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EU Bioeconomy Economics and Policies: Volume II

Edited by
Liesbeth Dries
Wim Heijman
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PART I

Food

CHAPTER 1

The EU Food Sector

Liesbeth Dries

1.1 Introduction

This chapter will provide a brief introduction to the EU food sector. The food sector encompasses several stages of the food supply chain: the agricultural inputs industry, the agricultural sector, food manufacturing, food wholesale and food retail. In this chapter, the focus will be on the downstream segments of the food supply chain. The agricultural inputs industry will not be discussed. Sections 1.2 and 1.3 will present figures on the structure and competitiveness of the EU food manufacturing sector. Section 1.4 will discuss developments in the food retail sector and the functioning of the food supply chain as a whole.

The EU food sector has undergone tremendous changes in the post-war period under the influence of technological developments, improvements in people's standards of living and the increasing globalisation of food supply chains. Examples of technological improvements that allowed for more convenience in food preparation at home included, for instance, the invention and spread of microwave ovens in household kitchens. These developments, together with rising incomes and an increase in the number

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of women on the job market, triggered rapid developments in the food processing and retail sectors such as the increased offer of convenience foods and pre-cooked meals (Nisbets 2019). A parallel development since the end of the 1960s was the increasing popularity of dining out and the subsequent rise in the food service sector (Nisbets 2019). The latter developments are directly linked to the increasing living standards of European citizens in the post-war period. In line with the increase in wealth, the share of total household expenditures on food has decreased from over 30% at the end of the 1950s to around 12% (EU average) by 2017 (BBC 2018; Eurostat 2018). Still, the EU average hides wide diversity across member states. For instance, the share of food in total household expenditures is almost 28% in Romania, while it is only 8% in the United Kingdom (Eurostat 2018). A major driver of change in the food sector in recent years results from changing consumer preferences towards sustainable and ethical consumption practices.

1.2 The EU Food Sector[1] in Figures

The EU food sector had a total turnover of 1109 billion Euro in 2016 (up from 1061 bio Euro in 2012) and employed over 4.6 million people (up from 4.5 mio people in 2012) (ECSIP Consortium 2016; FoodDrinkEurope 2018). Small- and medium-sized enterprises make up 48% of the sector's total turnover and 61% of total employment (FoodDrinkEurope 2018). The EU food sector is a major player on global markets: total exports amounted to 110 billion Euro (17.9% of global exports) and total imports to 75 billion Euro in 2016 (FoodDrinkEurope 2018). The main sub-sectors in the EU food industry are the bakery, meat, dairy and drinks sectors. Together they accounted for about 60% of the total turnover, more than 70% of total employment and more than 50% of the export market share in the food sector in 2015 (FoodDrinkEurope 2018).

The member states with the largest food sectors are France, Germany, Italy, the United Kingdom and Spain. Also Poland has a substantial food sector, employing almost 10% of all EU food sector employees. Table 1.1 provides an overview of the main structural features of the food sector in these six main food manufacturing member states. France has the largest food sector in terms of both turnover and in the number of employees,

[1] In this section, the food sector refers to the food (and drinks) manufacturing sector only.

Table 1.1 Structure of the EU food sector in selected member states, 2016

	Turnover (bio Euro)	*No. of employees (000)*	*No. of companies*	*Turnover (mio Euro)/ Company*	*Employees/ Company*
France	179.8	623.4	59,757	3.0	10.4
Germany[a]	171.3	580.0	5940	28.8	97.6
Italy	133.1	385.0	56,500	2.4	6.8
Poland	56.1	421.5	14,324	3.9	29.4
Spain	96.4	480.0	28,038	3.4	17.1
United Kingdom	118.2	434.0	6815	17.3	63.7
Total EU	1069.9	4335.4	250,339	6.3	26.6

Source: FoodDrinkEurope (2018) and own calculations

[a]Only companies with more than 20 employees have been included

Table 1.2 Structure of the EU food and drink industry, 2012

	Turnover (bio Euro)	*No. of enterprises*	*Turnover per enterprise (mio Euro)*	*Persons employed (1000)*	*Employees per enterprise*
EU-28	1061	288,655	3.7	4515	15.6
United States	652	25,974	25.1	1550	59.7
Australia	71	13,018	5.4	240	18.4
Brazil	186	4959	37.5	1615	325.7
Canada	73	8318	8.7	266	32.0

Source: ECSIP Consortium (2016) and own calculations

followed by Germany. Food companies in Germany and the United Kingdom are larger in scale compared to the other main food-producing member states and compared to the EU as a whole.

Table 1.2 benchmarks some of the characteristic features of the EU food industry against a number of its main competitors. We observe that the EU food industry is larger in terms of both turnover and employment compared to the benchmark countries. On the other hand, the productivity of the food sector, measured as the total turnover per enterprise, is lower in the EU than in the benchmark countries. Especially food companies in Brazil (ten times) and the United States (seven times) have a much higher turnover per enterprise than EU food companies. This observation can be linked to the relatively small size of EU food companies. In terms of the number of employees per enterprise, EU food companies are on average four times smaller than their US counterparts and more than 20 times smaller than Brazilian food companies.

1.3 Competitiveness of the EU Food Sector[2]

Competitiveness of the EU food sector can be assessed based on different indicators: as a share of value added in the manufacturing industry, labour productivity, relative trade advantage, world market share or degree of innovativeness. Wijnands and Verhoog (2016) have made an assessment of the overall competitiveness performance of the EU-28 for the food and drinks industry and conclude that the EU's competitiveness is low compared to especially Brazil and the United States. Interestingly, using the insights from Wijnands and Verhoog (2016), ECSIP Consortium (2016) shows that the competitiveness of the EU food sector improved between the periods 2003–2007 and 2008–2012 when looking at the relative trade advantage and the world market share. However, indicators of the EU food sector's share in total manufacturing, labour productivity and value added worsened compared to the benchmark countries (United States, Australia, Brazil and Canada) over the same periods. While these observations seem counterintuitive, a potential explanation can be that the competitiveness of the EU food sector is based on product differentiation through quality (ECSIP Consortium 2016). Successful quality differentiation can earn a price premium for EU food products, and cost-related competitiveness indicators such as labour productivity will have less of an influence in international markets. The focus on the quality of EU food production is also found in the EU regulatory framework, for example, the EU Food Safety Law (see Chap. 16) and the EU Food Quality Policy (see Chap. 17).

The competitiveness of the food sector can also be assessed based on the degree of innovativeness. In general, the food industry is regarded as being less innovative than other industries, when comparing the shares of patent applications with the European Patent Office in total patent applications of the manufacturing sector. For instance, the share of patent applications by the food and drinks sector is only 2–3%, while it is 8–10% for the automobile and pharmaceuticals sectors (INNOFOOD-SEE 2013). Figure 1.1 shows that the EU food (and drinks) sector has a

[2] In this section, the food sector refers to the food (and drinks) manufacturing sector only.

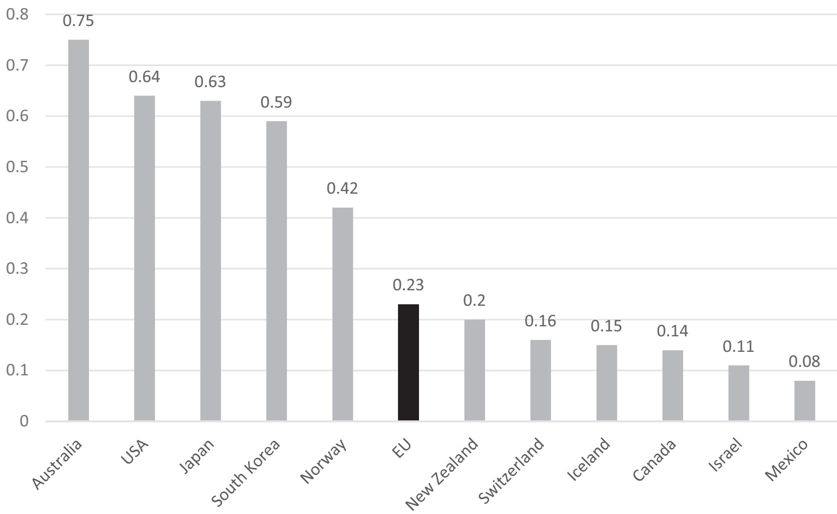

Fig. 1.1 R&D private investment in the food sector, percentage of output, average 2013–2015. (Source: Own representation based on FoodDrinkEurope 2018)

relatively low R&D investment intensity, that is, the share of R&D investment in total output of the sector, compared to a number of other food industries around the world. Especially the food industries in Australia, the United States, Japan and South Korea outperform the EU in terms of innovativeness. However, a large diversity also exists across member states within the EU. Figure 1.2 provides an overview of R&D intensity per member state. This shows that Finland and the Netherlands are frontrunners in food innovation within the EU, and their performance comes close to matching that of the best performing global benchmark countries. On the other hand, Romania, Bulgaria, Slovakia and Cyprus have a very low degree of R&D investment in the food sector.

1.4 Functioning of the EU Food Supply Chain

In the past decade, some concern has risen about the functioning of the EU food supply chain and in particular about the position of farmers in the supply chain. This concern stems on the one hand from the increasing deregulation of EU food markets, causing greater exposure to market imperfections and increased price volatility, with farmers running the risk

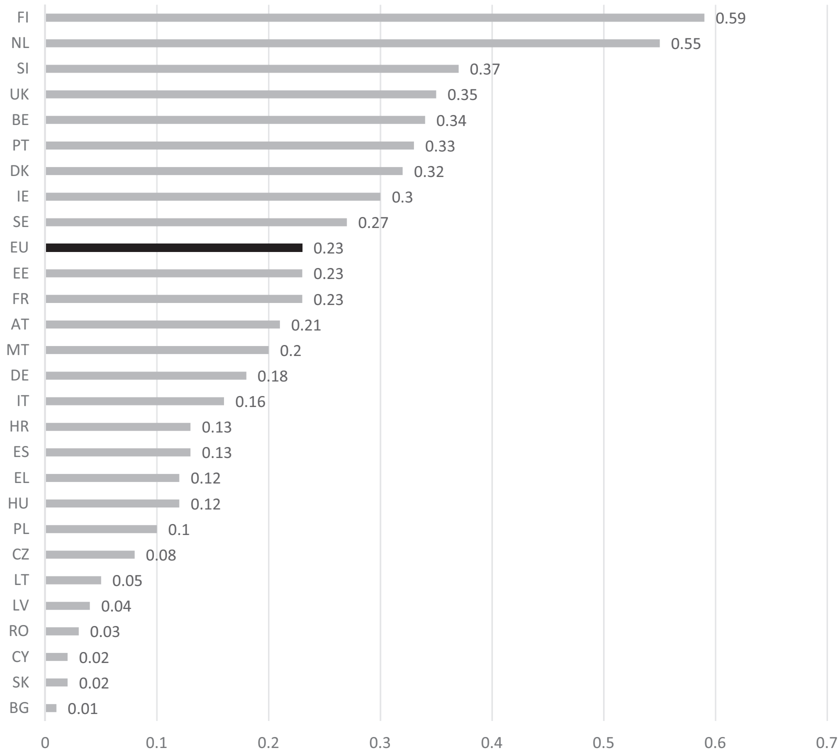

Fig. 1.2 R&D private investment in the food sector by member state, percentage of output, average 2013–2015. (Source: Own representation based on FoodDrinkEurope 2018)

of becoming the main shock absorbers in the supply chain for market risks and price volatility (AMTF 2018). Figure 1.3 gives some support to this concern. The figure shows the monthly evolution in agricultural prices, producer (processor) prices and consumer prices in the EU. It is clear that agricultural prices are much more volatile than prices of processed products and retail prices.

In addition to the influence of increased global integration of the EU food market, the alleged low bargaining power of farmers—who are weakly organised and up against highly concentrated processing and retail sectors—may exacerbate the vulnerable position of farmers in the food

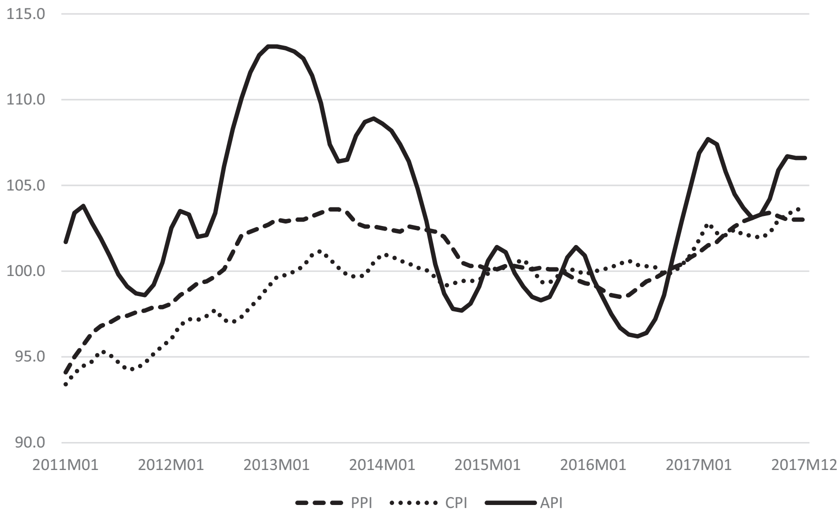

Fig. 1.3 Agricultural (API), producer (PPI) and consumer (CPI) price index developments in the EU, (2015 = 100), 2011–2017. (Source: Own representation based on Eurostat 2019)

supply chain.[3] Section 1.4.1 will take a closer look at developments in the retail sector, in particular the rising concentration in the sector. At the invitation of the European Commission, an expert group—called the Agricultural Markets Task Force—developed policy recommendations to strengthen the position of farmers in the agricultural food chain. These recommendations include increased market transparency, a ban on unfair trading practices and changes to competition rules to allow farmers to work together in producer organisations (AMTF 2018). Section 1.4.2 will discuss some of the recent policy developments, especially in relation to the ban on unfair trading practices.

[3] Note that there may be other reasons than the weak bargaining power of farmers that can explain an imperfect pass-through of price changes along the supply chain. The fact that agricultural products make up just a (small) share of the total value of processed and consumer products and the presence of adjustment and menu costs (the cost for firms to change their prices) may also play a role (see, for instance, Vavra and Goodwin 2005 for an overview).

1.4.1 *The Growing Importance of the Retail Sector in the Food Supply Chain*

A major concern about the functioning of the EU food supply chain relates to the extent of retailers' bargaining power vis-à-vis their suppliers because of increasing retailer concentration, the formation of buying alliances and the development of retailers' own brands or private labels (Chauve and Renckens 2015). Food retail markets are becoming increasingly concentrated. Figure 1.4 shows the market share in total edible groceries of the top five retailers in each EU member state. Average (top five) retailer concentration in the EU has increased from 35% in 2004 to 46% in 2012. Retailer concentration varies widely across member states, from over 60% in Germany, Austria and Estonia to barely 20% in Italy, Romania and Bulgaria. Moreover, Fig. 1.4 shows a rapid rise in retailer concentration in the new EU member states. The market share of top five retailers in the edible groceries market has increased with more than 10 percentage points in all member states that have acceded the EU since 2004, except for Hungary. Looking at the EU market for edible groceries as a whole, the top ten of retail companies include Carrefour, ITM, Rewe Group, Tesco, Edeka, Aldi, Ahold, Schwarz Group, Auchan and Leclerc. The

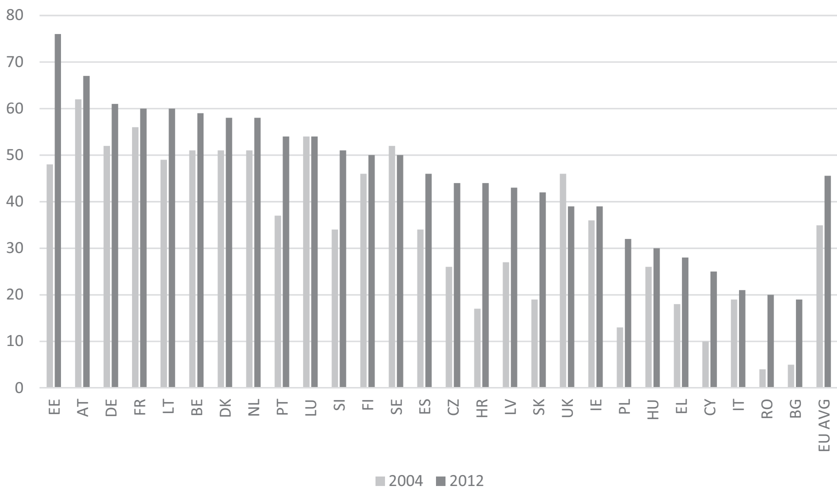

Fig. 1.4 Market share of the top five retail groups in the total edible groceries market in different EU member states, percentage, 2004–2012. (Source: Own representation based on European Commission 2014)

combined EU market share of these ten companies increased from 26% in 2000 to 31% in 2011 (European Commission 2014).

The increasing concentration in the retail sector is augmented by a growing network of national and European buying alliances (FoodDrinkEurope 2016). A buying alliance is "an organization created by several shops or retailers with the aim of improving their purchasing conditions [...] particularly to strengthen the retailers' bargaining power through higher volumes to reduce purchasing costs, for the procurement of large international brands or for private labels" (European Commission 2014, p. 52). Buying alliances operate across different EU member states, for example, AMS and EMD are active in 22 and 20 member states, respectively (European Commission 2014).

Finally, private label products are increasingly being seen by retailers as a tool for building client loyalty and strengthening their brand image. While offering value for money to consumers, private labels offer an opportunity for creating higher margins to retailers (European Commission 2014). Private label market shares have increased for most product categories in the EU between 2004 and 2012 (Chauve and Renckens 2015). The private label market share (for selected edible and non-edible groceries) is as high as 42% in the United Kingdom, 39% in Spain, 32% in Germany and 28% in France (PlanetRetail 2013).

1.4.2 Policy Initiatives to Improve Farmers' Position in the Food Supply Chain

On 17 April 2019, the Directive (EU) 2019/633 on unfair trading practices in business-to-business relationships in the agricultural and food supply chain (UTP Directive) came into force. The UTP Directive is part of the wider EU policy agenda that follows up on the recommendations of the Agricultural Markets Task Force (see AMTF 2018). Other examples of policy initiatives under this policy agenda are improved possibilities of producer cooperation in the Omnibus initiative and measures undertaken by the Commission to enhance market transparency, such as the Food Price Monitoring Tool (see Eurostat 2019).

The UTP Directive aims to prevent the imposition of unfair trading practices on suppliers who, due to their weaker bargaining power and limited legal and financial means to litigate, may be forced to accept unfair practices to maintain commercial relations with buyers in the supply chain. Suppliers in the context of the UTP Directive include not only farmers, and their organisations, but also downstream suppliers of agri-food products such as small and medium manufacturers or distributors (European Commission 2019).

The UTP Directive provides mandatory rules that outlaw certain unfair trading practices. These rules will complement existing member states' rules as well as voluntary initiatives of the industry. National legislation on UTPs exists in the majority of EU member states. The choice of the legal instrument of a directive aims at leaving the necessary leeway for member states to incorporate the UTP Directive into national legislation, while providing an EU-wide framework and ensuring a level playing field. Member States will have 24 months, starting April 2019, to introduce the new rules into national legislation. They are furthermore obliged to designate a public authority charged with enforcing the rules. This body can conduct investigations and impose fines in case of infringements (European Parliament 2019).

The Directive prohibits 16 specific unfair trading practices. "Black" unfair trading practices are prohibited under all circumstances. "Grey" practices are allowed if the supplier and the buyer agree on them beforehand in a clear and unambiguous manner. The ten black unfair trading practices are (European Commission 2019):

- Payments later than 30 days for perishable agricultural and food products
- Payments later than 60 days for other agri-food products
- Short-notice cancellations of perishable agri-food products
- Unilateral contract changes by the buyer
- Payments not related to a specific transaction
- Risk of loss and deterioration transferred to the supplier
- Refusal of a written confirmation of a supply agreement by the buyer, despite request of the supplier
- Misuse of trade secrets by the buyer
- Commercial retaliation by the buyer
- Transferring the costs of examining customer complaints to the supplier

The grey unfair trading practices include (European Commission 2019):

- Return of unsold products
- Payment of the supplier for stocking, display and listing
- Payment of the supplier for promotion
- Payment of the supplier for marketing
- Payment of the supplier for advertising
- Payment of the supplier for staff of the buyer, fitting out premises

1.5 Conclusions

The EU food sector makes a considerable contribution to the EU economy, both in terms of turnover and employment. Compared to other major food producers around the world, the EU food sector includes a large share of small- and medium-sized enterprises. This translates into a relatively low level of productivity, per enterprise and per employee. On the other hand, the EU holds a very competitive position in world food trade. The EU food sector is regarded as a less innovative sector when compared to other manufacturing sectors as well as in comparison to some of its global competitors. However, major differences exist between member states in the EU and some member states, such as Finland and the Netherlands, have high levels of private R&D investment intensity. In recent years, concern has risen about the vulnerable position of farmers and small- and medium-sized suppliers in the food chain. This has resulted in a number of policy initiatives such as the Directive banning unfair trading practices.

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CHAPTER 2

EU Food Law: A Very Short Introduction

Kai Purnhagen

2.1 EU Law and Foods

The regulation of the European food market has ranked high on the agenda of the EU since the foundation of the European Communities (EC) (Krapohl 2007, 38; Purnhagen 2013, 27). The law on trade in agricultural commodities and particularly in foods has shaped the architecture of EU law and the EU as such in a way that is probably not comparable to any other area of EU law. Food law touches upon the life of every citizen inside of the EU. Via trade, it also touches a growing amount of people outside of the EU (Bradford 2012, 1; Sinopoli and Purnhagen 2016), on a daily basis and at every stage of one's life. Foodstuffs are regulated at several levels of the EU, that is, at Member State and EU levels. Most of EU food law follows a maximum harmonization structure, which means that EU law provides a comprehensive legislative framework, while Member States have little leeway to adjust their own laws (Vos and Wendler 2006, 74; Faure 2018, 283). Consequentially, this contribution focuses on the regulation of food law at EU level.

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At EU level trade in foods is dealt with in primary and secondary laws. With the coming into force of the General Food Law (hereinafter GFL) (European Parliament and Council 2002), and subsequent comprehensive secondary legislation, most food trade-related issues are regulated at a secondary level. The lion share of EU food law hence concerns secondary legislation. According to Art. 3 (1) GFL, which applies to the GFL only, 'food law' means the laws, regulations and administrative provisions governing food in general, and food safety in particular, whether at Community or national level; it covers any stage of production, processing and distribution of food, and also of feed produced for, or fed to, food-producing animals."

2.2 Primary EU Food Law

Foodstuffs fall within the regime of the free movement of goods according to Art. 34 Treaty on Functioning of the European Union (TFEU). Hence, any quantitative restriction of food trade in the EU or measures having an equivalent effect are prohibited in the EU. However, when "food" is classified as an agricultural product, the special regime of the Common Market Organisation (CMO) applies. As this contribution covers "food law" only, I will leave aside the regulations pertaining to agricultural products. To realize the free movement of goods in the EU, EU institutions may initiate secondary legislation based on Art. 114 TFEU. Art. 114 TFEU is the so-called internal market clause, as it serves as the competence norm for secondary legislation enacted to establish the internal market. As such, it also serves as the basis for all secondary food laws in the EU. The tests attached for a legal act to be compatible with the requirements of Art. 114 TFEU are relatively lax. Only in one case, the infamous Tobacco judgement, has the Court declared a secondary legal act not to be in compliance with the requirements of (current) Art. 114 TFEU (Weatherill 2011, 827). For EU food law, the provisions of Art. 114 (III, IV, V and IIX) TFEU deserve special attention. Art. 114 III TFEU requires the Commission to base its legislative proposals on a high level of health, safety, environmental and consumer protection. In determining this high level, the Commission has to take into account new developments based on scientific facts. Whether this high level is maintained or these scientific facts are actually taken into account in the final measure depends on the decisions taken by the Council and the Parliament in the legislative procedure, which are, however, according to Art. 114 III TFEU obliged "to achieve this objective." In drafting most measures of food law, a high level of health and safety was taken into account. If Member States want to deviate from these harmonized measures, they can do so to "maintain national provisions on grounds of major needs referred to in Article 36, or relating to the protection of the environment or the working environment,"[1] or if "new scientific evidence relating to the protection of the environment or the working environment"[2] is available. However, if they do, they have to "notify the Commission of these provisions as well as the grounds for maintaining them." Member States have to inform the Council if specific problems of public health arise, according to Art. 114 IIX TFEU.

