pollution linked to animal husbandry is obtained by limiting animal waste (*via* genetics, feed, etc.) and by optimizing the metabolic functioning of the farming systems (*via* the use of waste in the form of fertilisers or renewable energy);
- Mixed crop-livestock systems exploit the synergies between crops and animals; for example, by providing straw from crops that in turn benefits from the fertilizing power of animal manure; and

158. For more details on these different alternative practices to chemical crop protection and their impacts on productive, economic, environmental, and social performances, see Guyomard *et al.* (2013).
159. This first point can be extended to animal welfare (see Chapter 10).

• Biodiversity within livestock farming systems is preserved by enhancing domestic biodiversity (diversity of species and breeds) and adapting land-use patterns (grazing, agro-forestry, etc.) and managing landscapes.

At the risk of oversimplification, agro-ecological practices can be summed up by two key words: diversity and complexity. The positive effects of diversity on the environment are now well established, at the cost of greater complexity in agricultural practices and systems. Moreover, a greater diversity of species, varieties and/or breeds increases the resilience of production systems to adverse events.

Obstacles to the agro-ecological transition of European agriculture

Several factors explain why the AET of European agriculture is difficult.

The first reason is related to the polysemy of the notion. The distinction between weak *versus* strong ecological modernization (Horlings and Marsden, 2011), analysed in light of the ESR Efficiency, Substitution, and Redesign (ESR) grid proposed by Hill and MacRae (1995) can help to overcome this first difficulty. The main aim of the weak ecological modernization path is to increase the efficiency of external inputs with a dual perspective of reducing negative environmental impacts and lowering production costs. This is based on standardized genetic and ecological engineering through the implementation of good management practices, the use of improved plants or animals, the use of precision technologies, and the substitution of chemical inputs by biological inputs that are less harmful to the environment. In contrast, the strong ecological modernization path is based on the management and development of the biological diversification of agricultural ecosystems and the intensification of ecological interactions between the different components of the biophysical system. It corresponds to a logic of system redesign adapted to the farm, to the area in which it is located, and to time (Therond *et al.*, 2017).

This theoretical analysis of different transition pathways enables us to identify the initial trade-offs faced not only by the farmer involved in the AET of his farm, but also by the public decision-maker who seeks to promote this transition through restrictive and/or incentive measures. The scale of the environmental challenge suggests that the mere search for greater efficiency in the context of a weak ecological modernization of European agriculture is not enough. The levers of greater efficiency must nevertheless be mobilized, and their support by public authorities will be all the more justified as it is based on results (that is, less negative effects on the environment) and facilitates the adoption of levers relating to substitution and, above all, redesign.

The second question relates to the modalities of public intervention. The Polluter Pays Principle (PPP) calls for not compensating (let alone remunerating) the farmer for renouncing environmentally negative agricultural practices, in Europe and elsewhere. Such environmentally damaging practices should be discouraged by regulations and/or taxes. This raises the problem of the capacity of farmers to financially support the additional costs

involved, especially if the policy is one of taxation. From this perspective, the CAP implicitly defines a reference point below which practices are regulated (through cross-compliance and the greening of first pillar direct aids) and above which they are encouraged (currently by the Agri-Environmental and Climate Measures (AECMs) of the second pillar; in the 2023-2027 CAP by both the AECMs still in the second pillar and eco-scheme measures in the first pillar). This distinction raises the questions of the optimal choice of this reference, its possible evolution over time,[160] its spatial declination according to the differentiated acuteness of local environmental issues, and its legitimacy (a reference that is too demanding may lead to excessive economic difficulties for farmers, while a reference that is too modest may limit the ambition and consequently its effectiveness). Moreover, AECMs, as implemented to date, compensate only for the additional costs and/or lost profits associated with the use of more environmentally friendly practices. They are not based on the environmental benefits generated, a property that would increase their environmental efficiency (maximizing the ratio of environmental benefits to public expenditures).

A third difficulty relates to the dependence on the local context (biophysical, climatic, etc.) of practices that are unfavourable or on the contrary favourable to the environment. This makes it difficult to define solutions that would be universal in scope and valid in all situations. This difficulty raises the question of the transition from an obligation of means (agricultural practices) to an obligation of results that is required to ensure that measures are better based on the environmental damage avoided and the environmental benefits generated.

A fourth difficulty is linked to the fact that research has often evaluated and expressed the benefits of AET on the basis of criteria on spatial and temporal scales that are not those used by the agricultural producer when making decisions by reasoning at the farm scale (Kleijn *et al.*, 2019).

Furthermore, the issue of work (time, organization, arduousness, skills, etc.) arises in all forms of agro-ecological systems because of their intrinsic complexity and the complexity of the reasoning that their implementation implies; also, because the AET challenges the logic of increasing the productivity of labour, which has been a common feature of the dynamics of European agriculture since the end of the Second World War and the implementation of the CAP.

The barriers to AET are not limited to the farm or groups of farms. The technical, economic, and organizational coherence of agricultural practices in conventional systems is reinforced by the same type of coherence at the level of the agri-food chains. This dual coherence leads to a socio-technical locking of the whole of agriculture and agri-food that hinders (if not excludes) the development of more sustainable alternative models (Geels, 2002).[161] Because

160. Depending on the progress of knowledge about the impacts of a particular practice on the environment; also depending on the increased acuteness of a particular environmental issue; for example, climate change or biodiversity decline (see Chapter 7).

161. Naturally, this coherence exists only if external effects on the environment and health are not considered (which was the case for a long time) or are insufficiently considered (which is the case today). Taking into account the costs related to these external effects suggests that economic coherence is no longer achieved when all private and public costs are accounted for.

of the greater diversity that they require, and which disrupts these coherences, agro-ecological practices come up against barriers to adoption that are all the greater changes involve a redesign of the systems involved.

Agro-ecological practices can degrade the economic performance of farms not only because they may generate additional private costs (for example, in the context of the substitution of chemical pesticides with a set of more environmentally friendly alternative methods of crop protection) but also because they correspond to increased risk-taking for the farmer (at least in the learning phase of implementation) or because they reduce receipts due to lower yields or more difficult valorisation of products from crop or livestock diversification. As shown by Meynard *et al.* (2018), crop diversification is only made possible by acting simultaneously and in a coordinated manner on the three levers, which are: first, the varietal selection; second, the improvement of production techniques at the farm level; and third, the coordination of the various stakeholders in the sectors and outlets.

The AET of European agriculture therefore requires us to consider both the levers to unlock agri-food chains and systems at the territorial level and changes in practices at the farm level. The more radical these changes are, the more the transition involves other components of innovation, in particular: farm advisory services, which must relinquish an essentially prescriptive stance to accompany change by instead fostering experience sharing and stakeholder reflexivity (Labarthe, 2010); training, which must enable farmers to acquire new professional skills enabling them to reconfigure their practices while taking into account local specificities (Coquil *et al.*, 2018); and the involvement of farmers to adapt complex technical choices to their workload (Dedieu *et al.*, 2006).

Agro-ecology in the current CAP

The current CAP (2015-2022) aims at promoting the AET of European agriculture by simultaneously using the levers of constraint (cross-compliance and greening) and incentives (AECMs). The reference to agro-ecology is only implicit through practices that would be prohibited or on the contrary recommended. Support for organic agriculture (OF), both in terms of conversion to OF and maintenance in OF, is given special attention as a prototype of an agro-ecological system. Beyond this focus on farming practices, the CAP also seeks to promote OF through research, innovation, advice, training, investment, and market opportunities.2.1. Targeted measures on agricultural practices

Measures targeted on agricultural practices

Cross-compliance and the greening of first pillar direct aids are based on the stick logic with a reduction in support (payment of penalties) if the criteria attached to these two schemes are not met. Cross-compliance includes requirements relating to adherence to regulatory provisions in the fields of environment, animal health and welfare and the maintenance of Good Agricultural and Environmental Conditions (GAECs). Greening includes three provisions: the first concerns a minimum diversity of crops on arable farming land (crop acreage);

second, the maintenance at national or regional level of permanent grasslands and the prohibition to return, work or convert such grasslands if they are located in a sensitive area[162]; and third, the obligation at farm level to maintain or establish Ecological Focus Areas (EFAs) on the equivalent of 5% of the arable land area on the basis of a closed list of EFAs classified according to an area equivalence criterion (see Table II-2 of the Introduction to Part II). Cross-compliance and greening essentially respond to the logic of increased environmental efficiency. Their capacity to promote the redesign of agricultural systems is extremely limited.

The second pillar AECMs fall under the carrot logic even if the aid granted under this heading only compensates for the additional costs or loss of profit. They correspond to multi-year contracts taken out by the farmer only if desired, co-financed by the European and national/regional authorities. Over a minimum of five years, the farmer voluntarily undertakes to avoid the use of certain practices and/or to adopt more environmentally friendly practices going beyond the legal obligations of cross-compliance and greening. AECMs are defined at the level of the CAP second pillar managing authority. In France, it is thus at the regional or sub-regional level that AECMs are implemented according to a three-class typology: first, system measures at the farm level requiring simultaneous consideration of biological, physical, agronomic, and socio-economic dimensions; second, measures with localized issues at the scale of a plot or group of plots responding to a circumscribed environmental issue; and third, non-zonal measures aimed at preserving pollinators and genetic resources used in agriculture and threatened with decrease and disappearance(see Table II-1 of the Introduction to Part II). AECMs and in particular system AECMs theoretically have the capacity to foster changes that would go beyond the goal of only improving efficiency. However, the budgetary resources allocated are too modest to provide substitution, let alone a redesign commensurate with the environmental challenges.

Support for Organic Farming[163]

Aids for conversion to and maintenance in OF are similar to system AECMs although they can be applied at the parcel level and do not necessarily cover the entire area of the farm. In France, they are activated throughout the territory and are therefore open in all Regional Development Programs (RDP) established by the regions on the basis of specifications defined at the national level. The aid granted is calculated to compensate on average for the loss of profitability between organic and conventional production. Maintenance aid is therefore lower than conversion aid because producers certified in OF benefit from higher prices for

162. In France, the regional criterion compares the current year's ratio of land under permanent pasture and meadows on the regional Utilized Agricultural Area (UAA) to the ratio of a base year (2015), specifying rules to be adopted by the farmer if this regional ratio deteriorates by more than 5% (obligation to relocate) or by more than 2.5% but less than 5% (conditions for reversion). A sensitive meadow corresponds to an area of permanent grassland and meadowland present in the Natura 2000 areas for heathlands, rangelands and summer pastures, in areas determined on the basis of their richness in biodiversity within Natura 2000 areas for natural grassland.

163. Box II.1 in the Introduction to Part II provides a summary analysis of the benefits and potential drawbacks of OF.

their products (which is not the case for producers in conversion who cannot benefit from the OF label). Both types of aids are paid in the form of annual payment per hectare and vary according to the type of vegetation cover (Table 8.2).

Conversion to OF is often strongly linked to a profound change that clearly corresponds to a redesign logic. The existence of a set of specifications to be respected in order to benefit from this official sign identifying quality and origin (SIQO)[164] facilitates the implementation of aid for OF and its effectiveness by allowing its monitoring: that is, the practices and the certification of farms by independent organizations. Although often neglected or poorly understood when public policies are designed, the issue of monitoring is nevertheless essential to effectiveness, credibility, and acceptance of measures. This may prove problematic when it comes to promoting agro-ecological systems other than OF systems due to the absence of explicit and certified specifications and the diversity of practices to be implemented on a case-by-case basis. Making the granting of AET conditional on an obligation of results is a potential way to overcome this impasse. This point is detailed in the third section on policy recommendations.

Beyond the measures targeting agricultural practices

Other CAP instruments seek to facilitate the AET of European agriculture through innovation, training, advice, investment, and product valorisation. They all fall under the second pillar of the CAP.

The European Innovation Partnership for Productive and Sustainable Agriculture (EIP-AGRI) seeks to bridge the innovation gap in agriculture by supporting the creation of multi-stakeholder partnerships to facilitate knowledge sharing (following the model of open innovation) and the incorporation of knowledge from the field. Insofar as the various tools of the EIP-AGRI very often target environmental objectives and innovative practices to be developed, tested, and generalized to this end, the system can without question be considered as serving AET, even if not exclusively. This issue of innovation in European agriculture and its support by the CAP is the specific subject of Chapter 12. In a related way, the development of research programmes focused on agro-ecology, in particular on ESs, aims to provide the scientific knowledge underlying the choice of agricultural practices to be promoted, maintained, or prohibited.[165]

Other instruments available have a more modest scope in view of agro-ecological ambition at least as they are currently implemented. This is because the reference to agro-ecology is at best only implicit and/or because their granting is only (too) infrequently conditioned by requirements regarding the use of agro-ecological practices.

This is the case for investment aid paid under competitiveness and adaptation plans for agricultural holdings in the second pillar. These plans promote a "new" approach to investment as part of an overall strategy to improve the economic, social, environmental, and health performance of farms. Each MS defines priority targets over a spectrum that is nonetheless

164. According to the French acronym SIQO, for *Signes d'Identification de la Qualité et de l'Origine*.
165. These research programmes (such as the multi-actor projects and thematic networks of the EIP-AGRI) are not financed by the CAP, but by the European research policy, the so-called Horizon 2020 policy for the period 2014-2020. The EIP-AGRI also aims to better articulate the objectives of European agricultural and research policies and their respective tools in terms of research and innovation.

Table 8.2. Support for Organic Farming in France: Comparison of the periods 2011-2014 and 2015-2020*.

Types of vegetation cover	Conversion aid (euros/ha/year		Maintenance aid (euros/ha/year)	
	2011-2014	2015-2020	2011-2014	2015-2020
Market gardening, arboriculture, vegetable, and industrial beet seeds	900	900	590	600
Annual crops, seeds of cereals protein crops and fodder crops	200	300	100	160
Vegetable field crops	350	450	150	250
Viticulture	350	350	150	150
Meadows associated with a livestock operation	100	130	80	90
Moors, summer pastures and rangelands	50	44	25	35
Lavender, lavandin, milk thistle, caraway, fennel, psyllium, and sage weed	350	350	150	240
Other perfume, aromatic and medicinal plants	350	900	150	600

Source: Authors' elaboration from the French Ministry of Agriculture. * Aid 2015-2020 corresponds to the CAP 2014-2020, which was only implemented as of 1 January 2015.

very broad so as not to displease any of the stakeholders. In France, this relates to the following: the modernization of livestock buildings; the economic and environmental performance of crops through the control of chemical inputs and the protection of natural resources (without excluding more specific needs such as greenhouses or orchards); and the improvement of the energy performance of all farms in terms of both fossil energy savings and the production of renewable energy. The investments supported in this way through the direct payment of a part of their costs therefore essentially respond in line with the logic of efficiency (with substitution at best) and with little (or no) redesign.

This is also the case for SIQO support, which is based on three principles: first, a collective approach voluntarily initiated by producers; second, strict production conditions validated by the public authorities; and third, regular controls carried out by approved independent organizations The guarantees are varied and include origin, quality, use of a traditional method, etc. With the OF exception, which explicitly carries an environmental ambition that is part of the logic of redesigning the production system, these official signs may (or may not) at the discretion of the producers include environmental objectives and as a result obligations in terms of regulating agricultural practices that are unfavourable or favourable to the environment. In addition, a given official sign may include environmental provisions that are differentiated according to productions or even within a given production: in France, the environmental requirements of the Label Rouge (LR) are today much higher for broiler chicken than for pork, and vary greatly from one SIQO cheese to another.

Analysis and recommendations

The environment of the European agro-ecosystems continues to deteriorate reflecting the inadequacy of the current CAP instrumentation in this area. Chapter 7 sets out the basic principles of an agri-environmental policy more in line with the lessons of public economics. Such a policy is based on i) a stricter application of both the Polluter Pays Principle (PPP) and the Provider Gets Principle ((PPG) and ii) the lessons of fiscal and environmental federalism calling for a distinction to be made between the scales of governance according to whether the environmental public good is global or lo*cal*. In the absence of being able to implement this ideal policy, mainly due to the divergent points of view of the MS and the different categories of actors, this section is mainly placed within the framework of the current CAP instruments whose efficiency and effectiveness must be improved.[166] We return to the structure of the previous section starting with the measures targeted at agricultural practices, and continuing targeted at the technical-economic environment of farms.

Targeted measures on agricultural practices

Cross-compliance can be considered as an application of the PPP in the sense that conformity with cross-compliance usually entails an additional cost for the farmer. Greening can be analysed from two opposing angles: first, as respecting this same PPP if one considers that failure to comply leads to the loss of part of the first pillar's direct aid (according to a penalty scheme that is nevertheless extremely mild) or on the contrary as not respecting it if one considers the alternative perspective where compliance with the greening rules allows the farmer to receive the share of first pillar direct aid attached to it. The future CAP that will apply over the 2023-2027 period removes this ambiguity by (more or less) incorporating the three greening measures into cross-compliance and would thus be theoretically strengthened. It implicitly defines the reference to be respected in the framework of an application of the PPP above which the farmer would be paid for additional efforts, *via* AECMs or the new[167] instrument of the eco-scheme in the framework of an application of the PGP. In the case of AECMs, this budgetary aid is still limited to compensation for the additional costs or lost profits resulting from the prohibition, maintenance, and/or implementation of practices that better protect the environment. Budgetary support provided through AECMs would therefore still not be based

166. The search for efficiency is more demanding than the search for effectiveness. A public policy that achieves its objectives is effective but it is not efficient (at least, in relation to alternatives) if it mobilizes too many resources for this purpose (in relation to alternatives).

167. Even if the practical modalities of implementation of the eco-scheme are not precisely known at the time of writing, this new mechanism can be seen as an extension of AECMs. In both cases, it is a mandatory scheme at the MS level but optional for the farmer who can decide whether or not to subscribe to it. In both cases, they are implemented on a contractual basis. There are at least three differences: i) AECM contracts are multi-year contracts whereas those of the eco-scheme are annual (although it is theoretically possible to make them multiannual, which would then cancel out this first difference); ii) AECM contracts are co-financed by the EU and the countries/regions whereas those of the eco-scheme are totally financed by the European budget; and iii) the financing of the eco-scheme contracts is ensured by reducing direct aid under the first pillar and reallocating the corresponding budgetary resources. For more details on this comparison, see the Conclusion or Guyomard *et al.* (2020).

on the environmental benefits generated. The post-2020 CAP eco-scheme mechanism offers the possibility of compensation that goes beyond additional costs or loss of profit without it being currently possible to know whether some MS will take advantage of this opportunity and set (at least in part) the additional remuneration on the environmental benefits generated.

Where to place the reference sharing the applications of the Polluter Pays and Provider Gets Principles?

Economic theory alone cannot define the benchmark below which the PPP would apply and above which the PGP would be the rule. A modest threshold will benefit the farmer at the expense of the environment unless one imagines very high AECM or eco-scheme aids; in the latter case, the taxpayer will come out worse off. On the contrary, an ambitious threshold will penalize the farmer to the benefit of the environment or the taxpayer. In this context where economic theory does not greatly assist, our practical recommendation is to set the sharing reference between the PPP and the PSB of at least at the level of the cumulated requirements of cross-compliance and the greening of the current CAP and better still at a higher level in the framework of the necessary acceleration of the AET of European agriculture. The EU policy-making process does define how the CAP is to be implemented after 2028, 2035, etc. The signal to farmers must nevertheless be clear: the threshold defining the applications of the PPP (below the threshold) and PGP (above the threshold) must increase over time.

This first recommendation will benefit from a concomitant evolution of the AECM scheme both in terms of correcting its current weaknesses and in terms of changing its foundation from an obligation of means to an obligation of results.

Addressing the AECM's weaknesses as they are currently implemented

The weaknesses of the AECMs are known. As a tool introduced in 1992, these measures are flexible and target a wide variety of environmental objectives (see the introduction to Part II). The downside is that they are difficult to develop, administer, monitor, and evaluate in terms of both effectiveness and efficiency. Where they are chosen by farmers, they usually achieve local environmental benefits that are nevertheless insufficient for any significant improvement at the territorial, regional, national, and European levels. This point calls for cross-compliance that is not simply a facade as it concerns all agricultural land. Although poorly informed and measured, the public and private costs of administering and managing the measures are in most cases high. The more ambitious the measure, the higher the public costs (Barreiro-Hurlé *et al.*, 2010). Nevertheless, unit public costs tend to decrease with the number of participants and over time through a learning process (Falconer *et al.*, 2001); two points in favour of their implementation on a collective basis[168] and over a long period. Private management costs are far from negligible, discouraging the adoption of the most ambitious environmental protection measures (Espinosa-Goded *et al.*, 2013).

168. For example, within the framework of a contractualization between the national or regional managing authority of measures and collectives bringing together all of the actors present in a territory and by delegating to these collectives the responsibility for the involvement of its members.

The environmental effectiveness of the AECMs would benefit from greater continuity in time and space. On this second point, Dupraz *et al.* (2009) show that the geographic dispersion of environmental efforts makes them ineffective when there are threshold effects.[169] Increasing payments in the most sensitive areas within the framework of the simplified approach of a base proportionate to the environmental benefits generated is a first response (Desjeux *et al.*, 2015). Solutions that are more elaborate deserve to be investigated within the framework of collective contracts or schemes granting subscribing producers an additional premium as soon as territorial continuity is ensured (such as the granting of an agglomeration bonus). Finally, numerous studies suggest that windfall effects are not uncommon especially when the AECMs target the reduction of potentially polluting chemical inputs (Chabet-Ferret and Subervie, 2013). A windfall effect refers to the situation of an agricultural producer who would have eliminated the prohibited practice and/or adopted the recommended practice even without the AECM aid. However, such a situation can only be described as a windfall if it is viewed from the perspective of compensation for additional costs or lost profits, and not as compensation for environmental benefits. This observation raises the question of the shift from measures based on an obligation of means (which is largely the current situation) to measures based on an obligation of results (impacts on the environment).

From an obligation of means to an obligation of results

The AECM move towards results-based measures aims to condition and proportion payments in line with the environmental benefits generated as part of a stricter application of the PGP, which should make support more legitimate in the eyes of taxpayers and citizens.[170] Farmers will be remunerated because they provide ESs and thus generate environmental benefits, not because they remove, maintain, and/or introduce practices for expected but not explicitly measured environmental benefits. Moving to results-based AECMs would also reduce information asymmetries between public authorities and agricultural producers, thereby increasing the effectiveness and efficiency of the scheme. It would offer greater freedom and responsibility to agricultural producers leaving them the choice of agricultural techniques, practices, and investments to be mobilized to achieve environmental objectives at a lower private cost. The factual assessment of the experiences and experiments relating to results-based AECMs is positive. However, there are also drawbacks (Bureau, 2018).

Pure results-based AECMs based solely on outcome indicators are more than rare; for example, there were only five in 2014 (Allen *et al.*, 2014). More frequently used are hybrid measures, which also include prohibitions or obligations in terms of agricultural practices. The main difficulty in implementing results-based AECMs relates to the definition and calculation of outcome indicators that are relevant, reliable, non-manipulable, straightforward to inform, easy to manage, and immediately understandable. From this perspective, the problem of

169. In the case for example where the environmental benefit is tangible only if a minimum area is committed, or if this benefit increases more than proportionally with the area committed.

170. The European Commission's very strict reading of the World Trade Organization (WTO) rules, according to which payments should be limited to extra costs or the loss of profit, is not a credible obstacle to moving towards results-based AECMs and to remunerating farmers on the basis of the environmental benefits generated (Bureau, 2017).

exogenous factors that can positively or negatively influence the results without this influence being attributable to the measures will be stressed.[171] The solution to this problem will involve the use of modelling linking measures and impacts and of an independent expertise whose aim will be to evaluate the respective influences of the measures *versus* exogenous factors. This will have the direct consequence of increasing the costs of managing the measures.

The limitations mentioned above are partly linked to the fact that the results-based AECM's experience and experiments mainly concern a highly complex environmental dimension; that of biodiversity (see Chapter 7). Other dimensions, in particular those relating to the reduction of chemical inputs, carbon storage, and even soil quality[172] are probably easier to manage by means of results-based measures. However, this is most likely not the case if the objective covers a set of environmental dimensions. The multiplication of results-based initiatives on a wide range of environmental targets considered simultaneously should make it possible as part of a learning process to optimize the design of measures, both in terms of participation by agricultural producers and maximizing environmental benefits. Beyond effectiveness, efficiency will be increased by implementing the measures through incentive mechanisms based on, for example, agri-environmental auctions.[173] Spatial and temporal continuity will be ensured by including these two aspects in the specifications to be respected.

On a practical level, we will endorse the final recommendation of Bureau (2018) who suggests complementing the current practices-based AECMs by result indicators. These would initially be optional in order to ensure their relevance and allow for the learning process. They would gradually become mandatory as the obligations of means are phased out.

From results-based AECMs to payments for environmental services

Results-based AECMs will facilitate the development of Payments for Environmental Services (PESs) paid for by the user, whether an intermediary or an end user, as a complement to measures paid for by the taxpayer. In one sense, a PES is a private transaction between users of environmental services who voluntarily agree to pay the providers of these services (Wunder, 2005). In a broader sense, the payer can be a public authority on behalf of its citizens, a situation that is particularly well suited to public goods because they are usually provided in a sub-optimal way without public intervention (Wunder, 2015). AECMs, and even more so when they are results-based can thus be assimilated with a particular type of PES paid exclusively by the taxpayer (Duval *et al.*, 2016).[174]

171. For example, the use of fungicides to control or eliminate fungal pests in crops will be lower (all other things being equal) if it does not rain, simply because there will be less fungal development.
172. On this point, see the Swiss experiment on soil organic matter content (Johannes *et al.*, 2017).
173. In general, agri-environmental auctions consist of aligning the various projects of agricultural producers who commit themselves, in return for remuneration, to provide ESs (such as those defined in Table 8.1). The auction is won by the highest bidder; that is, the one who undertakes to provide the services concerned at the lowest cost to the buyer, in this case the measure managing authority. For more detail on this point, see for example Charlier (2016).
174. An AECM is a degraded PES to the extent that the payments offered are not commensurate with the environmental benefits generated. This degradation would disappear as part of their evolution towards results-based AECMs especially since the scale of remuneration will take into account the magnitude of the environmental benefits.

The financing of a PES can therefore be provided by a public authority in the context of a private-public transaction, a private economic actor in the context of a private-private transaction, and/or a public authority and a private actor in the context of a private-public and private transaction. The possibility of resorting to private funding, in part or in full, largely explains the recent enthusiasm for the concept at the level of both world and European agriculture. Such a solution would make it possible to supplement the financing required by European agriculture's AET at a time when public budgets allocated to agriculture and the environment are constrained. Whatever the methods of financing the PES, their concrete implementation raises questions that have already been discussed in the context of correcting the weaknesses of the AECM scheme and their evolution towards results-based AECMs. This implementation requires: first, the identification and measuring of environmental services; second, defining remuneration scales based on the environmental benefits generated taking into account both the willingness of farmers to commit to and the willingness of public authorities and private users to pay; and last, implementing spatial and temporal coherence of the entire system.

The development of PES financed from public resources other than those of the CAP[175] and by private actors[176] must not be a pretext for reducing the agri-environmental budget of the CAP, more specifically the AECM budget (and in the future CAP, the eco-scheme budget). PESs implemented and financed under the CAP will benefit from distinguishing between global agri-environmental public goods, which require EU-wide public funding, and local public goods to be co-financed by national, regional and/or local funds.

Beyond measures targeted at agricultural practices: labour and capital factors[177]

AET is a profound and often radical change in current production systems. It requires organizational changes at the farm level with the acquisition of new skills and more complex, often longer, and sometimes more arduous work (Guyomard *et al.*, 2013; Midler *et al.*, 2019).[178] These different dimensions of the labour factor, which need to be better specified and evaluated, will be legitimately supported within the framework of the CAP because they are similar to public goods and are not (or only imperfectly) provided by the sellers of chemical inputs from which agro-ecology is seeking to free itself. Because training and advice must be adapted to local specificities, support will be provided under the second pillar with high co-financing from MS and regions.

175. For example, a local public drinking water production company will offer payments to farmers to reduce the concentrations of pollutants in water catchment areas. The local public company will benefit from this proposal by avoiding high water treatment costs.

176. In the context for example of an insurance company seeking to reduce flood risks and the cost of compensation in the event of a disaster; or of a company seeking to increase the service of carbon storage in soils or in agro-ecological infrastructures as part of carbon compensation, Corporate Social Responsibility (CSR), or simply for its public image.

177. Recommendations for research and innovations to be developed, tested and disseminated are set out in Chapter 12.

178. Conversely, the work also includes several positive characteristics: more interesting, better accepted and recognized by neighbours and society in general, etc.

The AET also often requires investment in physical assets, which are likely to be more so in livestock holdings (buildings and related equipment; see Chapter 10) than in annual and permanent crop holdings. However, even in the latter, the need for agro-ecological investment is significant.[179] Beyond practices and labour, the AET therefore requires consideration of the capital factor. Public support for investment granted under the second pillar CAP will benefit from being reserved for modernization investment, which will also make it possible to improve the environment by conditioning and proportioning the aid to the environmental benefits generated (application of the PGP). Bell *et al.* (2018) have developed a methodology that makes it possible to qualify the environmental impacts of investments by linking them to underlying agro-ecological practices. This methodology can be used not only to better target CAP aid, but also to mobilize green finance for AET. On the first point, beyond basing CAP investment aid on environmental benefits, linking it to AECMs will increase the joint environmental effectiveness of the two tools particularly as soon as the objective becomes part of the redesign of systems. These two tools are currently being developed in a disjointed manner whereas changes in practices and investments are often linked and complementary. On the second point, the financing of agricultural investment is mainly provided by means of bank loans and farmers' personal resources, with little recourse to the financial markets. A new type of instrument called green bonds is rapidly developing on the financial markets.[180] Agriculture, both global and European, remains largely excluded today. Just as the PES is mobilizing private resources, green bonds are a tool for easing the budgetary constraints to which the CAP is subject.

Conclusion

The environmental toolbox of the 2025-2020 CAP combines the features of both the carrot and the stick. The stick (cross-compliance and the greening) is interesting because it covers an extremely large proportion of agricultural land, whereas the area on which the carrot can have an effect is smaller because AECMs are freely subscribed to only by those farmers who wish to do so. This system, as it is currently implemented, will not be sufficient to ensure the AET of European agriculture and the changes in practices and systems that it requires. To a large extent, this is linked to the fact that the measures mainly target efficiency (that of inputs purchased externally) and substitution (of these same inputs by less environmentally damaging alternatives), and only very marginally the redesign of farming systems (with the exception of system AECMs). This shortcoming of the environmental toolbox is also linked to the fact that the stick (which is not large) and the carrot (which is also not large) are based on an obligation of means; that is, farming practices that are prohibited, regulated, maintained, or imposed, from which positive effects on the environment are expected but without these being explicitly evaluated and explicitly linked to the practices implemented.