2.3 Secondary Law

Art. 114 TFEU provides the basis for secondary food law. The limits set by Art. 114 TFEU hence provide the major legal framework for the determination of the content of EU food law. Unlike most of the other areas of secondary internal market law, EU food law follows a horizontal structure, with parts of the GFL setting out the framework and general principles which need to be applied to all food law in the EU and all stages of food production.

2.3.1 General Food Law

The GFL sets out general horizontal requirements applicable to the food market in the EU. According to Art. 4 (1) GFL, parts of the GFL follow a food chain approach (Vapnek 2007), which means that it applies "to all stages of the production, processing and distribution of food, and also of feed produced for, or fed to, food-producing animals."

2.3.2 Important Definitions

Art. 2 GFL stipulates that 'food' (or 'foodstuff') means any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be ingested by humans." It includes "drink, chewing gum and any substance, including water, intentionally incorporated into the food during its manufacture, preparation or treatment." Several products are not considered "food," most importantly feed and live animals unless they are prepared for placing on the market for

[1] Art. 114 III TFEU.
[2] Art. 114 IV TFEU.

human consumption as well as products such as medicines which are covered by a special regulatory regime.

2.3.3 The General Principles of Food Law

Art. 5–10 GFL are designed as general principles for the whole EU, which are according to Art. 4 II GFL "to be followed when measures are taken." This includes amending of all existing national food laws. All measures need to apply and balance the general objectives as mentioned in Art. 5 GFL, such as a high level of protection of human life and health, protection of consumers' interest, animal health and welfare, and plant health and the environment, and the free movement of food and feed in the Union. Where appropriate, existing scientific standards have to be taken into consideration in the development or adaption of food law. To achieve the objective of a high level of protection of human life and health, food law has to be based on a scientific risk assessment.[3] Where a possibility of a harmful effect on health is identified but scientific uncertainty persists, the precautionary principle allows the adoption of provisional risk management measures.[4] In addition, the protection of the consumers' interest, in particular the prevention of misleading practices, guides the food market.[5] Art. 9 and 10 GFL make certain that public consultation and public information are essential elements of the regulatory framework.

2.3.4 The General Obligations of Food Trade

Arts. 11–13 GFL are designed as general obligation of food trade with the EU and the EU's role in international trade. Major rules include importers' and exporters' obligation to comply with EU food law, unless the target country applies differing laws. The EU also submits to the development of and adherence to international standards, where appropriate.

2.3.5 The General Requirements for Food Law

Arts. 14–21 GFL set out the general regulatory requirements for food law. According to the rationale of the GFL triggers regulatory interference when a food is unsafe.[6] The obligation to secure that food on the internal

[3] Art. 6 GFL.
[4] Art. 7 GFL.
[5] Art. 8 GFL.
[6] Art. 14 GFL.

market is not unsafe is according to Arts. 17 (1) and 19 GFL primarily with the food business operator (FBO). Member States have a duty to enforce, monitor and verify FBOs in exercising their duty.[7] Note that the FBOs duty is not to provide safe foods but rather to ascertain that food which is on the EU market is not unsafe. This differentiation is an important one, as the standard of proof for FBOs and Member State authorities is more relaxed in this sense (Purnhagen 2015). Note also that what is understood as "unsafe" is determined legally. The term does cover food not only which is injurious to health but also such that is unfit for human consumption.[8] Furthermore, the law defines certain issues as unsafe, such as when one foodstuff of a batch is considered "unsafe," then all other foods of the batch are considered "unsafe" as well.[9] Art. 14 GFL provides a catalogue of these unsafety definitions. Other secondary legislation extends this list, such as Art. 24(1) Regulation 1169/2011, whereby all foods that have passed the "use by" date are considered "unsafe."

The obligations for FBOs, after such "unsafeness" was identified, are enumerated mostly in Art. 19 GFL. Depending on the gravity of risk for the final consumer and whether the product has already reached the final consumer, FBO has to initiate withdrawals, recalls or information measures. Table 2.1 illustrates the different measures.

Table 2.1 Requirements of food business operators in case of food safety problems

Provision	*Condition*	*Legal consequence*
19(1)	FBO has reason to believe food is not in compliance	Initiate procedures to withdraw
	Id.	Inform CA
	Id. + may have reached consumer	Inform consumers
	Id. + id.	Measures to achieve high level of health protection
	Id. + id. + health measure insufficient	Recall
19(3)	FBO reason to believe food may be injurious to health	Inform CA about measures taken
19(4)	Risks exist	Collaborate with CA to reduce risks

Source: Own presentations

[7] Art. 17 (2) GFL.
[8] Art. 14 (2) GFL.
[9] Art. 14 (6) GFL.

FBO has to adhere to traceability requirements as set out in Art. 18 GFL. This obligation includes the possibility to identify each supplier in the chain and proper communication via labelling. According to Art. 21 GFL, EU law on product liability remains applicable, indicating that the lawmaker sees the EU product liability regime applicable to the food sector and also as a sufficient liability tool.

2.3.6 The Food Safety Authority (EFSA)

Arts. 22–49 GFL set up and govern the European Food Safety Authority. It provides scientific advice to the Community's legislation and policies in food and feed safety.[10] It also has extended information duties. Its role is different from other regulatory oversight bodies such as the US FDA, as it cannot be classified as a traditional regulatory agency. The GFL chapter on the EFSA sets out several rules regarding its governance, liability and other requirements.

2.3.7 The Rapid Alert System for Food and Feed (RASFF)

Arts. 50–60 GFL set up the RASFF and several other tools to manage a crisis. The RASFF is a tool established for authorities to exchange information about measures taken responding to serious risks detected in relation to food or feed. Along the decision chain, several institutions are involved in the decision making in a coordinated manner (Fig. 2.1).

2.3.8 Other Important Secondary Food Laws

This section introduces other provisions of secondary food law. It is possible to provide neither a comprehensive illustration nor a deep analysis of the respective legal acts. Rather, I will present a summary of what are to my understanding the most important measures governing the EU food market. Neither it claims nor can it deliver completeness.

2.3.9 Food Information Law

EU Food Information Law consists of several secondary legal acts. Central to this field of food law is the Food Information to Consumers Regulation

[10] Art. 22 (2) GFL.

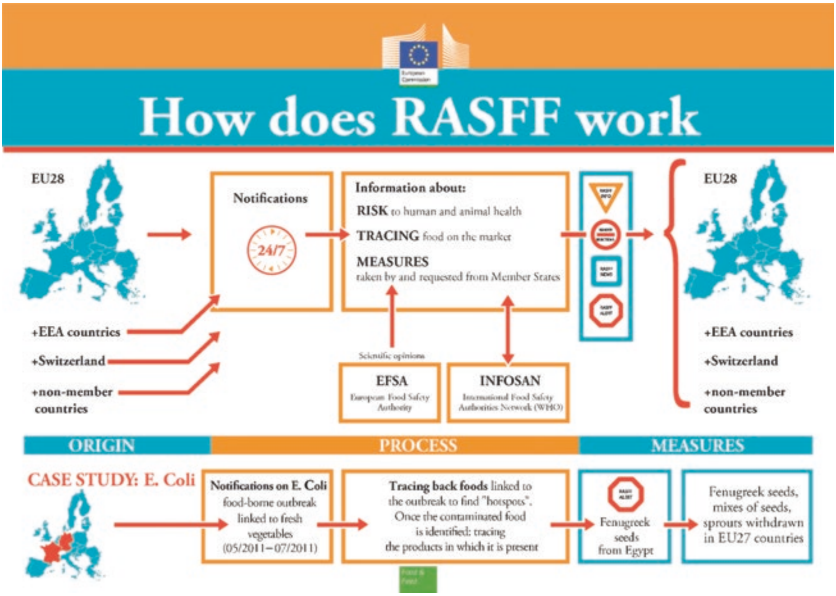

Fig. 2.1 The rapid alert system for food and feed framework. (Source: https://ec.europa.eu/food/sites/food/files/safety/rasff/images/030614_how_does_it_work.jpg)

(EU) No 1169/2011 (FIR), which provides a horizontal structure to regulate the food market. According to Art. 2 (1b) FIR, "'food information law' means the Union provisions governing the food information, and in particular labelling, including rules of a general nature applicable to all foods in particular circumstances or to certain categories of foods and rules which apply only to specific foods." According to its Art. 1 (1), the FIR "provides the basis for the assurance of a high level of consumer protection in relation to food information, taking into account the differences in the perception of consumers and their information needs whilst ensuring the smooth functioning of the internal market." According to Art. 1 (2) sentence 1 FIR, it also "establishes the general principles, requirements and responsibilities governing food information, and in particular food labelling." The FIR hence contains both horizontal regulations applicable to all food information regulation and detailed requirements for labelling other means of communication about foodstuffs.

Regulation (EC) No. 1829/2003 concerns labelling of foods which contain or consist of Genetically Modified Organisms (GMOs) or are produced from or contain ingredients produced from GMOs (GMO Labelling Regulation).[11] If they are delivered to the final consumer, they need to be labelled accordingly. If the proportion of the GMO ingredient is not higher than 0.9 per cent, then labelling is not required. Regulation (EC) No 834/2007 on organic production and labelling of organic products and its accompanying implementing acts provide the basis for the regulation of labelling of organic products in the EU. It provides substantive requirements for organic labelling and introduces a Union-wide applicable logo. Directive 2002/46/EC on the approximation of the laws of the Member States relating to food supplements concerns information to consumer requirements about food supplements. Regulation (EU) No 609/2013 on food intended for infants and young children, food for special medical purposes and total diet replacement for weight control introduces specific labelling provisions for these particularly vulnerable groups. Directive 2009/54/EC on the exploitation and marketing of natural mineral waters establishes labelling requirements for the sale of mineral water in the EU. In particular, the Directive regulates the use of trade names such as "natural mineral water" and establishes minimum requirements of their use. Article 7 of Regulation (EC) No 1925/2006 on the addition of vitamins and minerals and of certain other substances to foods stipulates requirements for labelling of foods to which vitamins and minerals were added.

Regulation (EC) No 1924/2006 on nutrition and health claims made on foods enjoys a special status in food information law. This regulation de facto establishes authorization requirements for health claims, thereby introducing the uncommon requirement to authorize information about health as such.

2.3.10 Food Authorization Procedures

Certain foods in the EU internal market require authorization procedures before they can be admitted to the market. In particular, foods which contain or consist of GMOs, novel foods, and food additives, food enzymes and flavourings require authorization.

[11] Regulation (EC) No 1829/2003 of the European Parliament and of the Council of 22 September 2003 on genetically modified food and feed (Text with EEA relevance), OJ L 268, 18.10.2003, pp. 1–23.

Regulation (EC) No 1829/2003 on genetically modified food and feed sets out a general authorization requirement for foods or feed containing GMOs in the EU. The application needs to be submitted to the competent national authority, which then starts a standardized risk-based authorization procedure. The risk assessment is centralized with EFSA, and the granting of approval is with the Commission, based on a political decision. Regulation (EU) 2015/2283 on novel foods requires all novel foods placed on the market to be authorized. According to Art. 3 (2) (a) Novel Food Regulation, "'novel food' means any food that was not used for human consumption to a significant degree within the Union before 15 May 1997, irrespective of the dates of accession of Member States to the Union, and that falls under at least one of the (…) categories," listed subsequently. Most importantly, "novel foods" are hence such that have a new or intentionally modified molecular structure, food consisting of, isolated from or produced from plants or their parts or animals or their parts, as well as food consisting of engineered nanomaterials. The application needs to be submitted online to the Commission, which seeks for risk assessment from EFSA. The final decision is with the Commission. Food additives, food enzymes and flavourings each also require an authorization, granted by EFSA after a successful comitology procedure.

2.4 Conclusion

Food law in the EU reflects a complex web of many different legal acts. However, with the enactment of the GFL as horizontal regulation, the pointillist interventions have gained a roof, which allows for more predictability of regulation. In addition, the rigorous application of the farm to fork approach across the whole supply chain makes the EU's regulatory approach unique to the world, which increasingly served as a de facto or de iure standard to govern also markets outside of the EU (Bradford 2012).

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CHAPTER 3

EU Food Quality Policy: Geographical Indications

Filippo Arfini

3.1 EU Food Quality Policy: History and Development

3.1.1 EU Food Quality Policy, Why?

The European Common Agricultural Policy (CAP) has multiple goals, including a stable and affordable food supply, the sustainable management of natural resources and viable rural economies. Initially, the CAP pursued a policy of food security. Article 33 of the Treaty of Rome had among its objectives: "increasing the productivity of agriculture", "guaranteeing the security of supply" and "ensuring reasonable prices for deliveries to consumers". From the 1960s onwards, at the height of economic and industrial reconstruction and in a society still largely rooted in the rural economy, Europe sought to facilitate the creation of a European industrial system which included food production. The availability of cheap food

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was central to this ambition, leaving an increasing proportion of household budgets for non-food spending.

The CAP has been successful in achieving its initial goals and contributed significantly to the general growth of the European economy, the emergence of new consumption patterns and the progressive internationalization of the European agri-food sector. Furthermore, the Single Market has stimulated food companies to expand their markets both for selling their consumer goods and for procuring raw materials. This resulted in food chains moving from local supply chains at a regional or national level to international chains.

However, over time, the CAP also came increasingly under pressure due to rising agricultural surpluses, budgetary restrictions, international trade conflicts and changing societal demands (Meester 2011). Addressing these pressures required a reorientation of agriculture policies from a producer focus towards a focus on the market and consumers. Following this view, the quality of agricultural and food products has become a central objective in the CAP to give farmers an instrument to compete under conditions of increasing market liberalization (Fischer Boel 2007). Hence, the purpose of the CAP is no longer simply to respond to the need for food security, a clear objective in the early stages of Common Agricultural Policy, but also to meet requirements for food safety and to offer European consumers food of high quality. Today, the agricultural sector is increasingly placing itself at the service of citizens and consumers by supplying "safe and healthy" foods obtained with environmentally friendly techniques.

3.1.2 Food Safety, an Integral Part of Food Quality

Besides being a tool for creating competitive advantage, quality also has a "health" dimension. High-quality food products require that they are not harmful to consumers' health, and this assumes the absence of contamination and intoxication risks. Fraudulent production practices or actions in the supply chain have in recent history led to serious food scandals in the EU, particularly in the beef and poultry sectors, and a climate of mistrust among European consumers towards agricultural production. If the quality of food products is questioned because of food safety issues, then this is particularly harmful to the sector and often leads to market crisis and a severe drop in consumption.

Faced with the possibility of damage to European food supply chains and to counter the growing mistrust of an increasingly industrialized agricultural production system, the European Commission took action with a new policy strategy that set as objectives: (i) simplification of the modalities of intervention in support of farmer incomes, (ii) payments to practices that respect the environment and animal welfare, (iii) guaranteeing the safety of food products on the EU market and (iv) guaranteeing the quality characteristics of food.

The "White Paper on Food Safety" (EU, COM 719/99) sets the stage for the creation of a European Food Safety Agency (EFSA), introduced food product traceability and established the Rapid Alert System on Food and Feed. In the European spirit, food safety does not imply uniformity of food production, and the EU in fact promotes the diversity of food products on the basis of their quality attributes. But the EU respects the right of consumers to make informed and conscious decisions. With the aim of raising consumer confidence in food, the European Commission promotes knowledge on the subject of food, imposes labelling requirements and also publishes scientific opinions.

The main tool established by the White Paper to prevent food safety risks is traceability (Reg.EC 178/2002). The slogan "From farm to fork" (European Commission 2004) involves much more than merely a technical intervention. Over time, it has increasingly become a system of guarantees, and a marketing, organizational and promotional tool. Along with mandatory and voluntary certification schemes, traceability has changed the organization of agricultural supply chains. It obliges food chain agents to know each other (companies must be able to identify their suppliers and customers in the chain), to follow shared production rules, and it gives food companies access to information about the quality of inputs.

Traceability started a new phase in trade relations. It has contributed to raising the level of consumer confidence in the European food system and among various levels of the supply chain (DG SANCO 2006). It brought into being new contractual forms based on principles of quality and safety. Over the years, the food system, under the pressure of traceability and Information Communication Technology (ICT), has become more modern, transparent, efficient and competitive, triggering a process of value creation within food chains.

The reorganization of food supply chains has also led to the development of "external" measures of farm support through the process of a horizontal organization. The creation of "Collective organizations" (CO) involves two types of institutions: (i) the Producer Organization and (ii) the Inter-branch Organization (a measure envisaged by CMO (EC) No 1234/2007). Policy tools targeting the support of collective organizations have several aims: (i) concentration of the production phase, (ii) increasing the bargaining power of producers, (iii) facilitating the introduction of technological innovations, (iv) managing technological and market risks and (v) establishing joint marketing and communication strategies with industrial counterparts (Bodiguel 2016; Giacomini et al. 2011).

3.1.3 The Origin of EU Policies on Organic Production and Geographical Indications

"European food quality policy" aims to promote not only food safety but also specific quality attributes linked to a specific Code of Practice of food production. This process received momentum with Agenda 2000's introduction of "agri-environment accompanying measures" and with EEC Regulation 2081/1991, EEC Regulation 2082/1991 and EEC Regulation 2092/91, which introduced Geographical Indications (GIs) and regulations on Organic products. These Regulations initiated a new era for the CAP. It was no longer a matter of stimulating agricultural production, but rather legal protection of quality products, defining production rules, enforcing certification schemes and the use of specific quality labels enabling consumers to recognize products without misinterpretation.

Regulations protecting European food products were actually initiated in the second half of the 1960s to meet the need to create a free European market, pursuing the objective of "abolishing duties between Member States, customs and quantitative restrictions on entry and exit of goods and all other measures having equivalent effect", contained in the Treaty of Rome. The first relevant regulation was Commission *Directive 70/50/EEC* of *22 December 1969* on the *abolition* of *measures* which *have* an *effect equivalent* to *quantitative restrictions* on *imports.*

In this regard, two rulings by the European Court of Justice played a decisive role in the subsequent legislative guidelines of the European Community: the Dassonville and Cassis de Dijon decisions. The Dassonville ruling clarified the concept of "equivalent measure", and the 1979 Cassis de Dijon ruling is considered a milestone in that it provided a turning point in the legislative guidelines on the free movement of goods. The Court of Justice in fact ruled that, in the absence of a common regulation on alcoholic beverages, each Member State is free to regulate, in its territory, everything concerning the production and marketing of alcohol beverages that are legally produced and marketed in another Member State. The ruling represents a measure having an equivalent effect, namely that there is no valid reason to prevent the Cassis de Dijon, legally produced and put up for sale in France, from also being marketed in Germany. Following this ruling, the principle of "mutual recognition" was extended to all products traded within the Community and was also introduced into the "new approach" adopted by the Commission in relation to the free movement of products in the internal market through the Council Resolution of 7 May 1985.

In parallel with the definition of the fundamental principles of the integration process, the European Community also issued several communications with the aim of regulating the scope of food legislation, such as Communication 85/603 on the boundaries of binding regulations and voluntary food standards and Communication 89/271 on obstacles to the free movement of food within the European Community. In Communication 89/271, the Community's orientation on quality food products is more precise. It identifies the need to obtain "a Community reference framework for establishing the procedures for the approval and mutual recognition of quality labels and indications enabling the recognition of quality, origin or particular or traditional manufacture" and introduces the aim of promoting a single European policy on labelling.

Two years later, on 24 June 1991, organic farming was regulated by EEC regulation 2092/1991, and the following year the new regulation on Geographical Indications and the Traditional Specialty Guaranteed was approved with the promulgation of EEC regulations 2081/1992 and 2082/1992. More recently, in 2006 and again in 2012, the European Commission updated the 1992 legislation by combining it into a single regulation, Regulation 1151/2012. Known as the "quality package", this regulation covers the definition of Geographical Indications, Traditional Specialty Guaranteed and products from mountain areas and islands.

Considering the high level of diversification in food production, Europe has embraced the concept of "Quality Assurance and Certification Schemes" (QAS) (Dries et al. 2006), which are schemes that enable food chains to guarantee that their products or processes fulfil predefined quality requirements. QAS can be defined as any code of practice, standard or set of requisites that enable stakeholders in the food supply chain to be guaranteed by a verification process. There are two types of QAS:

(i) "quality management systems" and (ii) schemes that explicitly aim at segmenting the final product market using labelling to signal product characteristics (European Commission 2006). The EU policy for Geographical Indications and Organic production are examples of voluntary, public QAS.

3.2 The EU Policy for Geographical Indications

3.2.1 What Are Geographical Indications?

A vast body of literature exists on the issue of GIs (Arfini and Mora 1998; Sylvander et al. 2000; Barjolle and Sylvander 2000; Tregear et al. 2007; Arfini et al. 2012; Barham and Sylvander 2011). This literature has made several observations on GI products, some of which may seem paradoxical:

- GIs are products originating from small geographical areas but are (sometimes) destined for global consumption;
- GIs can be produced by small companies, often unknown to the majority of consumers, but the strength of their reputation can be similar to that of multinational food brands;
- GIs are related to traditional and historical food products, but they are also presented as the food of the future. They are considered an expression of innovation which can win over consumers in the name of tradition;
- GIs in Europe present a complex institutional architecture aimed at guaranteeing strong protection for the geographical name, although this does not prevent the improper use of the designation on international markets;
- GI products present a unique unreproducible quality because they are based on the natural and anthropogenic resources of the area of origin. However, imitations are common and are traded all over the world;
- GIs are the intrinsic demonstration of the sustainability of their production processes, whose future might be compromised by general and local environmental degradation and market imperfections which prevent full remuneration of production factors;
- GIs are locally rooted products and only a fraction of output is exported. They are however significant in international trade negotiations.

Two elements essentially identify and characterize GI products: (i) the complex and multifaceted nature of the concept of quality and (ii) the multifunctional nature of GI systems. The quality of GI products derives from the close dependence on natural and anthropogenic local resources, the history of the territory of production and the cultural heritage. The reputation of a GI product has developed over time, and consumers identify it with the "concept of typicality" (Casabianca and Touzard 2009). Typicality is an intrinsic part of GI quality and is perceived by consumers as not reproducible. The multifunctional nature of GI systems means that interactions with public goods and positive externalities need to be considered (Barham and Sylvander 2011; Casabianca and Touzard 2009; Allaire et al. 2011).

Geographic names can be used to identify a wide range of agri-food products by creating an association between the products themselves and the place of origin. However, there are differences between the regulatory instruments with regard to indications of source, designation of origin and geographical indications. The recognition of GI products as a "category" of food goods has been a long and complex process, closely linked to the rules of international trade. The goal was, and remains, the definition of rules for the correct use of the geographical name that identifies the territory of origin associated with the name of the product, thus protecting producers and consumers from fraudulent behaviour.

3.2.2 Geographical Indications in Multilateral Agreements

Internationally, the protection of GIs takes place through accession to multilateral agreements. The multilateral agreements providing for the protection of indications of origin and designations of origin started historically with the Paris Convention (1883), followed by the Madrid Agreement (1891), and more recently the Lisbon Agreement (1958) and the "Agreement on the protection of intellectual property rights related to trade" (TRIPS) (1995).