179. As shown for example by Bell *et al.* (2018) in the case of cereal and oilseed field crop farms in the *Grand Est* region of France.

180. The recently created (2007) global green bond market is booming: issuance has increased from $3 billion in 2012 to $81 billion in 2016; it was expected to exceed $100 billion in 2017 (Berrou, 2017). Green bonds are now the leading asset on the Socially Responsible Investment (SRI) market.

We have formulated a coherent set of proposals aimed at increasing the effectiveness and efficiency of the environmental package as a whole. A key element of this coherence is the shift from an obligation of means to an obligation of results. We do not underestimate the difficulty of this evolution, particularly in terms of establishing causal patterns between farmers' actions and their environmental impacts while taking into account the specificities of the environment and other external factors (relative prices of products and inputs, public policies other than the CAP, etc.) that influence these impacts. This difficulty should not be used as a pretext for making no progress towards a more results-based agri-environmental policy, a development that also offers the possibility of easing the CAP's budgetary constraint through the development of PES and green bonds financed by the private sector.

More generally, the AET of European agriculture and the redesign of agri-food systems that it implies lead to a questioning of the coherence of the entire CAP system beyond the measures targeted at this necessary point of evolution. Because direct income support still accounts for the largest share of the CAP budget support (see Chapter 1), there will only be a real AET if the conditions under which the whole CAP aid is granted also encourage AET and the redesign of farming systems, under both the carrot and the stick. Adding value to agricultural and agri-food products from agro-ecological systems also requires attention to their outlets and changes in diets and the role of public authorities in this area (see Chapter 9).

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9. The CAP and Nutritional Issues

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The 1996 World Food Summit defined food security as a situation in which "[...] all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life".[181] This definition therefore includes four dimensions: the physical availability of food; access to food; the utilization of food; plus the corresponding temporal stability of these three dimensions. The original CAP, through the fifth objective of Article 39 of the Treaty of Rome (1957), clearly favoured the first dimension by seeking to guarantee the overall security of supply. From this point of view, it has been an undeniable success. Nevertheless, some categories of the European population have not benefited from this positive development (Box 9.1). Rather, above all else, today's issues of overnutrition, the increase in overweight and obesity rates[182] plus their corresponding negative effects on health are the subject of wide-ranging debate in the European Union (EU), raising questions about the potential role of the CAP and more generally, the evolution of agricultural and agri-food systems which this policy largely determines.

Indeed, in 2016, 59% of European adults were overweight or obese and 23% were obese.[183] Being overweight or obese are not diseases in themselves; instead, it is the link between being overweight or obese and the occurrence of serious pathologies (such as diabetes, hypertension, cardiovascular diseases, or certain cancers) that remain a widespread public health problem. This is all the more alarming given that the proportions of overweight or obese adults and children have risen sharply in almost all EU Member States (MS) over the last two decades. These rates are expected to continue to increase in the future if the eating habits of Europeans do not undergo a radical change. In addition to the negative effects of being overweight or obese on an individual's health, unbalanced diets *per se* are also responsible for a number of chronic diseases (cardiovascular diseases, some cancers, etc.). This problem is not specific to the EU. It concerns the large majority of developed countries worldwide as well as many developing countries in the context of the "double nutritional burden", which groups undernutrition and overnutrition within the same country or household (Batal *et al.*, 2018).

181. http://www.fao.org/3/y4671e/y4671e06.htm.

182. Overweight corresponds to a Body Mass Index (BMI) between 25 and 30, and obesity to a BMI greater than or equal to 30, the BMI indicator being calculated by relating weight expressed in kilograms to height squared measured in metres.

183. https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/obesity_en.

Within this context, this chapter analyses to what the extent the CAP should (or should not) incorporate specific objectives and instruments to combat overnutrition, overweight and obesity rates, and unbalanced diets. This issue has not yet been the subject of an explicit ambition on the CAP agenda, nor is it in the June 2021 CAP agreement for the period 2023-2027. More specifically, the importance of these issues raises a significant question regarding the possible responsibility of the CAP, both past and present, in the increase in overnutrition plus overweight and obesity rates. This analysis and the presentation of the public policy measures used to counter this epidemic lead us to critically scrutinize the possible role of the post-2020 CAP in this field.

Box 9.1. Undernutrition in the European Union.

Undernutrition is very low at the macroeconomic level in the EU as a whole and in individual MS with the rate of undernourished individuals being below 2.5% since at least the early 2000s (FAO, 2017, Table 1, p.6). In 2014-2016, the rate of food-insecure people was 1.7 percent, a modest percentage that should not overlook the fact that it represents almost 7.5 million adults over 15 years of age (FAO, 2017, Figure 1, p.7). The choice of indicator used to measure the rates of undernutrition can lead to higher or lower figures. Thus, according to the INCA2[184] survey, more than 12% of the French population was food insecure[185] in 2005-2007. However, if we limit the scope of analysis to those who report not having enough to eat "often" or "sometimes", the rate is only 0.9%, which represents 600,000 people.[186] Those in the French population experiencing food insecurity are, on average, younger, and more often women or single parents with children. The energy intakes of their diets are not significantly lower than those of other population categories; however, the nutritional quality of their diet is lower with notably less fish, fruit, and vegetables. Expenditure on food is also more modest (Bocquier *et al*., 2015). This food insecurity is a health risk factor for both adults and children and includes a higher associated prevalence of chronic diseases.

Unlike the United States (US) where the food stamps' programme of the US Farm Bill provides food assistance to the poorest families and individuals[187], measures to ensure access to food for the poorest families and individuals in the EU are essentially a matter of national social policies, rather than agricultural policy measures in the strictest sense. Nevertheless, these social policies have been modestly supported by the CAP. Established in 1987, the European programme for the Most Deprived Persons (MDPs) has allowed charities to benefit from the public intervention stocks. The successive reforms of the CAP, and the resulting reduction in intervention stocks (see Chapter 1) has led the EU to authorize supplementing these stocks through market purchases. This

184. https://www.anses.fr/en/content/inca-studies.
185. Here defined as the number of individuals who report not having enough to eat "often" or "sometimes", and/or those who, for financial reasons, are not able to eat all of the food they want or need.
186. http://www.observationsociete.fr/revenus/pauvrete/quelle-insecurite-alimentaire-aujourd-hui-en-france.html.
187. The first food stamp program in the US was implemented in 1939. The number of its beneficiaries at March 2019 was just over 40 million, or just under one-in-six Americans. For more details, see: https://fns-prod.azureedge.net/sites/default/files/pd/SNAPsummary.pdf.

was adopted in 2013 but not without difficulty: some MS (in a blocking minority) had for a long time prevented any development considering that the programme for MDPs was above all else a social programme and was therefore primarily a matter for national decision-makers. The Fund for European Aid to the Most Deprived (FEAD) succeeded the MDP programme in 2014. With a budget of EUR3.4 billion for the period 2014-2020, it aims to provide non-financial assistance to the most deprived through food aid and/or basic material assistance (European Union, 2014). The FEAD helps 15 million people annually at the European level. Its future was nevertheless threatened, in the dual context of the difficulty of defining the EU budget for the post-2020 period and due to the possible merger of the FEAD with the European Social Fund, which would cause it to lose its autonomy and reduce its opportunities t o pilot change.[188] The EU would take pride in maintaining the FEAD with an increased and dedicated budget.

188. https://www.secourspopulaire.fr/laide-alimentaire-europeenne-en-peril.

Overnutrition in the European Union: The situation today

The effects of an unbalanced diet on the prevalence of a number of chronic diseases (long-term health conditions) are well established. The excessive consumption of fatty, sweet, salty, and meat products, plus the inadequate consumption of fibre, fruit, and vegetables, have resulted in an increased risk of chronic diseases. An excess of total calorie intake leads to the state of being overweight, the acute form of which is obesity. Being overweight and/or obese increases the risk of type 2 diabetes, high blood pressure, cardiovascular, respiratory, and joint diseases, plus some cancers. A recent study by the International Agency for Research on Cancer (IARC, 2018) shows that the four main risk factors for cancer in France are tobacco use (20% of cases), alcohol use (8%), an unbalanced diet (5.4%), and being overweight and/or obese (5.4%).

In 2016, more than half of Europeans over the age of 18 were overweight (36%) or obese (23%). In comparison, the proportion of underweight adults was only 2.3% at the same time (Eurostat, 2016). Therefore, nearly 17% of Europeans were obese in 2014, with wide variations between MS from around 10% in Romania and Italy to over 20% in the United Kingdom (UK), Estonia, Hungary, Latvia, and Malta. In addition to these geographical inequalities, social inequalities are also at play: the higher the standard of living and/or education, the lower the obesity rate. The percentage of Europeans who are obese or overweight, which has been on the rise for several decades, is likely to continue to grow and reach even more alarming levels in a large number of MS as soon as 2030. By that time, virtually the entire Irish population would be classed as overweight or obese (89% of men and 85% of women), and half would be obese (48% of men and 57% of women). An increase in the number of individuals who are overweight or obese would also be high in Greece, Spain, Sweden, Austria, and the Czech Republic with for example a doubling of the number of obese people in Greece. Nevertheless, a few MS are expected to see stagnation or even a slight decrease

in the percentage of overweight or obese people: in the Netherlands, 49% and 8% of men would be overweight or obese, respectively, in 2030, compared to 54% and 10% in 2010 (Breda *et al.*, 2015).

The social cost of overweight and obesity rates and its negative consequences is extremely high. According to the French *Direction du Trésor* (the Treasury Department), the annual cost in France was EUR20.4 billion in 2016, behind tobacco (EUR26.6 billion) but ahead of alcohol (EUR15.0 billion). This cost consists of an external cost of EUR9.1 billion including EUR7.1 billion for production losses alone, and a net cost to public finances of EUR9.5 billion corresponding to the balance between the additional cost for health insurance (EUR16.9 billion) and lower pension expenditure due to premature death. The annual social cost per individual would be EUR 360 for overweight individuals and EUR 1,300 for obese individuals (*Direction du Trésor*, 2016).

Do agricultural policies have a share of responsibility?

Two main mechanisms explain the dynamics of food consumption that have promoted the increase in rates of overweight and obesity, and unbalanced diets. The first mechanism relates to technical change and productivity gains in the agricultural and agri-food chains observed over a long period. These factors have made it possible to lower the price of food relative to that of other goods, thus giving access to large quantities of calories at low cost. Conversely, an increase in sedentary lifestyles and a decrease in physical activity have made energy expenditure more costly (Lakdawalla and Philipson, 2009). The second mechanism is a change in the relative price structure of different foods. This change would also have been harmful with regard to nutritional issues by decreasing the relative price of energy-dense foods and increasing that of low-energy-dense foods such as fruit and vegetables. Several studies show that a more balanced diet is frequently more expensive as the energy cost of a food or food group is negatively correlated to its nutritional value (in the French case, see Maillot *et al.*, 2007).[189] At the conjunction of the two mechanisms, innovations implemented by the agri-food industries have made it possible to develop processed and/or ready-to-eat foods, thus reducing the domestic preparation time of meals (Cutler *et al.*, 2003).

We now examine the extent to which agricultural policies over the years may have favoured these two mechanisms. This issue has been the subject of several studies in the US (Alston *et al.*, 2008; Beghin and Jensen 2008; Rickard *et al.*, 2013), however, there has been less emphasis on the EU situation (in the case of sugar, Bonnet and Réquillart, 2013a, 2013b).

Agricultural policies and total food costs

Economic research conducted in the US concludes that the impact of the US agricultural policy on the average price of food in that country is limited, if not extremely limited. The explanation lies in the small share (which decreases over time) of the cost of agricultural

189. The unfavourable dynamics of food consumption can also be linked to the increase in the share of processed foods in the diet, which is made possible by technological innovations in the processing and distribution industries.

raw materials in the price of the final food product; a share that is even more limited the more the final good is processed. Even if there is no similar academic work applied to the EU or its MS, the factual data are consistent (see Chapter 5). Thus, in France, the work of the *Observatoire de la Formation des Prix et des Marges des Produits Alimentaires* (Observatory of Food Prices and Margins) on the breakdown of the euro food currency shows that out of EUR100 of food expenditure excluding restaurants, agricultural products accounted for only EUR17.5 in 2014. This share has decreased over time, as the figure in 1999 was EUR21.3.[190]

Even if the analysis deserves to be extended, it is tempting to conclude that if the CAP has been able to contribute to the reduction in the average cost of calories it is more through the transmission of productivity gains generated in agriculture to actors downstream of farms than through agricultural policy *per se*. In a context of industrialization and mass food production, technological and structural innovations in processing and distribution[191] have also made it possible to lower the average cost of calories. Nevertheless, the CAP, especially that of the first period of price support (see Chapter 1), has been able to contribute to increasing the productivity gains in agriculture and developing the domestic supply of agricultural products. However, the CAP's responsibility in these two evolutions is difficult to quantify with precision due to the lack of a robust basis for comparing what the state of EU agriculture might have been without the CAP or under the influence of a different CAP (the so-called counterfactual scenario problem).

In any case, this first mechanism, combining productivity gains and lower food prices, is difficult to dispute. It has benefited final consumers since the reduction in household food expenditure has allowed them to devote a higher proportion of their budget to other expenses. The increase in the share of processed and ready-to-eat products has accompanied changes in lifestyles brought about by urbanization and labour market developments (the development of employment for women in particular).

Agricultural policies and changes in the relative prices of different foodstuffs

The impact of the CAP on the second mechanism linked to the structure of relative prices of the different food products is equally difficult to assess, let alone quantify.

The successive reforms of the CAP in operation since 1992 have essentially led to a reduction in the EU producer prices of cereals, sugar, dairy products, and to a lesser extent beef and veal relative to the prices of other agricultural products, in particular that of fruit and vegetables, which have never (or only to a very limited extent) benefited from internal price support. These developments are not *a priori* favourable to nutritional recommendations, provided they have been or are reflected in the final consumer prices of the various goods.

Moreover, the agricultural products that have benefited the most from the CAP support, both yesterday (*via* guaranteed prices) and today (*via* direct aids), are also those that have

190. https://observatoire-prixmarges.franceagrimer.fr.
191. This is in particular within the context of the development of supermarkets and hypermarkets, which has been encouraged by the public authorities in the various MS.

benefited from the most advanced industrialization processes. In this sense, the CAP would have accompanied the most industrialized agri-food sectors contributing through this channel to a greater fall in the prices of their products relative to those sectors in which industrial processing is less important, particularly for fruit and vegetables. Finally, even if the share of agricultural product prices in the prices of final products is low (and may be decreasing over time), the trade-offs made by agri-food processors between the different types of ingredients of agricultural origin used in the recipes of processed food products are based primarily on their relative costs, which may be influenced by agricultural policy measures.[192] These trade-offs may favour the use of ingredients of lesser nutritional value. Furthermore, the CAP support for products that are generally only lightly processed has mainly concentrated on the ruminant livestock sector. It is now known that the excessive consumption of red meat has deleterious effects on health (see Chapter 10).

Support from the second pillar of the CAP for quality products and channels, Organic Farming (OF), and short local chains can play a positive role in the nutritional quality of the food supply.[193] OF and other official Signs Identifying Quality and Origin (SIQO)[194] can improve the nutritional quality of products through the requirements they impose and/or the practices they induce (through the absence of mineral fertilizers, synthetic pesticides and antibiotics, higher use of grass for grazing, etc.) even if they are not always mandatory. Short local chains promote access to fresh products and contribute to changing food practices (Chiffoleau *et al.*, 2017). Nevertheless, these certifications and alternative production and distribution methods do not generally include a specific commitment to nutrition. In addition, these systems are often poorly funded.

The CAP also includes some targeted provisions to encourage the development of nutritionally healthier diets in particular through the school fruit, vegetables and milk scheme (which is also used to promote activities on "healthy diets" in the classroom),[195] and information and promotional measures (which are not limited to nutritionally superior products).

Public policy instruments to combat overweight and obesity rates

Public policies to combat overweight and obesity rates and unbalanced diets can be described by a four-cell matrix that distinguishes measures aimed at informing consumers *versus* influencing their dietary environment and actions targeted at the general population *versus* population categories at risk (Table 9.1).

192. The best example of this causality is in the US, in the use of isoglucose (a caloric sweetener produced from corn), which is used in the majority of processed food products in preference to sugar as a result of US sugar policy keeping domestic sugar prices high.
193. In the specific case of OF, see in particular the European Parliament Report of 2016 on "Human health implications of organic food and organic agriculture" (European Parliament, 2016).
194. According to the French acronym SIQO, for *Signes d'Identification de la Qualité et de l'Origine*. Indications comprise Protected Designation of Origin (PDO), Protected Geographical Indication (PGI), Geographical Indication (GI), Traditional Speciality Guaranteed (TSP), etc.
195. https://eur-lex.europa.eu/legal-content/FR/TXT/PDF/?uri=CELEX:32016R0791&from=EN.

Table 9.1. Classification of nutrition policies and illustrations.

	Total population	Risk categories
Consumer information	- Information campaigns - Nutrition labelling of products	- Targeted interventions in favour of disadvantaged populations
Food environment	- Tax measures - Quality of the food supply - Advertising regulations	- Targeted subsidies on products for disadvantaged populations (e.g., vouchers for fruit and vegetables)

Source: Authors' elaboration.

Information campaigns aimed at the entire population have long been favoured. While they promote changes in line with nutritional recommendations, their impact is limited (Capacci and Mazzocchi, 2011). The labelling of food products with nutritional information is more recent. The impact of this measure is also positive though limited in scope but with a greater response from specific categories, such as educated people or those with allergies. A full analysis of this impact requires taking into account the adaptations of the food supply; that is, the reactions of production and processing companies and retailing firms to the price and quality of supplied products. Moorman *et al.* (2012) show that in the US, processing companies have reacted to mandatory nutrition labelling by degrading the nutritional quality of their products. This reaction is primarily in response to a concern about cost reduction but also to the fact that some consumers negatively associate nutritional quality with organoleptic quality. Nevertheless, labelling policies that are simple to interpret, helping consumers to compare the respective nutritional qualities of products, and encouraging manufacturers to reformulate products are a step in the right direction.

Nutritional taxes are mainly applied to combat the excessive consumption of sweetened beverages. The relative change in consumption induced by the tax would be between 0.5 and 1 times the relative change in price (Colchero *et al.*, 2016; Silver *et al.*, 2017). As with labelling, a full analysis of the impact of taxes also requires consideration of the supply response because taxes may induce changes in product characteristics, including untaxed goods. The tax design can affect supply through two main channels. First, the agents in the food chains can more or less pass the additional cost of tax to consumers in the final price of products. From this perspective, an excise tax on quantities (levy of x euros per hectolitre of alcohol, sweet drinks, etc.) is to be preferred to *ad valorem* taxes (expressed as a percentage of the value of the good) because the former are more strongly passed on in the final consumer prices (Bonnet and Réquillart, 2013a, 2013b). Second, the modalities of taxation should be designed to provide incentives for firms to reduce harmful nutrient levels. They must therefore be defined in relation to these levels. Finally, the full analysis of the impact of the taxes must take into account the use of tax revenues generated and the substitution effects (the replacement of taxed products by untaxed other product categories).

More recently, policies to regulate the quality of food supply have been introduced in several MS. These policies are more or less restrictive ranging from bans on the use of certain ingre-

dients to voluntary approaches by companies and joint initiatives involving private firms and public authorities in public-private partnerships. They are mostly aimed at reducing levels of harmful nutrients (salt, sugar, trans fatty acids, saturated fatty acids) or increasing levels of desirable micronutrients or fibre. Modelling the impacts of food supply regulations suggests that these may be theoretically significant (Leroy *et al.*, 2016). They are less important in practice and several factors may explain this discrepancy between theory and practice: first, technological constraints limit the possibilities of reformulating products without excessive price increases; second, the development of new products allows companies to avoid the constraints, at least in part; and third, consumers' sensory preferences lead them to shift their consumption to other unregulated goods. The work of Griffith *et al.* (2017) on the regulation of salt levels in UK food products illustrates this point. Over the 2006-2011 period, the reformulation of existing products would theoretically have made it possible to reduce the salt content of the UK's food basket by 7.2%. However, this favourable effect was partially offset by the development of new products (+0.7%) and the shift of consumption to other goods (+1.2%), so that the reduction observed was ultimately only 5.3%.

Overall, the limited impacts of nutritional policies as they are applied today should be noted. This result is undoubtedly linked to the fact that the measures are not sufficiently restrictive (regulations, taxes) or do not provide sufficient information. It can also be explained by the reactions of demand (for example, rigidity, switching to other foods/brands, higher cross-price elasticities within a food category than between food categories, etc.) and supply (rigidity, development of new products to side step the constraints, etc.). Also worthy of note are the complementarity of measures applicable to the whole population (with modest effects but aimed at all) and measures targeted at categories at risk (proportionally greater effects but on smaller numbers). Finally, it should be noted that overnutrition and its harmful effects are essentially, if not exclusively, addressed through demand-driven nutritional policies. This follows a major lesson from public economics that recommends that the sources of distortions be addressed, which in this case is the consumption that does not comply with nutritional recommendations.[196] Their relative inefficiency is, as we have seen, partly due to the responsiveness of the nutritional supply not (or insufficiently) being taken into account. This leads us to look even further upstream; that is, at the supply of agricultural products and the possible role of a reformulated CAP with the objective of combating overnutrition, overweight rates, and unbalanced diets.

What role for the CAP?

From an efficiency perspective, the economic theory of targeting recommends that failures be addressed at source. It legitimizes demand-driven nutritional policies provided that unintended effects, particularly the responsiveness of the food supply, are properly addressed and provided that these policies take into account the difficulties consumers have in managing

196. However, supply-side policies also have a role to play, not least because consumers have little knowledge of their nutrient intakes and, as a result, find it difficult to assess and manage them.

their individual nutrient intakes. To date, nutritional policies have been essentially national in scope. This geographical scale is justified for at least two reasons: first, because there are no spatial externalities in this area; and second, it is therefore possible to take account of national heterogeneities in diets and consumer preferences for different food products. These preferences depend on the national macro-economic context (income levels and distribution by socio-professional category) but also on history, culture, traditions, etc. The rationale for maintaining nutritional policies at the MS level is reinforced by the fact that the costs related to the adverse health effects of overnutrition are borne and/or supported at the national level (production losses, health insurance and disability pension expenditures, etc.). The importance of these costs calls for a significant strengthening of the nutritional policies currently implemented.

The arguments developed above do not suggest that there is no role for the CAP. The universal nature of nutritional recommendations means that they would benefit from being defined at the EU level, if not at a global level. These recommendations would then be adjusted at the country or regional levels taking into account the composition of diets and consumer preferences at these levels. This recognition at the EU level could be implemented in the CAP if it cannot be in a common health policy. However, it should be remembered that the various EU policies are poorly funded with the exception of the CAP, the Cohesion Policy and, to a lesser extent, the Research and Innovation Policy.

These nutritional recommendations at the EU level, adapted to the specificities of each country, would be accompanied by much more ambitious measures than the present measures for the consumption and production of fruit and vegetables. In all European countries, for a large proportion of the population, this consumption is lower than the recommended "five fruit and vegetables a day". However, it has been established that increasing fruit and vegetable consumption has significant positive effects on health, both directly through an increased intake of vitamins and fibre and indirectly through an adjustment of the contents of diets that are lower in calories and less rich in fat, sugar, and/or meat products (Irz *et al.*, 2015). An additional argument lies in the convergence of health and environmental issues. Diets that are richer in fruit and vegetables also contribute to reducing diet-related greenhouse gas (GHG) emissions (Irz *et al.*, 2016), for example.

Encouraging an increase in the consumption of fruit and vegetables and accompanying a gradual shift towards diets that are less meat-focused and richer in plant-based products are therefore beneficial from both a health and an environmental point of view, and, in this respect, could be a key element of the future CAP. Support would be more effective if consumption measures targeted at the poorest households that consume proportionally less fruit and vegetables are implemented in a form that maximizes the likelihood that any aid granted would indeed be spent on the purchase of fruit and vegetables. At the same time, direct aid to European fruit and vegetable producers could be implemented in such a way as to limit the concern that incentives for fruit and vegetable consumption may excessively benefit foreign producers. Direct aid to EU fruit and vegetable producers will be more straightforward to legitimize, both internationally and domestically, if accompanied by

strong conditionalities in terms of agricultural practices, particularly in the use of chemical inputs that cause negative externalities on health and the environment (see the introduction to Part II and Chapter 8). From a longer-term perspective, encouraging the consumption and production of fruit and vegetables would also have the effect of positively redirecting technical progress, in line with the theory of induced technical progress.[197]

In defining a twofold winning strategy, it is recommended that the CAP should seek to promote the consumption and production of pulses (peas, beans, lentils, etc.) and fibres (cereals and wholemeal flours, black olives, dried fruit, dried beans, vegetables, etc.). It is also highly reasonable to encourage research and innovation aimed at facilitating the incorporation of healthy products and discouraging the incorporation of unhealthy products with processed products.

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10. The CAP, Animal Production and the Consumption of Animal Products[198]

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As in other parts of the world, animal production in the European Union (EU) and upstream and downstream activities that depend on it may be a significant cause of climatic, environmental, and health damage (Buckwell and Nadeu, 2018). Some of the damage is common to both animal and crop production. This is the case for example of water pollution, whereby the origin of the excess of nitrate in the waterways can be mineral and/or organic. Other examples are specific to the animal sector such as the enteric production of methane (CH_4) by ruminants or the use of antibiotics in animal husbandry, which increases the risk of antimicrobial resistance. Animal production is also the subject of criticism in its use of natural resources: notably, land and water use could be saved by increasing the share of plant products directly consumed by humans. Decreasing the share of animal products in food diets could also reduce the negative impacts on health of eating patterns that include excessive consumption of animal products (Marlow *et al.*, 2009; Bouvard *et al.*, 2015; Buckwell and Nadeu, 2018). An increasing additional concern is related to the welfare of farmed animals (European Parliament, 2017). For all of these reasons, a number of researchers, think tanks and non-governmental organisations recommend reducing the consumption of animal products where it can be considered excessive, and limiting the growth of this consumption at the global level by curbing the generalisation of the so-called westernisation of food diets. A reduction in the per-capita consumption of animal products would translate into a decrease in the production of animal products (provided that the individual reduction outweighs the growth in population).

198. A slightly shortened and modified version of this chapter has been published in the review Animal with the following title: "Why and how to regulate animal production and consumption: The case of the European Union" (Guyomard *et al.*, 2021).

However, animal production in the EU may also provide benefits notably from an economic point of view (around 40% of the value of EU total agricultural production is of animal origin; more than 60% of EU agricultural area is used for feeding animals). Some livestock systems, notably grassland-based systems, may also provide climate and environmental benefits by sequestering carbon, improving water quality, protecting biodiversity, and/or maintaining diversified and open landscapes (Dumont *et al.*, 2019).

There is thus legitimacy and scope for public policies aimed at reducing the damage and increasing the benefits of animal production and consumption. Both damage and benefits are often public goods that are not well taken into account by markets and private actors when they decide what they want to produce or consume, and how. This chapter offers thus the opportunity to apply the general principles of legitimate and effective public action as established in the previous chapters to the specific case of animal production and consumption in the EU by taking into account all of the issues at stake at the same time rather than issue-by-issue.

The chapter is structured as follows. After a review of the economic and social importance of livestock production in the EU, we discuss the climatic, environmental and health challenges. We then describe how animal production and consumption is currently regulated in the EU, notably within the CAP. This analysis leads us to propose a revision and extension of the CAP instruments in order to limit the adverse effects of animal production and consumption while maximising their benefits.

Services and disservices linked to animal production and consumption in the European Union

Economic and social importance of livestock production in the European Union

In 2018, the EU-28 was the world leader in milk production at 166 billion litres. At that time, it occupied the second place for pig meat (pork) production with 24 million metric tonnes of carcass equivalent (tce), and the third place for both poultry meat production (15 million tce) and beef meat production (8 million tce) (EC, 2018a; Eurostat 2019). The European net exports of animal products rose by more than threefold between 2000 and 2019 when they reached EUR33.7 billion (these trade figures do not include intra-Community trade). Exports are often based on non-price competitiveness criteria related to product safety, traceability and more generally quality. They also include relatively low value dairy products and less favoured cuts of meat that EU consumers do not wish to purchase. In a context where the European consumption of animal products is at best slightly increasing or stagnating, the economic importance of exports on world markets should be acknowledged.

In 2016, 55% of EU-28 agricultural holdings held livestock. Between 2005 and 2016, the number of farms with livestock decreased by 38% while the total number of farms declined by 29% (Eurostat, 2019; figures for the EU-27 excluding Croatia). According to the Animal Task Force, EU-28 livestock farms accounted for around four million direct jobs in 2010, mainly (more than two-thirds) in the 12 new Member States (MS) that adhered to the EU in 2004 or

2007 (Animal Task Force, 2017). These direct jobs are however on a declining trend in all MS (Hostiou *et al.*, 2020). In addition, they generate both indirect jobs (jobs in activity sectors that depend directly on livestock farming) and induced jobs (jobs created by the expenditure of households employed in direct and indirect sectors). Although complete and standardised data for all MS do not exist, several studies suggest that employment multipliers are likely to be high. For example, in France, the indirect employment multiplier of a significant livestock farm corresponding to a 1.3 full-time equivalent would be equal to 1.8, with 0.4 indirect jobs in upstream sectors, 1.0 in downstream sectors, 0.3 in food distribution sectors, and 0.1 in public and semi-public services (Lang *et al.*, 2015). The turnover of upstream and downstream industries is another illustration of the knock-on effect of livestock farming. In 2013, this figure exceeded EUR400 billion for the EU-27 (Animal Task Force, 2017).

Of course, the place of animal production in national agricultural economies and in rural territories varies greatly from one MS to another (and from one region to another in several MS). In 2016, the top five producers (in decreasing order, France, Germany, the United Kingdom, Italy and Spain) accounted for around 60% of the EU-28 supply. In 2016, the proportion of agricultural holdings with livestock varied from more than 90% in Ireland to less than 14% in Italy (Eurostat, 2019). At that time, livestock intensities - measured by the number of livestock units (LUs)[199] per hectare - varied by less than 0.2 LUs units in Bulgaria to 3.8 LUs in the Netherlands (Greenpeace, 2019). These country figures mask important intra-national disparities in both low- and high-density countries. In a context where numerous environmental pressures of livestock farming depend on animal densities, it is primarily at the regional and even intra-regional level that environmental damage should be assessed and corrected (Dumont *et al.*, 2019). However, the dependency on animal densities can be less important; for example, for Greenhouse Gas (GHG) emissions linked to livestock when they are expressed by tonne of product. Ruminant farming remains a life support in many European rural areas where economic alternatives are rare, including agricultural alternatives that would not be viable. This does not mean that livestock activities should be maintained unchanged and supported everywhere, regardless of climatic and environmental costs. In particular, animal stocking rates must be adjusted downwards in the numerous European areas where they are (too) high and cause severe ecological degradation.