The World Trade Organisation's (WTO) TRIPS was an important turning point between two phases in the definition of rules and the debate on GIs. Before 1995, international agreements could be divided into two types. The first type were agreements between many signatory countries, characterized by a very general definition of origin and very weak levels of protection, for example, the Paris Convention for the Protection of Industrial Property and the Madrid Agreement. The second type included agreements limited to a few signatory countries which provided a more precise definition of geographical indication and a stronger level of protection, for example, the Lisbon Agreement.

Except for the Lisbon Agreement, international agreements currently in force provide only general principles which signatory countries implement inside national regulatory frameworks. The weakness of the protection for GIs is essentially due to the low level of protection offered by the Paris Convention and by the limited number of signatory countries of the Lisbon Agreement.

3.2.3 The Lisbon Agreement

The Lisbon Agreement, signed in 1958, was the first multilateral agreement to give international recognition to GIs and an acceptable level of protection. Protection is achieved through an international register of the names to be protected.[1] Article 1.2 establishes that signatory states undertake to protect denominations of origin that are protected as such in their country of origin and registered in the international register administered by an international institution specifically created under the aegis of the UN: the World Intellectual Property Organization (WIPO). A fundamental requirement for obtaining international protection is that the designation of origin is protected in the country of origin; only on that condition can the designation appear on the international register and be published and notified to the other signatory states. Currently, only 28 countries appear on the register.[2]

For the first time at an international level, the Lisbon Agreement introduced common definitions in the field of Designations of Origin, thus improving the protection system. Article 2 defines Designation of Origin (or Appellation of origin), as the "geographical denomination of a country, region, or locality, which serves to designate a product originating therein, the quality or characteristics of which are due exclusively or essentially to the geographic environment, including natural and human factors". A key aim of the Lisbon Agreement is to prevent any member country from unilaterally deciding on the generic nature of a name. Only the member country in which the name originates can do this.

[1] https://www.wipo.int/branddb/en/index.jsp
[2] https://www.wipo.int/lisbon/en/

With the Lisbon Agreement, the signatory countries undertake to protect on their territory designations from other member countries where they are recognized and protected, preventing misleading use and any type of imitation or usurpation, even if the true origin of the product is indicated or if the denomination is used in translated form or accompanied by expressions such as: "of the type", "type", "imitations", "like" (Article 3). The Lisbon Agreement offers strong international protection to designations of origin, as it also extends to third countries.

3.2.4 TRIPS Agreement

Against the background of the Lisbon Agreement, the lack of clarity in the definition of names and the low number of signatory countries, the concept of the designation of origin was debated also in other international forums. A new agreement involving a greater number of countries was signed in 1994 during the Uruguay Round of the WTO and included an "Agreement on Trade-Related aspects of Intellectual Property rights (TRIPS)".[3] Although it contains few articles on GIs, the TRIPS Agreement potentially represents a valid instrument to improve the international protection of GIs, one reason being that WTO has over 150 member countries.

Article 22.1 defines geographical indications as "indications that identify a product as originating in the territory of a Member State, or a region or locality in that territory, when a particular quality, reputation or other characteristic of the product are essentially attributable to its geographical origin". Furthermore:

- Article 22.2 lays down the obligation of member countries to provide legal means to allow interested parties to ensure the protection of geographical indications against any use which may mislead the public or constitute an act of unfair competition;
- Article 22.3 states that each member country must refuse or declare a trademark that contains or consists of a geographical indication, if the use of this geographical indication in the trademark is such as to deceive the public with regard to the true origin of the product;

[3] https://www.wto.org/english/docs_e/legal_e/27-trips.pdf

– Article 22.4 states that the protection referred to above (Articles 22.2.1, 22.2 and 22.3) shall also apply to indications which, although literally true in relation to the territory of origin, falsely indicate to the public that the product is originating in another territory.

The protection enshrined in Article 22 is general and extended to all products recognized as GI, but it entails only "negative protection", since WTO member countries are only obliged to provide legal means to prevent wrongful use of a GI. Protection is limited to prohibiting the use of a certain indication by producers not located in the region designated by that indication. Moreover, when a legitimate holder of a given geographical indication wants to oppose the improper use of the name, the onus is on the legitimate holder to demonstrate that the use made of the GI is such as to mislead the public, and it is necessary to demonstrate its "misleading character" (Lucatelli 2000; Addor and Grazioli 2002; O'Connor 2003; Josling 2006; Thevenod-Mottet and Marie-Vivien 2011).

Article 23, on the other hand, establishes additional protection for GI wines and alcoholic beverages, which applies even when "*... the geographical indication is translated or is accompanied by expressions such as* "*genre*", "*type*", "*style*", "*imitation*" *or* "*similar*" " (Art. 23.1). Article 23 provides "strong protection", as it is applied independently of the risk of confusion or unfair competition. The legitimacy of an indication not corresponding to the place of production of the product is excluded a priori, irrespective of consumers' ability to distinguish a product which is actually originating in the area indicated.

This has given rise to a two-level protection system: the first, generic, enshrined in Article 22 and applicable to the geographical indications of all products; and the second, additional, established by Article 23 on the indications of wines and alcoholic beverages. This implies, for example, that in compliance with Article 23 it is not possible to use indications such as "Champagne-style sparkling wine, produced in Chile" or "Swiss Tequila", while names such as "Roquefort cheese, produced in Norway", or "Bukhara Carpets made in the USA" are permissible. In fact, these latter names could be considered as not deceptive if the true origin of the product is indicated. In other words, an indication, albeit marginal, of the true origin of the product is sufficient to permit it to be traded, although this weakens the protection given by the GI.

The generic protection of Article 22 can be invoked only if the public is deceived by the unlawful use of the geographical indication or if such use constitutes an act of unfair competition. Words such as “made in ...” can be used to justify expressions like “Parma ham, made in Canada”, or “Murano Glass, produced in Turkey”, since there is no real deception for consumers. This brings the risk that geographical indications may be transformed into generic names, and that in time they may be used freely by any producer or distributor, becoming the name of an entire category of products.

3.2.5 The Legal Dispute

The difference between the various product types also emerges in the cases of “homonymous” geographical indications (Art. 23.3), where a multilateral register is envisaged (Art. 23.4). For all other products, including alcoholic beverages other than wine, Article 22.4 only prohibits the use of a geographical indication which, although referring to the real place of origin of the product, misleads the public in suggesting that the product comes from another place of the same name. At the same time, the TRIPS Agreement does not clarify the expression “multilateral system of notification and registration”, and this has given rise to two opposing factions within the WTO. On one side, the European Union has its own sui generis system, and on the other, the United States uses the trademark system. Both factions are supported by countries with similar interests. Article 1.1 of the TRIPS Agreement leaves Member States to determine modalities for the implementation of the agreement in the framework of their respective legislations. For this reason, there are many differences in implementation between nations, which do not facilitate the protection of geographical indications at the international level.

The aim of the WTO agreement and TRIPS negotiations, however, is not only to improve the effectiveness of the international protection given by GIs. They also aim at facilitating bilateral and regional agreements between individual countries and/or groups of countries. For countries with a system for the protection of prescriptive geographical indications, which have as their objective the “strong” protection of indications internationally, bilateral agreements are an effective way to achieve the goal. However, agreements based on the rigid definition of indications of origin, like the European system, are difficult to extend to countries using the TRIPS definition. An example of such a bilateral agreement is the CETA agreement between the EU and Canada.

At the time of writing, the WTO dispute over the protection for geographical indications, excluding alcoholic beverages and spirits, is not yet settled. It is one of the major disagreements between WTO Member States. Note however that the dispute is not about the definition of geographical indications or designation of origin. The EU is a member of the WTO and accepts the TRIPS definition in a "sui generis" approach permitted by TRIPS, while other countries such as USA, Australia and New Zealand use the trademark system, also permitted by TRIPS. The dispute is not about the cost of managing the systems either; in the EU, these costs are paid for by taxpayers and in the USA by the owners of the trademark. Neither is it about ownership of the denomination; in the EU, the owners are the producers, and in the USA they are the trademark owners. The conflict derives from the question of what a "generic" product is and the "effective protection" of the sui generis system outside Europe, or wherever no agreements have been made, where trademark law protection is in force.

3.2.6 The EU Regulation on Geographical Indications

Regulation (EU) 1151/2012 is the last stage of a reform process that began immediately after the entry into force of EC Regulation 510/2006 on Protected Designations Origin (PDO) and Protected Geographical Indications (PGI), which in turn had updated and replaced the first EEC Regulation 2081/1992. Although it is known as the "Quality Package", Regulation 1151/2012 covers only some of the issues in food supply quality: (i) it regulates PDO and PGI labels in a single text, (ii) it reinforces the system of protection and (iii) it permits the use of texts and symbols of an area, with the PDO and PGI label, for collective geographical labels.

Regulation 1151/2012 maintains the difference between PDO and PGI, although there is debate as to whether this distinction is actually useful and above all to whom. The two types of GIs have the same level of protection on European markets but differ in the relationship with the area of origin. For PDO products it is very strong, covering all stages of production, and there is a direct link between production and processor. A direct consequence of the difference between PDO and PGI is the production and commercial strategy adopted by producers. A PDO company must comply with the specification that the area of origin of the raw materials and the processing area are the same. PGI specifications offer a greater degree of freedom related to the origin of the raw materials. PGI processing firms can thus overcome constraints related to the availability of local resources, especially in very restricted areas, and use production techniques for high volumes of input.

PDO products thus have a higher specificity and a (potential) difference in terms of quality and reputation. They are more closely linked to the agricultural phase than PGI products. Many PDO products can be considered niche products, with a prevalence of artisan manufacturing techniques, limited production volumes and sales largely on proximity markets. PGI products, especially the processed ones, are better suited to more industrial manufacturing techniques for wider markets. In reality, there are also PDOs with high production volumes, sold on wide markets, and PGIs with very low volumes aimed mainly at proximity markets. The distinction between PDO and PGI is, therefore, mainly functional to producers, who can use it to develop productive and commercial strategies functional to the characteristics of their target market (Arfini and Capelli 2011).

On the consumer side, there is also confusion between PDO and PGI, and a widespread idea that the two types of GI are equivalent. This implies that products with a strict Code of Practice and high level of quality may be penalized. EC Regulation 1151/2012, however, introduces a small but significant clarification useful to producers and consumers. It no longer distinguishes between the processing phases (production, transformation and processing) to take place in the defined area, but cites more generically "production phases". For PGIs, the former distinction of the three processing phases is substituted with the indication that at least one of them must be carried out in the production area (Table 3.1). This reformulation does not change the way in which the Commission distinguishes between PDO and PGI but makes it more comprehensible with the aim of guiding future producer decisions in adopting one system or the other. It is also hoped that consumers will be better able to appreciate the link between the product and the area of origin.

In order to sell PDO and PGI products: (i) compliance with the Code of Practice must be verified by an independent body (Art. 37 of the EC Reg. 1151/2012), (ii) their names must be protected against unfair competitors and (iii) the supply on the market must be promoted and marketed. As regards compliance, third-party certification is a strong guarantee for consumers, but it is a cost for producers and can be considered as an administrative burden which can alienate producers from the GI system.

Table 3.1 Distinction between PDO and PGI between regulations EC 510/06 and EU 1151/12

	Council Regulation (EC) No 510/2006 of 20 March 2006 on the protection of geographical indications and designations of origin for agricultural products and foodstuffs (Art.2)	*Regulation (EU) No 1151/2012 of the European Parliament and of the Council of 21 November 2012 on quality schemes for agricultural products and foodstuffs (Art.5)*
PDO	For the purpose of this regulation, "designation of origin" means the name of a region, a specific place or, in exceptional cases, a country, used to describe an agricultural product or a foodstuff: (a) originating in that region, specific place or country; (b) the quality or characteristics of which are essentially or exclusively due to a particular geographical environment with its inherent natural and human factors; (c) the production, processing and preparation of which take place in the defined geographical area.	For the purpose of this regulation, "designation of origin" is a name which identifies a product: (a) originating in a specific place, region or, in exceptional cases, a country; (b) whose quality or characteristics are essentially or exclusively due to a particular geographical environment with its inherent natural and human factors; (c) the production steps of which all take place in the defined geographical area.
PGI	For the purpose of this regulation, "geographical indication" means the name of a region, a specific place or, in exceptional cases, a country, used to describe an agricultural product or a foodstuff: (a) originating in that region, specific place or country; (b) which possesses a specific quality, reputation or other characteristics attributable to that geographical origin; (c) the production and/or processing and/or preparation of which take place in the defined geographical area.	For the purpose of this regulation, "geographical indication" is a name which identifies a product: (a) originating in a specific place, region or country; (b) whose given quality, reputation or other characteristic is essentially attributable to its geographical origin; (c) at least one of the production steps of which take place in the defined geographical area.

Source: Own presentations

As regards the strengthening of protection, EC Reg. 1151/2012 introduces two issues: (i) protection is extended to branded products which use GIs as ingredients (Article 13.1). This is particularly important because GI products are often ingredients in ready to eat and convenience food regional dishes and (ii) the obligation to protect the GI name "ex officio", in accordance with procedures determined by each individual Member State (Article 13.3). This aspect is of great importance for producers whose names can now be protected throughout the European Union.

In practice, with about 1382 GIs originating from 28 European countries and 9 non-EU Countries (DOOR database),[4] there is some doubt as to whether it is really possible to prevent and stop the illicit use of denominations in each Member State. Effective protection requires the full cooperation of the authorities responsible for supervision. This is feasible for the best-known denominations, but for niche GI products there is a high risk of counterfeit. Lastly, procedures for supervision, prevention and sanctions differ between EU Member States, so national authorities are likely to have different levels of effectiveness in *control and prevention action* across Europe.

Regarding the activities for promoting and marketing once GI recognition is obtained, EU Reg. 1151/2012 introduces important management tools. The former EC Regulation 510/2006 referred to "Associations", whose specific task consisted of presenting the "Application for registration", including the proposal for the definition of the production specification. EU Regulation 1151/2012 now distinguishes between "Applicant group" (any individual or legal body submitting to the Member State the application for the Denomination) and "Groups" carrying out product management, as summarized in the following bullet points (Article 45):

- Control and monitoring actions on the market contributing to the guarantee of the quality, notoriety and authenticity of the products
- Actions to protect intellectual property
- Information and promotion actions aimed at increasing the added value of products
- Supervisory actions against producers with regard to compliance with the specifications
- Actions to support the sector and enhance the products aimed at improving the effectiveness of the Denomination as well as the technological and economic skills of the producers

[4] http://ec.europa.eu/agriculture/quality/door/list.html?locale=en

In some member states, these activities are part of the national regulatory framework, and countries such as Italy and France have already assigned the governance of the denomination system to Groups in the form of GI Consortia. To carry out these activities, Groups require financial resources which are usually obtained from members on the basis of their volume of production. Clearly, the higher members' contributions, the more effective Groups can be on the market. Art. 45 of EU Reg. 1151/2012 also specifies that Groups must not be prejudicial to the action of Producer Organizations and Inter-branch Organizations, as regulated by the single CMO (EC) No 1234/2007. Moreover, in some EU Member States (such as Italy and France) the GI Consortia are alike to Inter-branch Organizations since they represent all the GI-chain members at board level.

In sum, EU legislation aims to establish that governance activities carried out by Groups are relevant for the management of the GI system and that they can be complementary to Producer Organizations and Inter-branch Organizations and not in conflict. This is reinforced by the fact that Groups can set "production quotas" in a production plan to be approved by the national antitrust commission. The "Milk package" (EU Regulation 261/2012) in fact enables GI-Groups, Producer Organizations and Inter-branch Organizations to control the milk supply, and in the case of GI-Groups to set "cheese quota" at farm or dairy level.

3.2.7 Assessing the Sustainability of the GI System

It is unclear whether the GI system is in reality a tool capable of supporting a sustainable agricultural model. The assumptions are that GI products express a specific quality level and generate public goods (Arfini et al. 2010; Belletti and Marescotti 2011). The FAO, in its publication "Linking People Place and Products" (Vandecandelaere et al. 2011), discusses the problem of construction and reproduction of a GI system and provides an interesting ex ante approach[5] useful to establish which type of GI can be organized by producers.

Impact assessment of an existing production system is a more recent topic (Vandecandelaere et al. 2018[6]; Belletti et al. 2015[7]). The following

[5] http://www.fao.org/docrep/013/i1760e/i1760e00.htm

[6] http://www.fao.org/policy-support/resources/resources-details/en/c/1175499/

[7] https://flore.unifi.it/retrieve/handle/2158/606197/18700/Belletti-Marescotti-%20et%20al%20-%20Effects-of-Protecting-Geographical-Indications.pdf

aspects need to be considered: (i) which theoretical model to use, (ii) which indicators to use, (iii) how to measure impact and (iv) which data sources are available. Recently, the European Union has also posed the problem of measuring effects, and two EU projects, FP7 Glamour[8] and H2020 Strength2food,[9] have attempted to define an appropriate methodology.

The definition of a theoretical approach to a GI system is complex and requires a multi-dimensional perspective in order to evaluate the level of economic, social and environmental sustainability in the area of production and consumption of GI goods. One interesting approach is the Localised Agri-Food System, which considers GI-food chains to be embedded in the territory of origin, and makes it possible to assess impacts at both chain and territorial level.[10]

The definition of the indicators and the selection of the variables can be facilitated using the FAO *Sustainability Assessment of Food and Agriculture systems* (SAFA).[11] This tool provides a list of indicators for each dimension of sustainability and suggests a qualitative approach for its measurement. Other research adopts a quantitative method in an attempt to find an objective and reproducible[12] approach. The main problem so far has been the lack of primary and secondary information related to GI-production systems for sustainability variables in sufficient detail at the territorial level. At EU level FADN, in a few EU Member States, collects information at the farm level but not for the whole GI-Chain.[13] In Italy, the Qualivita Foundation collects annual data and information on Italian GIs. However, comprehensive, quantitative assessments of the sustainability of GI systems are still lacking.

3.3 Conclusion

Over the years, the EU has reoriented the focus of policies targeting the agri-food sector towards more market orientation and liberalization. This has brought about a stronger focus on the production and marketing of

[8] https://cordis.europa.eu/project/rcn/104328/reporting/en

[9] https://cordis.europa.eu/project/rcn/200534/factsheet/en

[10] https://www.strength2food.eu/wp-content/uploads/2018/04/D3_1.Conceptual-Framework.pdf

[11] http://www.fao.org/nr/sustainability/sustainability-assessments-safa/en/

[12] https://www.strength2food.eu/publications/

[13] https://www.strength2food.eu/2017/08/24/determinants-of-farmers-engagement-in-food-quality-schemes/

high-quality food products. The EU food quality policy, targeting among others the protection of organic food products and geographical indications, is central to achieving these objectives. This chapter has focused on the policy for geographical indications and has provided a review of the origins and history of the policy, the relevant articles in the EU regulation and issues concerning the protection of geographical indications in multilateral trade agreements. While the goals of the EU quality policy are clear, comprehensive impact assessments of the policy are scarce.

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CHAPTER 4

Public and Private Food Standards

Maria Cecilia Mancini

4.1 The Spread of Standards in Agri-Food Systems

In recent decades, the world agri-food system has seen rapid organizational and structural changes leading to greater complexity and variety in models of production, distribution and consumption. There are many reasons for this radical transformation.

The globalization of trade has made a big impact on the structure of agri-food systems, which are evolving towards companies diversified in terms of technology, production methods and procurement strategies for raw materials, capital and know-how from all parts of the globe (Trienekens and Zuurbier 2008). As well as enabling communication between distant players, globalization of markets has increased the number of players in the production and distribution systems. This has created new opportunities for players to take advantage of the global network, but it has also made trade more uncertain by increasing distances, with trading partners who do not know one another and often face language and cultural barriers.

At the same time, the concentration of firms and the growth of buyer-driven supply have created a limited number of players with a key role in global supply chains, and strategic control has moved increasingly

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downstream, notably to large retailers (Gereffi et al. 2005; Ponte and Gibbon 2005).

Meanwhile, the saturation of mature markets has made it necessary to replace price competition with differentiation strategies more suitable for these markets and based on various quality attributes of processes and products. Evolving social trends have in fact altered the expectations and demands of consumers with respect to the safety and quality of food (Jaffee and Henson 2004). Safety and quality attributes encompass not only intrinsic characteristics of food but also the manner in which products are produced. Thus, food safety and quality are perceived by consumers in terms of a wide array of attributes that range from search, through experience, to credence attributes (Henson and Humphrey 2009). Indeed, a special feature of food products is that some of their quality and safety characteristics cannot be determined by visual inspection or consumption. Food is therefore classified as a credence good, which means that information on some of its characteristics is not accessible to the consumer (Nelson 1970). The increasing demand for products that meet ethical, cultural and health requirements, that is, that imply immaterial contents, has increased the presence of intangible attributes and the level of asymmetry information between producers and consumers. The large component of "credence" or "trust" attributes in food products explains why the consequences of the numerous food scare since the 1980s have been so serious. They have created extreme uncertainty on credence attributes and badly hurt the trust between consumers, agri-food firms and institutions, especially supervisory authorities (Jaffee 2005; Henson and Humphrey 2011). Agri-food system firms have suffered particularly badly because of inadequate information and communications instruments which are needed to help consumers distinguish between virtuous and fraudulent behaviours (Fulponi 2006).

The shortcomings of such instruments and related policies make it necessary to rethink coordination and safety supervision in the agri-food chains, as well as means of information to overcome the asymmetry of information. Traditionally, public authorities have guaranteed markets by supervising their proper working, especially in the food sector, where the importance of product to society makes great attention necessary. They continued to do so after the crisis of trust in the system, mainly by reviewing management strategies of production process safety and communication instruments aiming to recover credibility and reliability, but the rapid changes of the agri-food systems have made public intervention more difficult and less efficacious. Public incapacity to keep up with markets, society and stakeholder requirements has become increasingly clear (Busch et al. 2005).

It has become necessary to find further tools and measures to support national governments and, in many cases, take over their role. This has represented an opportunity for private stakeholders to identify private tools. In fact, stakeholders' response to the need for reliable mechanisms for safety management within the sector, with the aim of building consumer trust, is the creation and adoption of private standards (Brazzini 2015). The use of standards facilitates relationships between players in the sector and simplifies vertical coordination, and when aimed at consumers, standards reduce the asymmetry of information levels by virtue of the fact that they signal and guarantee characteristics of a product (Henson 2008). They have rapidly become more frequent around the world, and there is today a wide variety of different instruments. On one hand, this reflects the way safety and quality are managed in global supply chains (Henson 2008), but on the other, it makes the chains more complex. The shift from state regulation to private tools has altered the perspective of analysis, as the market has taken over many functions of public institutions (Busch and Bain 2004) and puts the focus on consumers rather than citizens.

4.2 The Classification of Standards

Broadly speaking, standards are "documented agreements containing technical specifications or other precise criteria to be used consistently as rules, guidelines or definitions, to ensure that materials, products, processes and services are fit for their purpose" (ISO/IEC Guide 2:2004). Their aim is to facilitate trade between anonymous economic agents by lowering the risk, increasing credibility and trust and increasing predictability for buyers and sellers. The efficacy of exchange is enhanced by the two main functions of a standard—as a guarantee of minimum quality and by defining the characteristics or specifications of the product or its production process and associated criteria of performance (Smith 2009). However, in an increasingly globalized agricultural and food economy, the role of standards is shifting from the traditional or historical role of reducing transaction costs in mass commodity markets towards that of strategic tool for product differentiation and market segmentation (Clayton and Preston 2003).

Standards can be classified according to several criteria (see, among others, Henson and Caswell 1999; Josling et al. 2004; Valceschini et al. 2005). The first distinction can be made on the basis of the promoter. On one side there are public standards, and on the other there are standards drawn up by private operators. Public standards are often national regulations, although there are exceptions such as organic standards and the EU Geographical Indications PDO, PGI and TSG. On the other side, there are many different types of private standards, whose contents vary according to the different aims pursued by the involved stakeholders.

Private standards can be set by institutes working towards global harmonization of schemes or by different players in the agri-food sector such as category associations, which regulate the complete supply chain and prioritize aims of the whole category against aims of the individual; private bodies, working in the interests of society as a whole, which are usually non-governmental organizations (NGOs); and large-scale distribution players, such as large retailers which set their own specifications and impose them on their producers and co-packers.

The second criterion is the function of the standard which is closely related to the interests of the stakeholder who has set or enforced the standard itself. Public standards are usually based on the objective of social welfare, and it is assumed that the interests of all actors—both producers and consumers and society at large—are taken into consideration. Private standards reflect the interests of the stakeholders who promote the standard, namely the interest of interests of firms, producers or private bodies.

The third criterion is the degree of freedom allowed in adopting the standard. At one extreme, there are compulsory standards imposed by public authorities with coercive power. In the area of food, an example is the well-known HACCP (Hazard Analysis and Critical Control Points), an approach to identifying and managing food safety risk. At the other extreme, there are voluntary standards. Private standards are voluntary, but public standards can be either voluntary or mandatory. Voluntary standards provide players with a tool to differentiate products through the definition of particular quality characteristics. Mandatory standards aim to protect the health and safety of citizens and consumers. In the middle ground, there are intermediate voluntary standards which are de facto compulsory, because of widespread acceptance by market participants, or when compliance with them is a requirement for suppliers to access the proprietary value chain of some large food retailers and food service firms.

A further criterion for differentiating standards involves the conformity assessment. Assessment can be provided by the first, second or third parties. The first-party assessment implies that conformity assessment is performed by the person or organization that provides the object; the second-party assessment takes place when the setter of the standard audits the object conformity, while the third-party assessment is performed by a person or body that is independent of the person or organization that provides the object.

Self-declaration often find application in the supplier-customer relationship when a standard is mandatory (e.g. HACCP), but law compliance is verified by Public Health inspections through spot checks or upon request. Voluntary standards generally apply for the second- or third-party assessment. Second-party audits are usually set up by players wanting direct control of the supply chain in order to reduce risks in terms of the law and reputation. They usually involve the supplier inspecting client activity directly in order to check process and product conformity. They also usually have a big economic impact because of the cost of control and supervision. In the case of third-party audits, the concept of certification comes into play, whereas certification "is a procedure by which a third party gives written assurance that a product, process or service is in conformity with certain standards" (ISO/IEC Guide 2, 2004). Third-party assessment does not necessarily imply certification, but certification is commonly considered as an efficient communication tool of compliance.

Other criteria for classifying standards are the focus and the content of the standard. The focus is the main thrust of the requirements and can be on the product or the production process. Product-focused standards specify the characteristics necessary for conformity and, possibly, certification, but do not describe how such characteristics are obtained. Production process standards, on the other hand, relate to the different phases and operations and thus entail detailed control of company practices.

The content of the standards is mainly related to the safety or quality of the product. Food safety is a part of food quality, at least to the extent that food safety is a basic prerequisite for any quality attribute, and it is essentially a "public good" to be guaranteed through compulsory standards set by the government. In fact, because they tend to feature externalities and informational asymmetries, markets alone generally do not provide the socially desirable amount of food safety (Smith 2009).

Food quality standards respond to a wide range of evolving consumer preferences; and there is a wide variety, with different aims and different

Fig. 4.1 Classification of public and private standards by promoter, aim, freedom of action and assessment. (Source: Own presentation)

target groups. They can refer to intrinsic characteristics of food (i.e. chemical, physical and sensory properties of food) or to the externalities of production processes impacting on labour force, natural resources, animal welfare and involving the issue of food security. Standards are thus a way of overcoming information asymmetry because they signal and guarantee increasingly complex product characteristics. Figure 4.1 shows the classification criteria described above.

Still further classifications of standards can be found in literature. One useful classification for private standards is based on the user category to which they are addressed: business-to-consumer (B2C) standards are aimed at consumers and business-to-business (B2B) standards are aimed at players in the supply chain. Private B2C standards are often associated with large retailers' own-label products and producer association schemes highlighting certain characteristics of a product, for example, organic production processes or fair labour conditions. Their main function is to signal that the product possesses specific attributes for which consumers are willing to pay a higher price. Private B2B standards operate between actors in the food supply chain and are used to a large extent for risk management in production. As they are used between operators in the sector itself, they do not involve consumer communication strategies. No certification costs are therefore incorporated into the end price of the product; they are borne by supply chain members, particularly those in the primary and secondary sectors.

Lastly, standards can be classified by their scope. They can in fact cover just one level in the supply chain. In this case, requirements concern the specific activity, for example, in the case of the primary sector, animal welfare, the use of pesticides or farming techniques. These are known as sector standards. Otherwise, standards cover more than one level in the supply chain and requirements can concern farming, processing and/or distribu-

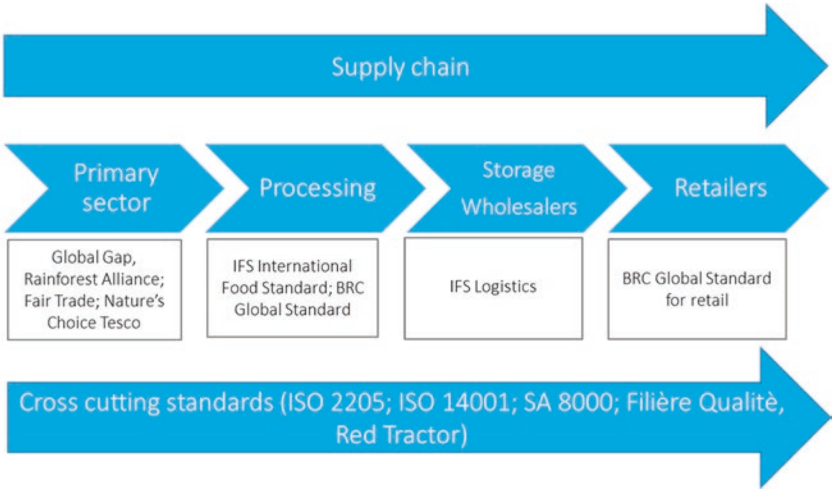

Fig. 4.2 Standards in the agri-food system, sector versus supply chain standards. (Source: Own presentation based on CSQA www.csqa.it)

tion. Standards covering all phases "from farm to fork" are known as "supply chain standards". Figure 4.2 shows some of the most widely used standards in agri-food systems today, classified according to whether users are single or multiple levels of the supply chain, that is, as sector or supply chain standards. The single standards are described in the next section.

4.3 Examples of Private Voluntary Standards in the EU Agri-Food System

4.3.1 *B2B Standards*

Some of the most impacting B2B standards implemented in the European agri-food systems are retailer led initiatives, such Global GAP, BRC Global Standard and IFS—International Food Standard.

The Global partnership for Good Agricultural Practice (GlobalGap) standard (www.globalgap.org), known as EurepGap until 2007, was developed in 1997 by a group of retailers belonging to the Euro-retailers produce working group. GlobalGAP focuses on agricultural production and aims at guaranteeing food safety through compliance with minimum standards. It covers fruits and vegetables, meat products and fish from aquaculture as well.

The BRC Global Standard developed from the initiative of British retailers (British Retail Consortium, www.bcrglobalstandards.com) in 1998 when direct inspections of own-brand product manufacturers were halted and third-party inspections and certification were introduced. The BRC Global Standard contains requirements for food processing where food is handled, processed and packed. The BRC Global Standard certification acts as a guarantee in safety requirements (including compulsory HACCP), product and process, hygiene of personnel and factory environment requirements. The BRC subsequently regulated other operators in the supply chain and issued several standards, among which the BRC standard for food packaging firms and the BRC standard for stockers and distribution;

International Food Standard (IFS) (www.ifs-certification.com) is a standard developed by retailers to ensure the safety of own-brand products. It was initiated in 2002 by German food retailers from the HDE (Hauptverband des Deutschen Einzelhandels) and adopted in 2003 in France by the FCD (Fèderation des Entreprises du Commerce et de la Distribution) and in 2007 in Italy by Federdistribuzione. IFS includes the same requirements as the BRC Global standard and uses the same inspection system. Like BRC, HDE has widened its scope to other levels in the supply chain as well as processing and also issues standards for packaging and logistics companies.

SO standards: many standards adopted in the agri-food systems refer to ISO—International Standardization Organization, an independent, non-governmental international organization with a membership of 162 national standards bodies. Besides the well-known ISO 9001—Quality management systems standard, other widely used ISO standards in EU agri-food systems are: ISO 22000—Food Safety Management System, which sets out requirements to help organizations along the food supply chain to identify and control food safety hazards and ISO 14001 Environmental Management systems for companies engaged in managing their environmental responsibilities in the production processes.

4.3.2 B2C Standards

Numerous B2C standards have also been introduced. Here too, large retailers have been the main promoters. Many have introduced own-label products signalling the particular quality of products in the attempt to meet new consumer requirements.

Here are a few examples:

Tesco Stores' "Nature's choice", which is a farm-management scheme promoting sustainable farming by its suppliers. As well as setting standards for fresh produce, the rules cover aspects ranging from the use of fertilizers, pesticides and manures to pollution prevention, natural energy resources, recycling and conservation.

Carrefour's "Filière Qualité", which uses production protocols to ensure fresh and antibiotic-free products, obtained with respect to the environment and biodiversity, as well as worker and animal welfare.

Most of these schemes are run by large retailers, but the following are examples of schemes run by private stakeholders:

Red Tractor scheme, run by the National Farmers Union of England and Wales, is a farm and food assurance scheme that provides traceable, produced responsibly and safe food. Red Tractor standards also cover animal welfare and environmental protection. The Union Jack flag in the Red Tractor logo indicates that the food has been farmed, processed and packed in the United Kingdom.

SA 8000—Social Accountability was established by Social Accountability International (SAI) in 1997 as a multi-stakeholder initiative. The SAI Advisory Board includes experts from trade unions, businesses and NGOs from various countries. The standard promotes the implementation of International Labour Organization (ILO) conventions covering social justice and working conditions.

The Rainforest Alliance is a non-governmental organization (NGO) working to conserve biodiversity and ensure sustainable livelihoods by transforming land-use practices, business practices and consumer behaviour. The Rainforest Alliance launched the world's first sustainable forestry certification programme in 1989 to encourage market-driven and environmentally and socially responsible management of forests, tree farms and forest resources.

Fairtrade Standards are designed to support the sustainable development of smaller producers and agricultural workers in developing countries. In order to be certified, Fairtrade producers have to comply with the standards laid down by Fairtrade International. The certification system covers a wide range of products, including bananas, coffee, cocoa, cotton, cane sugar, flowers and plants, honey, dried fruit, fruit juices, herbs, spices, tea, nuts and vegetables.

Genetically Modified Organisms (GMOs)-free products schemes: there are a growing number of standards aiming at guaranteeing GMOs-free products in the EU countries, including private and public schemes.

As previously mentioned, B2C standards are developed by public agencies as well. One very successful example in the EU market is the French "Label Rouge" initiative, which is a scheme aimed at assuring the superior quality of a product, gained through compliance with the stringent set of standards. Products eligible for the Label Rouge are food items (including seafood) and non-food and unprocessed agricultural products such as flowers.

This list of schemes is partial, but it reveals the complexity of the norms and schemes currently being introduced into European agri-food systems. They are aimed at stakeholders taking part directly or indirectly in production processes at different levels. The examples show that the content of some schemes has precise aims while in others it is more general in nature.

There is also a new type of standard, which is expected to become more widespread in the next few years. Business-to-society (B2S) standards (Homer 2010) build on traditional standards and add further specifications to meet the requirements of stakeholders outside the production system. An example is the Carbon Footprint standard which aims to quantify, manage and reduce the carbon footprint of a product, that is, the emissions of greenhouse gas caused by the entire product life cycle.

4.4 The Interplay Between Private and Public Standards

The rapid evolution of supply chains and consumer requirements, together with the constraints on public authorities, called for new tools and measurements to support national governments and, in some cases, to replace government action.

The limitations of public intervention and the need for integration with private schemes became clear with the shift of supervisory authority on food products towards the private sector (Lin 2013). The United Kingdom was one of the first countries to move in this direction. The 1990 UK Food Safety Act (1990) significantly altered the role of the private sector in managing food safety. The law introduced the concept of "due diligence", whereby sector operators were made responsible for more proactive behaviour and given more responsibility in the eyes of the law. Legally, they are now held liable for upstream suppliers as well as being liable for their own actions. The UK law laid the foundations for an approach involving the whole supply chain and future EU intervention under the slogan "from farm to fork" (Loader and Hobbs 1999; Henson 2008; Humphrey 2012).

Sector operators are thus encouraged to look for private measures to compensate for shortcomings or absence of public intervention (Reardon et al. 2001; Henson and Reardon 2005). The use of reference parameters recognized throughout the agri-food supply chain gives standards a key role in risk management as well as simplifying relationships between stakeholders. These parameters have also made it possible to ensure that minimum standards for both market requirements and legal requirements are met (Henson and Humphrey 2009). This is particularly important in the light of the increasing globalization of supply chains and trade. Standards can in fact supplement legislation in countries where it is insufficient and guarantee safety levels by making all products meet international standards. This supplementing of national legislation and inspection and supervision simplifies trade contacts. In addition, a reference to risk management standards makes it possible to mitigate the impact of potential food scares both legally and in terms of company reputation. At the same time, the adoption of private standards raises another important issue, namely the relationship between private standards and the World Trade Organization (WTO) rules on international trade. According to the WTO Sanitary and Phytosanitary (SPS) Agreement, countries can impose import restrictions to protect humans, animal and plants life or health. However, the measures taken should be chosen so as not to distort trade more than necessary and have to be based on scientific evidence and risk assessment. In order to contrast the competitive disadvantage of the domestic industry, countries with more stringent legislation might want to impose similar requirements on or ban imports of goods produced under different conditions. This is allowed under the framework of the SPS Agreement to the extent that the restrictions concern the characteristics of the final product, while no restrictions are allowed on the process and production methods. However, private standards, not being under the jurisdiction of the WTO rules, can impose process and production methods requirements, as well as restrictions not directly related to the humans, animals and plants life or health. Therefore, private standards harmonize the requirements in production conditions arising from differing national legislations and level the playing field for global competition in the food supply chains (Andersson 2011; Carlsson and Johansson 2013).

This partial shift from the public to private sphere is taking place at the same time that the coordination of food safety management is moving downstream to retailers. The centralization of functions previously carried out by different operators to this single key has in turn led to an unprecedented increase in the power of large retailers over the supply chain. In this way, the guarantee of own-label characteristics, which is an essential requirement for large retailers, has become a very binding aspect for co-packers, who need to standardize production processes as well as to ensure product characteristics according to retailers' set standards. The use of requirements in private standards has thus reduced the asymmetry of information between actors along the supply chain and consequently transaction costs, particularly regarding inspection costs. A final effect is an improvement in vertical coordination (Giacomini et al. 2010).

What could be seen as a mandate from the consumer on safety and quality at the point of sale has encouraged retailers to draw up their own certification standards. The imposition of joint standards by retailers in contracts with farm producers and manufacturers and processors has been seen as a form of collusion aimed at selecting the most efficient suppliers. In fact, suppliers selected are asked to make price reductions while retailers to retain their profit margins even where retail prices are kept low in the bid to increase sales. The own label has given the dominant role to large retailers in vertical control of the supply chain, and the control is strengthened by the implementation of private certification standards (Giacomini et al. 2010).

Private standards are necessary for firms in large-scale distribution, and agri-food firms are increasingly forced to use them. This is a problem particularly for small firms, for whom standards can constitute a barrier to market entry because of their cost. Of particular concern is that private standards based on both second-party audit and third-party certification increase costs for farmers and small manufacturers who have to invest resources to be compliant with the requirements and to pay audit costs. The use of private standards for risk management has in fact shifted costs from the collectivity to members of the supply chain. The relevance to society of public bodies is reduced to providing a framework, and their role has become less important. Firms have usually absorbed the costs, but they are not always able to recoup them in product selling prices.

This concern involves farmers and firms of developing countries as well, facing major challenges in complying with private food safety standards.

Costs of processes of compliance and conformity assessment tend to be pushed down global agri-food value chains away from those who set the standards adopters towards their suppliers, often producers placed in developing countries (Henson and Humphrey 2009). "This prevents developing country producers from reaping the full benefits of implementing standards, reducing the returns to related investments" (Henson and Humphrey 2009, 7).

Where standards include the wider aspect of product quality as well as safety aspects, their aim becomes product differentiation rather than risk management. Implementation of standards is a strategic choice aiming not so much at raising levels of food safety but signalling specific characteristics with the aim of differentiating competitive products. Here, Private standards are a component of horizontal competition between various retail chains, where there is ample space for them rather than public authorities.

In recent decades, the proliferation of private schemes on safety and quality has shifted intervention away from the citizen to the consumer, and from public responsibility to the market (Busch and Bain 2004). Since 2000 there has been a search for a single instrument including private and public initiatives in synergy, with the aim of designing and adopting reference standard meeting the needs of both sides (Green and Perito 2008). Co-regulation as an integrated approach can have a positive impact on risk management by lowering overall costs. But there are several obstacles to the spread of co-regulation, particularly the question of reconciling public and private interests (Martinez et al. 2007). New forms of organization and private agreements are appearing in the transition from regulation carried out exclusively by the state to private regulation where the state provides a framework for matters of importance to society, while "details" of regulation are left to the private sector (Busch and Bain 2004).

It is thus likely that in the near future integration between state and private regulation will be influenced by private governance systems which are set to impact public regulation in many areas.

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CHAPTER 5

Health and Nutrition: Policy, Consumer and Industry Perspectives

Jutta Roosen, Irina Dolgopolova, and Matthias Staudigel

5.1 Introduction

Recent years witnessed an increase in diet-related diseases globally, making unhealthy diets one of the leading causes of disability and death. The World Health Organisation (WHO) finds that poor nutrition practices such as the insufficient consumption of fruits and vegetables and a high intake of salt, sugar, saturated fats and trans-fatty acids combined with low levels of physical activity lead to increased risks of non-communicable diseases (such as heart disease, atherosclerosis and diabetes), overweight and obesity (WHO 2010). Changing dietary patterns requires behavioural change, which can be initiated at the individual as well as at the societal level.

In this respect, European policy makers have implemented a range of actions aimed at improving nutritional patterns of the population and decreasing the risks related to overweight and obesity. A series of white papers and strategic action plans outlined the need to implement Europe-wide policies advocating healthy diets, beginning in 2000 with the First

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Food and Nutrition Action Plan for the WHO European Region (WHO 2003). In 2007, the European Commission issued the Strategy for Europe on Nutrition, Overweight and Obesity Related Health Issues focusing on promoting healthy diets and physical activity and implemented the Action Plan on Childhood Obesity to reduce and stop the increase in childhood obesity towards 2020 (European Commission 2018). More recently, the WHO Regional Committee for Europe issued the European Food and Nutrition Action Plan 2015–2020, which aims at reducing the incidence of non-communicable diseases and obesity. The Action Plan proposes five main goals: (a) create healthy food and drink environments; (b) promote the gains of a healthy diet throughout life; (c) reinforce health systems to promote healthy diets; (d) support surveillance, monitoring, evaluation and research; and (e) strengthen governance, alliances and networks to ensure a health-in-all-policies approach (WHO 2014).

Despite these efforts at the community level, the main action level for nutrition policy remains national or local. By mandate, the European Union is active in areas where the functioning of the internal market is concerned (e.g., through harmonizing labelling rules or by authorizing health claims) or the Common Agricultural Policy (e.g., on fruits and vegetables or dairy products). In contrast, the treaties do not provide much basis for recently discussed nutrition policies, especially taxation and reformulation approaches, since health systems and fiscal policies remain in the competence of the member states.

For these reasons, health and nutrition policies in the EU are only regulated in a few cases by the community, and the large majority of actions shows strong heterogeneity across member states with respect to the choice of policy type and the degree of restrictiveness. In this chapter, we review the most important regulatory instruments in nutrition policy that are implemented or under discussion in the EU and individual member states together with the most important scientific findings regarding consumer perspectives on healthy food choices. First, we provide a definition of nutrition quality and stylized facts on the state of nutrition in the EU. Then we discuss theoretical underpinnings of nutrition behaviour, potential leverage points, rationales and available policy instruments. We next review EU nutrition policies in the area of food labelling and school programmes and provide a brief overview of policies in individual member states. The effect of policies on consumers' nutritional choices is assessed based on a literature review. The end of the chapter discusses industry perspectives and concludes.

5.2 Nutrition Quality and Consequences of Unhealthy Nutrition Patterns

Nutrition policy finds its origin in addressing issues of nutrition and public health. It is located at the nexus of three problems that coexist to different degrees in different countries: Hunger and undernutrition, micronutrient deficiencies, and overeating resulting in obesity (European Academies Science Advisory Council 2017). The convolution of multiple challenges is sometimes called the triple burden of malnutrition when the combination of overweight and obesity with undernourishment and micronutrient deficiencies exists in the same country. In order to justify, design, monitor and evaluate nutrition and health policies, policymakers need precise and comparable indicators of these nutritional issues and their implications for public health and associated costs. Our intention in this section is to provide a basic overview over indicators and available data sources for nutrition. A basic lesson from this compilation is that there are little data available, and if available, these are mostly not harmonized across EU countries. Reasons for these limitations may be found in the lack of political interest in providing harmonized data but also in culturally and socially heterogeneous nutrition patterns.

Nutritionists judge dietary quality by the adequacy of nutrient supply with regard to a person's need. The nutritional societies publish *dietary reference values* and guidelines for different population groups by sex, age and persons of specific needs (e.g., pregnant or breastfeeding women) with regard to energy (kcal), macro- and micronutrients. Macronutrients encompass carbohydrates, protein and fat while micronutrients cover vitamins, minerals and trace elements. Given the triple burden paradigm, nutrients are often categorized in those at risk of excess and deficient intake (Herrmann and Roeder 1998; Thiele et al. 2004). Those nutrients at risk of excess intake are fat, cholesterol, sugar, alcohol, and sodium and moderation should be exercised, while the others—including some essential fatty acids and complex carbohydrates—are classified as nutrients at risk of deficient intake for which adequate provision is desired.

Considering the complexity of the human diet, alternative approaches describe dietary quality by means of *dietary guidelines* (i.e., five portions of fruit and vegetables per day, two times fish per week, etc.). Healthy nutrition behaviour is hence described by indices that summarize the extent to which eating patterns respect these guidelines. One widespread indicator in this regard is the healthy eating index (HEI). The HEI was originally developed in the United States by the US Department of Agriculture and is based on the Dietary Guidelines for Americans. It is based on the principles of adequacy and moderation (Täger et al. 2015). Alternative versions of the HEI exist. For example, for Germany the HEI-EPIC was developed on similar principles of adequacy and moderation, but also on a mix of both these principles, for example, for grains or dairy products (Täger et al. 2015). Given that dietary guidelines are socially and culturally derived as a mix of what a person needs and what is socially acceptable, there are no EU-wide indicators measuring in how far these rules are followed and no harmonized data are available.

Apart from the food balance sheets of the Food and Agriculture Organization (FAO) which delivers only rough estimates of food availability, there is also no homogenized data source to calculate nutrient intake in Europe. Data for the assessment of *food intake* and *diet quality* can be collected using indirect methods or direct methods. As indirect methods, researchers use agricultural statistics or income and consumption surveys. The problem with these data sources is that nutrient intake is either estimated from residual supply (agricultural statistics) or extrapolated using household-level purchase data (income and consumption surveys). It is hence only an approximation of the individual intake of food and nutrients. Direct methods work either retrospectively, for example, with a 24-hour-recall or with a diet history interview, whereas prospective methods use eating protocols or observation studies (Straßburg 2010). Once the consumption of individual food items is known, data on the average nutrient content for these items is used to calculate *nutrient intake*.