Impacts on land use

Livestock activities are secondary or tertiary processors of plants and thus require more land than crops to provide the same levels of calories or proteins (de Vries and de Boer, 2010). Six kilograms (kg) of plant protein - from 2 to 10 kg depending on the species and farming systems - are needed to produce 1 kg of animal protein (Pimentel and Pimentel, 2003). Increases in the

199. Livestock Units (LUs) allow the aggregation of different herds on the basis of coefficients defined according to the feed requirements of the animals classified by species and age. The reference (coefficient equal to 1) is a dairy cow producing 3,000 kilograms of milk per year. The coefficients for other animals are derived from this, e.g., 0.7 for a heifer aged two years or more, 0.3 for a pig for slaughter once it reaches 20 kilograms, 0.1 for a sheep or 0.007 for a broiler chicken. For more details, see: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Livestock_unit_(LSU).

demand and supply of animal products therefore have a greater responsibility than crops in the agricultural land expansion required to feed the planet at the expense of natural, semi-natural (heathlands, wetlands, etc.), or forest areas. However, these statements must be qualified by both the fact that animal proteins have a higher biological value than plant proteins (FAO, 2013) and the fact that farmed animals recycle biomass and protein that cannot directly be used for human food. At the world level, 86% of protein used by livestock is not edible as human food (Mottet *et al.*, 2017). In the EU, pigs and ruminants use many plant by-products and ruminants use grasslands and marginal lands that cannot be readily cultivated or directly mobilised for human consumption. Ruminants have the unique ability to convert cellulose into milk and meat. The counterpart result is the emission of biogenic methane.

European forest areas have been increasing for several years in the EU. This does not mean that the EU has no responsibility for the world's deforestation. According to recent estimates (European Commission, 2019b), the EU would be responsible for around 10% of global deforestation through the import of several products (mainly timber, rubber, cocoa, meat, maize, soya, and palm oil). European animal production and consumption contribute to this embodied deforestation through the import of meat and most importantly of animal feed ingredients. Cereals used for feeding European livestock are largely of domestic origin. By contrast, the EU produces only around 30% of the protein-rich products it consumes (Muller and Bautze, 2017). Between 2011 and 2019, 18.8 million tonnes of soya bean meal and 13.8 million tonnes of soya beans corresponding to 13.1 million tonnes of protein were imported. This is a major issue for pig, poultry, and dairy cows that take up approximately one-third of soya protein each, but not for beef (Dronne, 2019). This dependency has induced a large number of reports and plans aimed at developing domestic protein production at the EU or MS level but without significant success to date. The EU protein deficit has slightly decreased since 2000 thanks to the development of first-generation biodiesels supported by proactive policies that have allowed an increase in the supply of domestic rapeseed cakes. However, first-generation biofuels are facing more criticism because their environmental benefits - notably in terms of reductions of GHG emissions - are increasingly questioned (Marelli *et al.*, 2015), and also because their development may conflict with food security (Mohr and Raman, 2013).

Climate and environmental impacts

According to the European Environmental Agency, the EU-28 farm sector generated in 2017 around 11% of total European GHG emissions in carbon dioxide equivalent (European Environment Agency, 2019). Farm animals produced almost 60% of this percentage through the enteric fermentation of ruminants leading to methane emissions (CH_4) and through the management of animal manure for all species leading to CH_4 and nitrous oxide (N_2O) emissions (see Chapter 7). Lesschen *et al.* (2011) estimated that dairy and beef cattle accounted for 80% of total livestock GHG emissions, ahead of pork (16%) and poultry (4%). When accounting for emissions related to the production, transport and processing of feed, the livestock sector would be responsible for around 80% of European agricultural GHG emissions, both within and outside of the EU borders (Leip *et al.*, 2015).

Biogenic CH_4 from ruminal fermentation and manure processing has a different impact on climate warming than N_2O and carbon dioxide (CO_2) that is not well captured by the conventional GWP100 metric – GWP100 for Global Warming Potential over a 100-year time horizon – (Fuglestvedt *et al.*, 2018). This is because CH_4 has a short lifespan while N_2O and CO_2 are both long-lived gases. As a result, there is no additional warming effect in the long term due to CH_4 if methane emissions remain stable. This is not the case for N_2O and CO_2 emissions. However, reducing all agricultural GHG emissions linked to livestock is a critical necessity in order to contribute to climate neutrality. This requires diminishing CH_4 emissions for a rapid effect on climate change as well as reducing N_2O and CO_2 emissions for medium/long-term effects.

Livestock can generate other environmental damage of varying intensity depending on the species and production systems. Gaseous emissions of ammonia, nitrogen oxides, and volatile organic compounds have direct negative effects on the quality of the environment by contributing to the formation of fine particles and the eutrophication of aquatic environments. In particular, livestock is responsible for about 80% of total ammonia emissions in the EU through manure management, inorganic nitrogen fertilisers, animal manure applied to soil, and urine and dung deposited by grazing animals (European Environment Agency, 2019). The specialisation of farms and the geographical concentration of animal production have progressively induced regional nutrient imbalances, notably for nitrogen and phosphorus, which are the source of the diffuse pollution of soil, water, and air. According to Leip *et al.* (2015), livestock activities are largely responsible for nutrient leakages from rivers into coastal waters, ranging from 23 to 47% for nitrogen and from 17 to 26% for phosphorus depending on the geographical areas. The specific contribution of livestock to biodiversity loss, both directly and indirectly through animal feed, is more difficult to quantify (Buckwell and Nadeu, 2018). At the world level, European livestock contributes to deforestation and its associated biodiversity decline (European Commission, 2019b). Locally, the main negative impacts are linked to the conversion of grassland areas to cropland with the associated removal of natural and semi-natural habitats favourable to wild fauna and flora, and to the intensification of grassland management practices through increased fertilization and higher stocking rates.

The magnitude of the damage caused largely depends on livestock systems and the region in which they are implemented (Dumont *et al.*, 2019). At the local level, a key parameter is the balance between stocking rates (the number of LU per area unit) and the environment's ability to produce feed and to absorb animal manure. In areas (11% of European Utilized Agricultural Area or UAA) where grassland is rare and livestock systems are intensive (with a high number of animals per area unit, high productivity per animal, and a significant use of inputs purchased from outside the zone), damage to the different environmental compartments is particularly significant. However, corresponding livestock farms are efficient in terms of fossil fuel use and GHG emissions per kilogram of the final product. This is not necessarily the case in grassland areas (33% of European UAA) and in mixed crop-livestock areas (32% of European UAA), which also generate some environmental benefits. Grassland areas maintain a high level of soil carbon content compared to arable land - which is why it is important to retain them - and have the capacity to store additional carbon (Leip *et al.*, 2015). Well-managed grasslands may provide environmental services such as carbon storage, water

purification, biodiversity protection, and the maintenance of diversified landscapes favourable to wild fauna and flora. About 50% of European endemic plant species depend on the grassland biotope and 50% of bird species depend on grassland habitats for food and reproduction (Veen *et al.*, 2009). In mixed crop-livestock areas, the balanced spatial association of crops and animals allows the biogeochemical cycles of carbon, nitrogen, and phosphorus to be more regulated, which contributes to an improvement in soil quality and to the preservation of a diversified landscape framework shaping the distribution and abundance of organisms for different trophic levels (Martin *et al.*, 2020). In each environmental setting, a threshold level of grassland intensification is required to maximise benefits. On the other hand, grassland intensification leads to an increased environmental risk (Soussana and Lemaire, 2014). In other words, biodiversity loss can result both from overgrazing and from under-grazing. Furthermore, grassland landscapes are highly appreciated by Europeans for rural recreation purposes (Millennium Ecosystem Assessment, 2005).

Impacts on health

Animal production is also increasingly questioned because of health considerations. The two main health issues are related to the impact of the use of antibiotics in livestock on antimicrobial resistance and to the adverse effects on an individual's health due to the excessive consumption of animal products, notably meat.

In the early 2000s, around 25,000 Europeans died each year from infections caused by antibiotic-resistant bacteria (World Health Organization, 2011). Part of the problem is of an agricultural origin in a context where humans and animals share the same pharmacopoeia and livestock farms are significant consumers of antibiotics. After banning the use of antibiotics as growth promoters in 2006, the EU decided in 2018 to ban their prophylactic uses in livestock farming from 2022 onwards. It also decided to reserve the most critical antibiotics for human medicine only, and to require that imports comply with European standards (European Commission, 2018b). At the start of the 2000s, antibiotic use in the EU was twice as high in veterinary medicine compared with human medicine, with half for prophylactic uses (Buckwell and Nadeu, 2018). Since that date, the agricultural use of antibiotics has decreased significantly notably in MS where this use was initially high. However, current use varies considerably among MS; according to the European Medicines Agency (EMA), from a maximum of 450 milligrams per kilogram of animal biomass in Cyprus to less than 20 milligrams in Finland and Sweden (EMA, 2018). These national gaps can be explained by the differences in the composition of animal populations, livestock systems, and Organic Farming (OF) development that prohibits the use of antibiotics. They are also explained by more (or less) rational uses of antibiotics and varying rearing intensities among these countries. Finally, it is important to note that the intensification process of livestock can increase the risks of zoonotic disease emergence and re-emergence.[200] However, the complexity of the underlying mechanisms limits the ability to predict these risks with any precision (Jones *et al.*, 2013).

200. A zoonotic disease is a disease transmissible between vertebrate animals and humans either directly through contact or indirectly through the consumption of animal product or a vector such as an insect, a spider, etc.

The average per capita consumption of animal products is high in the EU both in absolute terms (twice as high as the world average) and with respect to nutritional recommendations. In 2018, each individual European consumed 69.5 kg of meat and 256 of milk equivalent annually. According to Buckwell and Nadeu (2018), these consumption levels were much higher than recommendations for meat and only slightly higher than recommendations for milk. An excessive consumption of meat may have negative health consequences. Excessive red and processed meat intake appears to be associated with an increased risk of obesity and a higher Body Mass Index (BMI) (Rouhani *et al.*, 2014). The impact on the incidence of some cancers remains controversial (Domingo, 2019). In October 2015, the International Agency for Research on Cancer (IARC) classified the consumption of red meat as "probably carcinogenic for humans", and the consumption of processed meat as "carcinogenic for humans" (Bouvard *et al.*, 2015). Some studies have corroborated this classification (Zhang *et al.*, 2021) but others have concluded only low or very low absolute effects suggesting that the recommendation to decrease red and processed meat consumption to limit the incidence of some cancers is not fully relevant (Han *et al.*, 2019). Overall, it seems that increasing the consumption of plant proteins that would replace animal proteins may induce health benefits, at least in developed countries and thus in EU MS (Zhang *et al.*, 2021).

Even if the excessive consumption of animal products must be avoided, it is important to recall the nutritional benefits of meat products consumed in accordance with recommendations (INRA, 2019). Meat products provide proteins of high nutritional quality containing the nine essential amino acids in adequate proportions and that are easily and quickly assimilable. They are a unique source of (or are very rich in) several micronutrients (vitamins, selenium, zinc) and various bioactive components. In the same way, dairy products are important sources of nutrients (calcium, iron, magnesium) that are essential for bone development. Consuming a sufficient level of animal products is highly recommended for specific populations, notably for older people for whom meat consumption helps to limit the risks of sarcopenia[201] and iron anaemia, and for women of childbearing age in order to prevent iron deficiencies. Much research has highlighted the risks of nutritional deficiencies and the negative health outcomes of unbalanced food diets that may too severely limit or ban animal products, including meat (Key *et al.*, 2006; de Smet and Vossen, 2016).

Farm animal welfare

The welfare of farmed animals is of increasing concern for European citizens. According to the 2016 Special Eurobarometer focused on the attitudes of Europeans towards animal welfare, 94% of respondents stated that it is important to protect farm animal welfare (from 86% in Croatia, Hungary, and Poland to 99% in Portugal, Finland and Sweden) while 82% thought that farm animal welfare should be better protected than it is at present (European Commission, 2016).

201. Sarcopenia is a geriatric syndrome that begins with the decrease in muscle capacity with age and, as it worsens, will lead to a deterioration in muscle strength and physical performance.

Long limited to the repression of acts of cruelty, this concern now extends to all conditions in which animals are reared, transported, and slaughtered. Advances in scientific knowledge on pain, suffering, and the consciousness of animals have led to the official recognition of animals as sentient beings, both at the EU level (enshrined in the EU Treaty of Amsterdam in 1997) and in MS (for example, in France through the recent inclusion in the *Code Civil*). At the EU level, several Council of Europe conventions and several directives have reflected this recognition (Mormède *et al.*, 2018). They correspond to an essentially preventive approach *via* the prohibition or limitation of certain practices that potentially generate suffering and pain on the one hand and the simultaneous obligation to use means to increase the welfare of animals and to encourage the expression of their natural behaviour (hens like to be able to scratch the ground and take an occasional dust bath; ruminants like to graze on high quality and abundant grasslands; etc.) on the other hand. Encouraging the expression of animal natural behaviour is an extremely important aspect of animal welfare.

These regulations raise two main questions related to the determination of the optimal level of animal welfare and the stick and carrot instruments to be used for this purpose. Because animal welfare is a global public good that benefits all those who care (Farm Animal Welfare Committee of the United Kingdom, 2011), public intervention at a supranational scale is preferable. Following Treich (2018), Guyomard *et al.* (2020) emphasized that intervention at the European level would avoid "the double penalty of unilateral actions by a single country; first, an economic penalty induced by competitiveness distortions, and second, an animal penalty, insofar as competing countries that are less regulated would have an incentive to produce more animal products so that, ultimately, animal welfare would be globally degraded."

Animal public policies in the European Union

Livestock holdings and the supply of livestock and livestock products are mainly regulated at the EU level within the CAP, complemented by a few national measures. By contrast, the consumption of animal products is essentially regulated at the MS level. Consumption regulations are much weaker than production regulations.

Livestock supply regulations within the CAP

The current CAP is composed of two pillars. The first pillar, totally funded by the EU budget, includes income support direct aids that represent the majority of the CAP expenditure (EUR41 billion in 2018). It also includes market support spending but for much lower amounts (less than EUR3 billion). The second pillar is co-financed by national and/or regional authorities with EU expenditure equal to EUR14 billion spread over a number of measures (see Chapter 1). European holdings keeping livestock receive around 60% of all first and second pillar payments.

Market support and import protection measures

Following the progressive suppression of producers' price guarantee measures and export subsidies (see Chapter 1), the European market for animal products today is directly supported

by import tariff and non-tariff measures only. Although they were reduced following the multilateral Uruguay Round Agreement on Agriculture (URAA) that concluded in 1994 (see Chapter 4), the Most Favoured Nation (MFN) tariffs on EU imports of animal products remain high: nearly 50% for meat, 33% for processed meat and 30% for dairy products and eggs (Lawless and Morgenroth, 2016). In the case of bovine meat, MFN tariffs continue to protect the European market, to limit imports from third countries, and to maintain high domestic prices. Decreasing these tariffs and more generally import protection measures that include a complex set of multilateral and country-specific tariff quotas could increase European imports. This increase would not automatically improve the state of the environment on a global scale as environmental practices may be less effective abroad than in the EU. For dairy products and pig meat, European imports have been extremely limited over several decades with domestic prices close to international prices and European exports having grown over the last 10 years in response to increased demand from Asian countries, notably China.

The larger share of EU imports of animal products is mainly achieved through agreements that include lower tariffs for predetermined quantities (tariff rate quotas). The failure of multilateral discussions in the Doha Round of the World Trade Organization (WTO) has led the EU to negotiate numerous bilateral trade agreements with a high number of developing and developed countries. The question of tariff concessions on the imports of animal products that the EU accepts - or could accept in the framework of these bilateral agreements - is a sensitive issue, mainly because of their potential impacts on domestic animal production levels, prices, and incomes (see Chapter 4).

In addition to border taxes, non-tariff measures (including sanitary measures) apply to imports. In a general way, EU food safety policies must ensure that agricultural and food products imported into the EU comply with requirements that offer safety guarantees equivalent to those that are imposed on domestic products. This generates considerable tensions with trade partners who contest alleged impacts on human health of some of the practices that are forbidden in the EU and have led to for example EU import bans on chlorinated chicken or hormone treated beef (Johnson, 2015).

Decoupled and coupled income support direct aids, cross-compliance and greening

EU livestock holdings benefit from the two generic income support measures of the first pillar; namely, basic income support direct aids and greening direct aids. Both types of aids are decoupled; that is, they are disconnected from production choices and levels in order to comply with WTO requirements of the so-called Green Box. These aids are granted in the form of payments per eligible hectare. This second characteristic implies that the larger the size in hectares, the higher the amounts of decoupled direct aids received by the farm. This positive correlation is a strong incentive to expand the size of holdings. It also raises the complex question of the unequal distribution of decoupled direct aids among farm holdings in a context where they still include an historical component implying that payments per hectare are much higher with intensive farms (Buckwell et *al.*, 2017). On the other hand,

decoupled direct aids also represent a large share of agricultural incomes for a large number of holdings that specialize in beef, dairy, sheep and goat production (Table 10.1). This implies that their reduction, or any change in their distribution, could affect the viability of numerous ruminant livestock farms (Chatellier and Guyomard, 2020). By contrast, pig and poultry farms appear to be much less dependent on subsidies.

Table 10.1. Total subsidies granted to European farms according to production types in 2018.

	Farms (number)	Subsidies per farm (€)	Subsidies per AWU (€) *	Subsidies per hectare of UAA **	Subsidies in % of farm income
Farms specialized in					
- Dairy	438 600	20 600	10 900	439	57%
- Sheep and goats	328 000	14 400	10 200	297	85%
- Cattle	356 900	22 800	17 000	401	133%
- Pig and poultry	111 200	16 900	7 000	399	30%
- Mixed crops	180 400	7 100	4 500	335	44%
- Mixed livestock	100 400	10 700	6 800	357	76%
- Mixed crops and livestock	545 100	12 100	8 100	353	107%

Source: FADN 2018. * AWU: Average Work Unit; ** UAA: Utilized Agricultural Area.

Both types of direct aids are subject to the so-called cross-compliance. In a first attempt to link CAP payments with minimal environmental requirements, they are granted only if farmers comply with Statutory Management Requirements (SMRs) related to environmental protection, food safety, public, animal and plant health, and animal welfare, plus obligations of Good Agricultural and Environment Conditions (GAECs) corresponding to basic farmland management rules. Non-compliance results in a reduction in payments. In most cases, these reductions, and the way in which they are applied, are probably too weak to be effectively dissuasive (European Court of Auditors, 2018).

The greening of the CAP introduced within the 2013 CAP reform consists of three additional requirements that primarily target carbon sequestration and biodiversity preservation through: first, the minimal diversity of crops; second, the maintenance of permanent grassland at national or regional levels; and third, the management of at least 5% of arable land as Ecological Focus Areas (EFA). Green payments account for 30% of the national envelopes of the first pillar direct payments. Because smaller farms are excluded, the greening scheme covers only 70% of the EU agricultural area.

In addition, any MS has the option to maintain part of the first pillar direct payments as coupled aids: up to a maximum of 13%, with the option to go up to 15% if the additional 2%

is targeted at protein plant production (fodder legumes for animal feed and grain legumes for human consumption). Eligible animal production excludes pig and poultry farms except for OF holdings. In 2019, 27 out of 28 MS granted coupled direct aids to the value of €4.2 billion (European Commission, 2019c). Around 75% of these coupled direct aids were targeted to beef cattle (40%), dairy cattle (21%), and sheep and goats (13%). While the way in which this coupled support was previously paid may have provided an incentive to increase livestock and meat production, some consider that this is no longer the case today. Indeed, coupled support is now limited to existing livestock numbers and production, and only when there is a risk of abandonment of land for agricultural use, insufficient product supply, and/or adverse market effects (Baldock and Mottershead, 2017). This argument can be questioned to the extent that, for example, granting coupled aid because there is insufficient product supply has precisely the objective and consequence of increasing product supply relative to a scheme where such aid would not be granted.

Second pillar measures

European livestock farms can also benefit from several measures of the second pillar. Specifically, these are payments for Areas of Natural or other specific Constraints (ANCs) that were implemented in the early 1970s and payments for Agri-Environment and Climate Measures (AECMs) that became compulsory for all MS within the 1992 CAP reform. European farms can also benefit from OF aids, investment aids, and economic aids aimed at developing official signs of quality, the on-farm processing of farm products and short supply chains. At the EU level, livestock holdings receive around two-thirds of the second pillar aids. ANC payments benefit specialized livestock farms and mixed cropping-livestock farms proportionally more simply because they are over-represented in Less Favoured Areas (LFAs). This is also the case for AECM and investment aids (even if available statistics do not allow amounts to be quantified with any precision). AECM payments support farmers operating (more) environmentally friendly practices. These payments acknowledge that at least some of these practices can compete with competitiveness objectives and induce higher production costs that justify compensation. The latter is limited to additional costs or income losses. Compulsory for MS but optional for farmers, AECM payments cover around 25% of the EU agricultural area with important variabilities among MS.

Climate and environmental assessment

Climatic and environmental issues of EU agriculture and in that framework EU livestock are thus mainly addressed within the CAP through cross-compliance, greening, AECM aids, and to a lesser extent ANC payments. The first and main objective of ANC payments is to compensate for the lower incomes earned by farmers located in disadvantaged areas. These payments can also be justified because maintaining agricultural activity in these areas is beneficial for the environment because it limits farmland abandonment, maintains open and diversified landscapes, and preserves biodiversity. Cross-compliance and greening requirements of the current CAP (and conditionality of the 2023-2027 CAP) are too weak to generate significant climatic and environmental benefits (Pe'er *et al.*, 2019; Dupraz and Guyomard, 2019).

The ecological efficiency of AECMs is greater but limited by several drawbacks (Cullen *et al.*, 2018): support expenditure is modest at less than EUR5 billion per year; private and public transaction costs are high; targets are numerous but potentially conflicting; windfall effects are frequent; etc. (see Chapters 7 and 8). The incentives they provide are too low to do more than - at best - the conservation of localised ecological benefits. In the same way, the ability of the new instrument of the eco-scheme of the future CAP to significantly improve the ecological footprint of European agro-ecosystems is highly questionable (Guyomard *et al.*, 2020). The requirements of the eco-scheme measures retained by the different MS are likely to be very insufficient for achieving an effective climatic and environmental ambition, let alone the agricultural objectives and targets of the Green deal (see Conclusion).

Public policies targeted on consumption issues

Within the CAP, dairy products benefit from the so-called School Milk Programme, which combines the distribution of dairy products with educational activities. Furthermore, all agricultural products are eligible for promotional aids that aim to encourage the consumption of European products. The budgetary support granted under these two headings is modest, valued at around EUR200 million per year (compared with direct aids of the first pillar totalling around €43 billion per year).

More generally, while the supply of animal products is subject to significant regulations at the EU level, demand is not whether under consumption support or measures aimed at modifying inadequate food diets. Furthermore, consumption measures are essentially implemented at the MS level. Until now, nutritional policies have sought to advice on the health benefits of more balanced food diets in the form of dietary recommendations, information campaigns and/or nutritional labelling (see Chapter 9). Dietary recommendations provide simple messages for consumers on different groups of products. In the case of meat, the general message is to limit consumption with in some MS an additional invitation to try alternative protein sources. Recommendations vary from one MS to another (Springmann *et al.*, 2020). For red meat, numerous MS recommend a maximum of 500 grams per week. This quantity may be lower (300 grams per week in the Netherlands) and even much lower (one serving per week in Greece). In the case of processed meat, recommendations are to limit and sometimes avoid (Greece) consumption. In the case of milk and dairy products, recommendations are less heterogeneous (two or three portions per day).

Public policy recommendations

The analysis presented in the previous section can be summarised by three main points. First, animal production in the EU faces significant challenges on all dimensions of sustainability including the health dimension. Several challenges question the acceptability of animal production, at least of current livestock practices and systems, by a proportion of the European population in a context where the lack of economic viability of numerous livestock holdings, especially of ruminant farming, is an obstacle to progress in policy reform.

Second, even if some livestock systems provide positive ecosystem services, numerous European livestock farms are not located in a secure operating space within which they can develop in a sustainable way (Buckwell and Nadeu, 2018).[202] Third, even if the responsibility of the CAP should not be overestimated – public authorities have always been reluctant to increase food prices and the food industry has largely shaped the current food system –, this is partly due to the failure of the CAP in not being able to favour the development at a large scale of more environmentally friendly livestock systems.

Of course, the objective hierarchy varies depending on species, systems, regions, and consumption patterns. However, in all cases, these objectives should be focused simultaneously on the following:

- Reducing the negative climatic, environmental, and health impacts of animal production and consumption, notably by decreasing GHG emissions, biodiversity degradation, nutrient leakages into the environment and antibiotic use; improving animal welfare and reducing the consumption of animal products when the latter does not comply with nutritional recommendations;
- Increasing the provision of amenities, notably those associated with grassland-based systems (carbon storage, biodiversity preservation, water purification, and the maintenance of diversified and open landscapes);
- Providing livestock farmers with more stable incomes and better working conditions, and

This should ultimately reconcile livestock and society in the framework of peaceful relationships recognizing the complexity of the question and that animal production and consumption do have adverse effects (that should be reduced) and positive impacts (that should be maximised).

Current policies be they defined at the EU or MS level are deficient in many, if not all, of the objectives listed above. This is despite the progressive integration of climatic and environmental objectives and instruments into the CAP, and is also despite the high direct aids granted to livestock farmers within the CAP. The positive side to granting high direct aids to livestock farmers is that it provides important room for manoeuvre in terms of reorienting this support towards greater sustainability. However, because CAP aids represent a high share of livestock farmers' incomes (sometimes more than 100%; Table 10.1), their necessary reorientation can only be gradual in order to limit economic risks. On the other hand, this income dependency to aids should not be used as a pretext to maintain a situation of

202. These two authors consider four dimensions to define a secure operating space for European animal productions. The two positive dimensions recognize the nutritional quality of animal products and the environmental benefits of grass. They are measured by comparing meat and milk consumption with nutritional recommendations and by requiring a minimum number of ruminants (measured in LUs) to ensure the maintenance of permanent grasslands and the associated positive environmental services. In both cases, these boundaries are now being exceeded within the EU (to a much greater extent for meat than for milk for the nutritional border and with the exception of five MS (Romania, Lithuania, Bulgaria, Latvia, and Estonia) for the grassland borders). The two negative dimensions relate to GHG and nitrogen emissions from livestock production. The limits to be respected are defined as the percentage reductions required to comply with the Paris Climate Agreement of 2015 and a balanced nitrogen cycle (Steffen *et al.*, 2015): in both cases, the limits are largely exceeded in the EU and a major effort to reduce GHG and nitrogen emissions from livestock is required.

status quo where barely anything would change (as has too often been the case in the past including the very recent past in the case of the CAP that will apply from January 2023 over the five-year period 2023 to 2027; see Conclusion).

Ensuring the agro-ecological transition of livestock farms

European livestock farmers must resolutely engage in the transition of their production systems in order to minimise climatic, environmental, and health disservices and increase the provision of amenities, notably those linked to grassland-based ruminant systems. The transition is not restricted to agro-ecological practices; that is, to nature-based solutions (Dumont and Bernués, 2014). It also encompasses practices and technologies including precision livestock farming and animal breeding, which can be used to achieve efficiency gains and reduce the ecological footprint of livestock (Ingrand, 2018). The CAP must promote this necessary and urgent change. It will do so more effectively (i.e., in the most efficient way) if it relies as closely as possible on lessons from the theory of public economics, which is far from being the case in the current CAP.

A stricter application of the Polluter Pays Principle

An optimal policy requires a much more systematic and rigorous application of the Polluter Pays Principle (PPP). For global public goods, such as climate mitigation and biodiversity preservation, it is crucial that the PPP be implemented at the EU level with this application level having the additional benefit of limiting competitiveness distortions among MS. This could be achieved through the taxation of the main determinants of agricultural GHG emissions (nitrogen fertilizers and cattle populations) and environmental damage, notably biodiversity loss in agro-ecosystems (excess nutrients, synthetic pesticides, and veterinary products). Such a taxation scheme should send the right price signals to all actors within the food chain in a context where climatic and environmental costs highlight the inadequate pricing of animal products (Pieper *et al.*, 2020). However, taxation policies are the sovereign prerogatives of MS and there is no doubt that it will be very difficult – if not impossible – to obtain a political agreement on a taxation scheme at the EU level.

Fortunately, a similar climatic and environmental outcome could be achieved through the current or planned instrumentation of the CAP; more specifically by considerably reinforcing cross-compliance and greening requirements[203] whether under SMRs (notably through the Nitrates Directive and the Water Framework Directive) or under GAECs (by removing derogations and adaptations that contribute to make them poorly efficient and by making penalties for non-compliance truly dissuasive). Reinforcing greening and cross-compliance requirements is a second-best policy option that seeks to mimic the effects of a climate and biodiversity tax scheme.

An improved legitimacy and efficiency of the Provider Gets Principle

A more systematic and rigorous implementation of the PPP would enhance the legitimacy of its counterpart, the Provider Gets Principle (PGP), which underlies the AECMs of the current

203. Conditionality requirements in the PAC 2023-2027.

CAP and will underlie both the eco-scheme and the AECMs in the future CAP. The application of the PGP is only partial since AECM payments only compensate for the extra costs or profit losses, and are not proportionate to climatic and environmental benefits.

Additional climatic and environmental efforts that go beyond regulatory minima defined by conditionality requirements should be encouraged. Payments should be proportional to ecological benefits that a shift from an obligation of means (practices) to an obligation of results (impacts) will make easier. From a theoretical point of view, results-based payments are more efficient than practice-based payments (Bartkowski *et al.*, 2021). They however suffer from one important practical disadvantage linked to the difficulties and costs of identifying, measuring, and valuing ecological services. Research in that domain is very active and guidance handbooks are already available for designing and implementing results-based agri-environment schemes (in the case of biodiversity, see for example Keenleyside *et al.*, 2014). An additional limitation is related to data availability. This limitation could be assuaged by supporting the development of a large and consistent set of pilot experiments through the CAP.

Given the diversity of ecological benefits and their variability depending on systems and territories, a service package approach is an interesting avenue to explore. We will illustrate this point with the example of grasslands. Permanent and temporary grassland areas have been eroded for a long time in the EU due to a lack of adequate protection (Huyghe *et al.*, 2015; Guyomard *et al.*, 2022). The decrease in permanent grassland appears to have ceased since the start of 2000 thanks in particular to cross-compliance and greening measures aimed at their maintenance. However, these areas have continued to decline in some regions, even in the most recent years (for example, in France, in the regions of Hauts-de-France and Normandy). Beyond minimal conditionality requirements, there is legitimacy to remunerate the numerous ecological services provided by grasslands and to increase remuneration amounts with the quantity and quality of services they provide. To that end, a new regulatory definition of grassland areas should be proposed based on their age, composition (plant species) and management as these three characteristics are the main determinants of the quantity and quality of ecological services that grasslands can provide (Smith, 2014; Kruse *et al.*, 2016). For the sake of simplicity, it would be possible to define permanent grassland as land used to grow grasses or other herbaceous forages that are not included in the crop rotation for 10 years or more (instead of the current five years or more). Conditionality requirements would be based on this revised definition of grassland. They would be supplemented by payments for climatic and environmental services on the basis of a five-level grid corresponding to: (i) temporary grassland; (ii) temporary grassland of less than five years with legumes; (iii) temporary grassland of more than five years with legumes; (iv) intensively managed permanent grassland where intensification will be assessed by a criterion of stocking rate per hectare; and (v) extensively managed permanent grassland. The package of climatic and environmental services provided by grassland areas increases along this gradient; this must be same for payments (Guyomard *et al.*, 2022).

These payments for ecological services could be financed by using a share of the envelope of decoupled and coupled direct aids. Ideally, coupled direct aids to livestock (slightly

more than EUR3 billion per year) should be suppressed because they suffer from important drawbacks linked in particular to their poor efficiency assessed in terms of animal and herd zootechnical performance, Total Factor Productivity (TFP) and agricultural income support (Rizov *et al.*, 2013; Ciaian *et al.*, 2013). In addition, as noted by Guyomard et *al.* (2020), "they contribute to maintain livestock farmers in the productions that are supported in this way, and in doing so, limit the necessary adaptation and reorientation in response to market demands and consumer expectations. This is all the more so as investments in livestock materials and buildings are designed with these coupled directs aids in mind, which increases the fixation in beneficiary productions". One could object that livestock coupled direct aids contribute to maintain activity in ANCs. However, there already exists an instrument of the second pillar that precisely targets this objective of maintaining agriculture in the entire European territory by compensating higher production costs in disadvantaged areas.

The same rationality based on a consistent and balanced use of both the PPP and the PGP could also apply to animal welfare. As noted above, because of its global public good nature, its provision requires an intervention of public authorities at the EU level. Minimal requirements should be reflected in cross-compliance (conditionality in the future CAP) criteria (that are very likely insufficient on this point in both the current and planned CAP). Efforts that go beyond these minimal requirements should also be encouraged by payments for animal welfare services based on performance obligations; that is, direct measures on animals and herds.

In a more general way, the shift from an obligation of means to an obligation of results would facilitate the development of payments for ecosystem services that would be funded not only by taxpayers but also by intermediate and final users. The development of market solutions would allow the CAP budget constraints to be alleviated.

Supporting livestock farmers' incomes from a dynamic perspective

The importance of the different aids of the CAP in livestock farmers' incomes requires a transitional period (Table 1). It is clear that an increased implementation of the PPP and the PGP along the lines described above could threaten the economic viability of numerous European livestock farms if applied too suddenly and without adequate consultation. On the other hand, there is some urgency to reduce the climatic and environmental footprint of European livestock. The path of the necessary transition of livestock systems is thus narrow. Three measures could enlarge this path and minimise adverse income effects. First, a temporary risk premium could be granted to any livestock farmer firmly committed to the ecological transition of his holding (along the lines of premiums paid to farmers in their conversion towards OF). Second, the product of any ecological tax could be maintained in the farming sector through a bonus-malus scheme, which would encourage "virtuous" farmers and penalise "less virtuous" farmers. Third, agricultural trade agreements signed by the EU should include stronger climatic, environmental, and health requirements to avoid pollution leakages and ensure a level playing field between foreign and European competitors.

The third point deserves further explanation. The improvement of the climatic and environmental status of European agriculture could come at the price of agricultural intensification

and agricultural land expansion elsewhere in the world because of increased European imports. Since climate mitigation and biodiversity preservation are global public goods (see Chapter 7), climate and biodiversity leakages should be avoided through European border adjustment mechanisms. Specific attention must be paid to agreements with less developed countries so as not to constrain their own economic development that frequently relies on agriculture. However, less developed countries are primarily concerned by the issues around securing their imports and access to food for their entire population.

Finally, the criteria that must be met in order for investment aids to be granted through the second pillar must be strengthened. Livestock producers should prove that supported investments lead to a reduction in the use of fossil energy, a reduction in climatic and environmental damage, and an improvement in animal welfare.

Beyond the CAP: Do we need to regulate the consumption of animal products?

As shown in the second section, the consumption of animal products - notably the excessive consumption of red and processed meat - is not without negative consequences on human health, the climate, and the environment. These negative impacts justify consumption regulation policies. However, justifications are not automatic for all and vary in function of the nature of impacts.

In the case of health, a first possibility is to consider the consumer as being sovereign and thus responsible for her/his food choices. According to this first logic, a deleterious effect on health due to an inadequate consumption pattern is only a matter of private choice and does not give rise to intervention by public authorities. This first vision suffers from two flaws. First, because national health systems are essentially funded by taxpayers; as a result, health costs are largely borne by the community as a whole and not by individuals. This situation corresponds to a negative externality justifying the intervention of public authorities to correct the problem at its source, thereby changing inadequate food diets. Second, health effects linked to unsuitable eating patterns appear only in the long term. It is thus very difficult for the consumer to integrate negative health effects in her/his short-term decisions. These two drawbacks justify a paternalistic policy (Griffith and O'Connell, 2010).

In the case of climatic and environmental impacts, the theory of public economics recommends intervention at the source of the externality; in this case, to act on supply-side processes. Public authorities may consider - as a valuable alternative or as a complement - the simultaneous regulation of consumption patterns. Let us illustrate the point using the example of GHG emissions. Supply-side mitigation measures might be more accurate to differentiate taxes and subsidies according to the emission levels of livestock systems. By contrast, taxes and subsidies at the consumption level can be used to guide consumers' choices toward food product categories that on average emit less GHG. In so doing, they will favour plant-based products. Another advantage of consumption-side tax and subsidy measures is that they apply to both domestic and imported products, which avoids the risk of the carbon leakage of supply measures even without border carbon adjustment mechanisms.

Furthermore, demand measures may be more efficient than supply measures that entail high monitoring and control costs, and because of the limited emission reduction potential through agricultural mitigation practices only. In order to significantly diminish GHG emissions of food systems, it will be necessary to reduce livestock activity levels (Wirsenius *et al.*, 2011; Henderson *et al.*, 2017). This would allow a reduction not only of gross GHG emissions linked to animal production and consumption (notably that of red meat) but also an increase in biomass and soil carbon storage by converting agricultural lands (notably low productivity grazing lands) to other even more favourable uses from a climatic and ecological point of view (wetlands, peatlands, hedges, forests).

Consumption regulation instruments

Three main types of policy instruments can be used to influence the consumption of animal products: first, fiscal instruments; second, instruments aimed at providing more and better information; and third, behavioural instruments.

To date, only a small number of MS have introduced taxes to limit the consumption of animal products. In 2011, Denmark introduced a tax of EUR2.15 per kilogram of Saturated Fatty Acids (SFA) on products containing more than 2.3 grams of SFA per 100 grams of product. This tax scheme mainly targeted butter and margarine. This policy resulted in a 10-15% decrease in SFA consumption (Jensen and Smed, 2013) but led some consumers to switch to lower priced distribution channels. The tax was withdrawn in 2013 because of the high administrative costs of the scheme, controversies over its inflationary effects, cross-border purchases, and the negative impacts on the economic results of firms.

Various papers have tried to simulate the impacts on health and GHG emissions of food taxation/subsidy schemes based on the content of GHG in products. Results can be summarised in five points (Doro and Réquillart, 2020): (i) animal products and notably meats are the most heavily taxed products; (ii) the consumption of red meat is the most impacted because it is the most taxed; (iii) the consumption of white meat is less impacted, not only because it is less taxed but also because it partially replaces red meat; (iv) GHG emissions of food diets are reduced but only to a limited extent (less than 10% even when taxes are based on high carbon prices); and (v) the health impacts of taxes strongly depend on the design of the tax scheme: in revenue-neutral scenarios, impacts on health are highest when meats are taxed and tax revenues are used to subsidise the consumption of fruits and vegetables.

By contrast, many MS have set up information campaigns as part of their nutritional policies. The most widely-known example of such an information campaign is the "Eat Five Fruit and Vegetables a Day" recommendation. Campaigns aimed at increasing the consumption of fruit and vegetables have a positive impact on consumption levels of these products that is however only modest (Capacci and Mazzocchi, 2011). Interestingly, Castiglione and Mazzocchi (2019) show that in the United Kingdom (UK), the increased consumption of fruit and vegetables was accompanied by a decreased consumption of meat. Information campaigns aimed at changing meat consumption patterns are less developed and their effects are less known. However, simulation work suggests that such campaigns targeted at meat consumption would increase social welfare. For example, Irz *et al.* (2016) found

that in the case of red meat consumption in France, information campaigns would have positive effects on both the health dimension and the climate one by reducing the GHG emissions of diets.

Food labels provide information to consumers that allows them to better select products according to characteristics that would otherwise be difficult to assess (production methods, content in GHG, nutritional score). Labels can help guide consumers' choices towards healthier and/or more environmentally friendly food products. However, those products are frequently more expensive. As a result, they will be purchased by consumers who have a positive willingness to pay for such characteristics. Numerous studies showed that this willingness to pay is positive for attributes related to product safety and health. It is much less the case for environmental attributes. Such a difference can be explained by the fact that the first characteristics have a direct impact on the consumer who consumes the product while environmental characteristics do not have a direct impact on consumers and are then faced to the well-known problem of financing public goods: even if a consumer cares about the environmental dimension, she/he is likely to be reluctant to pay a price premium for more environmentally friendly food products because of the small impact of her/his individual consumption on the environment.

Food consumption is more than the sole economic act of choosing a basket of goods. It includes hedonic, historical, cultural, social, and religious dimensions that contribute to explaining why it is so difficult to change food consumption behaviours. Nevertheless, it is worth attempting to change behaviours by creating new norms. The latter can be the result of public and/or private actions, as well as initiatives developed by various associations such as the Meatless Monday Campaign that started in the United States in 2003 and today extends to more than 40 countries. Easy to understand, this type of campaign can help the consumer "to take the plunge" in changing entrenched habits. It can also have an impact on the supply side; for example by leading restaurant owners to change their menu for one day of the week.

Several experiments with nudges - positive reinforcement and indirect suggestions as ways to influence the behaviour of individuals or groups of individuals - have been implemented with the aim of changing food consumption patterns. Impacts would be positive but limited in scope (Cadario and Chandon, 2019). For example, making it easier to choose a vegetarian menu in a restaurant would increase the choice of this menu by six percentage points (Kurz, 2018). Implementing targeted communication by providing comparative information to targeted people is also a solution. Facilitated by the development of New Information and Communication Technologies (NICTs), the development of this type of communication is not without its drawbacks: implementation costs, credibility of messages, risks of manipulation (Kurz, 2018).

Geographical level of implementation: at the European Union or Member State level?

To date, nutritional policies have been essentially designed and implemented at the MS level. This spatial scale can be justified for at least two reasons: first, because there is no spatial externality in this domain; and second, because it is therefore possible to take account of national heterogeneities in diets and preferences. The latter depends on the macro-economic

context (income levels of the different socio-professional categories) but also on non-economic factors such as history, tradition, or culture. The rationale for maintaining nutritional policies at the MS level is reinforced by the fact that a large portion of costs related to the adverse health effects of too caloric and unbalanced diets are borne at the national level (production losses, health insurance costs, disability pension expenditures, etc.). These costs remain high today: they will increase in the future, and thus call for a significant strengthening of current nutritional policies, using the full range of tools described above.

Conclusion

The need for an agro-ecological transition of European agriculture applies to both crop and animal production. The latter is the origin of negative services that must be reduced and positive services whose provision must be maximized. The CAP instruments would gain in legitimacy and effectiveness by better targeting the reduction of disservices and the increase in amenities. In view of the high weight of direct aid in the (often) low incomes of livestock farmers, it is possible to temporarily postpone a stricter application of the PPP by subsidizing the agro-ecological transition of livestock farms and using the resources currently allocated in the form of decoupled and coupled direct aid for this purpose so as to remain within the limits of the budgetary framework. Even if the CAP has a role to play, it is also (and perhaps above all) through national nutritional policies that the reduction of the excessive consumption of meat products must be targeted by using the full set of public instruments that can be mobilized, including a possible consumption tax.

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Part III

The CAP, Rural Development, and Innovation

Introduction

Cécile Détang-Dessendre, Hervé Guyomard

The objective of the CAP was mainly if not exclusively economic for the first three decades of its existence, from its origin to the 1992 reform. The economic objective remains today, even if the instruments used to this end no longer involve market regulation but rather direct payments to support agricultural incomes (see Part I). From 1992 onwards, the economic objective was coupled with an increasingly important environmental objective; however, the instruments designed to protect the environment in agro-ecosystems have not been fit for the challenge (see Part II). In a context where European agriculture would have negative effects not only on the environment but also on human health, the addition of an explicit health objective in the CAP raises several issues concerning the negative impacts on health of agricultural practices and systems (see Chapters 7 and 8) and the negative impacts on health of diets that are too high in calories and/or too unbalanced (see Chapter 9). In this third part, we look at two additional and cross-cutting objectives of the CAP; that of the development of rural territories on the one hand and of innovation on the other. The explicit inclusion of these two objectives in the CAP is long-standing and raises two related questions regarding the legitimacy/relevance of this inclusion and the efficiency/effectiveness of the instruments used.

The CAP and development of rural areas

Economic, social, and territorial cohesion has been a key competence of the European Union (EU) since the Single European Act of 1986. A first European regulation defined the principles of the European Cohesion Policy in 1988. At the time, the policy had five objectives, two of which were of primary importance for rural areas: Objective 1 aimed to promote the development and structural adjustment of regions where development was lagging, a lag suffered by rural territories in particular; Objective 5, which was divided into Objective 5a (speeding up the adjustment of agricultural structures) and Objective 5b (promoting the development of rural areas), recognized the primary importance of agricultural activity through Objective 5a even if it was not the only activity capable of promoting the development of rural territories; hence Objective 5b. Ten years later, in 1999, Objective 5 was abolished and the number of objectives in the European Cohesion Policy was reduced from five to three. Objective 1 remained unchanged. At the same time, it was decided to structure the CAP into two pillars (see Chapter 1). The wording of the so-called "rural development" second pillar is misleading insofar as it is strongly focused on agriculture. It considers agriculture (and forestry) as an essential economic activity in rural areas, which are essentially perceived

as production areas with, nevertheless, a growing awareness of the importance of environmental considerations over time (Berriet-Solliec *et al.*, 2009). Since then, the objective of developing rural territories has thus been targeted by two European policies; that is, the European Cohesion Policy and the CAP.

In this context, Chapter 11 begins by recalling the main challenges facing rural territories in the EU. It then analyzes the extent to which CAP measures, both those specifically targeted at a development objective for these territories and more generally all CAP instruments have (can have) an impact on the development of rural territories, and explains the mechanisms underlying potential knock-on effects. The same analysis is carried out for the Cohesion Policy. As a result, this makes it possible to legitimize the intervention of public authorities for the development of rural territories and to lay down the principles of an optimized European policy in this domain in terms of objectives, instruments, and the geographical levels of their design and implementation.

The CAP and innovation

Innovation is specific in that it is a cross-cutting objective that should facilitate the achievement of the other objectives of the CAP and, beyond that, expedite the significant commitment of European agriculture on the path to sustainability. The same applies to research. At the European level, the latter is supported by a specific policy, the European Research Policy, which is also known as the Horizon 2020 Policy on the 2014-2020 budget programming. Its field of application is not limited to research in its strictest sense. In addition to scientific excellence (strengthening the EU's position in the scientific field) and the networking of research laboratories on a European scale, it also covers the two dimensions known as industrial primacy (the development of industrial innovation) and societal challenges (climate change, sustainable transport, health and ageing populations, etc.).[204] It is therefore more broadly speaking a European research and innovation policy. The research developed under agriculture and associated fields (environment, food, development of rural territories, etc.) essentially comes under the third pillar; that of societal challenges.

Knowledge transfer and innovation, already present in various measures of the national rural development plans of the second pillar of the CAP in the 2007-2013 programming period, are a reaffirmed priority of this second pillar in the 2014-2020 programming period. Existing innovation support measures are maintained. A new mechanism has been introduced, which is called the European Partnership for Innovation for Productive and Sustainable Agriculture (EPI-AGRI). It aims to promote the development and transfer of innovation by mobilizing several tools financed either by the European Research Policy or by the CAP.[205]

There is no disputing the ongoing need for research and innovation. Perhaps less consensual are the priorities that research and innovation should target especially when supported by public authorities at the EU level as well as at the level of Member States (MS) and/or their

204. https://www.touteleurope.eu/actualite/la-politique-europeenne-de-la-recherche.html.
205. The different tools of the EIP-AGRI are detailed in Chapter 12.

regions. In this context, Chapter 12, which focuses on innovation in European agriculture and its support through the CAP, first proposes a reflection on the major areas of innovation that can contribute to the desirable and desired development of agricultural systems and more generally food systems. Anticipating the lessons of this analysis, our conviction is that no action lever towards progress should be excluded, from genetics to short supply chains, from digital technology to ecosystem services. On this basis, we then examine the extent to which the current CAP instrumentation complemented by other policies at the EU, MS, and/or regional levels is adapted to these needs. This is done by studying on the basis of the theoretical framework of analysis proposed by Hekkert *et al.* (2007) the different functions that an innovative ecosystem must perform in order to be effective and efficient.

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11. The CAP and Rural Development: The Paradoxical Position of the Development of Rural Areas in European Policies

Francis Aubert, Cécile Détang-Dessendre, Bertrand Schmitt

When considering the question of rural development in the light of regional economies, the issues analyzed are those of the economic growth in the areas concerned, the reduction of differences in demographic, economic, and social development, and the disparities in living conditions between these territories and other territories. In general, rural areas in the European Union (EU) maintain a wide range of economic relations (flows of goods, services, and people) with urban systems and especially the nearest town or city (Dax and Copus, 2016). These relations are characterized by differences in the living conditions of their inhabitants in terms of housing, commuting time, and affordability of employment and services. From this perspective, the support provided by European policies for the development of rural territories is paradoxi*cal*.

Indeed, whereas spatial dynamics can only be considered today in a multisectoral and multidimensional way, it is a sectoral policy (in this case the CAP) that explicitly claims support for the development of European rural areas through measures within the second pillar of this policy (which is wrongly called "rural development"). Most of this support is reasonably directed towards the actors within agriculture and its directly associated sectors, and towards the regulation of these sectors even though they currently represent only a small part of the economies and populations of rural areas. Conversely, while the European Cohesion Policy (which is based on Structural Funds such as the European Regional Development Fund or ERDF, and the European Social Fund or ESF) aims to achieve the objectives of the economic and social development of regions and territories, territorial competitiveness and the reduction of growth and living condition gaps between regions and territories, it does not explicitly identify rural areas as one of its priorities. The development of rural areas is therefore poorly integrated into the policy that should be of most concern to these areas.

One of the origins of the special place occupied today by rural development in European policies can be traced back to the successive evolutions of the CAP and the European Cohesion Policy. At the time of the 1988 reform of the Structural Funds, rural development objectives were most clearly identified, independent of agricultural structural objectives. Among the six objectives of the European Structural Funds, the so-called Objective 5b was developed, aimed exclusively at lagging rural areas. The decade that followed was an exception. Ten years later, following the first Cork Conference in 1996 and when the Agenda 2000 was formulated, the reform of the Structural Funds resulted in the merging of Objective 2 (support for the conversion of regions affected by industrial decline) and Objective 5b (support for development in lagging rural areas) into a single objective for the so-called economic and social conversion of areas facing structural difficulties. Objective 5a (which aims to support changes in the production structures of farmers, fishermen, and those involved in the processing and/or marketing of agricultural and fisheries products) and part of Objective 5b thus joined the CAP to form the second pillar of this policy. Since this restructuring of the system, the ambiguity of the positioning of rural development within European policies has persisted. This ambiguity has even been reinforced, particularly in 2007 during the removal of sub-regional zoning specifically dedicated to Objective 2 of the European Cohesion Policy in favour of the integration of regional policies into common strategic frameworks (Dax and Copus, 2016).

At a time when the guidelines for European policies for the post-2020 period are being drawn up, this particular position of rural development raises a series of questions in terms of both relevance and effectiveness. We first look at the analysis of the instruments that the second pillar of the CAP implements for the development of rural areas and their effects on this development. We then analyze the extent to which the other instruments within the two pillars of the CAP currently contribute (or may contribute in the future) by supporting agricultural activity in the development of rural areas in which this activity occurs. We therefore examine whether and to what extent the development of agriculture can contribute to the development of rural areas and meeting the challenges facing them. Third, we look at the European Cohesion Policy and how it affects (or not) rural areas. Finally, we examine the content of an optimized European strategy for the development of rural areas and the relevant geographical scale at which it should be deployed.

Rural development in the CAP: Objectives, measures and impacts

The challenges of rural development

Europe's rural areas vary significantly from one Member State (MS) to another, depending primarily on population densities and economic activities on the one hand and remoteness from centres on the other (Dax and Copus, 2016). These rural areas do, however, share distinctive commonalities in terms of population, living conditions, income, and employment (European Commission, 2017). Broadly speaking:[206]

206. See also Eurostat (2015; 2017) and European Commission (2018).

• The population is ageing in all MS but more significantly in rural areas (20% of rural inhabitants are over 65 years old, 18.2% in urban areas);
• The Gross Domestic Product (GDP) per capita in rural areas is on average 70% (82% in France) of the EU-28 average, while in urban areas it is 125% (145% in France);
• The risk of poverty (the share of the population with income after transfers below 60% of the national median income) is higher in rural areas, especially in the Eastern and Southern MS (differences are smaller in the Western and Northern MS);
• The probability of holding a higher education degree is lower in rural areas (21% of 30-34 year olds in rural areas *versus* 34% in urban centres); and
• Unemployment rates are, however, lower in the rural areas of the EU-15 countries but higher in the rural areas of the EU-N12 countries.[207]

There are two main reasons for these differences between rural and urban areas: first, there us a structural effect linked to the decline of historical economic sectors, including agriculture, which are over-represented in rural areas and, conversely, a weak importance in the sectors of activity that are growing (services) and/or most innovative (new technologies). Second, the differences are due to the geographical effect of dispersion and the lack of polarization that prevents rural areas from benefiting from the growth drivers associated with agglomeration economies.[208] In addition, it should be pointed out that service activities have become, in both structure and evolution, the main sources of employment and dynamism in all European regions, including rural areas where they account for 65% of value added (80% in urban areas).

The place of rural development in the CAP

Although the Cork Conference of November 1996 reaffirmed the importance of a non-agricultural approach to rural development, three years later at the Berlin Summit in March 1999, rural development became one of the specific challenges of the CAP. The Rural Development Regulation (RDR) then laid the foundations for support for rural development by the European Agricultural Guidance and Guarantee Fund (EAGGF), which funds the CAP. The overall envelope programmed under the second pillar of the CAP for the period 2000-2006 in an EU of 15 MS was EUR56 billion (16.6% of the total CAP budget). This has been increased to EUR96 billion for the period 2007-2013 in an EU of 27 MS.[209] It has increased slightly (by +3%) over the period 2014-2020 to EUR99.6 billion (25% of the total CAP budget) in an EU of

207. EU-N12 refers to the 12 MS that joined the EU at the time of its enlargements in 2004 (Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia) and 2007 (Bulgaria and Romania). Croatia joined in 2013.
208. Agglomeration economies are based on the existence of externalities that make it possible to maintain a trend of increasing returns for spatially grouped agents due to burden- and risk-sharing effects, efficient matching effects due to the density and diversity of jobs and qualifications, and learning effects that enable the capitalisation and circulation of innovations (Duranton and Puga, 2004).
209. Since 1 January 2007, the EAGGF no longer exists with its two sections having become autonomous through the EAGF (European Agricultural Guarantee Fund) for the Guarantee Section and the EAFRD (European Agricultural Fund for Rural Development) for the Guidance Section. The EAFRD finances the second pillar. It intervenes solely in return for national and/or regional public aid participating in the financing of operations, with co-financing rates varying according to the nature of the operations.

28 MS, following Croatia's accession in 2013. A complete picture of funding requires adding second pillar national and regional co-financing for the three periods, as this co-financing even if the latter is significantly lower than the European contributions.

The geographical level of management of the CAP Rural Development Programmes (RDPs) varies according to the administrative organization of the MS and the periods involved. We can thus note the evolution of the French declination between the 2007-2013 and 2014-2020 periods. For the first 2007-2013 period, the policy was framed by a national document, called the Hexagonal Rural Development Programme (HRDP), subdivided into regional documents and contributed to by local authorities by co-constructing and co-financing certain measures. For the 2014-2020 period, the administrative regions have become managing authorities for the Regional Rural Development Plans (PRDRs), with national cohesion being ensured by a National Framework Document (NFD), which sets the key objectives. The overall amount of the envelope for the period 2014-2020 in metropolitan France is EUR14.9 billion, of which the EU finances EUR11.4 billion. This amount is comparable to that of Italy and Poland, and slightly higher than that of Germany, Spain, and Romania. The share of the CAP European funds dedicated to the second pillar of the CAP varies greatly among the MS: 10% in the UK, less than 20% in France, and nearly 40% in Poland.

Over the period 2007-2013, the second pillar programming was structured into five axes: first, improving agriculture and forestry; second, improving the environment and the countryside; third, quality of life and economic diversification in rural areas; fourth, the LEADER initiative (links between the rural economy and development actions),[210] which is a cross-cutting methodological axis; and last, technical assistance. For the period 2014-2020, the second pillar is structured into six priorities (Table 11.1), which are further divided into 20 measures.

Even if the average breakdown of programmed expenditure under the second pillar varies greatly between MS, Priority 6 still falls short of environmental or competitive priorities. Even in the countries where it carries the most weight, such as Bulgaria (28%), Romania (27%), Germany (24%), Sweden (21%), or Croatia (20%) its share never exceeds the combined weight of the two environmental priorities. Moreover, many MS allocate very little second pillar expenditure to the development of rural areas. This is the case in Denmark (which mobilizes only very little of the second pillar as a whole), Ireland (6.5%), the Czech Republic (7.5%), the United Kingdom (8%), the Netherlands (8%), Belgium (8.5%), Finland (9%) and Portugal (10%). Searching for the logic behind the allocation of second pillar resources in a relatively significant way to the development of rural areas, Dwyer *et al.* (2016) find a (weak) positive correlation between the weight of Priority 6 and the rural poverty rate but no link with the rural demographic dynamics of the country concerned. This result suggests that rural poverty is a major concern of the MS, which have decided to allocate relatively significant CAP resources to this priority.

210. From the French acronym LEADER, for *Liaison Entre Actions de Développement de l'Économie Rurale*.

Table 11.1. The 2014-2020 priorities of the rural development policy in France within the CAP, and matching with the priorities for the period 2007-2013.

2014-2020 RDP	Priorities	2007-2013 HRDP
Priority 1	Knowledge transfer and innovation	Transversal
Priority 2	Rural development through farm competitiveness	Axis 1
Priority 3	Processing and marketing - food supply chain and risk management	Axis 1
Priority 4	Preservation and restoration of ecosystems and biodiversity	Axis 2
Priority 5	Actions to address climate change	Axis 2
Priority 6	Promoting rural development through socio-economic development	Axes 3 and 4

Sources: French *Document de Cadrage National* (DCN) for the period 2014-2020; Pham and Berriet-Solliec (2018).

The wording of the axes for the 2007-2013 period and the priorities for the 2014-2020 period show that the second pillar of the CAP focuses on the agricultural sector, its downstream sectors, and the relationships with ecosystems and ecosystem services that are impacted by the agricultural sector. The challenges and objectives for the development of rural areas are not clear or explicit. For the 2007-2013 period, they are confined to Axes 3 and 4, both of which carry relatively little weight in financial terms.* For the 2014-2020 period, support aimed more specifically at the development of rural areas, independent of the agricultural sectoral dimensions, is mainly grouped under Priority 6. This represents less than 15% of the expenditure programmed at the European level under the second pillar (Figure 11.1), while 46% and 7% of the funds are allocated to Priorities 4 and 5, which include the Agri-Environmental and Climate Measures (AECMs) and the Compensatory Allowance for Natural Handicaps (CANHs); 20% to Priority 2, which targets the competitiveness of European farms; and 10% to Priority 3 dedicated to food chains and risk management (Dwyer *et al.*, 2016).

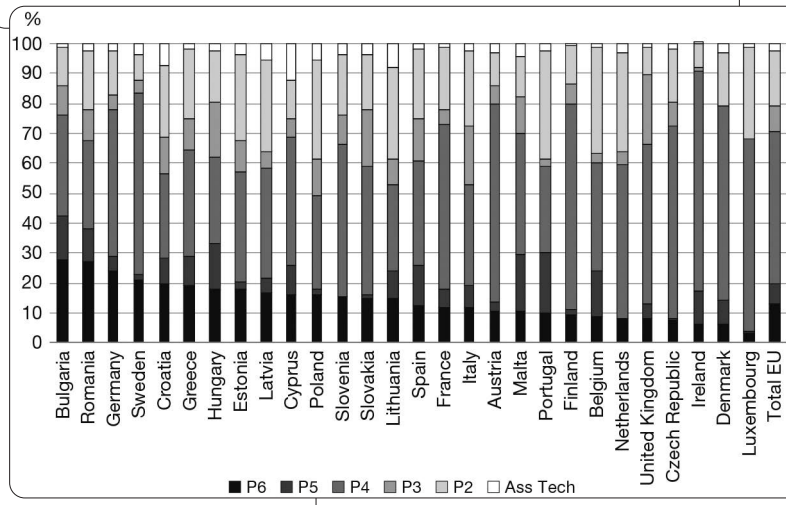
*In France, these two axes (quality of life and the diversification of rural economies, and the LEADER initiative) accounted for, respectively, 8% and 5% of the EUR 7.5 billion allocated by the EU to France under the second pillar over the years 2007-2013, while 24% was devoted to Axis 1 (improving the competitiveness of the agricultural and agri-food sectors) and 64% to Axis 2 (improving the environment and the countryside).

Impacts of the second pillar of the CAP on the development of rural areas

Ex post evaluations of the impacts of second pillar measures have been carried out for different MS in the framework of the 2007-2013 programming period. The definition of development indicators is a prerequisite for these evaluations.