The consequences of unhealthy eating can be tracked using their association with *morbidity* and *mortality*. The amount of disease and death is an important epidemiological indicator to understand the health impact of an unhealthy diet. The economic impact can be analysed by using the definition of a Disability-Adjusted Life Year (DALY) (Prüss-Üstün et al. 2003). One DALY corresponds to one year of "healthy" life lost due to disease or death. The sum of DALY of a given population is known as *burden of disease*, which is used by WHO to estimate how far away a population is from the ideal health situation where the population lives a healthy life for a long period, free from disease or disability (Prüss-Üstün et al. 2003).

Over the last decades, unhealthy eating patterns have been associated with the emergence of non-communicable diseases worldwide. In a country's economy, non-communicable diseases represent a heavy financial load to families and society in general, considering the direct and indirect costs. Direct costs include financial costs of healthcare (e.g., consultation, medicines, laboratory) and other costs related to seeking healthcare (e.g., transportation, special dietary regimes). Indirect costs cover the loss of working time of the affected person and her caregivers, and loss of income of the ill person and caregivers due to absenteeism, loss of business opportunities, and so on (Kankeu et al. 2013).

Another indicator used to measure the consequences of an unhealthy diet is the body-mass index (BMI), which is defined as a person's weight divided by the square of the person's height (kg/m^2) and ranges from underweight (<18.5 kg/m^2) to obesity (≥30 kg/m^2). In Europe, overweight and obesity account for nearly 23% of total medication costs for obesity-related diseases, which include diabetes, endometrial cancer and osteoarthritis as leading diseases. As a result it is estimated that between 2% and 4% of total health care costs in a country are attributable to the effect of overweight and obesity (Lette et al. 2016). Information on the prevalence of overweight or obesity at the EU level comes from the European health interview surveys (EHIS), which started as a "gentlemen's agreement" between 2006 and 2009 and was then put on a regularly basis by Commission Regulation (EU) No 141/2013.

5.3 Behavioural Foundations, Rationales and Instruments of Food and Nutrition Policy

For understanding the effectiveness of regulatory tools in the context of nutrition policy, it is important to keep in mind that nutrition and eating are social phenomena. Not only individual factors such as incomes, prices, time constraints and health conditions matter for consumers' food choices, but the family and household context is equally shaping consumption decisions and resulting health outcomes (Sims 1998). Policy can influence the food environment and furthermore affect the macroeconomic setting and technology development through regulatory choices. Consequently, the food context is multifactorial and complex and has been recently characterized to be "obesogenic", that is, contributing to excessive energy intake (Timmermans et al. 2018). Figure 5.1 illustrates the food context in which consumer choices are made.

Food and nutrition policy can affect diets via a number of mechanisms including the learning of healthy eating preferences, reducing barriers to expressing such preferences, helping consumers to reassess unhealthy food

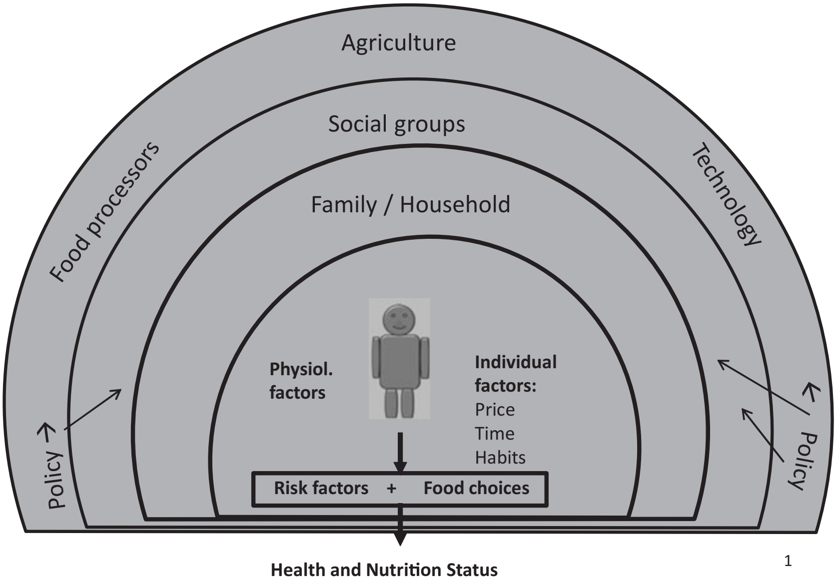

Fig. 5.1 Food choice in context. (Source: Own presentation according to Sims 1998)

preferences and stimulating a positive food system response (Hawkes et al. 2015). The success of policy interventions hence depends on enabling behavioural change among consumers via psychological and motivational factors, at the same time involving the food system and food environment to support such changes. The success of actions aimed at improving the healthiness of diets strongly depends on how consumers perceive information about nutritional properties of food delivered in different formats. Mogendi et al. (2016) report strong evidence that not only nutritional knowledge but also nutrition and health claims and information influence consumer decisions regarding food. Thus, it is important to look at societal developments in the nutrition-health nexus from both macro- (policy, industry, technology) and micro- (individual) perspectives. These developments are becoming increasingly important because advances in the bio-economy lead to transformations in the consumer environment, by, for example, creating new food products that can benefit consumer health and well-being.

Consumers' poor dietary habits and unhealthy food choices are often associated with changes in the market structure and/or with market failures. Rising incomes and falling real food prices lead to an increase in the demand for food and nutrients. At the same time, calorie expenditure requires active engagement and—nowadays—physical activity plays a lesser role in people's daily working routines. Ubiquitous offers of convenience goods and fast food address the increase in the opportunity cost of time that many European households face. All these trends can explain part of the increasing burden of overweight, obesity and diet-related diseases despite functioning markets. However, if there are market failures such as externalities or asymmetries in information, regulatory interventions can be justified (Mazzocchi et al. 2009).

In the nutrition context, it is assumed that externalities exist with respect to health care costs. Poor nutritional choices can lead to comorbidities associated with costs that are born by the public health system. Other issues that warrant market interventions are information failures, that is, the assumption that information on healthy eating and food properties is not known by consumers or that marketing activities lure consumers into bad choices.

Public health experts have hence called for policy measures including discriminatory taxes on nutrients at risk of oversupply such as fat or sugar. The idea behind price-based instruments is the principle of a Pigouvian tax, which internalizes the external costs of an (economic) activity such as increased health care costs from excess sugar consumption by increasing the price by the corresponding social cost. In October 2011, Denmark introduced a tax on fat, but abandoned it again in January 2013 (Smed et al. 2016). Other countries, such as Mexico, implement a tax on specific food products such as high-caloric, sugar-sweetened beverages (Colchero et al. 2017).

In addition, improvements of the information environment call for consumer education or food labelling including nutrition fact panels, front-of-pack labelling or the regulation of nutrition and health claims. Regulation of food advertisement can also change the information environment. For example, in France it is required that all food advertisement must bear accompanying messages on the composition of a healthy diet. Some countries impose restrictions on (junk) food advertisement addressed to children. Far beyond these food-based measures go calls for additional interventions in education, personal responsibility and the environment. A study by the McKinsey Global institute identified 74 interventions in 18 areas including measures such as food reformulation, changes in the urban environment or workplace wellness (Dobbs et al. 2014).

In recent years, several governments (e.g., in the UK, France and Germany, amongst others) established advisory councils on behavioural economics to investigate the potential benefits of policies based on nudging approaches. Such behavioural approaches are also studied and discussed in the context of nutrition policy.

5.4 EU Nutrition Policy

Nutrition policies implemented by the EU comprise regulations on food labelling (including nutrient values and allergens), claims on health and nutrition attributes of food products, food composition and standardization, and fruit, vegetables and milk schemes. These will be described in more detail in the following.

5.4.1 Food Labelling

Labelling covers a number of information tools such as nutrition labels and guidelines daily amounts (GDA). Here the absolute and relative contribution to nutrient intake of a standardized portion size is described, usually on the basis of a diet of 2000 kcal daily. In addition, warnings on allergens may be given and front-of-pack labelling may inform the consumer directly about the healthiness of a product.

A number of EU laws regulate nutrition labelling in the EU, such as the regulation on food information to consumers (Regulation (EU) No 1169/2011) which regulates food labelling, improved identification of allergens in food and mandates nutrition information. It is aimed at helping consumers make informed choices based on the information provided on food products. Additionally, the Audiovisual Media Services Directive calls to limit inappropriate promotion of foods and beverages containing fats, trans-fatty acids, salt/sodium and sugars to children.

5.4.2 Functional Foods, Nutrition and Health Claims

The European Commission Concerted Action on Functional Food Science in Europe (FUFOSE) started assessing scientific evidence on functional foods in 1995 and provided a working definition of functional food: “a food that beneficially affects one or more target functions in the body beyond adequate nutritional effects in a way that is relevant to either an improved state of health and well-being and/or reduction of risk of disease. It is consumed as part of a normal food pattern. It is not a pill, a capsule or any form of dietary supplement" (European Commission 2010). In terms of their beneficial effect on health, functional foods have been linked to the following areas of human physiology: (a) promoting optimal development and growth in early age, (b) regulating basic metabolic processes, (c) defending against oxidative stress, (d) improving the function of cardiovascular system, (e) improving gastrointestinal physiology and function, (f) enhancing cognitive and mental performance, and (g) boosting physical performance and fitness (Ashwell 2002).

While the introduction and marketing of foods with additional functional properties was booming at the end of the 1990s and early 2000s, many of the advertised claims were not sufficiently backed by sound scientific evidence. As a consequence, the European Union has any nutrition and health claims under Regulation (EC) No 1924/2006. The Nutrition and Health Claims Regulation (NHCR) sets precise requirements on when food businesses can highlight a specific benefit on the product or in advertisement. According to the regulation a *nutrition claim* "means any claim which states, suggests or implies that a food has a particular beneficial nutritional property" (EC 1924/2006). This can be due to the energy content that it provides, provides at a reduced or increased rate or does not provide (e.g., such as light claims) or due to nutrients or other substances that it contains, contains in reduced or increased proportions or does not contain (e.g., low fat or high protein).

Health claims on functional food products can be divided into two types: enhanced function and reduction of disease risk. Enhanced function claims are covered under Article 13 of the regulation and describe beneficial aspects of food without explicitly mentioning the risk of a specific disease. It implies a relationship between the food category, the food or one of its constituents and health (e.g., calcium strengthens bones). A reduction of disease risk claim regulated in Article 14 links the consumption of certain functional food to decreasing the risk of a certain disease and to ensuring adequate child development. It suggests that the consumption of a food category, a food or one of its constituents significantly reduces a risk factor in the development of a human disease or promotes child development and health.

Food bearing nutrition and health claims must comply with additional labelling rules and composition requirements. These are regulated in the nutrition profiles which exclude for example products containing high amounts of sugar. In addition, nutrition (GDA) labelling is mandatory for products bearing nutrition and health claims. Nutrition and health claims are based on scientific evidence that is judged by the European Food Safety Authority (EFSA). Authorized claims are published in the EU Register of nutrition and health claims made on foods (European Commission 2019).

The NHCR has been analysed with regard to its aim to "… ensure that any claim made on foods' labelling, presentation or marketing in the European Union is clear, accurate and based on evidence accepted by the whole scientific community". In its implementation, the EFSA has taken a conservative view, reducing the risk of accepting claims with insufficient scientific evidence. From a welfare perspective, this effort to avoid false claims (avoiding type-I errors) may result in a higher probability of rejecting truthful claims (increasing the risk of type-II errors). Of the 4637 general function claims initially submitted by industry, the EFSA approved only 222 (Bonanno et al. 2015). Bonanno et al. (2015) have shown that consumers may experience considerable welfare losses if false claims are permitted, but they would equally suffer losses if truthful claims are forbidden. Both errors lead to a malfunctioning of the market. Forbidding truthful claims have in particular an increased impact on consumer welfare when firms withdraw the affected product lines from the market (Bonanno et al. 2015). Ippolito and Mathios (1990) show that advertisement of health benefits by food companies can play an important role for consumer choices as it lowers the cost of information acquisition and processing.

5.4.3 Food Standards

Food standards define the composition and nutrient content of specific food products. The Codex Alimentarius Commission of the FAO/WHO defines food standards for a wide variety of issues. Regarding nutrition, the EU sets standards for food supplements according to Directive 2002/46/EC, on the addition of vitamins and minerals that "enrich" or "fortify" the food product as in Regulation (EC) No 1925/2006. In 2018, the Commission has forwarded a draft on a new regulation on trans-fats in food. Apart from these examples, EU-wide food standards are, however, fairly limited. Member states are implementing additional initiatives. These are sometimes characterized by a cooperative arrangement between the government and the industry. For example, Germany has recently enacted a strategy for reducing sugar, fat and salt in selected food categories that was elaborated in conjunction with the food industry. The strategy is one of self-commitment of the industry (Bundesministerium für Ernährung und Landwirtschaft 2018). Other countries follow more coercive policies (Réquillart and Soler 2014).

5.4.4 School Fruit, Vegetables and Milk Scheme

The programme regulated under EU 2016/791 merged the existing School Fruit Scheme and School Milk Scheme, which coexisted until July 2017. The scheme subsidizes the distribution of fruits, vegetables, milk and milk products to schools and/or day care centres for young children across the European Union under the Common Agricultural Policy. The scheme is targeted at children who regularly attend nurseries, pre-schools or primary or secondary-level educational establishments and is implemented at the national and regional level in various ways. Its major objective is to encourage healthier eating habits by increasing availability and accessibility of fruits and vegetables as well as milk and milk products. There exist a number of review studies that assess in how far school intervention programmes can improve aspects of dietary quality. Regarding fruit and vegetable programmes, the evidence speaks for an increase in consumption by + .2–1.0 servings, portions or pieces a day (De Sa and Lock 2008; Staudigel et al. 2018; Van Cauwenberghe et al. 2010).

5.4.5 Policies in EU Member States

While all policies outlined above have been implemented by the EU for the community as a whole, there are many other nutrition policy approaches that are adopted by individual member states. Instruments and strength of regulation are very diverse across member state and mirror historical attitudes towards a more libertarian or paternalistic take on policy, but also regarding the traditional standing of consumer rights in each country. For example, we see tax policies implemented in the UK, France, Denmark or Hungary. Regarding food labelling, the *NutriScore* concept in France and the traffic light system in the UK go substantially beyond the GDA approach agreed upon at the EU level. In contrast, Germany is more hesitant towards strict regulation, and policymakers favour education and information approaches.

5.5 Evidence from Consumer Studies

The success of policies promoting healthy food choices in the end depends on the individual. Whether or not individuals adopt newly proposed healthy eating patterns, or whether or not a given policy produces the desired effect in a given population of individuals with defined characteristics, can only be estimated with limited certainty. In this section we review scientific literature reporting consumers' understanding of healthy diets and their perception of and reaction to different interventions aimed at improving dietary choices.

The review by de Ridder et al. (2017) reports that although there is little consistency among consumers' view in different countries about what a healthy diet actually is, consensus exists about the components of an unhealthy diet. In addition, the study found that there is poor evidence regarding health effects from specific food products. However, research has shown that a Mediterranean-style diet has a positive effect on health. With regard to adherence to dietary recommendations, the study reports that most people fail to follow nutritional recommendations and consume too much food and too much unhealthy food. Particularly, people with a low socio-economic status are susceptible to unhealthy nutrition patterns. Moreover, people who attempt to regulate their caloric intake through dieting mostly fail to maintain dietary restraints for longer periods of time and regain weight.

The most important determinants of eating behaviour are intentions, habits, self-control, and the physical and social environment of an individual. Promoting health-benefiting eating patterns relies on interventions targeting both cognitive (i.e., knowledge, attitude) and behavioural (i.e., social reinforcement) perspectives. However, the evidence of the true impact of interventions remains inconclusive. The most promising interventions include those targeting habitual behaviour or those that are performed in the form of nudges[1] (de Ridder et al. 2017). A recent Cochrane systematic review on nutritional labelling provides similar evidence regarding the reliability of studies. It suggests that although interventions using nutritional labels with energy information may lead to a reduction in calories consumed in restaurants, the evidence is rather weak due to the low quality of studies (Crockett et al. 2018).

[1] A nudge is defined as "any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives" (Thaler and Sunstein 2008).

The effectiveness of nudging interventions is discussed in the review by Cadario and Chandon (2019). Their study classified the interventions depending on if they influence attention, interest or action. The most successful interventions are those focused on action, followed by interest and then by attention. Besides, interventions are more successful when decreasing unhealthy eating than when improving healthy eating or decreasing overall eating (Cadario and Chandon 2019). Another positive evidence of the effectiveness of nudges is provided in the review by Bucher et al. (2016). Their review investigates how food placement strategies influence food choice. They summarize studies that manipulated a food position in terms of its proximity to the consumer or the order in which the food is presented. The overall conclusion is that the position of food can influence food choice and is a promising strategy for inducing behavioural change. However, there is a need for high-quality, quantitative research on the topic (Bucher et al. 2016).

Brambila-Macias et al. (2011) analysed the policy interventions implemented in Europe to promote healthy eating: those based on the provision of information, as well as those based on modifying the market environment. To that purpose, they classified existing systematic reviews, academic papers and institutional reports into studies describing policies focusing on supporting more informed choices (i.e., utilizing advertising controls, public information campaigns or social marketing, nutrition education, nutritional labelling, nutrition information on menus), and studies describing policies focusing on changing market settings (i.e., fiscal measures, meal regulations), nutrition standards, reformulation and other relevant policies, (e.g., in the agricultural sector). The results showed that supporting informed choice has a heterogeneous and weak effect when compared with changing the market environment, which have proven to be—albeit more intrusive—more effective (Brambila-Macias et al. 2011).

The assessment of fiscal measures affecting food prices mostly occurs based on simulation studies (Thiele and Roosen 2018). An analysis of the effect of the Danish experience with a tax on saturated fats using consumer purchase data is provided by Smed et al. (2016). According to this study, the tax resulted in a 4% reduction in saturated fat intake and an increase in vegetable consumption. However, the study also highlights the complex effects of market interventions, as salt consumption increased for most consumer groups. A study of the sugar-sweetened beverage tax in Mexico found even stronger average effects, namely a decrease in taxed beverage consumption by 8.2% over two years. Untaxed beverage purchases increased by 2.1% in the same time frame (Colchero et al. 2017). Compiling the evidence on healthy food subsidies and unhealthy food taxation, Niebylski et al. (2015) conclude that considerable price effects are needed to have an effect on dietary quality. Fiscal measures seem most successful when supplemented with information policies (Thiele and Roosen 2018).

Reformulation policies try to change the energy and nutrient contribution of processed foods. Reformulation effects are in general decomposed in direct and indirect effects where the former result through the consumption of the reformulated product and the latter are caused by substitution effects between products. Studies show moderate effects of reformulation policies and illustrate the limited effect of consumer substitution (Jensen and Sommer 2017; Spiteri and Soler 2018). Hence, policies promoting food reformulation may have greater impact than interventions aimed at changing consumers' food choice (Spiteri and Soler 2018).

Wright and Bragge (2018) analyse the effectiveness of interventions aimed at improving food choices when dining out. They find that providing health information together with interpretive material such as traffic light labels leads to lower calorie intake. Moreover, social norms and social modelling can be helpful in improving food choices. Manipulating portion or dish sizes provides a comparatively small effect on healthy food choices.

So far, the evidence on the effectiveness of different nutrition policies from the consumer perspective is controversial. While some studies report the success of policy interventions, others claim that there was no observable change in consumer behaviour or that the change was only short-term. Most of the controversy stems from insufficient evidence (e.g., due to small sample sizes) or large heterogeneity among studies (e.g., regarding research designs, products of choice, etc.). Thus, it is not clear if policy interventions produce the intended effect of improving dietary patterns and consequently health and well-being of the population. What appears across studies, though, is that a concerted effect of combining policy instruments to alter the food environment seems most promising.

5.6 Food Industry Perspectives

The increasing prevalence of overweight and obesity has put the food industry under increased pressure to improve its marketing actions and the nutritional quality of its products. The political economy of the food industry reacting to this pressure can be understood from past experiences when similar regulatory pressures existed. The self-regulation of the industry in the form of voluntary agreements has been studied in the context of environmental regulation (Segerson and Miceli 1998) and food safety regulation (Segerson 1999). The general question of voluntary agreements is if they are likely to occur and if so, if they are efficient in achieving public policy goals.

There are a number of specificities of the food industry and nutrition quality that should be considered when addressing the question of effectiveness of voluntary regulation. The competition in the food industry is high and multiple responses have to be born in mind when considering the role of the industry in improving the nutritional quality of food. Réquillart and Soler (2014) mention in this regard the cost effect of reformulations and the so-called unhealthy = tasty intuition. Because a relevant segment of consumers associates healthy products with a loss in taste, the food industry faces difficulties in communicating health reformulations such as reductions in sugar, fat and salt to consumers being wary of the sensory deterioration of the products. In competition with other firms "[…] a single firm has no interest in deviating from the equilibrium by enhancing (through reformulation) the healthiness of its products", because there is a high risk to lose customers to competitor firms that do not reformulate at the same time.

Reformulation policies have their potential in improving consumers' diets (Jensen and Sommer 2017; Spiteri and Soler 2018). However, the industry also notes limitations in this approach because of desired safety and technological attributes of food products. For instance, in the context of salt reductions, industry experts are concerned over food safety and shelf life impacts given the preservation properties of salt. Also for some food products such as bread, salt influences texture (Lacey et al. 2016).

In addition, the industry's response to nutrition regulation can result in counterintuitive effects. For example, firms' reactions to bans on food advertisement to children have shown that these bans can be effective. A study in Quebec, Canada, showed that francophone children subjected to a ban on advertisement to children under age of 13 were less likely to visit fast food restaurants in comparison to their Anglophone counterparts that may be subjected to advertisements from TV channels in other provinces (Dhar and Baylis 2011). However, critics claim that the effect on competition was not sufficiently incorporated in that study and that increased price competition may offset the effects of advertisement bans (Dubois et al. 2018).

Voluntary labelling initiatives for nutrients as permitted by regulation 1169/2011 have resulted from actions in different European countries. For instance, in 2018 several food companies in France have introduced the *NutriScore* system, a five-coloured scoring system based on the nutrient content of 100 g of the food. Some firms have transposed this initiative to other countries such as Germany. Similar initiatives are the keyhole symbol in the Scandinavian countries. An analysis of new product introductions in the UK food market over the period 2007–2009 has shown that the likelihood of bearing front-of-package labels depends on the product category and was more likely for private-labelled products (van Camp et al. 2012). For rendering labelling initiatives effective, a consistent label format and positioning, and complete market penetration are considered as important factors (Storcksdieck genannt Bonsmann and Wills 2012).

5.7 Conclusion

This chapter reviewed existing nutrition policies in the EU and its member states and their effects. Consumers' food choices are related to a large number of factors and aspects that can be influenced by policies, such as information and price, and that are often less influential than other aspects such as taste or family preferences. Results of intervention studies have shown that interventions are most successful if they address several aspects of food choice: the global food environment, consumer information, and the availability and accessibility of healthy choices.

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CHAPTER 6

Future Developments in the EU Food Sector

Liesbeth Dries

6.1 Trends, Opportunities and Challenges for the EU Food Sector

6.1.1 *Trend 1. Consumer Preferences and Sustainability*

Changing consumer preferences offer opportunities to the food sector to develop new products, to explore new niche markets and to reap the benefits of the first-mover advantage. At the same time, they bring along the challenge of innovation, and opportunities may not be achievable for all actors in the supply chain. Consumer preferences are likely to continue on the path of healthy and functional food products, of ethical and sustainable production as well as consumption, and with a growing demand for transparency on production processes and origins (RSM 2019). The drive towards increased sustainability in the food sector is only partly driven by the demand coming from consumers. Food supply chain actors will also have their own motivations for becoming more sustainable in their activities, be it because of the policy framework with

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either obligatory or stimulating measures (e.g., tax exemptions for environmentally friendly investments), be it because of cost-saving motivations (e.g., energy savings from solar panels or windmills) or be it because of personal motivations.

6.1.2 Trend 2. Food Safety Remains Key, Both in the EU and Internationally

Ever since the BSE crisis in the 1990s, food safety has been high on the agenda for EU policy makers but also for the EU food sector itself. In recent years, several food scandals have emerged in international markets (e.g., *Escherichia coli* on fresh spinach in the USA, melamine contamination in milk in China). This has heightened attention to the issue of food safety also in important export markets for the EU food sector. To keep its competitive trade position in world markets, it is crucial that the EU food sector's reputation of a high food safety provider remains intact. The comprehensive EU General Food Law, and its implementation through national monitoring and control systems, is an important tool in achieving this challenge. But the primary responsibility for providing safe food and upholding the reputation for the food sector as a whole lies with each of the actors in the food supply chain. As the guarantee of sector reputation can be seen as a public good, ensuring individual responsibility will remain a challenge.

6.1.3 Trend 3. ICT Opens the Door for New Opportunities

Emerging digital technologies can offer opportunities to food chain actors to develop new business models and as such broaden their markets or—at least temporarily—differentiate from competitors. The digital transformation of the food sector is rapidly proceeding. This is evidenced clearly on the consumer side with the growth in digital in-store consumer tools, such as self-scan checkouts and e-commerce. PlanetRetail (2014) shows that the share of grocery purchases through e-commerce channels is still significantly lower in the main EU food markets, France and Germany (10%) and Italy (7%), compared to Asian markets in China (31%) and Japan (33%). The main exception here is the UK, where 27% of groceries are being bought using e-commerce.

Besides digitisation on the consumer side, there are also major digital innovations that offer opportunities for implementation along the food chain. One of such developments that receives a lot of attention currently is blockchain. A blockchain can be compared to a digital ledger that securely stores transactions and other information. Blockchain technology was developed as the architecture that underlies Bitcoin. Its success in this context has raised interest for transferring the technology to other uses, among which, in the food chain. The most obvious application of blockchain in the food chain is for traceability purposes. Blockchain allows for a rapid response to food safety problems and an immediate identification of the source and the companies along the chain that have come into contact with contaminated products. With food safety still being a top-priority for the EU food sector, such a tool may be very valuable. The technology has been tested for specific product lines by global food processors (e.g., Unilever) and retail companies (e.g., Walmart), but it is not yet widespread. Although blockchain holds the promise of improved efficiency, transparency and collaboration along the food supply chain, some challenges to adoption may also persist. Such barriers include, for example, resistance by food chain actors to full transparency and standardisation. On the other hand, the potential of blockchain may only be fully reached if it is used in combination with other technologies and systems (e.g., sensors and precision delivery systems for pesticides and water) and when the room for human error or fraud when entering data is minimised (Environmental Leader 2018; Forbes 2018; IFT 2019; SCM 2017).

6.2 EU Policy Developments in Relation to the Food Sector

The EU food sector has a strong competitive position on international markets (ECSIP Consortium 2016). Safeguarding this competitive edge requires a supportive legal framework. The main policies that contribute to the EU's competitive position in world food trade relate to food quality and safety (see Sect. 6.1.2) and regional trade agreements. Furthermore, innovation will be necessary to achieve the opportunities that present themselves and to strengthen the position of the EU food sector both internally and internationally. Also in this respect, there is an important role to be played by the EU regulatory framework.

6.2.1 *Regional Trade Agreements*

For most of the history of the European Union, the focus of EU external trade policy has been on reciprocal tariff cuts in free trade agreements (FTA) with other European countries; reciprocal tariff cuts with non-European nations in the World Trade Organization (WTO) and unilateral tariff preferences for developing countries (Baldwin and Wyplosz 2012). This focus changed with the communication of the European Commission (COM 2006, 567) known as Global Europe. The communication stresses the role of the EU's trade policy in strengthening European competitiveness and for seizing new opportunities. In particular, the promotion of trade liberalisation is advocated within the framework of bilateral relations. Preferred partners for FTAs were, among others, identified as the ASEAN (Association of South-East Asian Nations) countries, South Korea, India, China and Mercosur.

In the past two decades, the EU has been very active in negotiations with potential FTA partners to achieve the Global Europe ambition. For instance, since 2006, comprehensive FTAs have been negotiated and applied with South Korea, Colombia, Peru, Ecuador, Central America (Panama, Costa Rica, Honduras, Guatemala, Nicaragua and El Salvador) and Canada (European Commission 2018). The strategy has also paid off for the EU food sector as extra-EU food exports almost doubled over the past decade and grew more than intra-EU exports (FoodDrinkEurope 2018). In 2017, EU agri-food trade with FTA partners made up a third of total EU agri-food exports (European Commission 2018). The role of FTAs in achieving export growth for the EU food sector was confirmed by Copenhagen Economics (2016). Their analysis showed that the trade agreements with Mexico, South Korea and Switzerland have increased EU agri-food exports by more than 1 billion Euro and raised value added in the agri-food sector by 600 million Euro.

Importantly, free trade agreements are seen to have the advantage of covering domains that are not (or insufficiently) provided for by international regulations or the WTO (European Commission COM 2006, 567). One of these domains relates to food quality and safety policies. The EU has sanitary and phytosanitary (SPS) issues high on its agenda when negotiating free trade agreements to guarantee the upholding of the EU's rigorous standards on food safety and animal and plant health. Furthermore, chapters on SPS issues in the FTAs are intended to reinforce cooperation with the authorities of the partner countries and speed up the flow of information about any potential risks to food safety through a more efficient information and notification system (European Commission 2017). In addition, FTAs provide an opportunity to achieve protection of geographical indications—distinctive food and drink products from specific regions in the EU—beyond the protection that is currently provided by the TRIPS (Trade-Related Aspects of Intellectual Property Rights) agreement of the WTO. This is of particular interest for products such as traditional cheeses and meat products that are not covered by TRIPS, and for FTAs with countries that have historic ties with EU countries, for example, Mercosur (*Mercado Común del Sur*, including Argentina, Brazil, Paraguay and Uruguay for the case of the EU-Mercosur FTA), where traditional European products have often been copied (European Commission 2017).

Despite the advantages that are being created for the EU food sector by the EU's trade agenda, there may also be a serious danger on the horizon. At the time of writing, the Brexit has been looming over the EU for over two years already and still huge uncertainty exists as to which exit scenario will be followed and what form the future trade relations between the UK and the EU will take. Even the smallest disruption or obstacle to these trade relations may have significant consequences for the EU food sector because the UK is the largest trading partner of the EU-27. In 2017, the EU exported 32.3 billion Euro worth of food and drink products to the UK and imported 13.8 billion Euro of British food products (FoodDrinkEurope 2018). Ireland has the closest trade relations with the UK and will, hence, be affected most severely by disruptions in trade. But also France, Denmark, the Netherlands, Poland, Belgium and Italy have more than 9% of their total food exports destined to the UK.

6.2.2 Innovation and the Policy Framework

Innovation in the food sector is crucial to uphold a competitive position at the world stage. A clear, effective and supportive regulatory framework is key in fostering such innovations. On the other hand, the regulatory framework may also pose barriers to innovation by creating uncertainty, lengthy procedures, or even prohibiting certain innovations. If such barriers are created, then this may reduce the innovative capacity of the EU food sector by lowering budgets for R&D investments or by relocation of the most innovative food businesses. As an example, the average time of the approval process of novel foods[1] in the EU at the end of 2014 was 35 months. It was estimated that such a long period can reduce the rate of return on R&D costs by an average of € 4 million per product (FoodDrinkEurope 2016).

[1] *Under EU regulations, any food that was not consumed "significantly" [in the EU, ed.] prior to May 1997 is considered to be a novel food. The category covers new foods, food from new sources, new substances used in food as well as new ways and technologies for producing food* (EFSA 2019).

Since January 2018, a new EU policy for the assessment and authorisation of novel foods has come into force (Regulation (EU) 2015/2283 on novel foods). It remains to be seen whether the new policy is equipped to provide a more favourable environment for food innovations in the EU.

6.3 The EU Food Sector and the Circular Economy

The circular economy is high on the policy agenda in the EU but also in individual member states. A circular economy maintains the value of products and materials for as long as possible, waste and resource use are minimised and new value creation is sought for products that reach the end of their lifespan (European Commission 2019). A circular food system has three main requirements, namely, the sustainable and efficient use of natural resources (including soil, land, water and biodiversity); the optimum use of food and the optimum use of residue streams (PBL 2017). The sustainable use of resources requires management practices that prevent degradation, pollution or depletion. Efficient use can be achieved through the use of renewable resources, for example, the use of biomass in the creation of bioplastics or biofuels. The optimum use of food mainly requires the prevention of food waste and the optimum use of residue streams entails, for example, the use of residue streams from the agricultural sector in animal feed or biofuel production. In some cases, higher-value alternative uses of residue streams can be sought (PBL 2017).

At the EU level, initiatives to support the circular economy are seen in the light of improving long-term sustainability and competitiveness in the Union. In December 2015, the European Commission adopted the EU Circular Economy Action Plan (COM/2015/0614 final). In March 2019, all 54 actions under the plan were delivered and the European Commission adopted a comprehensive report on the implementation of the Circular Economy Action Plan (COM 2019, 190 final). Concerning the food sector, the so-called Circular Economy package focuses mainly on the prevention of food waste. In the EU, around 88 million tons of food waste is generated annually with associated costs estimated at 143 billion Euro (Stenmarck et al. 2016). Food is lost or wasted along the whole food supply chain, from farm to consumer. The actions undertaken at EU level to support the prevention of food waste include (i) a multi-stakeholder EU platform on food losses and food waste, (ii) revision of the Waste Directive (Directive (EU) 2018/851 amending Directive 2008/98/EC on waste), (iii) food donation guidelines and (iv) simplified and improved understanding of date marking on foodstuffs. The revised Waste Directive calls on EU member states to reduce food waste at each stage of the food supply chain, to monitor food waste levels and to report on progress made. It also provides a definition of food waste based on the definition of food from the General Food Law and it requests the European Commission to adopt legislation on a common methodology for food waste measurement, monitoring and reporting.

6.4 Conclusions

In order to safeguard its competitive position in the years to come, the EU food sector will have to continue to deliver high quality and safe food products on internal and international markets. The adoption of digital tools such as blockchain technology may help to achieve this goal. On the policy side, several developments are crucial in sustaining the food sector's global competitive position. Comprehensive regional trade agreements that emphasise issues related to the trade in agri-food products provide important opportunities to EU food exporters. On the other hand, EU policies that pose barriers to food innovations may be detrimental to the sector's competitive position. Finally, achieving a sustainable EU food sector will remain a challenge and initiatives related to the circular economy and the prevention of food waste and the use and valorisation of waste streams will need further attention in the future.

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PART II

Rural Areas

CHAPTER 7

A Public Good Perspective on the Rural Environment: Theory and History

Martijn van der Heide and Wim Heijman

7.1 Introduction

The discipline of economics addresses problems of scarcity, trying to explain how to fulfil people's unlimited needs and aspirations under scarce resource constraints. Without scarcity—for example, the Garden of Eden, where all the scarcity has disappeared—there are no economic problems which force people to make choices among available alternatives (Sowell 2007). So, when concerns about rural areas are connected or intertwined

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with economics, the challenge is to meet human needs indefinitely without degrading the liveability and ecological quality of the rural environment.

In this chapter, we focus on the various approaches to the theory of public goods. Our treatment is guided by two major questions:

- What is the relevance of property rights and the public goods properties of the rural environment?
- Which allocational problems are related to an efficient supply of rural goods and services in a spatial economy, and what can be gained by the application of existing theories of optimal provision of public goods?

These two questions form the basis of the succeeding four sections, which deal, respectively, with (i) the terms public goods, common-pool resources and property rights; (ii) the tragedy of the commons; (iii) club theory and (iv) the Tiebout hypothesis. A fifth section contains concluding remarks.

7.2 Public Goods, Common-Pool Resources and Property Rights

7.2.1 Characteristics and Typology of Public Goods

Many natural assets and rural amenities, such as species and the view of an attractive landscape, are characterised by the absence of fully defined property rights. They are public or collective goods or possess some features associated with such goods. This has already been described in numerous articles, reports and textbooks, varying from Barkley (1974) to a Special Section on public goods from farming and forestry in *EuroChoices* (2018, volume 17, no. 3). There is, in this regard, nothing new under the sun; it is the juice of the rural environment. Especially because many contributions are different angles of the same view. However, also rural areas change over time, and therefore, understanding the notion of rural public goods necessitates using different lenses at different times. These days, for instance, the distinction between 'public' and 'private' has become blurred, and among experts and policymakers, the consensus appears to be that private actors are more efficient in providing and taking care of public goods than the state. The public role, they say, should therefore be limited to that of supervision and facilitation.

Table 7.1 A general classification of economic goods

	Rivalry	
Excludability	*Low/Absent*	*High*
Easy	Toll or club goods (e.g. water storage and nature reserves)	Private goods (e.g. minerals and processed food)
Difficult	Pure public goods (e.g. sunsets and climate regulation mechanism of the Earth's atmosphere)	Common-pool resources (e.g. wild game for hunting, open access resources ground, fish stocks, open access forest and grasslands)*

Source: Based on Moretto and Rosato (2002, 5, Table 1)

*Rivalry does not necessarily need to be high. In certain cases, such as rivers, large bodies of water or groundwater basins, rivalry is rather medium than high

As is summarised in Table 7.1, pure public goods have the characteristics of non-rivalry and non-exclusion (e.g. Jongeneel and Slangen 2004; Sandberg 2007; Slangen et al. 2008).[1] Non-rivalry implies that, once the good is provided to a consumer, it can be made available to other consumers at no extra cost; that is, the marginal social cost of supplying the asset to an additional individual is zero. For example, nature reserves in rural areas—hereafter referred to as just nature reserves—protected by or for one agent will benefit everyone else who can access the area (Proost 1999). Non-exclusion means that one user cannot prevent consumption by others. Due to the non-exclusion attribute—that is, due to the fact that it is impossible or at least very costly to deny access to a natural asset—markets fail to allocate resources with public good characteristics efficiently. This may be understood by noting that prices do then not signal the true scarcity of the asset (Hanley et al. 1997).

As Cooper et al. (2009, 3) show, the characteristics of non-exclusion and non-rivalry are not either 'present' or 'not-present'. 'In reality, both may be exhibited to almost any degree, from zero to 100 per cent'. As a

[1] Some authors, for example, Perman, Ma and McGilvray (1996, p. 102), use the term 'public good' to refer to any good that is non-rival in consumption, irrespective of whether it is also excludable or not. Furthermore, most economic textbooks concerning public goods (e.g. Baumol and Oates 1988; Cornes and Sandler 1996) usually deal with the case in which a public commodities is a 'good' for everyone. However, there are also commodities, for example, air pollution or, for shepherds, the existence of wolf populations, which can be referred to as public bads (Sandberg 2007).

result, all goods can be situated along a continuous spectrum of 'publicness', with private goods at one end and pure public goods at the other.

Though many amenities in rural areas differ from private goods because they possess the characteristics of public goods, it needs stressing that many public goods are not pure public goods. Most natural assets, such as a lake or ocean, a fishing ground or a forest, are 'common-pool resources'. It is difficult or costly to exclude or limit users from these, while one person's consumption reduces resource availability for others (Ostrom 1999; Ostrom et al. 1999; Steins and Edwards 1999; Ostrom 2002, 2003; Berkes 2008).[2] A unit of a common-pool resource harvested by one user is thus not available for others. As is shown in Table 7.1, this rivalry of resource units is shared with private goods. The difficulty to exclude users, however, is typically a public goods property.[3] Table 7.1 also shows that the benefits of both toll goods and pure public goods are non-rival so that the consumption by one user does not necessarily detract from the benefit still available to other users. However, whereas the toll good is restricted to people who pay the producer or the holder of the good, the benefits of a pure public goods are shared by all consumers, whether they paid for them or not.

For both common-pool resources and public goods, the problem of excluding beneficiaries can lead to substantial free-riding; that is trying to make individual gains without contributing to maintaining and improving the resource itself. Due to free-riding, overexploitation is a potential threat to common-pool resources, but absent in regard to pure public goods. The reason for the absence of overexploitation in pure public good situations is that one's use of a pure public good, such as climate, does not subtract from the availability of that good to others.

It is obvious that excludability in consumption is only possible if the holder of the good has the availability of physical and institutional means to perform an effective control on the users. This has two important implications. First, if no person or group is endowed with well-defined property rights to an asset, then no one has the legal right to deny access to other

[2] Perrings, Folke and Mäler (1992, p. 208) even put it stronger by asserting that many species, local populations, ecosystems and ecosystem services are both exclusive and rival in consumption. This means that these assets are private goods (see also Perman et al. 1996).

[3] These two characteristics were already analysed by Weisbrod in 1964, who in his influential article about option value wrote '... that a number of significant commodities exist which are apparently of a pure individual-consumption variety, but which also possess characteristics of a pure collective-consumption good' (p. 471).

people. Second, physical properties of the asset can make exclusion infeasible. Consider, for example, a nature area. Private property rights may be established, but exclusion of visitors is not always possible. Besides, non-rival benefits give rise to zero marginal costs of use, so that exclusion is inefficient since potential consumers with a positive marginal benefit are denied access to the good. This access costs society nothing while generating positive economic benefits; thus, welfare is not maximised by exclusion—on the contrary. Another problem is that, because of the characteristics of non-excludable public goods (that give rise to the incentive for individuals to free ride), leaving their provision to private markets will result in undersupply with respect to the socially desirable level.

The problems associated with resources that are used in common are of particular interest in the debate over the sustainable use of nature. Hardin's (1968) 'tragedy of the commons' argument predicts the overuse and degradation of collectively used resources, including the destruction of fisheries, the overharvesting of timber and the degradation of water resources. Tragedy and apocalypse come together when Hardin writes (1968, 1244): 'Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all'.

Thus, as a result of a user's rational incentive to maximise his own utility, demand on a resource held in common increases to the point where private costs equal the benefits. Because each user ignores costs imposed on others (after all, those who damage other 'commoners' by using the resource in a less sustainable manner generally do not pay), the common-pool resource will inevitably suffer tragic overexploitation and degradation. Two solutions were proposed: '... either socialism or the privatism of free enterprise' (Hardin 1998, 682; see also Feeny et al. 1996; Ostrom et al. 1999). External authorities are thus presumably needed to impose rules and regulations on users, or to create private property rights and to allocate them to key users and beneficiaries (Ostrom 1999). Or, to be more comprehensive, goods or services that possess public goods characteristics require collective action to be properly and efficiently provided since the logic of individual interests results in a socially less than optimum response.[4] And although this collective action is usually associated with government intervention, it can also be accomplished voluntarily, between private agents, or as a com-

[4] Theoretically speaking, pure public goods do not require governments or the private sector to achieve the socially optimal levels of provisions: they are just available to everyone.

bination of both (Brouwer and van der Heide 2009; see also Ostrom 2008 for a detailed description of the so-called optimal institutional solutions for coping with sustainable harvest issues related to common-pool resources). Even stronger, Sukhdev (2012) claims that problems of the 'global commons', such as biodiversity loss, should not be put (entirely) in the hands of intergovernmental institutions anymore, because these bodies have failed dismally. He points to the need to recognise the key role of the private sector, not only in defining and setting economic direction but also in determining resource use globally.

Sukhdev's appeal does not violate economic theory—on the contrary. Dating at least as far back as Pigou (1920) and Coase (1960), economic theory suggests that some form of payments from the beneficiaries of natural assets (say tourism industry in a downstream river basin) to the providers of these assets (say upstream farmers or foresters) could result in an optimal supply. To make it more concrete, the tourist industry is dependent on high water quality standards for safe swimming and so on, and the payments that this industry makes compensate the upstream farmers and foresters for the additional costs of a sustainable and equitable use of the water in the upstream river. Such a (private) internalisation of externalities has been labelled payments for ecosystem services (or environmental services, PES). Another and today much-discussed example of internalising environmental costs (and to a lesser degree also benefits) by private actors is that of 'true pricing' or 'true cost accounting' (for details, see Sustainable Food Trust 2017).

These mainly theoretical solutions, however, are not always in line with daily practice; that is, they are not always supported by empirical research. The practice of solving the problems of the commons has long been a more complex matter and is far more difficult than theory suggests. The fact is namely that overexploitation has also occurred under private and state property regimes, and therefore, Hardin's work has frequently been criticised as oversimplified (Dietz et al. 2003).

A convincing rebuttal to the received wisdom that the transfer of common-pool resources to (i) government control or (ii) private property are the only two options available in solving the tragedy of the commons is to be found in Ostrom (1990), who has shown that solutions to this problem will vary greatly from situation to situation (see also Anderies 2000; Cox et al. 2010). In addition, worldwide empirical research of common properties has found many examples where the tragedy did not happen. For instance, Ostrom (1990) presents several in-depth case studies of actual common-pool resources where a group of individuals achieves a cooperative outcome by the establishment, application and monitoring of its own rules to control the use of the resource units. A more recent overview of successful cases in which communities have developed sophisticated mechanisms for the successful management of common property is presented in a special issue in the International Journal of the Commons (Schlager 2016). Speaking in general terms, the success of these outcomes depend on property regimes, as well as evolution of norms and design of rules (see also Ostrom et al. 1999; Ostrom 2000, 2002; for a short critique, see Steinberg 2009).

Especially groups of people who can trust one another are more likely than strangers to develop social norms that limit resource use. Social bonds and cohesion build trust and enable the establishment and implementation of norms. Evolved norms, however, are not always sufficient to guarantee a sustainable use of the common-pool resource. The development of well-tailored appropriation and provision rules helps to account for the maintenance of the resource. Individuals who violate these operational (and well-defined) community rules are likely to be sanctioned by other people of the group. Cheap, accessible conflict resolution mechanisms are therefore crucial. Another important factor of a successful governance of the commons is the existence of clearly defined boundaries that delineate who is allowed to use the shared resource.

7.3 Property Rights and Taxonomy of Property Rights Regimes

Cole and Grossman (2002, 317) state that property rights are fundamental in economics and that '… assumptions of well-defined property rights underlie all theoretical and empirical research about functioning markets'. Indeed, the allocation of property rights in society affects the efficiency of (natural) resource use. When excessive depletion and overexploitation occur as the result of the fact that many natural assets are not owned (or owned but with poorly defined and enforced property rights), the market has failed to signal the true scarcity of the asset. That is, the extent to which a market is able to reach an efficient allocation of resources depends upon the property rights arrangements that prevail. To have a property right is to have the capacity to turn to the pertinent authority system to protect one's interests (Bromley 1997; see also Schmid 1995). Without well-defined property rights, it is impossible to sanction one another, or to exclude or limit other users. As a result, when no one can be prevented from using or exploiting the resources, there is a lack of incentive on the part of the users to conserve the asset or to manage it properly.

Bromley (1992, 2) defines a property right as '... a claim to a benefit stream that some higher body – usually the state – will agree to protect through the assignment of duty to others who may covet, or somehow interfere with, the benefit stream'. It needs stressing, however, that there is no consensus in the economic literature about the precise definition of property rights. In fact, definitions of property rights in the economic literature sometimes diverge from the conventional legal paradigm (Cole and Grossman 2002).