Castaño *et al.* (2019) review seven studies conducted in different MS or regions of MS (Ireland, Malta, Portugal, Scotland, Spain, Romania). Five studies look at the impact on economic growth and job creation, and two look at the impact on labour productivity. Analyses show a stronger impact of measures (in particular investment support measures and agri-environmental measures) on economic growth (measured by the change in gross value added expressed in purchasing power standard) than on the creation of new jobs.

Figure 11.1. Respective shares of the six priorities in the programmed expenditure of the 2014-2020 CAP Rural Development Programmes in the different MS.



Sources: Adapted from Dax and Copus (2016); Dwyer *et al.* (2016).

In France, work has specifically focused on Axes 3 and 4 with regard to three objectives: first, maintaining and developing employment in rural areas; second, making the environs more attractive for those living there (residential mobility); and third, improving the quality of life in rural areas (Epices and ADE, 2017).[211]

Axis 4 under the LEDAER initiative financed actions totaling EUR561 million, 80% of which was of European origin. Because it is based on an integrated local development approach, the priority is cross-cutting and has been able to mobilize measures from the other priorities. In practice, it is mainly the measures under Axis 3 that have been implemented to develop territorial projects based on Local Action Groups (LAGs)[212] (Allaire *et al.*, 2018) – between 2007 and 2013, a total of 223 LAGs were set up in France –. Axis 3 includes seven measures. The measure dedicated to the creation of basic services for the economy and population of rural

211. The performance indicators mobilized are three employment development indicators (variations in total employment, face-to-face employment, and sectoral employment in trade, services, construction, and agriculture); four quality of life indicators (variations in equipment scores reflecting the abundance of services within a community/suburb relative to the community/suburb with the best endowment for different sectors, including childcare and health); and two indicators of population attractiveness (population growth rate and migration rate). The statistical work was carried out at the level of municipalities with less than 20,000 inhabitants (6,382 municipalities having received support under Axis 3, 4,098 under Axis 4 and 1,497 under both Axes 3 and 4).

212. The LEADER programmes were set up in 1991 to promote bottom-up approaches involving local public and private actors within a LAG that draw up a territorial project. Integrated into the EAFRD in 2007, they are part of a broader vision of territorial approaches known as Community-Led Local Development (CLLD) approaches.

territories (early childhood, health, access to employment, leisure, culture, etc.) is quantitatively the most important. It mobilized EUR490 million; that is, more than one-third of the expenditure under Axis 3. The other measures targeted the creation of micro-enterprises, the diversification of agricultural and forestry activities, the promotion of tourist activities, the conservation and development of the rural heritage, and last the training of those involved.

The evaluation of the causal effects shows[213] positive but limited effects of the Axis 3 measures on total employment. These effects are mainly associated with jobs in the sectors of trade and services to the population: 64% of the job gains attributable to these measures are in fact created in these sectors; that is, an average of nine jobs out of the 14.5 jobs that the Axis 3 measures were able to generate. The LEADER programmes do not appear to play a role in employment except when combined with Axis 3 measures. The impacts on the quality of life of the key Axis 3 measure devoted to the creation of basic services are also positive. In particular, this measure has encouraged the development of childcare services. In relation to improving the living conditions of rural populations, the simultaneous implementation of a LEADER programme increases the benefits. Finally, in terms of residential attractiveness, the achievements reached under this same measure and the LEADER initiative have modestly improved the migratory balance, however without significantly influencing the population trends in the rural areas studied. The structure of the population in these areas, which is proportionally older than in towns, largely determines the natural balance and has a greater influence on population trends than the measures in question.

The four strategic recommendations were: first, to strengthen the territories' capacity to support innovation and foster change; second, to strengthen integrated approaches at both the sectoral and territorial levels; third, to improve coherence with other programmes and policies; and last, to strengthen the territorialization of measures. Support for innovation and knowledge transfer is a priority of the CAP in the current period 2014-2020 through the use of the new instrument of the European Partnership for Innovation for Productive and Sustainable Agriculture (see Chapter 12). Priority 3 of the 2014-2020 programming period includes the recommendation relating to the organization of sectors, and the strengthening of the LEADER programmes that need to develop territorial approaches (this strengthening is however somewhat limited). What remains is the weakness of articulations with other policies, notably the European Cohesion Policy: on this point, no real progress has yet been made.

To sum up, it should be noted that measures specifically targeting the development of rural areas are not at the heart of the CAP, or even of its second pillar alone. The budgetary resources that these measures mobilize are modest. Their impacts are limited in scope, particularly in terms of economic development and demographic dynamics. These measures alone cannot meet the developmental challenges of Europe's rural areas. The question then arises as to whether the other CAP measures can have a positive effect on the development of rural areas. This question is the subject of the following section.

213. The methodological challenge of such an evaluation is to be able to reconstruct the unobserved counterfactual; that is, the characteristics of rural territories if they had not benefited from Axis 3 and Axis 4 support. Defining this counterfactual is necessary to compare performances, with and without support (Brodaty *et al.*, 2007).

What are the knock-on effects of the CAP as a whole on the development of rural areas?

One hypothesis, often implicit in the discourse on the role of the CAP in rural development, relates to the knock-on effects that support for agriculture would have on the economic dynamics of the territories that it primarily affects. The fact that the agricultural sector has the capacity to induce local economic growth is clearly established. On the basis of a review of the international literature, Léon and Surry (2009) thus conclude that the type I multipliers were between 1.1 and 2.5; these are the indicators that measure the knock-on effects that agriculture induces *via* its intersectoral relations with the productive spheres that are both upstream and downstream directly linked to it, which include goods and service industries related to the supply of seeds, fertilizers, pesticides, or animal feed, and industries involved in the collection, transport, and processing of agricultural products. This wide range reflects the contrasting spillover effects on the local economy, ranging from almost zero effects (when the multiplier is close to 1) to high effects (when the multiplier is close to or exceeds 2). These effects increase significantly (in a range between 20% and 80%) when the impacts of spending permitted by local household income supplements corresponding to the expansion of activity in the region (type II multipliers) are added. The magnitude of these knock-on effects varies significantly depending on the agricultural sector. Thus, when Cardenete *et al.* (2014) seek to assess the type I spillover effects of the various Spanish agricultural sectors in order to identify those that public policies could (should) support as a priority, they show that the livestock sectors have higher spillover effects than the crop sectors. Implicitly, it is on the basis of these results that Cerles *et al.* (2017) develop and explore different scenarios for the evolution of the ruminant meat sectors in the French region of the Massif Central by 2050, and the public policy instruments that could support them.

For these multiplier effects to be transformed into local economic development and to irrigate the entire local economy, two conditions are required: first, the weight of agriculture must be substantial; and second, the upstream and downstream sectors must already be present. If this is not the case, it is more difficult to envisage that these knock-on effects translate into an effective territorial dynamic. This is established by Abildtrup *et al.* (2012) in the case of Denmark: their analysis of the links between local population growth and local employment growth in the different sectors of economic activity reveals that the evolution of jobs within agriculture has no effect on the growth of jobs within other sectors of local economies. The same result was shown by Abildtrup *et al.* (2018) in the case of France, and by Cardenete *et al. (*2014) in the case of Spain (in that country with the exception of dairy farming).

Broadening the subject to regional economies and their inter-relationships, Bonfiglio *et al.* (2016) seek to assess the effects of the CAP on European regions at the NUTS3[214] level.

214. The Nomenclature of Territorial Units for Statistics (NUTS) is a hierarchical system for dividing up the economic territory of the EU. There are three nested breakdowns: NUTS level 1 corresponding to 104 "large" European regions; NUTS level 2 corresponding to 281 regions and used in particular to implement European policies when they include a regional dimension; and NUTS level 3 corresponding to 1,348 "small" regions and used in particular to carry out specific diagnoses. The regions eligible for the European Cohesion Policy are defined at NUTS 2 level, which is also used to draw up the annual reports on cohesion in the EU. For more details, see: https://ec.europa.eu/eurostat/fr/web/nuts/background.

Over the period 2007-2011, each euro of the CAP would have generated a growth in the regional Gross Domestic Product (GDP) of EUR0.70 on average, and all payments granted through this policy would have created 4.6 million jobs in the EU as a whole. Their *ex ante* assessment of the potential effects of the CAP for the 2014-2020 period concludes that the regional effects would be even greater. More than 50% of the effects on economic growth and more than 40% of the effects on employment would be extra-local; that is, outside the region where the CAP payments are made due to cross-sectoral economic relations. Thus, the effects of the CAP would be equally distributed between predominantly rural, intermediate and predominantly urban regions.[215] The rural regions, where the agricultural sector is the most significant, and the intermediate regions, where it remains significant, would each have received only one-third of the effects of the CAP, whereas they received more than half and more than one-third of the 2007-2011 CAP payments, respectively.

Looking at the effects of the CAP on another crucial dimension of economic and social development, that is, the reduction of inequalities, Azevedo *et al.* (2018) show that CAP funds are often but not systematically directed towards the regions where poverty is most prevalent. Within each MS, these funds go to their most deprived regions in the countries of Southern Europe (Spain, Portugal, Greece, Italy) and Central Europe (Romania, Bulgaria, Slovenia). In contrast, in Western European countries (Austria, France, Germany, Ireland, the UK) but also in Poland, Hungary, and Slovakia, the amounts per region are negatively correlated with poverty rates. Finally, and despite the heterogeneity of CAP budget allocations between and within MS, Azevedo *et al.* (2018) highlight a positive impact of the CAP on poverty reduction, notably through second pillar measures. Increasing farm incomes and improving employment and living conditions in agriculture supported by CAP measures lead to poverty reduction in regions where high poverty rates and a high share of agriculture in the regional economy are often combined.

Finally, the link between local agricultural dynamics, CAP support (mostly sectoral), and the economic and social development of rural areas appears to be significant. This role is particularly clear in the European rural territories strongly structured by agriculture such as many Bulgarian, Greek, and Romanian regions, and certain Croatian, Spanish, Polish, and Portuguese regions (Perpiña Castillo *et al.*, 2018). Moreover, because of the importance of intersectoral relations, which take place both within rural areas and between rural areas and other regions, the CAP is also likely to have a marked impact on areas that are not directly concerned by agriculture.

European Cohesion Policy and rural development

Chronological landmarks

While the objective of "strengthening the unity of the economies [of the EU MS] and ensuring their harmonious development by reducing the differences existing between the various regions and the backwardness of the least-favoured regions" was established within the Treaty of Rome from the outset in 1957, the wording in terms of economic and social cohesion

215. Considered here in the sense of European statistics with a share of the rural population in the regional population of more than 50%, between 15 and 50%, and less than 15%, respectively.

was not introduced into the EU Treaties until much later, in 1986, under the framework of the Single Act (European Community, 1987). The territorial dimension was explicitly added in 2007 with the Lisbon Treaty.

The European regional policy aims to reduce the disparities between the different regions of the EU; disparities that have mechanically grown with each successive enlargement of the EU. For example, the 2004 and 2007 enlargements to include countries in Central and Eastern Europe[216] increased EU's population by 20% but its GDP by only 5%. The disparities are assessed on the basis of the gaps in the wealth of the regions relative to the European average: the regions identified as lagging behind in development will thus benefit from significant aid, notably through the ERDF, in order to improve their infrastructures and attract productive investment. This strategy is based on the objectives of solidarity between countries/regions and efficiency, with economic and social cohesion being a condition for the success of the Single Act.

At the time of the 1988 reform of the Structural Funds, which accompanied the establishment of the Single Market, the cumulative allocations were doubled to ECU69 billion[217] for the period 1988-1993, an amount representing just under one-third of the total EU budget (Table 11.2).[218] One of the objectives on which the new intervention procedures are based directly concerns the development of rural areas. Objective 5b marks the period of clearer identification of rural areas in the European Cohesion Policy with the preparation of RDPs and the launch of the LEADER initiative in 1991. This period covers two programming phases until the Berlin agreements in 1999, which established the second pillar of the CAP. Since then, rural areas have been taken into account through both the Cohesion Policy and the second pillar of the CAP.

From the beginning of the decade 2000 onwards, successive programmes have targeted: first, the lagging European regions (regions in which the average per capita GDP is less than 75% of the European average); and next, the sub-regional territories within which rural areas may have a special place as areas that are exposed to the risks inherent in the rapid changes in regional economies. The main axes of intervention targeted the economic and social conversion in the period 2000-06 and competitiveness in the period 2007-2013. The Europe 2020 strategy, which aims at smart, sustainable, and inclusive growth, structured the programming for the current period 2014-2020. Rural areas are no longer identified as such. Since the disappearance of specific zoning for the construction of ERDF regional programmes, rural areas are incorporated into the broader regional entities to which they belong and are therefore treated within the overall dynamics of these regions.

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216. See Footnote 202.

217. In 1979, the EU then composed of nine MS adopted a common currency of account, the European Currency Unit (ECU). Its value was based on a basket of MS currencies defined according to their respective importance in production and intra-Community trade. The ECU served as a means of payment between the MS central banks and as a reference unit for indicators of divergence within the European Monetary System (EMS). The EURO succeeded the ECU, first in scriptural form (circulating by cashless means of payments such as bankcards or cheques) and then in cash form (coins and banknotes) from 31 December 2001.

218. This is in a context where the EU had enlarged to include Greece in 1981 and Spain and Portugal in 1986. More generally, the absolute amounts presented in Table 11.2 must take account of the successive enlargements of the EU. The percentage figures in this table are therefore more interesting when it comes to making temporal comparisons (rows in Table 11.2).

Table 11.2 Budgetary indications* for the place of rural territories in the successive waves of the European cohesion policy and the CAP (current ECU or euros).

Period	1988-1993	1994-1999	2000-2006	2007-2013	2014-2020*	2021-2027 (forecast)
European Cohesion Policy	69 (ECU billion**)	168 (ECU billion)	213 (billions of €)	347 (billions of €)	340 (billions of €)	330 (billions of €)
Share in the total EU budget	≈ 31%	≈ 30%	≈ 33%	≈ 35%	≈ 33%	29%
Of which for rural areas	Financing under Objective 5b: ECU 2.8 billion	Financing under Objective 5b: ECU 6.1 billion	Financing under Objective 2: €22 billion.	Financing under the EAFRD and the ESF*** (10 to 20%): €30 to 60 billion	na	≈ €2.6 billion
Budget for the second pillar of the CAP	No Pillar 2	No Pillar 2	na	€96 billion	€99.6 billion	€70 billion
Of which targeted rural development measures	No Pillar 2	No Pillar 2	na	€5 to 10 billion	€5 to 10 billion	na

Main sources: Jouen (2014, 2018); Darvas *et al.* (2019); * Budgets of European origin not including possible national and regional co-financing; ** Amounts in ECU and EURO can be compared; *** From the DG REGIO data for territories outside urban agglomerations; na: not available.

From a logic of zoning and cach-up to a logic of projects and targeting

The share of the European Cohesion Policy budget in the total EU budget reached a peak of around 35% over the period 2007-2013 (Table 11.2). It then fell by two percentage points in the 2014-2020 programming period. Within these envelopes, the share dedicated to the convergence objective is largely preponderant and absorbs around three-quarters of all cohesion funds.

The period 2000-2006 occupies a pivotal position. European cohesion policy aid targeted at rural areas comes under Objective 2 for areas facing structural difficulties (due to industrial change, agricultural crises, etc.), with the delimitation of the areas concerned giving rise to the establishment of a zoning system in each MS. During the period 2007-2013, this zoning was abolished (at least for the objective of regional competitiveness and employment). Funding was available to any region, including those classified as the least-favoured regions according to the convergence objective. The logic of zoning thus vanished from European policies for rural areas,[219] replaced by a range of projects under the Lisbon Strategy. The coherence of this strategy at the EU and MS levels is ensured by the dual channel of a European reference framework and national strategic plans. At the local level, integrated territorial development approaches are encouraged *via* in particular two tools open to all structural and investment funds: first, the Community-Led Local Development (CLLD), which was motivated by the success of the LEADER initiative; and second, the Integrated Territorial Investment (ITI), which brings together the resources of different funds in a given territory.

Today, support for rural development comes much more from the ERDF and the ESF than from the fund specifically dedicated to the second pillar of the CAP (namely, the EAFRD). The objective of territorial cohesion and the reduction of sub-regional disparities appear to be better adapted to the current development problems of rural areas (such as rural-urban relations, access to digital equipment, job and training creation, the revitalization of small towns, energy transition including housing, mobility, health, etc.). Agricultural activity is now only one of the key factors in the development of rural areas. In this vein, Jouen (2018) estimates that over the future period 2020-2027, rural territories should benefit from three times as much funding from the European Cohesion Policy as from the EAFRD; that is, around EUR2.6 billion compared to around EUR850 million.

Over and above the budgetary resources allocated to rural areas, the question that arises is how they are allocated and the priority that these areas are ultimately given in the national and regional strategies designed to mobilize the cohesion funds. The 2014-2020 programming of these funds was based on the so-called smart specialization approaches promoted by the European Commission. These approaches are inspired by the work of innovation economists and geographers (Forray, 2014). They seek to identify each region's resources and then

219. Measures under the second pillar of the CAP that directly concern the development of rural territories are also accessible to all types of territories with only rare exceptions (e.g., the measure for the renovation of rural villages whose eligibility is based on a definition of rural, which may vary from one region to another).

concentrate the funds on a limited number of fields of activity and technological sectors in which the region has, or aims to have, a comparative advantage at the global level. Drawing on these resources should make it possible to generate new innovative activities that will increase the competitive advantage of the territories. A total of 151 regions covering 90% of EU's population have used this framework to create their 2014-2020 development strategy and incorporate it into the European Cohesion Policy (McCann and Ortega-Argilés, 2014). The involvement of rural areas, even if they are beneficiaries of cohesion funds, only takes place as hinterlands or territories driven by an economic dynamic that is essentially led by the major urban centres.

As the programming methods for the period 2020-2027 have not yet been clarified, there is an opportunity to reflect specifically on the rural issues that a European Cohesion Policy should cover in a way that is consistent with its other objectives.

Towards an optimal development policy for Europe's rural territories

The existence of policies specifically dedicated to rural development is not self-evident. The declining evolution of the place reserved for them in the range of public actions attests to the doubts that accompany their conception. These policies are aimed at areas that share a set of characteristics, in particular in terms of density and remoteness correlated with significant and persistent differences in socio-economic conditions for businesses, households, or administrations. Documented observations and the explanatory capacities of regional economy mechanisms provide tracks for considering (re-considering) a theory of action in favour of a rural development policy.

Elements of a theory of action for the implementation of a rural development policy

The socio-spatial input from which rural development policies derive calls for three categories of problems to be addressed; that is, the mode of production, the way of life, and the mode of public administration. From the dual perspective of regional growth and territorial cohesion, we examine the specific problems that face rural areas and the tools available to correct the disparities identified.

The first problem relates to the social inequalities that manifest themselves to the detriment of agents settled in rural areas. Understanding and addressing these inequalities lead to a rural development policy focused on redistribution while taking into account the fact that many social policies also aim to achieve this objective. The question then arises as to the value of an additional specification attached to the rural location of individuals. The debate initiated when a Ministry of Territorial Equality was set up in France may shed light on this matter (Laurent, 2013). There exist two polar conceptions: first, the lack of justification for public intervention to correct inter-individual differences linked to geographical position in a society where everyone has the possibility of migrating to a more favourable place; and,

conversely, the need to equalize the living conditions of individuals above a certain threshold (whatever the reasons for their current situation). This is a conception stemming from the theory of equal opportunities that inspires the current policy of territorial redistribution. The aim is to equalize the resources available to individuals when these are insufficient due to circumstances that are beyond their control (Dworkin, 2000). Such is the case of a childhood spent in an environment that is not conducive to learning or the development of human capital, as the rural context often illustrates. A rural development policy can seek to correct these disadvantages and mitigate their consequences, for example through mobility and training aids. From a Rawlsian perspective of justice (Rawls, 1971), special attention should be paid to the most deprived since rural location can generate additional social difficulties due to isolation and remoteness from essential services such as education or health.

The second area in which socio-spatial differences are a problem concerns the contribution of rural areas to economic growth. The underlying argument is that the resources available in rural areas are not optimally used. Public intervention in rural areas is part of a rural development concept that should help to maximize the wealth of the EU and its MS (Hilal *et al.*, 2013). The rural characteristics of factor endowments and the conditions for their development cover two dimensions. First, there are particularities that stem from the nature of these endowments; that is, due to the low level of artificialization in rural areas, rural territories have a large amount of space and natural factors (soil, water, biomass, landscapes, etc.). The direct development of this space and these factors requires the establishment of activities to make intensive use of them, which are currently not particularly cost-effective and rely on indirect public financing of the positive externalities generated by their maintenance. The example of agriculture is enlightening in this respect. It is at the origin of amenities that are attractive features for households that are sensitive to their living environment and to non-market goods and services (as well as to low housing prices). The demographic dynamics thus triggered are able to, in turn, lead to the creation of service activities for the population. Second, there are peculiarities that relate to the scale of analysis; more specifically, the fact that rural areas do not form complete economic systems. In order to have all the resources necessary for the economic development of rural areas and to generate positive multiplier effects, industrial, logistical, and urban areas must be associated with them. It is at the regional level that the development of rural areas' endowments and their contribution to economic growth can be conceived.

The last point to consider is that of the mode of public administration. In unitary states, the conception of a policy such as the rural development policy is national, with its application in territorial contexts requiring local adaptations and relays. In federal states, this type of policy is designed and applied from the outset at the regional level. At the European level, it is the register of governance that is carefully examined; first, to analyze the conditions of concrete application of European measures (control of the effectiveness of the interventions and the good use of the means granted), then with a view to delegating the application (or even the design) of appropriate measures to more local levels. These different approaches are accompanied by a real difficulty in clearly identifying the relevant level of public action in favour of rural areas, including the geographical origin of funding.

At what geographical scale can/should rural development policies be developed and financed?

The political logic of EU construction, which has established subsidiarity as a principle of binding law,[220] is reinforced by the attention now being paid to the issues of decentralization and participation, which cut across all MS. The regional level has gradually established itself as the relevant level for designing and implementing measures linked to the Structural Funds. Thus, even in France, the 2014-2020 programming of the European Structural and Investment Funds (ESIFs)[221] has been delegated to the regions on the grounds of their greater proximity to territories and populations as well as their responsibility in the fields of economic development and spatial planning. Overall, the public economy perspective reinforces the assumptions in favour of local management while at the same time revealing important counterpoints that make it difficult to formulate an unequivocal vision of the optimal nature of the system to be promoted (Box 11.1).

The debate highlights the decisive nature of the public good[222] that a public policy intends to manage: if this public good is global, its design and implementation (production, financing, consumption) will be optimal at the national or supranational level; if it is local, the optimal level is lo*cal*. Consequently, cohesion policies of redistributive nature must be centralized because assistance to the most deprived has the characteristics of a global public good leaving little room for the voluntary commitment of contributors: in this sense, placing such policies at the European level is relevant. On the other hand, policies with a growth objective of an allocative nature (in the sense of allocating resources between territories) call for decentralization in order to take into account the diversity of local situations and the importance of the voluntary participation of local actors. Applied to rural development policies, which include these two aims of cohesion and growth, the solution can only be found by dissociating objectives and measures along a gradient from global to local; from EU to sub-regional territories. For measures that fall within the scope of European and national solidarity, such as those relating to the conservation of goods of a global nature the central level is the most appropriate with territorial relays to ensure effective implementation (access to information and monitoring of measures). For measures aimed at enhancing local resources and mobilizing economic agents, the local level is the most relevant when it is linked to a regional and national framework that allows for the coherence and regulation of all of the initiatives of the basic territorial units. Such rules of action highlight the absence of a simple and definitive solution for territorial organization. They underline the need for cooperation between

220. «Under the principle of subsidiarity, in areas which do not fall within its exclusive competence, the Union shall take action only if and in so far as the objectives of the proposed action cannot be sufficiently achieved by the Member States, either at central level or at regional and local level, but can, by reason of the scale or effects of the proposed action, be better achieved at Union level» (Article 5 of the Treaty on the Functioning of the European Union).

221. In Community terminology, we now speak of the ESIFs to refer to the ERDF, the ESF, the EAFRD, the Cohesion Fund, and the European Maritime and Fisheries Fund (EMFF).

222. The concept of public good, whether global or local, is defined and explained in the General Introduction to this book. The distinction between global *versus* local public good is also used to define the optimal level of intervention and financing of measures to better protect the environment and health (see Part II).

different territorial levels of administration in a process of multi-level governance, whereby rural development policies mainly involve the EU and the MS for measures to reduce social inequalities and regions and sub-regional territories for measures to promote regional growth.

Box 11.1. What does economic analysis tell us about the optimal level of policy deployment?

Two noteworthy formulations of the results of the economic analysis of public action highlight the importance of the heterogeneity of agents' preferences and the nature of the objectives pursued.

According to the decentralization theorem (Oates, 1972), the decentralized supply of a local public service is, for given production costs, more efficient than a centralized supply because it allows the heterogeneous preferences of local populations for the public service concerned to be taken into account. The optimal structure of the public sector would then correspond to defining possibly distinct perimeters for each type of public service. Such a configuration is not feasible because of the costs of organization and management. A compromise is then to match these optimal areas of intervention with the specific territories, a compromise that leads to favouring large scale development and centralization when economies of scale and spillover effects are significant.* Conversely, small scale development and decentralization occur when agents' preferences are heterogeneous and congestion effects are significant (Hall *et al.*, 2018).

The application of the decentralization theorem to redistribution policies is also a source of some difficulties. The implementation of these policies at the local level, both in terms of levies and transfers, raises problems of equity (people with identical positions with respect to fundamental rights must be treated in the same way regardless of their location) and adverse selection (redistribution policies that attract low income rights' holders and repel rich contributors). This is a strong argument in favour of centralizing redistribution policies. Nevertheless, Pauly (1973) considers that poverty alleviation can also refer to effective local management as proximity between donors and recipients can promote both willingness to pay and the monitoring of transfers.

* Economies of scale arise in the presence of indivisible costs where increasing the volume of production makes it possible to lower the average unit cost, while spillover effects are the opportunity for an agent located in one jurisdiction to take advantage of goods or services offered from another jurisdiction without incurring the cost.

Conclusion

This chapter has highlighted the paradox between a sectoral policy (the CAP) that explicitly displays a rural development objective (the development of rural areas), and a regional policy (the European Cohesion Policy) that does not explicitly display objectives for low-density areas.

Under the second pillar of the CAP, measures directly targeting non-agricultural rural objectives are, however, few in number, poorly resourced, and not particularly effective. This does not prevent the CAP as a whole from contributing to the objectives of reducing inequalities

and economic development. Observed in rural areas and European regions where the agricultural sector is still quite strong, these territorial impacts of the CAP are spreading, including to urban regions, thanks to the intersectoral relations that are maintained between the different regions. These observations constitute a strong argument for retaining a rural development objective for the second pillar of the CAP while ensuring that the funds earmarked for this purpose are not lost in the mass of agricultural aid.

In the European Cohesion Policy, it is difficult to precisely quantify the funds set aside for rural areas even if all indicators suggest that the amounts in question are likely to be higher than those coming from the specifically rural measures of the CAP. In order for them to be adapted to the specific development issues in the rural context, it is necessary to return to the clear identification of these issues so as to define the objectives of European policies in this area, the measures to be put in place, and the geographical levels at which they should ideally be implemented.

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12. The CAP and Innovation

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At any time and in any place throughout history innovation has played a key role in the transformation of agriculture. A period of intense transformation of European agriculture was seen in the aftermath of the Second World War when priority was given to increasing production and improving the partial productivities of land and labour. Innovation remains just as crucial today in meeting the exceptionally complex challenges of the sustainability of European agriculture that include, beyond the productive and economic dimensions, environmental, health, nutritional, and social aspects. To this end, no area of innovation can be ruled out *a priori* provided that the consequences of any innovation on all components of sustainability are assessed. Within this context, this chapter describes: first, how innovation can meet the challenges in developing the sustainability of European agriculture; second, how European policies and more specifically the CAP support innovation; and last, an analysis of the strengths and weaknesses of this support in order to draw recommendations for increased its effectiveness and efficiency.

We start with some vocabulary definitions and clarify the meaning of the terms, "research", "development", and "innovation". The Organisation for Economic Co-operation and Development's (OECD) Frascati Manual[223] differentiates between basic research, applied research, and experimental development: basic research is said to be free when it is developed with the sole aim of increasing scientific knowledge and is oriented towards making a theoretical contribution to the solution of technical problems; applied research aims to identify possible applications of the results of basic research or to find new solutions to achieve a predetermined objective; finally, experimental development is based on knowledge obtained through research or practical experience and is carried out (by means of prototypes or pilot plants) with a view to launching new products, establishing new processes, or substantially improving existing ones. Innovation includes experimental development as defined above; however, the concept is broader as it also includes various forms of so-called organizational innovations relating to new forms, modalities, and methods of work. Innovation can therefore be defined as "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations" (OECD, 2015). This definition opts for an entry by the final objective of innovation by distinguishing between product (in the

223. This manual sets out guidelines for OECD member countries to follow in collecting and reporting data on research and experimental development (OECD, 2015).

broadest sense, including services), process, marketing, and organizational innovation. Its simplicity masks the fact that very often an innovation is not reduced to a single form. Leuwis and Aart (2011), for example, define innovation as the successful combination of new technological devices (hardware), new knowledge and ways of thinking (software), and new forms of institution and organization (orgware). This multi-dimensional definition applies in particular to innovations in the redesign of agricultural systems; a redesign that combines the three components as outlined above (see Chapter 8). In addition, the OECD definition does not include innovation actors that are involved in both the supply and use of innovation. These actors (researchers, firms, consumers, citizens, public authorities, etc.), their interrelationships, and the arrangements put in place to foster them form an innovation system (Hall *et al.*, 2006). Last, while innovation has long been considered an unambiguous source of economic development (Schumpeter, 1942),[224] this is no longer the case today, at least not automatically and/or for all forms of innovation. This is particularly true for agriculture and food production because of the potentially negative impacts of certain innovations on the environment, health, or social ties. This chapter takes a broad view of the forms of innovation, by analysing their underlying processes and actors, and considering their impacts on all dimensions of European agricultural sustainability.

The issues at stake

There is no doubt that research and innovation are two essential components in the sustainability of European agriculture. The priority targets of this research and innovation are, by contrast, the subject of lively (and sometimes controversial) debate, driven in part by differing and even opposing visions of what European agriculture (and beyond that European society) should become in the future.

The difficulties in prioritizing innovation targets and pathways...

For a considerable length of time and at least until the early 1990s, research and innovation have focused on productive aspects such as an increase in output and on economic aspects such as an increase in the Total Factor Productivity (TFP) and the partial productivity of labour and land, which was also expected to increase income per unit of labour.[225]

224. This is despite the fact that the creation of innovations that give their initiators momentary leadership leads to market losses and a drop in profits for other players, which can even lead to bankruptcy (a process known as creative destruction).