A property right can be best understood as a relationship among individuals with respect to the use of natural assets rather than the relationship between an individual and a particular asset (Schmid 1995). It is possible to distinguish four broad types of property rights regimes in terms of their characteristics of rights and duties, under which natural assets are exploited (Bromley 1989, 1991; see also Steins and Edwards 1999; Starrett 2003):

- State or public property. Ownership and control of use are in the hands of the state. National parks are often cited state properties. Access for the public, that may be allowed to use (exploit) the natural asset, is held in trust by the state or its managing agency.
- Private property. Individuals have the right to utilise and benefit from the exploitation, conservation or sale of the asset, and the duty to refrain from unacceptable uses. Thus, for private provided goods, each individual actor has the exclusive right to exclude other individuals from participating in consumption (Bischoff 2008).[5] It is good to note that private property includes not solely individual property but also corporate property, such as companies, corporations and partnerships. Under corporate property, not all the owners are necessarily engaged in actively using and controlling the asset. In fact, corporate property usually has intervening parties, consisting of a group of owners that manage the asset as they see fit (Bromley

[5] Interestingly, the Swiss-born philosopher Jean-Jacques Rousseau (1712–1778) viewed private property as a destructive, selfish and egotistical institution that rewarded greed and self-interested behaviour. According to him, property was not a natural attribute of human existence. In his natural state ('state of nature'), man did not have property. Rousseau explains in his *Discourse on the Origin and Foundation of Inequality Among Men* (published in 1755) that '... the fruits of the earth belong to all and that the earth belongs to no one'.

1989). Due to pervasive duties that attend the private control of the asset, few owners are entirely free to do as they wish with corporate properties. It is also essential to realise that private property cannot exist without state sanction and protection; hence, private and corporate ownership do not imply absence of state regulation (van Kooten and Bulte 2000).[6]

- Common property. The rights to the asset are assigned to a specific group of users who manage the resources and exclude those who are not members of the group. Similar to private property, non-owners are excluded from use and decision making. According to Bromley (1989, 1991), common property represents private property for the group; that is, common property is corporate group property. The important difference between private and common properties is the ease with which individuals can be excluded (Ostrom et al. 1999). A common property right regime can be found in social units with definite memberships and boundaries, and with common cultural norms, such as tribal groups or subgroups, villages, neighbourhoods, kin systems or extended families. Due to the social interaction among members, the property-owning groups are willing to lower their own standard of living rather than forcing redundant individuals to leave the place (Bromley 1992, 1997).
- Open access. The asset is open to all, since there is no defined group of users or owners. Under open access, each potential individual or group can make use of the natural asset without regard for the interests of others. Due to the absence of property rights, no one has the legal right to keep other potential users out; open access regimes

[6] The same requirement exists for common property and for state property: without an authority system, that can assure that the expectations of rights holders are met, there can be no property (Bromley 1997). However, Coase (1960), in examining externalities, rejects such intervention by the government. Regardless of who holds the property rights, in a world of perfect competition, perfect information and zero transaction costs, external effects will often be efficiently dealt with by private bargaining. Under these conditions, no government intervention is necessary to secure an efficient allocation of resources, because the several users will take care of this allocation themselves, through bargains. Coase emphasises that the legal specification of property rights is not necessarily a good prediction of what the final allocation will be. Rather, the legal rules determine a starting point from which bargaining can proceed. The existence of well-defined property rights and the existence of a legal system that guarantees the enforcement of these rights are the necessary conditions for bargaining solutions.

are therefore fundamentally situations of no law. The tragedy of the commons is typically an example of open access, where everybody can utilise the asset without individual punishment.[7] Hence, overexploitation is a typical problem of an open access resource.

The four different property regimes are ideal categories. In practice, however, natural assets are often held in overlapping combinations of these regimes, which are to be found along a continuum (Feeny et al. 1996). It is possible to switch from one property right regime to another when conditions change. When the authority system breaks down, the state is no longer available to enforce compliance and, as a result, any property regime—private, common, state—degenerates into open access (van Kooten and Bulte 2000). Note furthermore that the same economic good according to Table 7.1 may be governed by different regimes. A common-pool resource, for example, may be governed by a common property regime, but this is not a necessity, as it can also be managed by an open access regime. Ostrom (2003, 249) puts it even more strongly by asserting that '... common-pool resources are not automatically associated with common-property regimes – *or with any other particular type of property regime*' (italics in original).

The conventional wisdom is that the solution to many problems related to nature and landscape loss lies in the establishment and allocation of well-defined property rights to the users and beneficiaries of natural assets. Starrett (2003) shows, however, that designing and implementing the 'optimal' property regime differs from natural resource to natural resource and that for some resources, there may even be no optimal design. So, prevention of overuse requires a property right regime that is based on the characteristics of the natural asset under consideration rather than on the ability of the regime to resist external pressure—especially when that pressure is unrelated to the nature of the property regime itself (Bromley 1992). As a result of this, no single type of property right regime works efficiently in relation to all natural assets (see Ostrom et al. 1999 for empirical evidence; and also Ostrom 2008). In some cases, only well-defined, individual rights in land can restrain overexploitation and

[7] Hardin's (1968) unfortunate use of the term 'commons' to describe an open access regime led to much confusion in the literature on the tragedy of the commons. Since the influential article by Hardin, natural resources used in common are variously referred to as 'open access', 'common-pool', 'common property' and the 'commons' (Steins and Edwards 1999). Nowadays, however, it is well understood that Hardin had open access resources and not common property in mind (Turner et al. 1994; Bromley 1997).

induce conservation-related investment, while in other occurrences a common property regime can be as appropriate as any other regime. So, although common property may risk a sustainable use and conservation of the asset, it does not necessarily lead to overuse. If sufficient trust and social pressure exist, a common property may be a successful management regime in controlling assets.

As a result, privatisation, which is often seen as the only real solution to counter ecological risks that an open access regime poses, is not by definition a prerequisite for permitting users and owners of natural assets to benefit from conservation. Even stronger, private ownership may lead to overexploitation of biological resources if the discount rate of the owner is very high (Clark 1990). Another problem of privatisation is that the owner may disregard certain externalities imposed on other people. As a result, regulation is still required. State property, finally, may conserve the natural asset, but much depends on the motives and decisiveness of the government, and its capability and robustness to manage the asset properly. If, for example, the government is weak, and its legitimacy is easily undermined, there is a continued threat of resource degradation. Therefore, for state property to work efficiently, the government must be able to monitor the use of resources, establish acceptable rules of use and enforce these rules (Bromley 1997).

To summarise the discussion so far, we have seen that many natural and rural assets share public goods properties. Nevertheless, the use by one reduces the quantity of quality available to others. Further, the majority of natural assets is not privately owned but has the characteristics of either common property rights or open access. The absence of well-defined property rights is widely regarded as one of the basis causes of nature loss and landscape degradation (see, e.g. Dasgupta 2008). There is little economic gain from conserving the rural environment, because the benefits of conservation are shared by all people, whether they have paid for them or not. Conversely, if they have no rights that define the privileges and obligations for the use of the natural asset, producers and consumers do not have to bear the implications of overexploitation and degradation. In economic terms, the perceived rate of return to nature protection is less than the rate of return to the economic activity that displaces or destroys the natural assets.

With an understanding of the relationship between property rights and the very characteristics of natural assets, it is now possible to analyse the essence of the public good problem; that is, the difficulties involved with the provision of public goods.

7.4 The Tragedy of the Commons

7.4.1 The Commons

We define the commons as a common-pool resource (CPR), which means that users cannot be excluded and the resource is rival (Table 7.1). The situation is presented as a game between two players: A and B who each can choose between two strategies: g_1 and g_2. The bi-matrix connected to the game is presented in Fig. 7.1. Each cell includes a possible combinations of strategies and its related pay-offs to the players. Each combination of strategies is referred to as (g_a, g_b), where a = 1, 2 and b = 1, 2, g_a and g_b representing Player A's and Player B's strategy choices, respectively.

The situation depicted in Fig. 7.1 concerns a CPR (the commons) consisting of, for example, an amount of grass available to two players (herders) A and B. Both have the choice between grazing a small number of goats g_1 and a large number of goats $g_{2:}$ $g_2 > g_1$. The related pay-offs can be described as follows. The gross revenue of the total amount of the grass

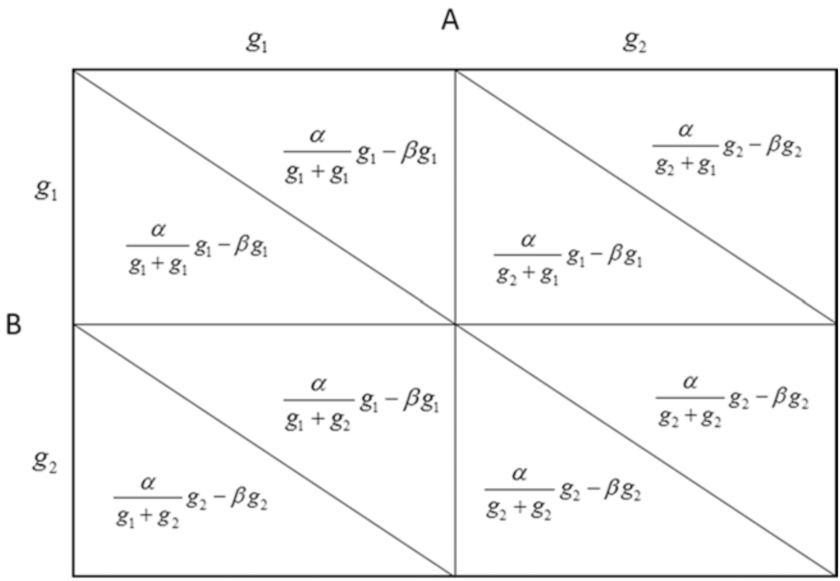


Fig. 7.1 The use of a common-pool resource presented as a game between two players: A and B. (Source: Own presentation)

equals α. If both players choose a small number of goats (g_1, g_1) as their strategy, the pay-off for both players equals half the gross revenue of the grass minus their costs. The costs equals an amount of money per goat β times the number of goats g_1. If both players choose g_2 as their strategy (g_2, g_2), their pay-offs equal half of the gross revenue minus β times the number of goats g_2. Because $g_2 > g_1$, it is clear that the net revenue for each of the players with (g_2, g_2) is smaller than with (g_1, g_1) if $\beta > 0$. In that case, (g_2, g_2) is a Pareto sub-optimum. A may also choose g_2, where B chooses g_1 (g_2, g_1) and the other way round (g_1, g_2). Finally we are assuming that (g_1, g_1) does not exceed the 'carrying capacity' of the grassland, which means that the number of goats ($2g_1$) is not such that the regeneration of the grass is hampered, where (g_2, g_2), with a total number of goats equal to $2g_2$, leads to the degradation of the grassland in the long run.

7.4.2 *Is the Tragedy of the Commons a Prisoner Dilemma?*

The definition for a Prisoner Dilemma (PD) Game is that all players must have a strict dominant strategy, where the resulting Nash equilibrium is a Pareto sub-optimum. The situation where both players choose g_2 as their strategy is called the tragedy of the commons and clearly is a Pareto sub-optimum because, if $\beta > 0$, both players will be better off in the situation where they both choose g_1. Both they earn half of the gross revenue but in (g_1, g_1) at lower costs than in (g_2, g_2). In order to arrive at the Pareto sub-optimum (g_2, g_2) through a strictly dominant strategy for both Players A and B, the following conditions should be fulfilled:

$$\frac{\alpha}{g_2 + g_1} g_2 - \beta g_2 > \frac{\alpha}{g_1 + g_1} g_1 - \beta g_1;$$
$$\frac{\alpha}{g_2 + g_2} g_2 - \beta g_2 > \frac{\alpha}{g_1 + g_2} g_1 - \beta g_1.$$

These conditions are fulfilled if $g_2 < \frac{\frac{1}{2}\alpha}{\beta} - g_1$. Assuming that $g_1 = \gamma g_2$, where $0 < \gamma < 1$, this can be rewritten as

$$g_2 < \frac{\frac{1}{2}\alpha}{(1+\gamma)\beta}. \tag{7.1}$$

If β equals 0 (when there are only fixed costs involved or when there are no costs at all), the herders both have a strict dominant strategy (g_2, g_2), so there is only one Nash equilibrium. Strictly speaking, the then arising tragedy of the commons (g_2, g_2) is not a PD, because the net revenues for both players resulting from (g_2, g_2) equal the net revenues generated by (g_1, g_1) and, in that case (g_2, g_2) is not a Pareto sub-optimum by definition. There is also no PD if (g_2, g_2) represents a zero profit situation for both players. In that case: $g_2 = \frac{\frac{1}{2}\alpha}{\beta}$, which means that, because of (1), the conditions for a PD are not fulfilled.

In practice, this means that, most probably, strictly speaking, not all the existing 'tragedies of the commons' will arise from a prisoner dilemma. However, the problems with respect to the use of common pastures, like the overgrazing of the Mongolian grasslands, may still be severe (Mc Laughlin 2019).

Sharing CPR seems to be not only a problem for rural areas. Considering the use of clean air in major cities, it shows all the characteristics of a common-pool resource (excludability, rivalry) including the possibility of low air quality resulting from this (Singh 2018). Other examples in urban areas may be overcrowded public parks and historic inner cities overrun with tourists. It is difficult to exclude people from using these 'commons' but some of that usage depletes their availability to others. To be sustainable, usage must be co-ordinated and regulated, which does not inherently mean that government management or privatisation are the only solutions. As mentioned earlier, late Nobel laureate Elinor Ostrom showed in meticulous detail that people can and do work together to manage shared resources sustainably.

7.5 Towards an Understanding of Nature and Rural Policy through Club Theory

7.5.1 Clubs and Club Goods

In standard economic theory of public goods, the rationale for the role of the government in providing a pure public good is that individuals can benefit from these goods without paying for them—the free rider problem.[8] The idea that rural areas in general and nature in specific pro-

[8] The provision of public goods has significant economic welfare implications. In seeking to provide nature, the government should not discriminate among citizens for wrong or

vide us with 'free goods' is deeply rooted in many cultural, farming and business practices. However, as already mentioned earlier, there are in practice only a few pure public goods (well, at least fewer than is commonly supposed). Most natural assets are common-pool resources, which are characterised by rivalry and difficulty of exclusion. Due to these two characteristics, many of these assets can be defined as 'impure' (or 'quasi') public goods or congestible goods. These goods include such items as public beaches or parks, which become more like private goods once their carrying capacity is reached and they become too full (Sandler and Tschirhart 1980, 1997). Thus, an increase in the number of people visiting these public areas may have an overall negative impact on community welfare. If, however, new areas are created, the users are spread over a large number of sites, which will lead to a higher satisfaction to any one individual because less people crowd one another.

Impure public goods lie between purely private and purely public goods. Buchanan, in his seminal paper *An Economic Theory of Clubs* (1965) was one of the first who developed a theory of clubs in order to bridge the gap between these two opposite types.[9] He explained the provision of a local public good—later known as a club good—by a club, which can be defined as a voluntary group of people deriving mutual benefits from sharing the costs of provision of a club good.[10] As such, club goods occupy a middle position between private goods, which are individually utilised or consumed, and public goods, which can be enjoyed or used simultaneously by any number of people.

Members of the club enforce the provision of a club good by excluding free riders from joining the club. Club goods are therefore excludable and

irrelevant reasons. That is, a fair distribution of public goods is required. For a thorough discussion about this distributional fairness, see Bovenberg and Teulings (1999) and WRR (2000).

[9] At almost the same time as Buchanan, Olson indicated in *The Logic of Collective Action* (first published in 1965) the need for exclusive clubs with restricted membership size to share impure public goods. However, for several reasons (see Cornes and Sandler 1996, pp. 352–353), Olson's analysis never generated the same interest as that of Buchanan. As a matter of fact, after Buchanan's celebrated work, it is Berglas (1976, 1981) who is considered to have developed club theory further.

[10] Buchanan developed and pioneered the original statement of club theory. The list of extensions is now very long (see, e.g. Berglas 1976; Berglas and Pines 1981; Byalsky et al. 1999). A survey of the literature is given by Sandler and Tschirhart (1980, 1997). Also Cornes and Sandler (1996, Part IV) provide a fascinating treatment of clubs and club goods and a helpful survey of the literature.

subject to some rivalry in the form of congestion.[11] They encompass swimming pools, golf courses, hospitals, libraries, universities, movie theatres, telephone systems, highways and public transport (Oakland 1987; Sandler and Tschirhart 1997; for a further classification of clubs, see Berglas et al. 1982). Members of these 'clubs' enjoy thus substantial benefits from memberships. However, these advantages could pose substantial inconveniences for non-members and even for society at large (see Lindberg 2009).

Because nature areas are subject to crowding (or congestion), club theory can be usefully applied to analyse allocation decisions and optimal provision levels for these areas. For example, non-governmental nature conservation organisations that possess closed access nature reserves can be considered as clubs. These organisations provide nature only to the members of the club; non-members are prevented from enjoying the benefits of the reserves. Most activities in these areas, such as recreation; picnicking; appreciation of wildlife; scenery and history; and biological, geological and archaeological research, are excludable and some of the benefits derived are to a certain extent non-rival.[12] Many of these activities are congestible as well, because beyond a certain use level, additional person's activity reduces the benefits or the quality of service still available to the other people.

Interestingly, Turner (2000) uses the theory of club goods to develop a model of managing multiple activities in a national park. The park (the club) provides both wilderness, which is considered as a pure public good, and recreational activities for visitors (the members).[13] The club is not exclusive. Since the national park is provided by the government, all citi-

[11] Rivalry manifests itself in congestion, or crowding (these two terms are often used interchangeably), which refers to the decline in quantity and quality of the good as new users of the service are added (Hanson 1978).

[12] Non-members are excluded from direct participation. They do not profit from the so-called user benefits, because non-member are excluded from enjoying certain ecosystem goods, such as animals, forests, and the scenic views that these nature reserves provide. However, non-members cannot be prevented from the life-support functions of these areas. Moreover, they can also benefit from knowing that these areas exist (existence benefit). Thus, in fact, nature reserves provide benefits to both members and non-members. In other words, there are two distinct groups of beneficiaries of nature reserves, which are heterogeneous and diverse in their individual preferences and not necessarily mutually exclusive in their persons.

[13] Important early work that is the basis for the literature treating recreation as a club good, with nature areas sometimes used as examples, is Fisher and Krutilla (1972). Their work deals with maximising the value of a tract of 'wilderness' land devoted to low density recreation. And although they included explicitly the cost of ecological damage and other external costs, apart from the costs of congestion, their landmark contribution has, nevertheless, until today received only scant attention.

zens must be allowed access, and hence membership size cannot be restricted.[14] Despite this unrestricted membership, there may be a price of admission (or other toll), although it is possible to gain access to the park without paying the entrance fee. Turner concludes that, on the basis of his model, different activities should be regulated separately through tolls that differ by activity. Tolls should be higher for activities with high direct and external costs. This result, however, seems to be in contradiction with Cornes and Sandler's assertion that government provision of club goods suffers from '... the inability of governments to vary congestion fees, since any possible claim of discrimination must be avoided. Once a fee is provided, that fee stays the same; thus, the toll cannot vary on the basis of crowding conditions or nonanonymous crowding' (Cornes and Sandler 1996, 401). Another conclusion drawn by Turner is that with efficient activity tolls, no entrance fee is needed anymore. This is because externalities associated with the activities of the visitors are internalised by these efficient tolls. Finally, according to Turner's model it seems unlikely that—due to the public good character of wilderness—toll revenues can fully finance park operations and that, in consequence, government subsidisation of the park system is inevitable.

Another theoretical discussion of the provision of wilderness by clubs is offered by Tisdell (1984). In an article of only four pages, he claims that clubs that manage a unique wilderness area tend to be too exclusive to use resource efficiently. To be more specific, Tisdell shows that if *total* utility from the wilderness area is to be maximised, then the socially optimal number of participants that use the area is higher than when the utility per individual club member is to be maximised. Thus, maximising the utility per member leads to a lower number of participants for sharing the area than when total utility from the area is to be maximised. However, the

[14] It is important to realise that club theory not solely relates to privately owned clubs but also allows for government-operated clubs, as well as for other institutional forms. For example, constitutional rules may prescribe government provision of certain club goods, such as highways. Cornes and Sandler (1996, Chapter 13), however, point out that government provision of club goods may restrict efficiency compared with the case of market provision, since a government does not have to compete against alternative institutional forms and membership size cannot be chosen optimally. In addition to local and national governments, another example of a club that is not privately owned is the United Nations. This multilateral organisation provides multiple club goods in terms of peacekeeping operations, humanitarian action and emergency relief, and development assistance. Because of the United Nations' limited financial resources and equipment, these activities are congestible goods. Peacekeeping forces, for example, cannot be deployed simultaneously in two different places. Once brought into action in one area, they can no longer be of service to other trouble spots.

author also acknowledges that despite this outcome, it is better for wilderness to be supplied by clubs than not to be provided at all.

The article by Tisdell touches—albeit indirectly—upon an issue that is nowadays a major concern in the relevant literature in economics and political science, namely: the relationship between the size of a club and its performance (see also the following subsection). Because of the free rider problem, larger clubs are assumed to be disadvantageous in pursuing their specific interest. Therefore, in collective contests for common-pool resources and club goods, larger clubs may be less successful than smaller ones (Nitzan and Ueda 2009).

Related to, but nevertheless quite distinct from the contributions of Turner (2000) and Tisdell (1984), is the study by Prakash and Potoski (2007), who analyse voluntary environmental programmes from a club theory perspective. They especially focus on specific institutional features and highlight the diversity in programme design. Moreover, the authors show that the efficacy of programmes can be undermined by problems associated with free-riding and shirking. Therefore, they suggest (p. 788) to '... carefully assess the population characteristics as well as the institutional context in which the club functions to decide about appropriate stringency of club standards as well as monitoring and enforcement rules'.

All in all, the few existing studies show that club theory can provide a theoretical foundation for the study of allocative efficiency of impure public goods where exclusion is possible, for example, by a fence in the case of the nature reserve (Sandler and Tschirhart 1980). Club goods are, in other words, associated with an exclusive group inasmuch as non-members can be excluded at an affordable cost. Although this excludability of benefits is probably the most prominent feature that distinguishes club goods from pure public goods, Sandler and Tschirhart (1997) identify several other discernible differences (see also Cornes and Sandler 1996):

- Membership of privately owned clubs is voluntary and the right of costless exit is always available. Recipients of pure public goods, however, cannot avoid the good's spillovers at a reasonable cost; that is, voluntarism may be absent. Examples are pacifists who cannot costlessly withdraw themselves from the national defence provision, or people living in the neighbourhood of a lighthouse who have to suffer the harmful effects of its flashing light.
- Club goods, unlike pure public goods, are 'congestion-prone' goods (Berglas and Pines 1981). All the consumers of the good derive util-

ity from sharing the services of the good and disutility from the size of the sharing group (or club). Thus, for club goods, both membership size and the provision of the shared goods are interdependent allocation decisions. Because of the crowding, the membership decision affects the provision choice, and vice versa, so that the decisions must be made simultaneously. Moreover, these decisions are not necessarily made by the same agents: individual club members have the possibility to leave the club and hence to reduce membership size, while the club as whole (or a management authority that represents member's standpoint) decides whether or not to accept new members. Pure public goods, on the other hand, do not restrict a membership restriction, so that all individuals can be members and only the provision decision needs to be considered.