225. Whereas partial productivity of a factor relates output to the quantity of that factor, TFP relates the same output to all factors used in production. An increase in the first ratio reflects the fact that to produce the same quantity of the good, a smaller quantity of the factor under consideration is used, possibly increasing that of another factor (in the case for example of a substitution of labour by intermediate consumption). In contrast, an increase in TFP reflects a better efficiency of all the factors of production used in the denominator of the ratio, possibly to the detriment of the over-exploitation of natural resources and environmental degradation. This is why so-called increased TFP indicators take into account the quality of the land factor and/or include natural capital as production factors; on this point, see for example:https://www.oecd.org/agriculture/topics/network-agricultural-productivity-and-environment/.

In terms of production growth as well as productivity growth, the success has been undeniable. However, this is less true today. The European Commission thus notes that the annual growth of TFP in the EU-28 fell over the decade 2005-2015 (+0.8%), compared to the 1995-2005 decade during which it was already modest (+1.0%). The decline was particularly marked in the EU-15, which saw the annual growth of its TFP fall from +1.3% over 1995-2005 to only +0.6% over 2005-2015 with considerable variability between European countries (European Commission, 2016a). This slowdown of TFP is now compounded by the negative environmental and health effects of the large majority of agricultural and food systems (see Part II). Therefore, meeting the challenges of productivity, income, environment, and health simultaneously requires even more innovation today.

While in the recent past there was at least a large majority of consensus within European society on defining targets and the path of innovation, this is no longer the case today. There are four main reasons for this, which are closely intertwined.

- First, the goal of sustainability cannot be limited to the farm and must include the vertical (commodity chains) and horizontal (areas and regions) environment of farms, which are two dimensions often found together (territorialized food systems). The interests of the different actors in these chains and territories do not always converge.
- Second, the different dimensions of sustainability are at best difficult to reconcile at least in today's institutional and regulatory framework where negative environmental and health impacts are barely internalized into the prices of products and production factors, and therefore scarcely taken into account in the decisions of private actors.[226] This also applies to the positive effects on the environment and health, which are difficult to value on the markets because they do not exist or are not complete (see Part II).
- Third, unlike at the creation of the CAP, there is no particular consensus on the European agricultural model of the future. In other words, it is not so much the objective in itself that makes the task difficult as there is no disputing the fact that European agriculture must be sustainable into the future: rather, the path to achieve this objective and the innovation targets that support it are unlikely to be found in a single option, and there must therefore be scope for backtracking if a solution advocated at one point is less effective than anticipated.
- Finally, as a direct consequence of the third point, certain categories of innovation are rejected by some stakeholders as illustrated by the rejection of Genetically Modified Organisms (GMOs), the industrialization of Organic Farming (OF), or the use of digital technology in European agriculture even though, together with other components, they can contribute to greater sustainability (Box 12.1).

226. This second point also underlines the failings of public authorities, which are responsible for defining the institutional and regulatory framework to allow the consequences of private actors' decisions on the environment and health to be internalized.

Box 12.1. Digital dimensions for the sustainability of European agriculture.

Digital agriculture can be simply defined as the application of New Information and Communication Technologies (NICTs) to agriculture. It is seen by some of its strongest proponents as the third green revolution and covers three interrelated dimensions:

- Systems for collecting, processing, storing, and disseminating large volumes of data in order to facilitate the tactical and strategic management of farms and their linkage to markets;
- Precision agriculture through the development of decision support tools and farm equipment using satellite data, drones, etc. allowing the management of the spatial and temporal variability of production conditions in order to limit the use of exogenous inputs (the right dose at the right time) for both economic and environmental benefits; and
- The automation and robotization of agriculture using automatic controls, robotics, and artificial intelligence techniques to facilitate the various tasks of the farmer*.

Seen from the farmer's point of view, digital farming is mainly a process innovation, often involving organizational innovation within the farm through its impact on work organization, new skills to be acquired, etc. If it is criticized, it is primarily because it can lead to a loss of autonomy and a risk of dependency for farmers if the data are controlled by external companies without transparency on the reliability of the advice given and/or the relevance of the recommended equipment. Additionally, it would promote greater efficiency in current agricultural practices and systems at a time when the scale of the challenges facing European agriculture necessitates their redesign (see Chapter 8). In other words, its detractors fear that digital technology will contribute to reinforcing the hold of the currently dominant socio-technical model. Without underestimating this threat, digital technology is also an opportunity to redesign agricultural and food systems beyond the sole objective of making current practices more efficient. This technology can be used for traceability and the certification of production methods and product origin, and can support increased product differentiation, the development of Payments for Environmental Services (PESs), or the development of insurance products. It can also reduce the costs of collecting and managing information for all stakeholders (first and foremost, the farmers) and can facilitate renewed solidarity within territories, between farmers (exchange of plots, equipment, production, etc.) and between farmers and other stakeholders in these territories (on-farm catering and accommodation, free space for a caravan or boat near a holiday resort, etc.). Digital technology, insofar as it makes it easier to measure impacts of farming practices and systems, can be a vector for switching from an approach based on an obligation of means (of practices) to an approach based on an obligation of results (benefits in terms of soil and water protection, biodiversity preservation, carbon storage, etc.), which would be valued through public aid (thus better legitimized) and by markets of products and/or services.

Therefore, the changes that digital technology can bring to agriculture potentially go far beyond the farm itself. This can be illustrated by the example of the "connected bee hive" in France**. The development of mobile networks was first used to report the looting and theft of bee hives. The implementation of temperature and noise sensors inside the hives has made it possible to verify that the hives are alive and to optimize the number

of physical visits to the hives by beekeepers. Scale systems are used to monitor the production of honey with the weight of the hive increasing regularly throughout the season. This technology also provides information on the inflow and outflow of worker bees in a context where a deficit in the bees' return to the hive is an early signal of a possible problem in their foraging environment. The last step goes even further by entrusting beekeepers with a new mission besides that of honey producers (and crop pollinators), with bees being the potential sentinels of environmental quality. Local authorities and private companies are taking advantage of this technologically connected opportunity to communicate environmental considerations in their Corporate Social Responsibility (CSR) approaches.

* https://www.smart-akis.com/index.php/fr/reseau/quest-ce-que-l-agriculture-numerique/
** https://positivr.fr/label-abeille-ruche-connectee/

...remind us to utilize all possibilities for innovation ...

The various difficulties listed above are all uncertainties. They encourage us to avail ourselves *a priori* of any components of innovation in terms of both the targets and the paths to be taken provided that the impacts of any innovation on all dimensions of sustainability are assessed, both *ex ante* and *in itinere* so as to take the necessary corrective measures if necessary. Measuring all impacts is all the more crucial given that the issues of productivity, competitiveness, and income on the one hand and environment and health on the other are at best difficult to reconcile.

Many areas of innovation can indeed contribute to a greater sustainability of European agricultural and agri-food systems and the territories in which they are embedded. The European Commission thus identifies five priority areas for research and innovation: first, the sustainable management of resources in particular soil, water, biodiversity, and genetic resources; second, plant and animal health; third, integrated ecological approaches at different scales from the farm to the landscape; fourth, the creation of markets for goods and services to foster economic growth in rural areas; and last, the development of human and social capital in rural areas (European Commission, 2016b). Each of these five areas is broken down into a set of targets. For example, for the area of plant and animal health, attention must be focused on: first, prevention rather than curative treatments; second, tools for detecting and controlling plant and animal diseases; third, a reduction in the use of pesticides and antibiotics; fourth, the relationship between animal feed and animal health; and fifth, animal welfare. These five priority domains are further complemented by five additional cross-cutting areas corresponding to the most desirable features of research and innovation activities: first, the multiplicity of possibly conflicting issues requires systemic and integrated approaches; second, the need to respond as well as possible to societal expectations requires the commitment of the whole society; third, information and communication technologies act as a facilitator; as do, fourth, research and innovation infrastructures; and fifth, work in economic and social sciences. For their part, Détang-Dessendre *et al.* (2018) identify seven priority areas of innovation corresponding to genetics and breeding, big data and digital technology for

precision agriculture, bio-based materials, the provision of ecosystem services, the foundation of food systems on the principles of the circular economy, agricultural practices to be co-constructed within the framework of innovation mechanisms open to all stakeholders and taking into account farmers' knowledge and know-how, and last, social innovation.[227] The European Parliament, for its part, opts for a cautious approach by presenting potential areas of innovation without aiming at exhaustiveness (McEldowney, 2019).

...and to focus attention on the functions of the innovation system

Insofar as innovation targets and pathways cannot be clearly prioritized and are more akin to an inventory of possibilities, the question of the legitimacy and modalities of public support for innovation is analysed here by focusing on the performance of the innovation system, its components, and their interrelationships.

In simple terms, an innovation system is a network of public and private organizations down to the individual actors, which, through their activities and interactions, create, accumulate, and transfer knowledge, skills, and objects that are the source of innovations. The concept places the flows of information, knowledge, know-how, technologies, etc. at the heart (OECD, 1997). The key actors involved in these flows vary according to the innovation regime under consideration.[228] Regardless of the regime, seven functions must nevertheless be ensured for the effective functioning of any innovation system (Hekkert *et al.*, 2007). These seven functions are summarized below in the case of the innovation system relating to agriculture, agri-food chains, diets, and the development of rural territories:

- Function 1 corresponds to entrepreneurial activities. Entrepreneurs are essential for transforming ideas, knowledge, networks, processes, or market opportunities into concrete actions leading to product, process, marketing, or organizational innovations. They can be insiders (actors already present) as well as outsiders (new actors finding the possibility of a new application in the field under consideration). Without entrepreneurs (as defined above) who are willing to take risks, there can be no innovation. Government intervention may be required if there are too few entrepreneurs, if they refuse to take risks that are too high (radical innovation), if innovation is not valued by markets even though it is desirable for example because it generates environmental benefits, etc.;
- Function 2 (the development of knowledge) and Function 3 (the dissemination of knowledge through networks) are equally essential. The traditional actors of knowledge, both

227. The last two areas identified by Détang-Dessendre *et al.* (2018) focus on characteristics of the innovation process yet to be mobilized. The first five areas are thematic priorities.

228. Three main innovation regimes can be distinguished. The regime of centralized innovation and knowledge transfer corresponds to a linear model in which knowledge is produced by research, distributed by training and advice, and implemented by entrepreneurs. The regime of distributed innovation and knowledge circulation is based on the sharing of information (knowledge and technology) between multiple actors from whom new ideas and applications are expected. The origin of the initial knowledge is always a research actor. This is in contrast to the third regime of collective experimentation and co-creation of knowledge in which the origin of knowledge can be co-produced by all actors. This third regime applies in particular to bottom-up approaches emanating from actors in the field.

theoretical and applied, are public institutions and private research and development companies (specialized companies and dedicated departments of pluralistic companies). Farmers are also producers of empirical knowledge that must be identified, characterized, and qualified (in the sense of their possible extrapolations and under what conditions to contexts other than those in which they were initially conceived and experienced). Function 2 includes the two dimensions of "learning by searching" and "learning by doing". Function 3 includes training, both initial and in-service, and counselling, which can be provided by different actors and by different models. It also includes innovation brokers and more generally more-or-less formalized networks that promote the flow of information. It aims to promote "learning by interacting" and when networks include producers of innovation, whomever they may be, "learning by using". The research does not allow us to conclude as to the superiority of one model of organization of these two functions over another. Government intervention will first have to ensure that they are carried out in an efficient and non-exclusive manner. This includes ensuring that no innovation regime[229] is undervalued, let alone excluded;

• Function 4 relates to the direction of innovation. Unlike Functions 2 and 3, which do not discuss the direction of the knowledge production and sharing processes, this fourth function is about setting the direction of innovation in a context where there are many costly options and both financial and human resources are limited. In other words, Function 4 is that of the innovation selection process. This function may appear to contradict the recommendation of the previous sub-section, which calls for availing oneself *a priori* of any innovation lever. This contradiction will be partly erased by noting that the function aims in particular to ensure that the direction of innovation meets collective expectations; that is, the sustainability of agricultural and food systems and the territories in which they are located and not only those of certain categories of stakeholders, whomever they may be. From this perspective, public authorities play an essential role through the implementation of the regulatory framework that best aligns the decisions of private stakeholders and the interests of society as a whole. Innovations that make it possible to reduce negative effects on the environment and health will develop especially as the costs of these effects are internalized and thus taken into account in the choices and decisions of all players. The same applies to innovations that increase the supply of positive ecosystem services, which will develop all the better as the regulatory framework allows them to be valued by the taxpayer and/or the final or intermediate user (see Chapters 7 and 8);

• Function 5 corresponds to the creation of markets. This is seen as one of the means of fulfilling the fourth guidance function through the creation and development of markets that are to be understood in a broad sense. They therefore include markets for new goods and services (products of on-farm production diversification and ecosystem services) and markets for process innovations corresponding to more virtuous agricultural practices and systems. Public intervention is justified here if the innovation targets market failures that make it difficult for the innovation to develop even though this development would generate public

229. See footnote 224.

benefits in terms of the environment, health, and social relations, etc. Public intervention can take several forms that are not mutually exclusive: new standards, taxes and subsidies, purchase obligations, etc. However, public support for an emerging industry is not without its drawbacks. These drawbacks have been studied within the framework of the theory of support for an emerging industry: the remedy may prove worse than the harm if the public benefits are not forthcoming, and the support then caught by one or more private players at the expense of all the other players and, ultimately, of the collective interest;

- Function 6 relates to the mobilization of resources, both financial and human. It strongly conditions Functions 2 and 3 relating to the creation and circulation of knowledge, especially when innovations target public goods and require infrastructure that is costly to maintain over a long period. It is also an action lever for Function 1, especially when the innovation involves farmers at its conception and adoption, and for Function 5 relating to the creation of markets; and
- Hekkert *et al.* (2007) identify a seventh function related to creating legitimacy and capacity to counteract resistance to change. This last function aims to make an innovation part of the dominant regime, or even to change it. Many existing actors will oppose an innovation that is contrary to their interests. For Hekkert *et al.* (2007), this means forming coalitions of advocates (in the broadest sense of the term) who will act as catalysts by putting innovation on the agenda (Function 4), by creating markets (Function 5), or by lobbying to attract resources (Function 6). Such coalitions do not automatically mean progress for society as a whole. They need to be overseen, particularly in the framework of Function 4 on the orientation of research and innovation.

The European strategy for research and innovation in agriculture

The European Commission is mobilizing two main policies to support research and innovation in the sustainability of agriculture, food, and rural development: the European Research Policy (called Horizon 2020230 in the 2014-2020 programming period, and Horizon Europe in the future 2021-2027 programming period) and the CAP. The European strategy in these two closely related areas was updated as part of a process initiated in Milan in June 2015 on the occasion of the World Expo, followed by a conference in Brussels in January 2016231 where the European Commission presented a synthesis report explaining why such a strategy was needed, its priority areas, and how it would be implemented (European Commission, 2016b). More than two years later, in May 2018, a further conference was held in Brussels to make an initial assessment of the implementation of the strategy.[232]

230. https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-2020_en.
231. https://ec.europa.eu/eip/agriculture/sites/default/files/field_event_attachments/re_programme_20160126-28_en.pdf.
232. https://ec.europa.eu/eip/agriculture/en/event/agriresearch-conference-%E2%80%9Cinnovating-future-farming.

The strategy's priorities for research and development target five thematic areas and five cross-cutting issues. Its implementation is based on some opportune main principles: first, building the European Research Area (ERA) and within this framework encouraging synergies between Member States (MS) and at the European level; second, fostering international cooperation; third, providing space for new approaches and new technologies; fourth, developing complementarities and synergies with private sector research; and fifth, stimulating the implementation of research and innovation by mobilizing in particular the tool of the European Innovation Partnership for Productive and Sustainable Agriculture (EIP-AGRI). The strategy covers research and innovation with varying intensities according to the priorities and instruments used under each principle without it being possible to clearly (and carefully) distinguish, with only a few exceptions, those that relate to support for research *versus* innovation. Moreover, the European Commission's official position papers do not make it possible to assess the concrete effectiveness of the implementation of the strategy in terms of its impact on innovation and downstream sustainability. This is because these documents are mainly focused (and this is already a commendable first step) on the budgetary resources allocated to a particular thematic or cross-cutting priority with, at best, a brief description of the objectives of the various underlying projects.[233] In other words, the focus is on the budgetary resources[234] and their allocation; much less on the results and impacts of the actions in terms of innovations and their effects on the different compartments of sustainability. In a context where the time required for innovation is well over two- or three-years' duration, it would nevertheless be unwise to draw definitive conclusions from a mid-term evaluation.

The European Innovation Partnership for Productive and Sustainable Agriculture

It is mainly through the EIP-AGRI that the EU supports innovation. Its purpose is to bridge the gap that may exist between research (in all its forms) and innovation (also in all its forms: processes, products, practices, systems, organization, etc.) To this end, the primary objective of the EIP-AGRI is to promote the flow of information and the transfer of knowledge and innovations between all actors in the innovation system including farmers, foresters, researchers, consultants, small- and medium-sized enterprises, local authorities, non-governmental organizations, etc. The EIP-AGRI corresponds to a set of instruments insofar as the scheme includes multi-actor projects, thematic networks, knowledge exchange networks, operational groups, and a cross-cutting support service. Multi-actor projects are finalized and applied research projects defined in response to stakeholders' needs (problem solving); they must provide knowledge and solutions that are easy to implement and translate into innovations.

233. https://research-and-innovation.ec.europa.eu/research-area/agriculture-forestry-and-rural-areas_en.
234. These resources dedicated to research and innovation are important, in particular under the Horizon 2020 policy (2014-2020), which devotes around EUR4 billion to societal challenge 2 (food safety; sustainable agriculture and forestry; marine, maritime, and inland waterways research; and the bio-economy). Other parts of the Horizon 2020 policy are also relevant to agriculture, agri-food industries, food, or rural development. The budgetary resources allocated under the CAP are more modest amounting a few hundred million euros.

Thematic and knowledge exchange networks do not aim to create new knowledge *per se,* but to identify and share research results and best practices that could easily and quickly be translated into innovations. These first three instruments are mainly facilitative or accelerative in nature and are funded under the Horizon 2020 policy. Operational groups bring together actors who collectively work on practical solutions to a concrete problem. One of the actors faces a problem or has an idea. This actor joins forces with relevant partners who together draw a roadmap that includes an objective, the tasks required to achieve it, the distribution of tasks among actors and over time, a budget, and the dissemination of results. The partnership composition of these groups varies according to the theme but they most often include farmers, especially as they were the originators of the idea that needs to be transformed into an innovation (the bottom-up approach). According to the European Commission itself, the operational groups are the centrepiece of the IEP-AGRI.[235] The cross-cutting support service aims to ensure the overall coherence of the system through the coordination of the IEP-AGRI networks at European, national, and possibly regional levels in certain MS (particularly those where the regions are the managing authorities of the second pillar of the CAP). It includes activities developed for the dissemination and circulation of knowledge. Within this framework, focus groups are established to take stock of knowledge (theoretical and practical) on a given topic in order to propose priority areas for innovation. These groups generally include approximately 20 experts (from all fields) who over a specific period of time (a number of semesters) produce a report that is disseminated with the transversal support service of the IEP-AGRI.[236] The two tools of the operational groups and the transversal support service are financed by the second pillar of the CAP.

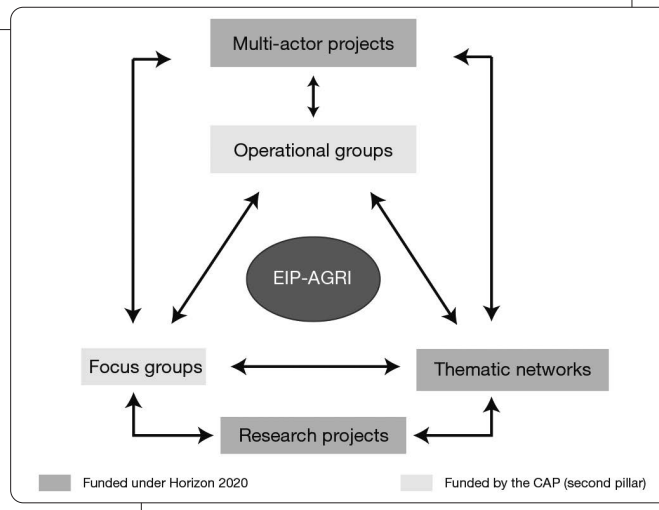
Figure 12.1 provides a graphical representation of the EIP-AGRI, each of its tools, and their linkages. The recent implementation of the scheme in the framework of the 2014-2020 programming of European policies makes it difficult, and perhaps premature, to assess its concrete scope today. The European Commission's mid-term evaluation is thus presented as a set of useful statistics but does not make it possible to analyse the concrete translation of the strategy into innovations.[237] In the following section, we use the theoretical framework of the seven functions of an innovation system presented earlier to propose a more qualitative analysis and to formulate recommendations to improve the efficiency of the system.

235. https://ec.europa.eu/eip/agriculture/sites/default/files/eip-agri_brochure_operational_groups_2014_en_web_updated_01032016.pdf.

236. https://ec.europa.eu/eip/agriculture/sites/default/files/eip-agri_brochure_focus_groups_2016_en_web.pdf.

237. Over the first three years of the 2014-2020 programming period, 140 multi-actor projects and 40 thematic networks with a total value of around EUR1 billion have been initiated under the Horizon 2020 policy. In these two types of actions, one participant out of two is a new actor who had not previously benefited from the European Research and Innovation Programme; these new actors are often agricultural producer organizations, agricultural advisory bodies, technical institutes, territorial development bodies, or local authorities. Over the same years, 600 operational groups were set up. At the end of November 2018, the figure was 900 and at the end of the seven years of programming, it is expected to be 3,200 (McEldowney, 2019).

Figure 12.1. The European Innovation Partnership for Productive and Sustainable Agriculture (EIP-AGRI).



Source: According to various documents of the European Commission.

Other CAP instruments

Measures under the first pillar of the CAP do not explicitly target support for innovation. However, direct aids under this pillar and the way in which they are granted can have an indirect impact on innovation through two main channels: first, by influencing farmers' behaviour; and second, by encouraging innovation (top-down or bottom-up) in response to constraints or positive incentives such as cross-compliance and greening. Direct aids can thus reduce the possible budgetary constraints of some farms and encourage their investments. Through stabilizing farm incomes (see Chapter 6), these aids can also encourage greater risk-taking and the adoption of new farming practices and systems. To the best of our knowledge, only Van der Meulen *et al.* (2016) have attempted to analyse the possible link between subsidies and farmers' probability of innovation. They conclude that subsidies (aggregated, without distinction of origin from the first or second pillar) would have a positive impact on the probability of adopting process innovations, but not product or organizational innovations; some *a priori* surprising results (such as a significant negative impact of cash flow on the probability of adopting innovations all together and organizational innovations in particular) nevertheless suggest that the equations are not statistically very robust. From the same perspective, cross-compliance and greening measures could have a positive impact on innovation by driving the development of new, more environmentally friendly practices. This effect is likely to be moderate given the modest nature of the constraint (see Part II).[238]

238. This effect corresponds mainly to Function 4 (orientation of innovation) of an innovation system.

Second pillar instruments other than those mobilized in the EIP-AGRI can also foster innovation. This is the case of the Agri-Environmental and Climate Measures (AECMs), which, with the exception of Function 5 relating to market creation, can contribute to all other functions of the innovation system. This is also the case for investment aid, which can encourage entrepreneurial activity (Function 1), innovation orientation (Function 4) and resource mobilization (Function 6). Other instruments under the second pillar include support for quality systems, farm and business development in rural areas, the development of basic services and village renewal in rural areas, the establishment of producer organizations, and support for more animal welfare friendly production systems. As far as we currently know, these instruments under the second pillar have not been evaluated in terms of their capacity to foster innovation.[239]

Recommendations

As part of the exercise to prepare for the post-2020 CAP, the European Commission recognises, at least implicitly, that innovation is a weakness of European agriculture when measured by the growth rates of TFP (European Commission, 2017). It also points to a technological backwardness of small agricultural structures aggravated by a low level of connectivity in rural areas, low investment by farms on average, and the weaknesses of Agricultural Knowledge and Innovation Systems (AKISs) in a large number of MS, those of the EU-12 in particular. In a study of eight European countries, Van der Meulen *et al.* (2016) find that annual adoption rates of process and product innovations by farmers as first adopters are extremely low (2%), but adoption rates by farmers of these same innovations as second adopters are significantly higher (30% for process innovations and 13% for product innovations), as well as for organizational innovations (14%) without distinguishing here between first and second adopters.[240] These adoption rates increase with the (economic) size of the farm and decrease with the age of the farm manager. On a macroeconomic level, McEldowney (2019) notes that public research and development spending on agriculture in the EU-28 has stagnated since the beginning of the decade 2010 at EUR3 billion per year (after having increased slightly between 2005 and 2010); and more than 90% of this expenditure is carried out in the EU-15 MS.[241] In relation to the gross value added of agriculture in the EU-28, the public research and development effort is therefore tending to decrease, from 2.4% in 2009 to 1.8% in 2014. Nevertheless, the share of public R&D expenditure devoted to agriculture is higher than the share of this sector in the EU's Gross Domestic Product (GDP). Finally, as innovation must be part of the response to environmental and health challenges, it is clear that the result has fallen short of expectations (see Part II).

239. Détang-Dessendre *et al.* (2018) analyse how the different instruments of the two pillars of the CAP can target one or more of the seven functions of an innovation system.
240. The eight MS analysed are Germany, Finland, Greece, Hungary, Ireland, the Netherlands, Poland, and Spain. The averages calculated over these eight MS mask large differences between countries.
241. As a result, spending has decreased in real terms that consider inflation. Heisey and Fuglie (2018) make the same observation for all high-income OECD countries.

It would be easy to conclude from this information that the public effort of MS and the EU in research and innovation for the sustainability of agriculture, agri-food, food, and rural development is insufficient. This assessment is likely because most of the research and development effort in agriculture is (as it has been in the past) in the public domain (Pardey *et al.*, 2013),[242] and many challenges concern public goods that are poorly taken into account by private actors alone, including those in research and development. Nevertheless, it is not possible to have a clear and robust picture of the public and private expenditure that each MS and the EU devote to research and innovation, and more specifically to innovation.[243] Moreover, research and innovation efforts should be assessed according to their impacts on productivity, income, environment, health, and rural development. Moreover, beyond effectiveness (obtaining a result without it being known whether a better use of resources could have been made), it is efficiency that matters most (maximizing the result in relation to the resources devoted). This efficiency perspective leads us to focus attention on the functions of the innovation system and to analyse, within this framework, how European policies and the CAP in particular could act.

Increasing the efficiency of public support for innovation in agriculture

The EIP-AGRI system is recent. Introduced in 2012, it was not concretely implemented until 2014. For this and other reasons, it is extremely challenging to make a complete and robust analysis of its effectiveness. Nevertheless, it should be stressed that the scheme is intended to remedy clearly identified shortcomings, in particular the gap between research and innovation (the insufficient translation of research results into innovation), which the EIP-AGRI seeks to bridge by promoting complementarities and synergies between projects relating to research and the European Research Policy on the one hand and projects relating to innovation taken jointly by the Horizon 2020 Policy and the CAP on the other. Although the European research and innovation strategy focuses on five thematic and five cross-cutting issues, the EIP-AGRI does not exclude *a priori* any lever of progress in particular in terms of targets, those corresponding to public goods and, in terms of innovation regimes, those corresponding to bottom-up approaches from the field. In this context, the focus of the EIP-AGRI on the circulation of knowledge is more than welcome and this scheme should therefore be continued. It must be supplemented so as to increase its effectiveness and efficiency. The following recommendations are aimed at achieving this objective by reviewing the various functions of an innovation system and ensuring they are fulfilled.

Function 1: Development of entrepreneurial activities

The risk-taking by farmers that is inherent in the adoption of exogenous innovation and/or endogenous change in farming practices, let alone farming systems, should be supported

242. The analysis of Pardey *et al.* (2013) is at the global level and not specifically at the level of the EU and/or its MS.

243. This finding is not specific to the EU and/or its MS. Heisey and Fuglie (2018) highlight that «it is difficult to compare the amounts of public and private spending on agricultural research and development between countries and even between global regions».

by the CAP. This support for risk-taking would apply only for a temporary period, fixed in advance, and defined as the learning by doing period. Corresponding aids would be higher for first-time adopters than for second-time adopters. Beyond the transition phase, this risk-taking support could be complemented by permanent support when the innovation targets a public good; however, care should be taken not to transform this support into a rent and/or if it hinders the development of markets for products and services from farms that are more respectful of environmental, health, or social public goods (see Chapter 7). Further, under Function 1, the EIP-AGRI would benefit from better involving all the actors, including consumers and citizens, within the framework of Public-Private-People (PPP) partnerships because of the non-unity of the paths of progress and the contestation of certain forms of progress by at least part of European society. From this perspective, the EIP-AGRI toolbox should include a new instrument; that of living labs. Generally speaking, a living lab is an open innovation device in which any progress towards a solution is co-constructed by and with all users, both direct users (that is, those directly concerned by the innovation) and indirect users (that is, those indirectly concerned by the innovation in the sense that it can positively or negatively impact them), and which is tested and implemented under real conditions.[244] Living labs will promote the entrepreneurial spirit and risk-taking by increasing the acceptability of innovations by all stakeholders because they will have been co-constructed. While multi-stakeholder projects have enabled the participation of new direct users, living labs will also encourage the participation of indirect users. In this sense, they will ensure a greater efficiency of Function 7 relating to the creation of legitimacy/capacity to counteract resistance to change.

Functions 2 and 3: Knowledge development and Knowledge exchange

Functions 2 and 3 relating to knowledge development and exchange, respectively, are at the core of the EIP-AGRI and its various instruments. The EIP-AGRI is well perceived by stakeholders in the agricultural and forestry sectors who consider that it is thus easier to engage in the innovation process through the operational groups (European Commission, 2016c). The success of this instrument of the EIP-AGRI is nevertheless uneven across MS and even between regions within a given MS (Van Hoye, 2017; Détang-Dessendre *et al.*, 2018). In particular, it appears that the creation and circulation of knowledge is real within the operational groups but that there is little outside of them. With this in mind, we make three main recommendations.

- First, to set up an exhaustive, harmonized, and easy-to-use database of the themes analysed and experimented on within the framework of multi-actor projects, thematic and exchange networks and operational groups (not only the initiatives' themes but also their results);
- Second, and directly related to the first point, to develop an analytical (modelling) framework to assess the extent to which the success of an innovation devised or tested in a given situation depends (or not) on local contexts; and, consequently, to determine whether or not

244. For more details, see for example the website of the European Network of Living Labs (ENoLL): https://enoll.org/.

this innovation can be implemented in other contexts and under what conditions. In other words, it is a question of ensuring the capitalization of knowledge through the analysis of what can make or increase its genericity, a dimension that goes beyond the only dissemination of results currently provided by the EIP-AGRI instrument of thematic and exchange networks. This modelling should cover the impacts of innovation on all dimensions of sustainability.[245]

• Third, the CAP should ensure that each MS has an effective and independent agricultural council capable of covering all dimensions of sustainability in equal parts.

Function 4: Orientation of innovation

Without excluding *a priori* a possible lever for innovation, CAP support for innovation would gain in legitimacy by targeting its action on potential market failures as a priority. Under Function 4 relating to the orientation of innovation, public goods such as the protection of the environment, the preservation of human health, the welfare of farm animals, or the development of rural areas would be targeted. The EU strategy for research and innovation in agriculture has already identified these targets, with the exception of that related to human health in view of the possible negative effects of agricultural practices on health and the deleterious effects on health of diets that are too rich and unbalanced (see Chapter 9). What is lacking in relation to Functions 2 and 3 analysed above is a monitoring of the actions implemented for addressing these priority targets, of their potential (multi-actor projects) or actual (operational groups) impacts on all dimensions of sustainability, and of the conditions of their implementation in different contexts. What is equally lacking is coherence with other CAP measures and more generally with measures of other public policies at European and national levels. For example, it is difficult to find an overall rationality for public support for actions aimed at reducing the consumption of fossil resources while they remain subsidized. The recommendations made within Chapters 7, 8, 9, 10 and 11 of this book also contribute, if not more so, to satisfying Function 4 relating to the priority orientation of the innovation on public goods.

Function 5: Creation of markets

The creation of markets is currently only modestly supported by the CAP through second pillar measures such as the development of quality systems for agricultural products and foodstuffs (Article 16 of Regulation (EU) No 1305/2013 on rural development policy) or the establishment of producer groups and organizations of producer groups (Article 27). The support granted to Organic Farming (OF) can also be read, at least in part, from the viewpoint of Function 5 relating to the creation of markets. The same applies to European and national plans to encourage the development of bioenergy by giving the latter a competitive advantage over fossil fuels. Within the specific framework of the CAP, we make two main recommendations: first, to support the creation of markets for products arising from the diversification of cropping systems in the dual context where the existence of such

245. Theoretical and applied assessment work on the different dimensions of sustainability is extensive. It is now a matter of ensuring their coherence and translating them into operational tools. The latter will benefit from being certified by independent bodies to promote their acceptance by all stakeholders.

markets is a major obstacle to this diversification while it generates environmental benefits (Meynard *et al.*, 2018); and second, to encourage the creation of service markets through the instrument of payments for services paid for by the final or intermediate user/consumer (companies, water management bodies, local authorities, etc.).[246]

Function 6: Resource mobilization

We have already emphasized the considerable difficulty in quantifying the public effort of the EU and the MS in agricultural research and innovation. We will highlight an additional dimension relating to the need to attract new private resources targeted at innovations that generate environmental, health, or social benefits through public-private partnerships specifically devoted to these objectives, or by using responsible financial instruments (that is, financial instruments with a dual logic: economic and for the protection of public goods).

Function 7: Creating legitimacy/countering resistance to change

The more-or-less general consensus on the objectives of the CAP is not enough to create legitimacy for a new trajectory for agriculture, agri-food, food, and the development of rural territories within the EU. This is particularly so because these objectives do not translate into a clear ranking of priorities, especially in areas where innovation should be focussed. However, setting these preferences irreversibly can be risky in a context where it is dangerous to exclude *a priori* a target and a path of progress provided that the reality of this progress in all dimensions of sustainability can be objectified. In this uncertain context, public support for innovation must, as a priority, target public goods by providing the regulatory and/or incentive framework that allows their protection to be taken into account in the decisions of private actors, whomever they may be, and open innovation schemes that will benefit from being extended to consumers and citizens as part of a process of co-construction of innovations involving without exclusion all stakeholders.

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246. Chapter 7 details this aspect in the specific case of Payments for Environmental Services (PESs). Payments for services should not be limited to environmental services alone; they will also target recreational services, animal welfare services, etc.

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Conclusion

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European agriculture is at a crossroads. This is nothing new. The question is more pronounced today in the context of the climate emergency and the unsustainability of a global economic system that relies excessively on fossil fuels and the overexploitation of natural resources that are not or only slowly renewable. These challenges also apply to European agricultural systems. Their ecological transition is a priority. It is coupled with an equally necessary transition in European diets, which are often too rich and unbalanced. These two transitions are taking place within an uncertain economic, social, and societal context for many European farmers who are faced with strong competition from third countries as well as between Member States (MS) and with their practices called into question by their fellow citizens. Moreover, European farmers are becoming fewer and older.

The CAP is also at a crossroads. Here again, the statement is not new and has been made many times even before the first major reform of this policy in 1992 (see, for instance, Tangermann, 1984). Since then, the CAP has entered into a process of permanent reform according to the revisions of the European Union (EU) multiannual financial framework and a logic of progressive steps dictated by the difficulty of reaching an agreement between MS with agricultural interests that are hardly reconcilable. Nevertheless, the CAP remains the most important European policy in terms of budget taking up about one third of the EU budget.

The guideline for the CAP reform process has long been clear. This is no longer the case. In response to external pressure from third countries to reduce the distorting effects of public policies on trade (Guyomard *et al.*, 1992), the first step was to reduce the importance of CAP instruments that have a direct impact on agricultural prices (guaranteed prices, export subsidies and import customs duties) in favour of direct income support measures progressively dissociated from production choices and levels (decoupling process). This substitution is now almost complete: the decoupling of agricultural income support measures is almost total even if coupled aids to certain productions of questionable effectiveness and efficiency still exit. Initially justified by the compensation of the decrease in farm incomes induced by the drop in price support, direct aids are struggling to find a new legitimacy even though they are still today an essential component of the income of many farms.

The criticisms are first of all of an economic nature. They concern the capture of European budgetary resources that could be useful for other issues (growth, employment, youth, defense, research, migration, and of course the climate and the environment). They also concerned their implementation within the agricultural sector, in particular the unequal distribution of support between farms depending on the MS, production choices and economic size

(the larger the size measured in hectares, the more payments the farm receives). Recently, there has been an increasing criticism that decoupled direct aids do not promote, or only insufficiently, the ecological transition of European agriculture. This last criticism applies more generally to the CAP as a whole despite the fact that climate and environmental objectives have been progressively taken into account and translated into coercive measures *via* cross-compliance and greening in the current CAP (conditionality in the future CAP that will apply from January 2023) on the one hand and incentives *via* the Agri-Environmental and Climate Measures (AECMs) in the current CAP (AECMs and eco-scheme measures in the future CAP) on the other hand. These measures are not up to the climate and environmental challenge. This is especially true in view of the increasing concerns and expectations relating to public health aspects, nutritional considerations, animal welfare or the proximity of food supply. Addressing all of these challenges in an urgent and coherent manner requires much more than a policy of gradual and incremental adjustments to the CAP alone. An aggiornamento of the CAP and more generally of a set of public policies is more necessary than ever.

It is in this perspective that this book has outlined the contours of a more legitimate and efficient CAP in the name of the sustainability of European agriculture and food. We summarize our analysis below dealing first with the economic aspects, then the environmental and health aspects, and finally the links with other public policies as well as the geographical scales of governance and financing. In a second section, we analyze to what extent the 2023-2027 CAP is in line with these recommendations. In a third section, we discuss the compatibility of these recommendations with the European Green Deal launched by the European Commission in December 2019. Far from calling into question the relevance of the European Green Deal, both the COVID-19 crisis and the war in Ukraine reinforce the necessity of European agri-food systems that rely less on external inputs and are more sustainable. It is in this light that we analyze the capacity of our recommendations for the CAP to help to achieve the European Green Deal objectives without ignoring possible/potential trade-offs between the different dimensions of sustainability.

Synthesis of the analysis: Lessons and recommendations

The main analytical framework used in this book is that of public economics, which justifies the intervention of governments essentially on the basis of a modification of income distribution considered as being too unequal, the correction of market powers exercised by certain actors, the incompleteness of markets and in particular markets for uncertainty and risk, and finally the existence of external effects, whether negative (disservices) or positive (amenities), and public goods/bads. These market failures legitimise government intervention. The two main questions to be addressed are then the instruments to be used and the geographical scales of intervention, financing and governance. The theory of fiscal federalism can be mobilized to define this optimal geographical scale. It is also necessary to analyze whether a measure or a set of measures applied to achieve a given objective must be included in the CAP or in other public policies. This last question refers to the necessary consistency of all public policies.

The CAP and the economy

What future for decoupled and coupled direct aids?

Direct aids granted to support agricultural incomes, which were nearly non-existent before 1992, represent more than two thirds of the current CAP budget (see Chapter 3). They are largely decoupled, granted independently of current production choices and levels. They play an important role in the income of many farms albeit in a heterogeneous way depending on the MS, the production specialization of the farm and its economic size (measured in hectares).

The legitimacy of including an explicit farm income support objective in the CAP is questionable. There is no real justification for redistributing income to households solely on the basis of activity sector, which the CAP does, rather than on the basis of living standards. Poor farmers must benefit from collective solidarity not because they are farmers but because they are poor. Measuring farm income, specifically the income of farm households, is very difficult. Public authorities, both at the European and Member State level, are constantly postponing the treatment of the problem, which allows everyone to choose the income indicators that suit them to the detriment of an objective assessment. The unequal distribution of CAP budgetary support (to the benefit of the largest farms measured in hectares) reinforces the feeling of illegitimacy of this policy as it is currently implemented. However, despite the shortcomings of statistical tools, it appears that incomes derived from agricultural activity of a large number of farms is highly dependent on the CAP budget support, specifically of decoupled direct aids. This strong dependence implies that the reorientation of decoupled and coupled direct aids of the CAP towards other objectives than the sole support of agricultural incomes can only be envisaged in a progressive and programmed way.

Environmental and health issues, relayed by society, can be the catalyst for a CAP that is truly focused on the agro-ecological transition of agricultural and agri-food systems and on the correction of market failures and the supply of public goods related to environmental protection and public health concerns. Supporting the incomes of the poorest farm households could then take the form of a minimum income covering basic needs, whose level should be set at national or perhaps regional levels. The reduction of agricultural poverty can be an explicit objective of the CAP on behalf of European solidarity. This is all the more true as research shows a positive correlation between the CAP on the one hand and poverty reduction and the creation of more remunerative agricultural jobs on the other hand. However, this positive relationship differs from one MS to another depending on their position in the structural transformation process of their economy (World Bank, 2017).

Rebalancing the repartition of value between the different actors in the food chain

As part of the initial CAP of agricultural price support, European farmers were protected from the potential market power of a much more concentrated downstream market, particularly at the retail stage (see Chapter 5)[247]. This is no longer the case. As a result, agricultural

247. This was not the case *vis-à-vis* the upstream sector providing the different factors of production.

producers of all MS are calling for a fairer sharing of value within the food chain. This call is exacerbated by the fact that changes in demand in the form of increasingly processed and differentiated final goods have led to greater homogenization of agricultural products upstream and thus have weakened the possibility for farmers to influence the selling prices of their products.

The CAP reforms implemented since 1992 have sought to readjust the balance of power within the food chain to the benefit of agricultural producers by regulating the commercial relationships between upstream (farmers) and downstream sectors and encouraging the regrouping of supply at the agricultural production level. Success to date has been very weak. National authorities in a majority of MS have attempted to do the same; for example, in France within the framework of the so-called EGalim law (food law), which notably includes a reversal of price construction starting from the farm level, invites to develop the contractualisation based on production costs at the farm level and increases the thresholds for resale at a loss.[248] But once again, success has not been forthcoming to date.

There is still a long way to go and the fair sharing of value between all the players in the food chain must remain a priority objective of the CAP of tomorrow. In this perspective, the recent disputes related to the grouping of agricultural producers in order to strengthen their bargaining power confirm that it is urgent to better articulate the CAP and the competition law in order to limit the tensions that the former may have generated in the name of the second. In this context, the buying power of large retailers being a key factor in the distribution of value, the fact that public authorities, at both the EU and MS levels, cannot really control the constitution of buying groups is worrying.

Risk management

Like their foreign counterparts, European farmers face multiple risks that tend to increase due to climate change and a growing economic instability in an uncertain sanitary and political global context. The almost total disappearance of CAP market management direct measures, which for a long time protected European farmers from fluctuations in the agricultural world prices, has increased this instability (see Chapter 6). As an attempt to deal with this, the EU has progressively developed a risk management toolbox in the CAP. The latter includes public support for insurance and mutual funds, an agricultural income stabilization instrument, and a crisis management mechanism operated on an *ad hoc* basis.[249] In addition to European risk management measures, national authorities also intervene notably through fiscal tools aimed at encouraging precautionary saving and the intertemporal smoothing of incomes.

The risk management toolbox of the CAP is comprehensive and in line with the lessons of economic theory, which calls for a distinction to be made between; first, rare, unpredictable and large-scale risks requiring intervention by the EU authorities; second, less rare, more predictable and smaller-scale risks that farmers can deal with through private risk markets,

248. https://agriculture.gouv.fr/egalim-tout-savoir-sur-la-loi-agriculture-et-alimentation.
249. Direct aids also contribute to smooth agricultural income variations.

which can be supported by public authorities through public-private arrangements; and third, frequent but small-scale risks that do not require public intervention. This toolbox is clearly underused by the various MS, which devote few budgetary resources to it – with the exception of the crisis reserve mechanism, the measures come under the second pillar co-financed by the European budget and national and/or regional budgets –, and it is important to understand the reasons for this. Beyond declarations of principle made by the parties involved, it is necessary to understand the behaviour of farmers when faced with risks and to assess whether emergency European and/or national political decisions adopted under the pressure of the moment are significant obstacles to the development of private, public and public-private tools for risk management. In that perspective, there is a need to think about risk management in a holistic way by taking into account all public and/or private measures, those specifically dedicated to risk management as well as those that can have indirect impacts on risks and/or their consequences. Such an approach should avoid crowding out effects (low attractiveness of one instrument simply because of the existence of another) and redundancies between public and private instruments. For this purpose, the use of modelling and simulations is essenti*al*. In particular, efforts must be made to ensure access to all the information needed to develop relevant and detailed modelling frameworks to capture all the mechanisms at play. This access to information is largely insufficient even though it is the main market failure justifying public intervention for risk management. On a more specific level, it would be useful to define, in an objective manner, the conditions for defining a crisis and the triggering of the measures granted in this regard.

The CAP, environment and health

The inclusion of climate and environmental objectives and instruments in the CAP is progressive. This inclusion remains largely insufficient today, especially considering that the climatic and environmental emergency is coupled with increasing public health concerns associated with the use of chemical substances and, from a nutritional point of view, with the development of diets that are often too high in calories and too unbalanced, which encourage overweight/obesity and many chronic pathologies. It is for the dual reason of their effects on the environment and health that a thorough reform of the environmental and climate aspects of the CAP is required. The reform will benefit from distinguishing between what is global and involves instruments, funding and governance at the European level (if not at the ideal global level) and what is local and therefore requires, at the very least, codesign, co-financing and co-monitoring by national and regional public authorities. This theoretical distinction between the global and the local encounters the practical difficulty that many environmental goods and services include the two spatial dimensions. This is the case, for example, for biodiversity, which provides not only localized ecosystem services (e.g. pollination) but also global benefits (e.g. preservation of the world's biological heritage). However, once an environmental good has the characteristics of a global public good, it is important that its preservation is ensured in a concerted and coherent manner at the European level.

Tackling climate change and preserving biodiversity at the European level

The global public good status of the fight against climate change and the preservation of biodiversity requires public intervention at the European level (see Chapter 7). This is only very partially the case within the current CAP since AECMs under the second pillar are applied nationally and regionally, and cross-compliance and greening requirements of direct aids under the first pillar provide countries with large room for manoeuvre that reduces their environmental ambition, effectiveness and efficiency. Overall, even if the ambition is explicitly stated, the CAP instruments currently applied to reduce Greenhouse Gas (GHG) emissions from the agricultural sector and protect biodiversity in agro-ecosystems are neither sufficient nor appropriate. Unfortunately, this will also be the case with the next CAP that will apply over the five-year period 2023-2027 (see below).

The Polluter Pays Principle (PPP) calls for the taxation of polluting activities according to the marginal cost of the damage they cause. This suggests that a Europe-wide tax should be introduced on the main drivers of agricultural GHG emissions, namely animals (notably ruminants) and nitrogen fertilizers. It is because these emissions are not easily observable that the tax could be based on their determinants (like the current energy-climate contribution, which is applied to fuels in a differentiated way according to their emission factors). In the interests of global coherence, coupled aids to livestock would be abolished because they constitute an incentive in the opposite direction to the tax and suffers from several other drawbacks: public and private administration costs are high; coupled payments are less efficient income support tools than decoupled aids and AECMs; they hinder the maximization of zootechnical performance and Total Factor Productivity (TFP); they also hinder the reorientation of livestock farms aimed at better adapting to market changes and consumer demands (especially because investments are considered taking into account coupled aids, which contributes to aggravating the inertia of livestock systems).[250]

The same PPP calls for the establishment, again at the European level and this time with the dual objective of protecting biodiversity and health, of taxes on pesticides and veterinary medicines differentiated according to their ecotoxicity. The determination of optimal rates for these two taxes is difficult due to the lack of accurate and easily collected data on the average and marginal damage caused by the uses of these products. A pragmatic solution would be to apply an increasing rate over time until biodiversity indicators show a recovery of biodiversity in agricultural ecosystems.

These European taxes can have effects on international trade that must be considered. They can induce competition distortions to the detriment of taxed European producers and to the benefit of untaxed foreign producers. Beyond the economic dimension, the remedy could turn out to be worse than the harm from a climate and environmental point of view if European taxation were accompanied by a shift in production to regions of the world that are less virtuous in terms of agricultural GHG emissions and biodiversity protection. These

250. For more information on this topic, see Chapter 10.

considerations argue in favour of taxing European imports according to the same principles and bases as those applied to domestic productions. They also argue for the inclusion of climatic, environmental and health conditionality in multilateral and bilateral trade agreements that the EU would have to sign as part of third-generation international agreements (Jardi and Vergez, 2018). The use of the conditional tense is appropriate here, as the bilateral agreements recently signed by the EU remain essentially trade agreements in the strict sense, taking too little account of climatic, environmental, health and social aspects.[251]

The considerations of competitiveness also call for maintaining the proceeds of the taxes within the agricultural sector according to a bonus-malus system that would favour the agro-ecological transition of European farms by encouraging the most virtuous practices and discouraging the least virtuous. A rigorous application of the PPP fully justifies the implementation of its positive equivalent of the Provider Gets Principle (PGP), under which it is legitimate to remunerate farmers for the adoption and implementation over time of more environmentally and health friendly practices and systems. In this regard, incentive payments commensurate with the ecological and health services provided will cover the maintenance of grasslands (notably permanent grasslands)[252], the permanent cover of agricultural soils, an adequate diversity of cropping systems and the maintenance of fixed landscape features.

Promoting the agro-ecological transition of European farms while considering local specificities

The current CAP seeks to promote the agro-ecological transition of European agriculture by simultaneously using the levers of the stick (cross-compliance and greening in the first pillar) and the carrot (AECMs in the second pillar). The 2023-2027 CAP will use the same levers of the stick (conditionality) and the carrot (AECMs and eco-scheme measures). These measures – as they are currently applied and as they will be applied over the five next years – are not up to the challenge because they essentially target partial efficiency (that of inputs purchased outside the farm) or substitution (of these same inputs through their replacement by alternative solutions that are less damaging to the environment) and too little the redesign of agricultural systems. The so-called systemic AECMs are an exception (see the Introduction to Part II) but they are insufficiently funded and are not widespread. This incompleteness of the current instrumentation is itself linked to the fact that the stick (not very big) and the carrot (not very big either) are based almost

251. See for example Ambec *et al.* (2020) in the specific case of the EU-Mercosur agreement.
252. Chapter 10 details how such incentive payments could be specifically provided for maintaining grasslands according to a five-level grid that distinguishes grasslands according to their characteristics (duration, composition, and management); see also Guyomard *et al.* (2022). The package of climatic and environmental services provided by grasslands grows along this five-level gradient, which legitimates increasing remuneration along it. The implementation of such a system requires the identification, quantification and evaluation of services according to this grid, taking into account local specificities. Sufficiently robust proxy indicators could be used initially (as a first step). The immediate implementation of experiments in a sufficient number of European territories that are representative of the diversity of production situations should make it possible to progressively complete and then replace these proxies and, if necessary, to correct them. On this point, see also Guyomard *et al.* (2022).

exclusively on an obligation of means by prohibiting, regulating, maintaining or imposing agricultural practices in function of their expected effects on the environment but without these being explicitly evaluated and linked to the practices implemented (see Chapter 8).

The tax-subsidy scheme for climate change mitigation and biodiversity protection summarized above will thus benefit from being complemented by a combination of stick and carrot measures, as it is today. The threshold below which the PPP would apply and above which the PGP would apply cannot be determined by economic theory alone. A pragmatic solution would be to set this benchmark at least at the level of the combined cross-compliance and greening requirements of the current CAP, better at a higher level, and to progressively increase this threshold over time. A second recommendation targets first pillar eco-scheme measures and AECMs in the second pillar. Because the eco-scheme is fully financed by the European budget, corresponding measures must target global public goods; that is, climate change mitigation, biodiversity preservation and restoration, as well as animal welfare (for more details on the rationality of this targeting, see Guyomard *et al.*, 2020). These eco-scheme measures will be supplemented by measures in the second pillar focused on local public goods; notably, water quantity and quality, soil fertility, and diversified landscapes. AECMs as they are currently applied suffer from well-documented weaknesses that are detrimental to their environmental efficiency and thus need to be corrected, in particular by ensuring greater continuity in time and space (which will have the extra advantage of reducing public and private administration costs). This also applies to eco-scheme measures related to land use. In addition, the obligation of means (i.e., practices) must progressively make way for an obligation of results (i.e., impacts) in the context of a transition towards payments for environmental services, more generally payments for ecosystem services that also include aspects relating for example to animal health or welfare. We do not underestimate the difficulty of this evolution, especially in terms of establishing causal patterns between farmers' actions and their impacts on the different dimensions of sustainability while taking into account the specificities of local environments and external factors that influence both choices and impacts (relative prices of outputs and inputs, other public policies than the CAP, etc.). This difficulty should not be used as an excuse not to move towards a more results-based[253] agri-environmental policy, which also offers the possibility to relax the budgetary constraint of the CAP through the development of payments for public services and green bonds financed, partly or fully, by the private sector.

Two final points are worth mentioning. First, the EU has sufficiently wide room for manoeuvre at the World Trade Organization (WTO) to implement climatic and environmental aids that should not be limited to extra costs of profit losses; in other words, to provide eco-scheme and AECM payments that would be proportionate to climatic and environmental benefits. Second, measures targeting agricultural practices and systems will be usefully complemented by other measures under the second pillar (training, advice, investment, structuring of outlets), which will benefit from being targeted as a priority on farmers committed to the agro-ecological transition of their holdings.

253. In a pragmatic way, it is possible to start by associating result indicators to current AECMs based on an obligation of means. Result indicators would initially be indicative to ensure their relevance and to allow further learning. They would gradually be made mandatory while the obligations of means would disappear.

The CAP and other public policies

The CAP must naturally be coordinated with a large set of other public policies at both the EU and MS levels. In addition to the competition and environmental policies already mentioned, this coherence concerns the trade policy and the research and innovation policy. Two other policies also deserve attention, the policy for the development of rural areas (an explicit objective of the CAP since the end of the 1990s) and the food policy, more specifically the nutritional policy, which is today a prerogative of the MS without strong links with the CAP.

The European trade policy

Far from the fortress image often wrongly portrayed in the media, the EU is both the world's leading exporter and importer of raw and processed agricultural products. Since 1994, agricultural trade has been governed by the Uruguay Round Agreement on Agriculture (URAA), which dictated the design of the first major reform of the CAP in 1992 and largely the modalities of subsequent CAP reforms because the WTO negotiations of the Doha Round initiated in 2001 are still at a dead end (see Chapter 4). This means that the rules agreed in 1994 on export, import and domestic support still govern world agricultural trade, and thus the EU's trade. In this context, the EU should not celebrate the failure of the Doha Round and more generally of multilateralism. This failure increases the risk of unilateral attacks by less virtuous countries with no effective way of settling disputes other than by force. Noting the stalemate in the Doha Round, the European Commission changed its position from the mid-2000s onwards by increasing the number of bilateral agreements, including with countries that could threaten European agricultural production. In this perspective, the bilateral agreements signed by the EU should be renegotiated by including effective provisions, not to maintain a high level of permanent protection on entry to the European market but to give domestic agricultural producers time to adapt to the new trade situation and, above all, to limit imports of agricultural products from regions that are less favourable in terms of climate change mitigation, environmental protection, health, and social rights (third-generation trade agreements). The latest agreement signed by the EU with the Mercosur countries is unfortunately not very ambitious (binding) on this last aspect (Ambec *et al.*, 2020).

The research and innovation policy

No one will dispute that research and innovation are two major levers for the sustainability of European agriculture. These two levers are activated at EU level by two increasingly coordinated and intertwined policies; that is, the research policy and the agricultural policy. In this context, the EU has recently developed and implemented the European Innovation Partnership for Productive and Sustainable Agriculture (EIP-AGRI). The latter aims to bridge the gap between research (in all its forms) and innovation whether it is product, process, practice or organisational innovation, whether it stems from the results of research (top down innovation) or from the field, including lay knowledge and know-how (bottom up innovation). The EIP-AGRI is implemented by mobilizing several tools funded by the research and/or agricultural policy (see Chapter 12).

The numerous and potentially conflicting challenges facing European agriculture invite us to intensify support for research and innovation, and especially to increase its efficiency. This effort requires the intervention of public authorities insofar as many of these challenges relate to public goods that are insufficiently considered by private research. It must be developed at the European level for at least three reasons; first, because some of these public goods are global public goods; second, because Agricultural Knowledge and Innovation Systems (AKISs) are deficient in several MS; and third, because the agro-ecological transition of European agriculture requires experimentation in a large diversity of contexts in order to capitalize on successes and failures. In this context, we make recommendations to ensure that the different functions that an efficient innovation system should fulfil are indeed implemented in the related fields of agriculture, environment, food and rural development. Under the entrepreneurial function, it is particularly important to encourage, through monetary compensation, the risk-taking by farmers who develop disruptive and systemic innovations; it is also important to extend the EIP-AGRI mechanisms to all stakeholders within the framework of Public-Private-People partnerships, which, through co-construction, should facilitate the acceptance of innovations (living labs are an emblematic mechanism of such open innovation devices). Three recommendations are aimed at the development and exchange of knowledge that are two priorities of the EIP-AGRI: first, the constitution at the European scale of a database of the themes studied and experimented with; second, the development, also on a European scale, of an analytical framework making it possible to assess the extent to which the success of an innovation tested in a given situation can – and under what conditions – be extrapolated to other contexts (capitalization); and finally, the implementation in each MS of an effective and independent agricultural advisory service able to cover equally the various dimensions of sustainability. Under the guidance function, public goods such as the fight against climate change, the preservation of the environment, health, and the development of rural areas should be prioritized. Support for market creation will target both the products of the diversification of production systems and the ecosystem services, in the latter case through payments for services paid for by the taxpayer and the intermediate (local authorities, water management bodies, companies, etc.) and/or final consumer.

The rural development policy

The development of rural areas is an explicit objective of the CAP since the early 2000s. This inclusion raises two main questions. First, is it legitimate to include in a sectoral policy such as the CAP an explicit objective of rural development? Second, is it efficient that the rural development pillar of the CAP be mainly dedicated to farmers? These questions are all the more relevant that the EU regional policy no longer include explicit targets for low-density areas (see Chapter 11).

Even if the CAP second pillar measures targeting non-agricultural rural objectives are few in number, poorly funded and not very effective, the CAP, taken as a whole, contributes to the objectives of reducing inequalities between territories and the economic development of rural areas. These territorial impacts are stronger in regions where agriculture remains important. They spread to other areas (including urban ones) thanks to the intersectoral

relations involving the different regions and areas. These propagation mechanisms are a strong argument for keeping a rural development objective within the second pillar of the CAP while ensuring that the funds devoted to this objective are not lost in the mass of all agricultural aids.

Public action in favour of rural areas should be differentiated according to its two main purposes. First, because it is a policy of redistributive nature, the purpose of cohesion calls for centralized public action implemented with regional relays in order to maximize the efficiency of measures by ensuring access to information and the monitoring and control of measures. Second, because it is a policy of allocative nature (mobilization of resources and actors in the territories), the purpose of growth calls for decentralization within a regional, national and European framework that allows for the regulation and coherence of initiatives of basic territorial units. It is therefore not so much a question of whether rural development objectives should be part of the CAP or the European Cohesion Policy but rather their spatial application in terms of funding and governance. The simplicity of theoretical action rules masks major operational difficulties. There is no single, definitive solution for territorial organization. There is a need for close cooperation between the different territorial administration levels in a multi-level governance process in which rural development policies mainly involve both the EU and MS for measures that aim to reduce social inequalities, and regions and sub-regional areas in measures to promote regional growth.

The food and nutrition policy

Food and nutrition issues are very marginally on the CAP agenda despite the fact that overweight and obesity rates and related chronic diseases are becoming increasingly important in almost all MS (see Chapter 9)[254].

Do the CAP and its successive reforms have a share of responsibility in this epidemic of overweight? Without totally exonerating the CAP, the analysis underlines that it is primarily the transmission of productivity gains generated in agriculture to its downstream customers that has allowed the trend towards a lower average cost of the calorie.

Should the CAP play a role in this area in the future? We answer this question in three points. First, there is a threefold legitimacy to act on a national or regional scale rather than at the European one: because there are no spatial externalities, because the preferences and diets of Europeans are heterogeneous, and because health costs related to overweight are borne by MS budgets. Second, the growing importance of the obesity and overweight epidemic shows that nutrition policies currently in place are insufficient and thus must be significantly strengthened. Third, the CAP could usefully complement these national policies through two main channels. The universal nature of nutritional recommendations means that they will benefit from being defined at EU level and then adapted at national and regional levels by taking into account the local specificities of diets and consumers' preferences.

254. Problems of undernutrition are much less prevalent in the EU than in other parts of the world. Nevertheless, they exist and need to be targeted by social policies. In the framework of the CAP, the EU would be proud to increase the resources devoted to the European Fund for Aid to the Most Deprived.

This dimension could be included in the CAP in a context where there is no real nutritional policy at EU level. In addition, promoting the consumption of fruit and vegetables, grain legumes (peas, beans, lentils, etc.) and fibers (wholegrain cereals and flours, vegetables, dried beans, dried fruit, etc.) and supporting a gradual shift towards diets containing less meat and more plant products are beneficial for both health and the environment. The CAP could support (subsidize) virtuous eating patterns by targeting, for efficiency reasons, the poorest European households. Direct aids to European producers of these virtuous products could be granted at the same time in order to limit the risk that measures targeted on consumption lead to excessive increases in imports from countries that are less virtuous from an environmental and health point of view. Such production aids will gain legitimacy, both internationally and domestically, if they are accompanied by strong conditionality on agricultural practices, particularly in relation to the use of chemical inputs.

Is the 2023-2027 CAP in line with the analysis lessons?

More than 3.5 years of negotiations to find an agreement

CAP spending on the seven-year period of the 2021-2017 Multiannual Financial Framework (MFF) would be EUR343.9 billion in 2018 prices with EUR285.6 billion for the European Agricultural Guarantee Fund (EAGF) that finances the first pillar and EUR77.8 billion for the European Agricultural Fund for Rural Development (EAFRD) that irrigates the second pillar. The latter figure would be topped up with an additional EUR7.5 billion from the Next Generation EU recovery plan adopted in July 2020 in order to tackle the economic situation induced by the COVID-19 crisis (European Council, 2020). Matthews (2020) provides an extensive analysis of these figures. It is difficult to compare the budget of the future CAP to the current one for many reasons (with or without the United Kingdom, partial budget for Croatia, assumptions about the inflation rate over the period, etc.). Matthews's calculations, based on commitments made in the final year of the current MFF period (2020) and then multiplied by 7, suggest a reduction between 6.4 and 10%, depending on the baseline, compared to the 2014-2020 MFF in constant prices, and a slight increase in current prices. In addition, the decrease would be larger for the second pillar than for the first pillar even though the gap is smaller than in initial budget proposals.

Reaching an agreement for the whole EU budget and specifically the CAP budget was very difficult. The exit of the United Kingdom, which was the second largest net contributor to the EU budget after Germany, is part of the explanation. The difficulty lies as much in the divergent interests of the different MS according to their European visions and their global budgetary positions (net contributor *versus* net beneficiary to the EU budget), and in the choices of repartition of the whole budget between the different European policies (Rubio, 2020). In this general context, the CAP budget was the subject of the greatest attention because it represents today about a third of the total EU budget: MS who wish to increase resources allocated to domains deemed to be of higher priority (migration, defence, growth,

employment, research, innovation or education) did so almost exclusively by taking them from the two European policies with the highest budgetary allocations (the CAP and the European Cohesion Policy) and not by increasing the EU resources and thus the MS contributions to the EU budget. Furthermore, there was the question of the allocation of the CAP budget between the two pillars and within each pillar between the different measures (for the first pillar, between income support direct aids and climate and environmental measures). The fact that the 2023-2027 CAP budget has been preserved must not mask the fact that the latter will be again challenged after 2027.

Following the release of a vision communication in November 2017 (European Commission, 2017), the European Commission presented its legislative proposals for the future CAP on 1 June 2018 (European Commission, 2018a).[255] These proposals were the subject of numerous reactions from the European Parliament, MS national and regional public authorities, agricultural producers' unions, non-governmental organizations, etc. The reduction in the CAP budget was then the first subject of disagreement. It was considered as being unacceptable for a majority of public and private stakeholders. Furthermore, some actors insisted on the need to strengthen the economic aspect of the proposals while others regretted that they did not match the climate and environmental ambitions that have been explicitly stated. Many voices also pointed the risk of renationalization of the CAP induced by the new mode of governance of the policy, which puts the emphasis on subsidiarity. Since June 2018, the European Commission proposals have been the subject of intensive work in the European Council, the Council of the EU and the Agriculture and Fisheries Council, the outcome of which is freely available on the European Commission website.[256] This information clearly illustrates the differing views between the various MS. After 3.5 years of hard work, an agreement was finally found in December 2021.

Objectives of the 2023-2027 CAP

The 2023-2027 CAP includes nine specific objectives, three for each sustainability dimension (Table C.1). These specific objectives are completed by two cross-cutting objectives: the first is related to innovation and the second to CAP modernization and simplification.

There is no dispute around these nine specific objectives. The main question then is knowing to what extent the 2023-2027 CAP instrumentation will be able to achieve them, simultaneously and in the most efficient way. The cross-cutting objective of modernization and simplification can also be readily subscribed to provided that it remains secondary: priority must be given to economic, environmental and social issues and the instruments chosen for this purpose must respect a simple criterion of efficiency by maximizing the ratio of all benefits (market and non-market) to the costs of the measures, including the public and private costs of their management. In particular, care must be taken to ensure that the modernization and simplification of governance through the National Strategic Plans (see

255. These proposals were theoretically due to come into force on 1 January 2021.
256. https://www.consilium.europa.eu/en/policies/cap-introduction/cap-future-2020-common-agricultural-policy-2023-2027/.

below), which could reduce public transaction costs at the European level, do not result in an increase in the same costs at the sub-EU level and in the private transaction costs borne by economic actors. The first simplification is undoubtedly to put an end to the stacking of measures that has developed over the course of successive CAP reforms (Guyomard *et al.*, 2020). In the past, one measure has too often been maintained or introduced to limit the effects of another (for example, direct aids coupled to certain types of production to compensate for the general trend towards the decoupling of income support direct aids). Finally, it would be more accurate to present the first cross-cutting objective related to innovation as a common lever that must be mobilized for achieving the nine specific objectives and the first cross-cutting objective. Furthermore, the consensus on the importance of innovation masks disagreements on the forms and modalities that the latter can recover, for example on the use of precision agriculture or new breeding techniques (specifically on their classification as Genetically Modified Organisms (GMOs) or not).

Instrumentation and governance of the 2023-2027 CAP

The two-pillar structure of the CAP is maintained. First pillar support will be granted in the form of a basic payment, a redistributive payment for small and medium-sized farms,[257] a specific payment for young farmers and an additional payment under a new eco-scheme instrument devoted to climatic and environmental issues (Table C.2). The eco-scheme will be mandatory for the MS but optional for the farmers. It corresponds to a payment in return for the implementation of agricultural practices addressing the CAP climate and environment objectives in ways that complement the other relevant tools available (notably the AECMs) and go beyond what is already requested under conditionality requirements. The latter will include globally unchanged cross-compliance requirements in the form of Statutory Management Requirements and standards for Good Agricultural and Environmental Conditions. They also will include the three greening requirements of the current CAP aimed at maintaining permanent grasslands, diversifying crop systems and developing Ecological Focus Areas (EFAs). The possibility of granting coupled direct aids to certain productions will be maintained. All first pillar direct payments will be reduced according to a progressive scale once they exceed an amount of EUR60,000 per farm, and capped at a maximum of EUR100,000 per farm. The possibility of increasing the thresholds in accordance with the costs of family and wage labour means that the constraint of degressivity and capping should not be active or severe for a very large majority of farms; the redistribution resulting from this will therefore be very modest (Matthews, 2018). Market measures are broadly unchanged and include public intervention on the markets (public buying-in and storage) at modest levels, private storage aid, the replenishment of the crisis reserve and the implementation of sectoral programmes for fruit and vegetables, wine, hops, olive oil and beekeeping with a possible extension to other sectors for a maximum amount equal to 3% of the first pillar envelope. The thematic coverage of the second pillar will remain virtually unchanged, as will the instruments for its implementation. In summary, it is thus the eco-scheme of the first pillar

257. The redistribute payment that is optional in the current CAP (at the choice of the MS) will be mandatory in the 2023-2027 CAP.

Table C.1. The nine specific objectives of the 2023-2027 CAP.

- Economic objectives
(1) Support viable farm income and resilience across the Union to enhance food security (Eco. 1)
(2) Increase competitiveness and agricultural productivity in a sustainable way to meet the challenges of higher demand in a resource-constrained and climate uncertain world (Eco. 2)
(3) Improve farmers' position in the value chain (Eco. 3)
- Climatic and environmental objectives
(4) Contribute to climate change mitigation and adaptation, as well as sustainable energy (Env. 1)
(5) Foster sustainable development and efficient management of natural resources such as water, soil and air (Env. 2)
(6) Contribute to the protection of biodiversity, enhance ecosystem services and preserve habitats and landscapes (Env. 3)
- Social objectives
(7) Modernize the agricultural sector by attracting young people and improving their business development (Social 1)
(8) Promote employment, growth, social inclusion and local development in rural areas, including bio economy and sustainable forestry (Social 2)
(9) Improve the response of EU agriculture to societal demands on food and health, including safe, nutritious and sustainable food, reducing food waste, as well as animal welfare (Social 3)

Source: European Commission (2018a).

targeting the climate and the environment, which constitutes the instrumental originality of the future CAP. This means that the green architecture of the future CAP now includes three specific instruments targeted on the climate and the environment; that is, conditionality, the eco-scheme, and AECMs. Other instruments may also contribute to the climatic and environmental ambition (Figure C.1).

The second novelty of the next CAP lies in the new model of governance aimed at increasing the efficiency of the policy by offering to MS greater room of manoeuvre to better address priority needs of the country. The EU sets the common framework in the form of specific and cross-cutting objectives, monitoring and implementation indicators, and broad categories of measures that can be mobilized. This common framework is deployed in each MS through the definition of a National Strategic Plan (NSP), which, on the basis of an identification of priority national needs, selects the most appropriate instruments and proposes monitoring milestones and success indicators. In its NSP, the MS should explain how its choices would contribute to raising the ambition and achieving the nine specific objectives defined at EU level. The MS is responsible for the implementation of its plan, which follows a logic of increased subsidiarity in order to better respond to local realities. However, this national responsibility is not total since the European Commission must approve each NSP and will monitor their implementation and results over time. In summary, the so-called New Delivery Model (NDM) of the next CAP extends to the first pillar the governance model used today for the second pillar. The European Commission adds that "an essential part of this framework will be an explicit obligation on MS to clearly show greater ambition than at present with regard to care for the environment and climate" (European Commission, 2018b). This statement can legitimately be questioned.

Analysis of the 2023-2027 CAP in the light of public economics lessons

It is difficult to provide a robust analysis of the future CAP and of its potential impacts on all sustainability dimension on the basis of information available at the date this conclusion is written (May 2022). This is because NSPs have still to be finalized and approved by the European Commission. It is also very difficult – if not impossible – to make a substantiated assessment of the new governance model. It is possible to subscribe to several principles of the matter (better adaptation to local needs, assessment on the basis of results, potential simplification) while immediately underlining several risks. The first is that increased subsidiarity leads to a reduction in efforts, already insufficient in the current CAP, in the fight against climate change and the preservation of biodiversity, two global public goods that require action at the European scale: there is a fear that the MS's efforts be concentrated on local public environmental goods because expected benefits are easier to justify and value to their populations. One can also fear that heterogeneous national sensitivities translate into heterogeneous NSPs and induce competition distortions between MS according to the relative importance given by each country to economic *versus* environmental objectives in a European market that would only be common in name.[258] Finally, the allegated simplification could remain largely theoretical: first, because of the transfer to the MS of administrative burdens currently borne by the European Commission; and second, because the dialogue between the latter and the MS could be very costly in the event of divergent assessments of NSP contents, success indicators, monitoring processes, etc. More generally, there is the major risk that the 2023-2027 CAP opens the gates of an increasing renationalization of the CAP after 2027 in a context where it will be budgetary more interesting for a MS that is a net contributor to the EU budget to decide on its own on the allocation of its agricultural budget without going through the Brussels level.

Climate and environmental ambition

The next CAP remains too far removed from the principles and lessons of public economics on the climatic and environmental front.

It is hardly in line with the lessons of environmental federalism, which requires a better distinction between the levels of funding, implementation and governance depending on whether environmental public goods are global (European scale) or local (regional or sub-regional scale). This was already not the case with the current CAP. The situation could worsen in the future insofar as the protection and remuneration of a global or local environmental good could be ensured by both the first pillar totally funded by the EU budget (under the new eco-scheme) and the second pillar co-financed by national and regional authorities (under the AECM scheme, which is maintained almost unchanged).

As in the past, the future CAP implicitly defines conditionality rules as the dividing line between applications of the PPP and the PGP. Conditionality requirements would benefit from

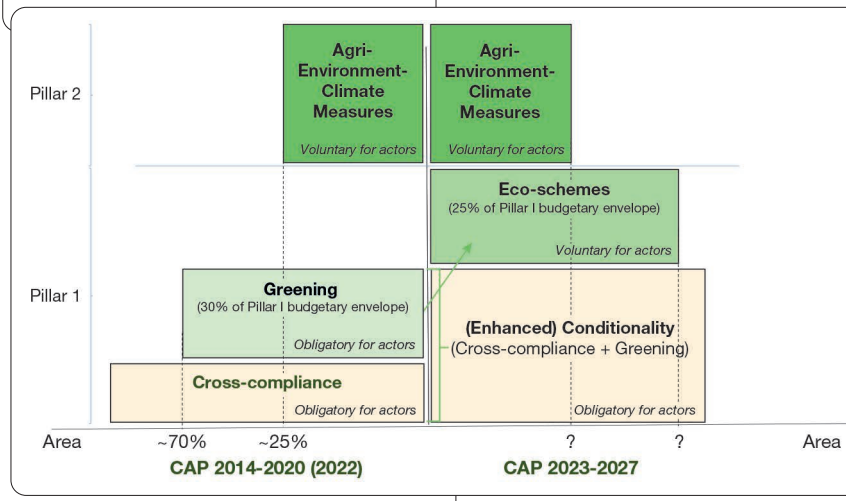
258. The market is common only for agricultural products. It is not common for factors of production. Input markets are still largely governed by mechanisms, institutional arrangements, and regulations that are defined at the national level and are only very lightly regulated and harmonized at the European level.

Table C.2. Structure of the first pillar: Comparison of the current and future CAP.

Current CAP	Future CAP
Payments	
Basic payment (mandatory for MS)	Basic income support for sustainability
Green payment (mandatory for MS)	/
Redistributive payment for small- and medium-sized farms (optional, at the choice of the MS)	Redistributive payment for small- and medium-sized farms (mandatory)
Bonus for young farmers (mandatory for MS)	Bonus for young farmers (mandatory)
/	Eco-scheme (mandatory at MS level, optional for the farmer)
Coupled aids	Coupled aids
Cross-compliance / Conditionality	
Subject to compliance with environmental, health and animal welfare Statutory Management Requirements (SMRs) and the use of Good Agricultural and Environmental Conditions (GAECs)	Globally unchanged SMRs and GAECS, plus inclusion of the three requirements of the current green payment

Source : Adapted from Guyomard *et al.* (2020).

Figure C.1. The green architecture of the current and future CAP.



Source: Authors' elaboration from Pe'er *et al.* (2022).

a clearer distinction between what is global and should therefore be applied uniformly at EU level and what are more local concerns that should be defined at lower, ideally sub-regional, levels according to the specificities of the areas. Above all, the application of the PPP remains too timid as conditionality of the future CAP is globally equivalent to cross-compliance and greening of the current policy (status quo). There is no explicit or implicit increased taxation of the climatic and environmental damage. This means that the future CAP will continue not to send to European agricultural producers the right price signals that take into account the fact costs are not limited to private costs but include public costs. Without right price signals, the necessary agro-ecological transition of European agriculture will be very slow and probably too slow. To the relevant objection that an ambitious application of the PPP would weaken the viability and competitiveness of many farms and agricultural sectors, it is possible to answer by at least three counter arguments: first, the taxation scheme can be implemented in a progressive way; second, the proceeds of the tax can be kept within the agricultural sector so as to encourage the adoption of more environmentally friendly practices and discourage the use of less environmentally friendly practices, for example through a bonus-malus mechanism. Third, the money saved on depollution costs and health spending can be used to compensate farmers provided that their practices and systems are (more) environmentally friendly.

A stricter application of the PPP would have the additional advantage of better legitimizing an equally more ambitious application of the PGP. However, on this point too the future CAP remains very timid. Payments associated with second pillar AECMs will still be limited to offsetting extra costs and/or profit losses; they will therefore continue to not be proportionate to the environmental and climate services provided. The future CAP leaves the door open for such a basis on services under the new eco-scheme.[259] It will be interesting to analyze to what extent and in what way the MS will seize this welcome opportunity. The future CAP does not include mechanisms that would promote the shift from an obligation of means (practices) to an obligation of results (impacts). In other words, it does not provide any incentives for the development on a large scale of payments for environmental services, more generally payments for ecosystem services, which would the dual merit of increasing the legitimacy of payments in the eyes of society and possibly loosening the budgetary constraint by allowing these payments to be remunerated not only by the taxpayer but also by intermediate and final users within the framework of contracts associating public and private financing.

Income support and generation renewal

On the economic side, the 2023-2027 CAP essentially extends the measures already in place with only some minor corrections. Decoupled and coupled direct aids would thus continue to be granted in the form of per hectare payments.[260] The current unequal distribution of unit amounts (i.e., per hectare) would be slightly corrected as part of the continuation of

259. The alternative is the granting of eco-scheme payments in compensation for additional costs and/or profit losses, as it is the case for AECMs.
260. This will also be the case for new eco-scheme payments.

the so-called external convergence process. The redistributive payment, which is currently optional at the discretion of the MS,[261] would be made compulsory: its capacity to correct the distribution of first pillar decoupled support between farms in a given MS, in favour of small- and medium-sized structures and to the detriment of the largest ones (measured in hectares), will depend on the choices made by the MS and on their political courage.[262] Degressivity and capping of all first pillar direct aids would also be mandatory. However, both measures will be applied in ways that will greatly reduce their ability to change the distribution of first pillar aids (Mathhews, 2018).

The additional payment for young farmers aims to support their installation and thus the renewal of generations, which is not assured in the vast majority of MS, if not in all. From the very beginning of the CAP and until the early 2000s, the so-called structural adjustment policies encouraged early retirement from farming in order to favour agricultural land transfers and allow current farmers to expand and new farmers to install with labour productivity gains compensating for the decline in the workforce. The age pyramid in agriculture with a large part of the population aged over 65 means that land will be available in the coming years but at what price? The access costs to land and capital act as barriers to entry and legitimizes the intervention of public authorities, essentially at a national level given the diversity of situations (that can be illustrated by contrasting the agricultural demographics of the Western *versus* Eastern MS as well as Northern *versus* Southern MS). The renewal of generations is also an opportunity for the agro-ecological transformation of European agricultural practices and systems provided that new entrants are encouraged and supported to implement such practices and systems.

The modalities of implementation of the additional payment for young farmers, (mandatory in both the current and future CAP) are left to the MS (amount of the envelope, size threshold, level of training required, etc.). In a context where only 6% of European farms are run by farmers under the age of 35, the stakes are high and the system should undoubtedly be reconsidered and strengthened, even more so as the budgetary resources allocated to this objective of supporting generational renewal have fallen by 13% between 2005 and 2015 for the whole EU (European Commission, 2017) and corresponding support is too weakly conditional on the use of more sustainable practices and systems.

Market measures that also contribute to support farm incomes will remain globally unchanged. They will include public intervention on markets (purchase and storage) but at very modest levels, aids for private storage, a crisis reserve, and sectoral programmes for fruit and vegetables, wine, hops, olive oil and beekeeping, with possible extensions to other agricultural sectors, for a maximum amount equal to 3% of the first pillar budgetary envelope.

261. Under the 2014-2020 CAP, ten MS or regions within a MS have mobilized the redistributive payment mechanism (Wallonia in Belgium, Bulgaria, Croatia, France, Germany, Lithuania, Poland, Portugal, Romania, and Wales in the UK) under varying in terms of area thresholds that are eligible, unit amounts per hectare, the share of the first pillar budgetary envelope mobilized, and a possible rise in power of the mechanism over time (European Commission, 2016).

262. As illustrated by Chatellier (2020) in the case of France, the capacity of the redistributive payment to modify the distribution of first pillar direct payments between farms is potentially important.

In summary, the future CAP provisions for first-pillar budgetary support will not provide a better justification of the latter: conditionality requirements and eco-scheme measures are likely to be too modest to increase their legitimacy in the name of the fight against climate change and improved protection of biodiversity; the repartition of aids between countries and farms will remain unequal; despite the stated intentions, the renewal of generations[263] remains in practice a secondary objective with too few budgetary resources and too few regulations including dispositions that would explicitly favour young farmers; etc.

Value sharing and risk management

The future CAP is more in line with lessons of public economics in the fight against potentially dominant positions of other actors in the food chain than farmers. In this area, the measures that are proposed essentially consist of encouraging the grouping of supply at farm level and promoting the development of short local circuits, including through processing and sale on the farm. Nevertheless, from encouragement to actual translation, there is one giant step that the future CAP does not take. Furthermore, the question of a better articulation between the CAP and competition rules is not explicitly addressed.

Compliance is also required in the case of risk management in a context where the risk management toolbox was already practically complete. The corrections proposed for the implementation of the crisis reserve, in particular the possibility to carry over unused resources from one year to the next, are welcome. However, it is regrettable that provisions of the future CAP do not encourage increased solidarity both vertically (between all actors of the food chain, from upstream input suppliers to downstream retailers and catering actors) and horizontally (within the territories), for example through the generalized replenishment of mutual funds by all the players in these sectors and territories. Furthermore, there remains the question of exceptional interventions, on an *ad hoc* basis, by the European Commission and/or national authorities, which admittedly cannot be regulated by a text but their triggering and implementing mechanisms must be specified so that they do not constitute an obstacle to the use of the risk management toolbox.

Trade, rural development and nutrition issues

The reaffirmation that food products imported from non-European third countries must meet European standards, including environmental standards, is highly welcome (European Commission, 2019). This has yet to be reflected in the numerous bilateral trade agreements concluded by the EU, either under consideration or already signed, which would need to be reviewed in order to ensure such compliance and to be able to take action in case of non-compliance. It is also in the best interest of the EU – as well as any country – to continue to defend multilateralism and the integration of non-trade concerns (health, climate, biodiversity, labour rights, children rights, etc.) in this framework.

It is difficult at this stage, if not impossible, to analyze to what extent the next CAP and European Cohesion Policy will be better articulated in the future; this will depend in particular

263. The renewal of generations is one of the nine specific objective of the future CAP.

on how the challenges of rural areas will be taken into account in the two policies. It is worth mentioning here the need for cooperation between the different intervention levels, the EU and the MS when the aim is to reduce social inequalities, and the regions and sub-regional areas when the aim is to promote economic growth.

Finally, the future CAP remains very conservative on nutritional aspects. While this caution may be justified from a public economics perspective in a context where deficiencies and their management are essentially national, there is nevertheless room for intervention at the European level, more specifically within the CAP (notably because there is no real European nutritional policy with sufficient budgetary resources). Provisions could include the definition of nutritional recommendations at European level, which will then be adapted at national and regional levels according to local supply and demand (consumers' preferences) specificities; a consistent set of measures aimed at decreasing excessive consumptions of animal proteins (processed and red meat); and support for the consumption of fruit and vegetables, pulses and fibre by targeting the populations that currently consume the least.

A final remark

Criticism is easy but art is difficult. We are well aware of the difficulty of reforming the CAP and finding a compromise acceptable to 27 MS with heterogeneous visions and interests. This difficulty explains why the CAP reform process has been ongoing for almost 30 years now, following a logic of successive steps on the narrow path of sustainability. However, the climate, environment and nutrition emergency requires an effort commensurate with the stakes. It requires now a giant step forward in the context of a profound re-instrumentation of the CAP.

The CAP and the European Green Deal

Agriculture and food in the European Green Deal

With the introduction of the European Green Deal, "Europe's 'man on the moon' moment" (to quote European Commission President Ursula von der Leyen), the European Commission intends to revive the European project with the aim to involve the current young generation towards the objective to "reconcile our economy with our planet".

Specifically, the European Green Deal "resets the Commission's commitment to tackling climate and environmental-related challenges that is this generation's defining task" (European Commission, 2019). While the December communication outlines the general framework for the whole range of EU activities, its application to farm and food in particular is detailed in the EU Biodiversity Strategy for 2030 and more importantly in the Farm to Fork Strategy (F2FS), both released in May 2020 (European Commission, 2020a, 2020b). The focus of the European Green Deal on the three related issues of climate, environment (notably biodiversity) and health is welcome and must be encouraged for all EU activities in general, for the European agricultural and food sector in particular. Its objectives are extremely ambitious, including for EU farm and food systems for which it sets several quantitative reduction

targets by 2030 for pesticides (-50%), fertilizers (-20%) and antibiotics (-50%) and quantitative increase targets by the same date for agricultural areas under organic farming (25%), agricultural areas under high-diversity landscape features (10%) as well as protected areas.

Current trends show that reaching these agricultural targets will not be an easy task. EU agricultural GHG emissions were reducing up until the 2010s and have slightly increased since (Guyomard *et al.*, 2020). Significant changes in farming practices and systems are now required to achieve further substantial reductions, including a decrease in the use of nitrogen fertilization and in the number of animals farmed. The biodiversity loss in agro-ecosystems continues due to increasingly specialized and simplified agricultural systems and rural landscapes relying on the widespread application of chemical inputs. Soil degradation and nutrient flows – notably nitrogen – in water and the atmosphere have reached alarming levels. With the possible exception of phosphorus and antibiotic, past trends show that it will be extremely difficult to achieve the climatic and environmental targets of the European Green Deal for agriculture without substantial changes in farmers' behaviours, agricultural practices and systems, and policy regulations and incentives. Despite numerous local initiatives, food losses and waste are not significantly decreasing. Finally, a large proportion of the European population does not comply with dietary recommendations that are consistent with the European Green Deal health and nutrition objectives. Current trends show no change in the unrelenting increase in excess weight, obesity and related diseases. Policies that are considerably more ambitious in this domain are needed, as well as in the domain of the bioeconomy.

Achieving the European Green Deal objectives requires a consistent set of strong policies

The whole and holistic approach adopted by the European Green Deal, recognizing the need to act on all compartments of the food chain in an articulated way, is welcome. This ambition must be supported by a consistent set of strong public policies that cannot be limited to agricultural supply side aspects and hence to the CAP, even if the latter is of key importance. Other policies that have to be mobilized cover aspects related to competition law, trade, health, nutrition, rural development, and research and innovation. Some of these areas benefit from other European policies than the CAP that must be consistently articulated: this is the case of trade (through the European Trade Policy), rural development (through the European Cohesion Policy), and research and innovation (through the European Research and Innovation Policy). Other domains like nutrition do not benefit from sufficiently strong policies at either the EU or MS level in a context where extensive change in eating patterns are required not only to fight against excess weight, obesity and related chronic diseases but also to reduce the climatic and environmental footprint of the whole food chain.

Making European agriculture consistent with the Green Deal is possible but requires a whole food chain policy that encompasses more stringent instruments on the supply side and extensive changes in eating patterns. In other words, the climatic and environmental dimension of the CAP must be strengthened, and the CAP itself must be extended in the

framework of a more focused and global food policy. Combined with efficiency gains at the farm and food chain levels, and the re-design of agricultural production systems, dietary changes at the consumer level may put the European food system on the right track to reach the Green Deal ambition.

Unfortunately, the future CAP as defined by the June 2021 agreement appears at odds with the climate, environment and nutrition ambition of the European Green D*eal*. The agreement appears as a business as usual policy promoting the status quo. It can be thus viewed as a defeat for the climate and the environment, and possibly as a Pyrrhic victory for European farmers since in the longer term, it is difficult to see why taxpayers would accept to continue the financing of a policy that no longer provides a public good, and for which the European added value has been significantly diminished as a result. Making the CAP more coherent with the European Green Deal is perhaps the best guarantee for its own continuity in the long run" (Guyomard *et al.*, 2020).

This does not mean that the future CAP does not contain several ingredients for a renewed agricultural policy in line with the European Green D*eal*. This essentially reflects the priority given by a large majority of European policy-makers to short-term issues and in particular to economic aspects to the detriment of longer-term issues linked to the provision of public goods. The proposals made throughout this book essentially respond to a logic of public money for public goods in line with the European Green Deal ambition.

There are clearly a number of potentially conflicting economic consequences of the European Green Deal for the different actors of the food chain, from agricultural producers who will be impacted by the use of more extensive practices and systems relying less on chemical inputs to final consumers who will be impacted by higher prices because of the extensification of agricultural practices. Rather than using these adverse consequences as an excuse to do nothing or hiding things under the carpet as if there were no problems, all potential trade-offs must be explicitly addressed. They require corrective measures aimed at limiting possibly negative consequences of the climate, environment, health, and nutrition ambition of the European Green D*eal*. Several levers can be mobilized to the end, notably for maintaining and increasing farm incomes by playing on the speed of the agro-ecological transition, mobilizing all sources of productivity gains including precision farming and new breeding techniques, promoting the diversification of income sources for agricultural households in particular through the development of payments for ecosystem services, or the use of at least part of savings induced by less depollution and health expenditure. Part of these savings could also be used to ensure an equal access for all households to balanced and healthy diets in line with nutritional recommendations, for example through the development of food vouchers targeted on the poorest households.

Both the COVID-19 crisis and the Russia's invasion of Ukraine are stressing the need to improve the resilience of EU agricultural and food systems. Increasing this resilience requires to reduce the European dependency on imports notably when they are supplied by a small number of countries only (with an additional climate benefit when reductions concern direct and indirect – through mineral fertilizers – energy uses). Far from meaning that the EU should

renounce to the Green Deal, both the COVID-19 crisis and the war in Ukraine provide an additional argument in favour of the European Green Deal, that of the search of greater resilience of EU agricultural and food systems.

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As in other parts of the world, agriculture in Europe is not sustainable. It must urgently and importantly evolve. The Common Agricultural Policy (CAP) must foster this evolution. In that perspective, this book draws the contours of an ambitious CAP that would facilitate the necessary agro-ecological transition of agricultural systems in the European Union.

The book is divided into three parts. The economic aspects are the subject of the first part. The climate, environmental and health dimensions are addressed in the second part. The third part deals with rural development and innovation. With the exception of the first chapter, which provides a brief history of the CAP, the different chapters are organized according to the same structure. They begin with a description of the issue; they continue with a critical presentation of how the issue has been considered within the CAP to date and, if relevant, in other public policies; they finally propose policy recommendations to better address the issue. Each chapter can be read independently. Even if the disciplines and skills mobilized cover a broad spectrum, the general framework of analysis is that of public economics. This reading key is used both to justify the objectives of the CAP and to define the policy instruments to be implemented in order to achieve these objectives in the most efficient way. The concluding chapter addresses three aspects: first, an analysis of the global coherence of our recommendations, including in terms of their links with other policies than the CAP; second, a critical reading of the June 2021 agreement for the 2023-2027 CAP in the light of our recommendations; third, a reading of our recommendations in the light of the ambition of the European Green Deal for agriculture and food.

This book is aimed at all actors interested in the future of the CAP and more generally of agriculture in the European Union: policy makers, agricultural stakeholders, non-governmental organizations, researchers, teachers and students.

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