- If all individuals in a population are allocated among a set of club, then the population is partitioned by the set of clubs. Each club enjoys the benefits of its own public good but not those of other clubs. This partitioning allows for competition among clubs, whereas there is no analogous partitioning for pure public goods.[15] Under certain idealised conditions—that is, for a homogeneous population with identical tastes and endowments—the resulting allocation of individuals among clubs is, at least in the abstract, optimal. In this situation, all people belong to any club supplying the club good and members have no reasons to move among clubs because no alternative club arrangement can improve the welfare of any member. Optimal partitions of populations among clubs forms the basis for the Tiebout model (1956), which analyses the provision of local public goods in a system of numerous governmental jurisdictions and whereby the act of moving reveals the consumer's demand for these goods. The next section explores the Tiebout model in greater depth.
- Club goods are characterised by the presence of an exclusion mechanism whereby users' rates of utilisation can be monitored, so that members can be charged accordingly, and non-members or non-payers can be kept out. Congestion costs highlight the need for utilising the exclusion mechanism to assign the proper tolls and consequently the total charges to the members. As such, the exclusion

[15] It should be realised, however, that in the case of club goods, the population is not partitioned either when some individuals do not belong to any club supplying the club good.

mechanism provides the incentives for members to join the club and to pay dues and other fees. Cornes and Sandler (1996) show that for a pure public good, the exclusion mechanism can be too costly, since the costs of establishing and maintaining the mechanism usually exceed the implied efficiency gains arising from exclusion. Therefore, according to the two authors, '... it is better to allow the pure public good's benefits to remain nonexcludable' (p. 349).

7.5.2 *Graphic and Visual Representation of the Club Framework*

A geometrical analysis of club theory is given in Fig. 7.2. Quadrant I depicts the optimal provision choice for two different sizes of the club ($N_1 < N*$). On the horizontal axis, the quantity of the shared good is

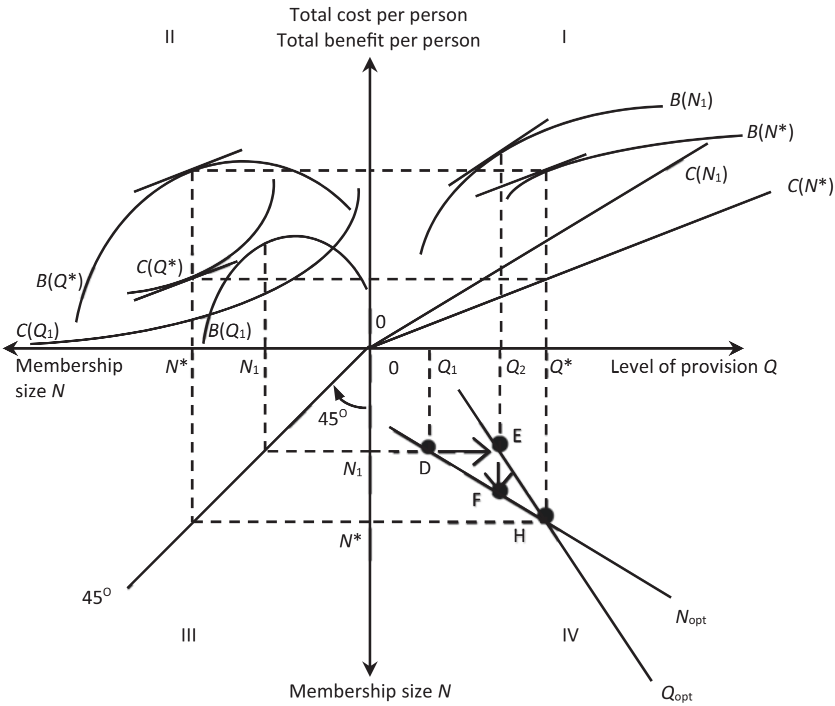


Fig. 7.2 Optimal club size and provision in four quadrants. (Source: Sandler and Tschirhart 1980, 1486, Figure 1)

given, while on the vertical axis, the total cost per member and total benefit per member are measured. For analytical simplicity, Buchanan (1965) assumes that the club good is produced under constant returns to scale. This condition, which implies that the marginal cost of provision is constant, is responsible for the linearity of the cost curve C in quadrant I.

The concave shape of the total benefit curve B indicates diminishing returns to consumption. For a given membership size N_1, the optimal provision corresponds to Q_1, at which point the slopes of the benefit and cost curves $B(N_1)$ and $C(N_1)$ are equal. As more members are added and membership size increases to $N*$, the total costs to the single person fall.[16] Furthermore, as club size is increased, the benefit function will shift downward and is lower and flatter than $B(N_1)$ because of increased crowding. The new optimal provision level is $Q*$, where the slope of the cost function $C(N*)$ equals the slope of the benefit function $B(N*)$, and net benefits are maximised. Thus, as is clearly displayed in quadrant I, there exists a positive relationship between increasing club sizes and optimal provision levels: larger clubs are expected to support larger facilities.

A similar construction may be used to determine the club size that maximises the net benefits per person. In quadrant II, total benefit functions and total cost functions confronting a club member are derived when a given level of provision is shared by a varying number of members. The shapes of the benefit functions $B(Q_1)$ and $B(Q*)$ indicate that as the club size increases, the benefits that the member derives from the good will, after some point, decline (owing to crowding). The cost functions $C(Q_1)$ and $C(Q*)$ are rectangular hyperbolas because the total cost per person will fall as additional persons become member of the club.[17] As the level of provision increases from Q_1 to $Q*$, both the benefit and the cost curve will shift upward. A higher level of provision inevitably means that more cost must be shared per member, so that the cost curve will become steeper at each size of the club for an increase in Q. Additionally, the benefit curve will be flatter at each size of the club because marginal declines in benefits owing to crowding are suppressed by the larger provision level. For each

[16] All members are assumed to have identical preferences, so that equal cost sharing is suggested. As a result, the total cost per member will fall as additional persons join the club.

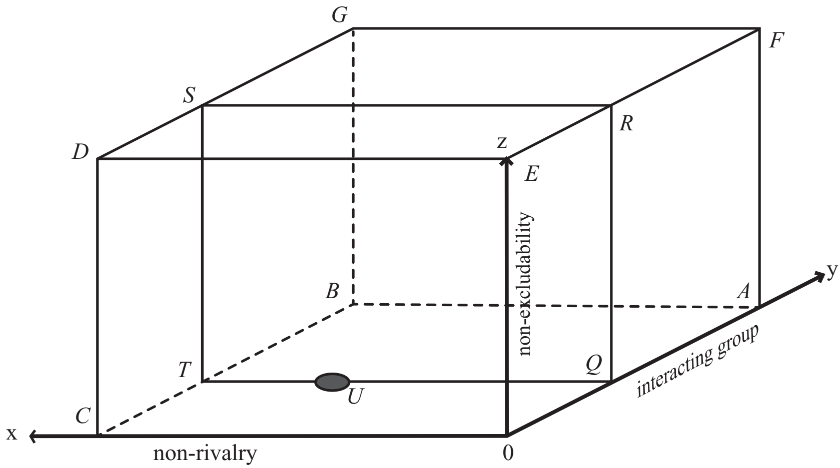
[17] With the total cost per person on one axis and the number of club members on the other, the cost curve must be rectangular-hyperbolic because the product of the two variables (total production costs of the club good) is a fixed constant (see Chiang 1984). A rectangular hyperbola approaches the axes asymptotically, implying that even if club size becomes very large, the total cost per member will never be zero.

given level of provision, the optimal size of the club is determined at the point where the derivatives of the total cost and total benefit functions are equal; that is, at the N value that equates the slope of the corresponding benefit and cost curves confronting a member. In quadrant II, N_1 is such an optimum for the provision level Q_1, while $N*$ is optimal for $Q*$.

The results obtained from quadrants I and II are combined in quadrant IV. Here, as in quadrant I, the provision level of the club good is measured on the horizontal axis, while the membership size from quadrant II is transferred to the vertical axis. This transfer is accomplished via the 45° ray of quadrant III. The Q_{opt} curve in quadrant IV relates to the values for the optimal provision level for each club size, which are derived from quadrant I. Since larger clubs are anticipated to support larger provision levels, the Q_{opt} curve is positively sloped. Similarly, the values for optimal club size for each provision level, derived from quadrant II, are transferred to quadrant IV in terms of the N_{opt} curve. Because the optimal size of the club is an increasing function of the level of provision—that is, larger provision levels are associated with larger optimal club sizes—the N_{opt} curve is also positively sloped. It should be noted that for convenience, the two curves are assumed to be linear, although this is not necessarily required.

Both the provision and the membership conditions are satisfied at point H, where the N_{opt} curve and the Q_{opt} curve intersect. At this point, the individual is in equilibrium both with respect to the level of the good to be shared and to club size. Suppose, for example, that the club good provision is Q_1. Then N_1 is the optimal membership size. Q_1, however, is too small relative to the corresponding membership size of N_1 and expansion to some point E is demanded. Once the provision level increases to this size, the individual prefers a larger club size and so on, until optimal membership and associated optimal provision is achieved at H. It is salutary to realise that, in order to reach a stable equilibrium, the Q_{opt} curve must be steeper than the N_{opt} curve. The two curves highlight the interdependency between the membership and provision decisions that are involved in the club model (Buchanan 1965; Sandler and Tschirhart 1980; Cornes and Sandler 1996).

Buchanan's treatment of clubs shows that, essentially, the public character of a good is related not only to the property of non-rivalry and the degree of excludability but also to a third feature, namely the size of the interacting group that shares and consumes the good. For a private good, the interacting or sharing group is one person (or one family unit), whereas the size of the interacting group for a pure public good includes an infinitely large number of persons. In Fig. 7.3, the three axes denote these three characteristics.



0	:	Unique private goods possessed by a single person, for example, Mozart's harpsichord, the Shroud of Turin, a Van Gogh painting
A	:	Private goods available to the entire world, for example, milk, fruit, ice creams, homes and clothing.
B	:	Toll goods, for example, bridges, international airports and long-distance highways.
C	:	Individual toll goods, for example, private beaches, private roads and NASA satellite services.
D	:	Pure public goods available to a single person, for example, the scenic view of the moon's surface experienced by a moonwalker.
E	:	Impure public goods available to a single person, for example, resources of outer space exploited by NASA and hunting grounds in remote and isolated areas.
F	:	Common-pool resources, for example, migratory fish shoals and groundwater reserves.
G	:	Worldwide pure public goods, for example, climate regulation mechanism of the earth's atmosphere, sunsets and pollution control.
U	:	Club goods, for example, nature reserves, swimming pools, universities and hospitals.

Fig. 7.3 Classification of goods. (Source: Loehr and Sandler 1978, 17, Figure 2)

Excludable goods—goods whose benefits are fully appropriated to the owner or provider—exist anywhere on the *OABC* plane, whereas total non-excludability is shown on the *EFGD* plane. Rivalry of consumption occurs at the origin 0. The extent of rivalness corresponds to the distance on the *x*-axis: at *C* the good is fully non-rival, so that one individual's consumption of the good does not diminish the amount of the good that may be used by others accordingly. Furthermore, the size of the sharing group ranges along the *y*-axis from one individual (at 0) to the whole world (at *A*).

Figure 7.3 covers goods falling at any point along the spectrum of goods (Loehr and Sandler 1978; Cornes and Sandler 1996).[18] For instance, private goods, which are fully rival and excludable, lie along line 0*A*, depending upon group size. The point *G* in the diagram denotes a worldwide pure public good, such as the climate regulation mechanisms of the Earth's atmosphere, because it is non-rival, non-excludable and shared by the entire world.

Local impure public goods—goods that do not display both non-excludability and non-rivalry in their pure forms and whose optimal size of the sharing group is small relatively to the community size—are placed on the 0*ABC* plane between 0*ECD* plane and *QRST* plane. Club goods, which are an important subclass of these goods and whose benefits are excludable but to some extent non-rival, are situated near point *U* in the box (Loehr and Sandler 1978).

As we saw earlier, club goods are characterised by excludable benefits that are given only to the person who join and pay for the club, and, theoretically speaking, withheld from all others. The possibility to exclude people is an essential prerequisite for the establishment of effective property right. Club goods are either state property (e.g. national parks; see Cornes and Sandler 1996; Turner 2000) or private/corporate property (e.g. irrigation systems, swimming pools and golf courses). Moreover, natural assets under a common property regime can also be managed and exploited as club goods. That is, in so far as it is possible to police and fence them—and exclusion is not too costly to be profitable—communally owned resources, such as grasslands and forests, fit the mould of club goods precisely. Clubs are of particular relevance to public policy, because they tend to provide a non-governmental alternative to the provision of public goods. As such, club theory shows that with regard to the allocation of congestion-prone impure public goods, governmental intervention is not always warranted.

[18] The classification of various physical goods is not as strict as the table might suggest, because characteristics of goods can change over time and over place. Technological progress has made it possible to exclude individuals from consumption of a good. For example, decoders make exclusion of radio and television transmissions possible. Moreover, food typically may be thought of as a private good, but under a communist regime it is supposed to be distributed equally among all citizens, with no one being excluded from it.

In the next section, we turn to a special type of club model, namely: the Tiebout model, which shows that the design of communities and the provision of local public goods have much to do with the analysis of public goods.

7.6 The Tiebout Hypothesis

One club model that has been the subject of numerous theoretical and empirical articles is that of Tiebout (1956).[19] In his seminal and celebrated paper on local public goods, Tiebout developed a 'voting-with-the-feet' hypothesis, whereby people with similar tastes for public goods sort themselves into homogeneous clubs or across local communities by moving to jurisdictions that satisfy their preferences. Tiebout's article was a direct response to Samuelson's observation that there exists no market or other mechanism that would provide proper incentives for the efficient provision of public goods, because individuals would not voluntarily reveal their preferences for non-excludable goods (Tiebout 1956; Wildasin 1987; Heikkila 1996). Tiebout argued, instead, that there exist competitive forces which make local governments allocate public goods in a Pareto-optimal fashion. He suggested that a system of local governments may act as a decentralised pricing system that generates an optimal allocation of public goods, since households can freely choose the jurisdictions in which they will reside. As Tiebout himself (1956, 422) put it: 'There is no way in which the consumer can avoid revealing his preferences in a spatial economy. Spatial mobility provides the local public-goods counterpart to the private market's shopping trip'. More specifically, consumers carefully balance the taxes they must pay against the bundle of publicly provided services they receive in return. Rather than waiting for annual elections or voting referenda to express their

[19] Although the Tiebout paper attracted relatively little attention for a decade or more after its publication, it has been cited in more than 1000 articles and books since 1970. See, for example, Bewley (1981), Berglas (1984), Rubinfeld (1987), Heikkila (1996), Kollman et al. (1997), Epple and Sieg (1999) and Caplan (2001) and the references therein. Dowding (2008) and Dowding et al. (1994) critically survey empirical tests of Tiebout models. The limitations of the Tiebout model are emphasised in an influential paper by Epple and Zelenitz (1981). The theoretical local public economics literature relies heavily on the Tiebout framework; a prominent example is Epple and Romer (1991), who investigate mobility and redistribution. However, the impact of the Tiebout paper goes far beyond its public finance origins. For instance, the Tiebout hypothesis is extensively applied to explain persistent geographic segregation (Zeng 2008), education resource inequality (Figlio et al. 2004) and the efficiency of ground lease systems (Deng 2002).

preferences at the ballot box, people find more immediate solutions to restoring imbalances that may suddenly arise between taxes and services: they vote with their feet and move.

In order to achieve a Pareto-optimal allocation of public goods, in the sense that no one can be made better off without making someone worse off, Tiebout invoked some highly abstract assumptions regarding individuals and their preferences, public good provision, communities, income and costs[20]: Given these assumptions, Tiebout showed that a decentralised decision mechanism leads to equilibria that satisfy Pareto optimality for local public goods. Allocative efficiency arises because the public goods are provided at minimum average cost and because individuals partition themselves among communities in which their demand is exactly satisfied. Viewed in this light, '... the Tiebout model is akin to homogeneous or mixed population situations in which individuals are partitioned into clubs, each containing *homogeneous* members' (Cornes and Sandler 1996, 352; italics in original).[21] In migrating to the community offering the most-preferred public good package, the (highly) mobile citizens will properly reveal their preferences for these public goods.[22]

The threat to move imposes competition on governmental units and, theoretically, forces them to be more efficient in supplying public goods

[20] Sharpe and Newton (1984) assert that Tiebout's assumptions are so unrealistic that the model is empirically irrelevant. However, the assumptions are no less realistic than ones used to describe perfectly competitive markets for private goods. Their criticism is thus not specifically upon Tiebout as such but rather upon the economic method (Dowding et al. 1994).

[21] There are, however, some important differences between the Tiebout and club models. First, they differ with respect to number of publicly provided goods: the Tiebout situation deals with a package of public goods, whereas clubs provide a single public good. Another difference involves the provision. In the Tiebout model, the public good provision is held fixed per jurisdiction and, therefore, provision and membership size decisions are not interdependent. In club models, however, membership decision affects the provision choice. A final distinction between club theory and the Tiebout hypothesis relates to the fact that membership (or community) size is based solely on cost sharing in the Tiebout model, whereas size is also based on social aspects, as friendship or companionship, in the club model (Cornes and Sandler 1996).

[22] A parallel can be drawn between the Tiebout model and the literature on environmental policy coordination or other forms of environmental agreements between countries. Comparable to the Tiebout situation in which individuals reveal their preferences for bundles of public goods by moving away, a strict national environmental policy choice can also result in migration responses. For if countries differ in their environmental policy, individuals and firms can locate in that country that pursues and implements the policy measures they prefer most (e.g. see Markusen 1975; Hoel 1999; Hoel and Shapiro 2000).

and services. The model sees economic competition as the primary check upon local governments. As such, the Tiebout model seems to be formulated in conformity with the Schumpeterian premise that democratic politics should preferably approximate the economic market, where policy outcomes of the political decision-making process are attentive and accountable to the interests and views of the citizenry. While the solution may not be perfect because of institutional rigidities, it is, like a general equilibrium solution for a private spatial economy, the best that can be obtained given preferences and resource endowments (Tiebout 1956). As a result, ever since Tiebout's article, it has often been argued that decentralised local governments have efficiency advantages over centralised forms (Ross and Yinger 1999; Howell-Moroney 2008). Indeed, in the Netherlands, for example, this has been a major argument for the decentralisation of nature policy to the twelve provinces.

In order to illustrate the Tiebout hypothesis, consider the following example. Suppose a community decides to create nature, for example, by building a public park, which results in a €100, per home annual increase in property taxes. Suppose further that there are two types of people in the world: those who do care for nature areas, and those who do not. Based on Tiebout's hypothesis, we would expect two things to occur. First, the demand for housing in this community among those who enjoy nature would increase. Second, there would be a decrease in demand for housing among those who do not care for, or oppose, nature areas. They will reveal their preferences by moving away. The overall effect on house prices in the community ultimately depends on which group is larger and feels more strongly about moving into or out of the community. Clearly, in the long term, public sector decision makers must elaborate and implement projects that are on balance favoured by the majority of community members, or they will see their population base erodes, as taxpayers will move away.

Unfortunately, the assumptions necessary to make the Tiebout hypothesis viable are extremely strong and not met in practice (see, e.g. Kay and Marsh 2007). For example, Tiebout assumed that there are many communities from which to choose, each with its own fixed public good package. In reality, however, there may not exist enough communities to allow individuals to sort themselves perfectly. In other words, if the number of communities is fixed, it is likely that not all individuals can locate public goods packages ideally suited to their tastes. Bewley (1981) even emphasised that the Tiebout hypothesis can be expected to hold only when the number of communities is at least as large as the number of individuals—a rather unlikely situation indeed. Similarly, efficiency requires that public goods be provided at minimum average cost, yet there may not be enough individuals of each type to achieve the appropriate scale of production to provide at minimum cost (Oakland 1987; Rubinfeld 1987; Allouch et al. 2009). This reduces the ability of individuals to perfectly sort themselves based on their demands for public goods. Another assumption that Tiebout made was that mobility is costless and that individuals can freely enter new communities. This is a strong assumption, however. The model is therefore more applicable for explaining the choice of residence in a larger city than for explaining migration across cities and states where costs of relocation are considerably higher. Despite these problems, the Tiebout model has provided one useful, very simple and yet very powerful—albeit somewhat artificial—model of efficient allocation of local public goods.

To conclude this section, we have shown that the Tiebout model, which arises out of the theory of clubs, can play a pivotal role in the analysis of public goods. It can yield—at least theoretically—useful insights into local public decisions that deal with provision of natural assets and rural amenities. However, although the Tiebout hypothesis has been investigated in depth, the bulk of the literature has focused on the advantages of larger or smaller jurisdictions in metropolitan areas, the relationship between the quality of local services, property taxes and property values, fiscally induced migration and the correlation between the number of competing jurisdiction and the degree of homogeneity of each jurisdiction (see, e.g. Dowding et al. 1994). Particularly interesting is the study by Banzhaf and Walsh (2008) who found substantial empirical support for the notion that households vote with their feet for environmental quality. Nevertheless, the Tiebout hypothesis has, to the best of our knowledge, not yet been studied in the context of the rural environment. In order to do so, the Tiebout approach should move away from its simplistic form, for example, by relaxing the assumptions that mobility is costless, that households can choose from *a large* number of jurisdictions, or that individuals can form communities of an optimal size in which the cost per person for the public good package is at a minimum. This latter assumption reduces the ability of individuals to perfectly sort themselves because communities above the optimal size will drive out individuals and refuse new settlers. Moreover, because the Tiebout approach relates to communities that offer *bundles* of public goods, it is needed to deduce the influence of each single public good—for example, a nature area located near a (rural) community—in this bundle on the actual moving decisions of consumers. Validating the Tiebout model for the provision and demand of rural amenities requires demonstrating a motivational link between rural areas and household movement. This can be done by making use of survey data.

The rural landscape is a public good. Many rural public and private services depend on it. With the discussion of club theory and the Tiebout hypothesis we have touched upon only a few aspects related to the provision of public goods. Public goods characteristics reduce the incentive to provide these goods and, as a result, private markets will tend to underprovide public goods (and to overprovide public 'bads'). The provision of public goods through privatisation, collective action or governmental intervention is the fundamental debate in public economics and therefore also in the debate about the provision of rural services. Finding solutions to public good provision, however, begins with the question whether a particular public good should be provided at all if it does not already exist. Questions regarding preferences and demand for public goods, as well as welfare evaluations of policy decisions concerning these publicly provided goods form the subject of other chapters in this book.

7.7 Concluding Remarks

This chapter has raised a number of institutional economic issues that concern the rural environment. Drawing on public good theory, we outlined a theoretical perspective to study the supply of natural assets in the countryside.

Natural assets are public type rather than private goods. They tend to be non-exclusive and rival (e.g. shoals of fish, forests and irrigation systems), exclusive and subject to some rivalry (e.g. nature reserves and private beaches up to some maximum use level) or non-exclusive and non-rival (e.g. scenic views and clean air and water). Some non-rival goods are non-excludable because preventing other persons from consuming the good is currently too costly. That is, they are characterised by high exclusion and monitoring cost because they are difficult to police and fence. As a result, many beneficiaries of these goods choose not to pay and will free ride on the efforts and activities of others. This can present a problem for provision. In reality, most natural assets are impurely public: they are neither absolutely rival, nor absolutely non-rival. Rather, they are either partially rival, which means that they can be made available in varying amounts to some individuals, *or* partially excludable.

Impure public goods, such as common-pool resources, possess some features of both public and private goods. They suffer from a congestion problem, due to rivalry. For instance, as more people are visiting a rural area, the usefulness of the area to any one individual is diminished. To illustrate, every year, hordes of tourists visit the iconic flower fields in the Dutch Bulb Region, leading to problems of congestion which can then worsen the attractiveness of this tourist destination. The area is therefore conditioned by the number of people that use it at any one time. From a theoretical perspective, impure public goods bridge the gap between purely private and purely public goods.

An important subclass of these impure public goods is club goods. In Buchanan's (1965) influential article on the theory of clubs, the first analytical statement was derived of the provision and distributional efficiency of impure public goods by clubs. Clubs, such as non-governmental nature conservation organisations, are defined as voluntary groups of individuals who enjoy the benefits from sharing the costs of supply of a local public good. If exclusion of individuals is possible and a public good is involved, then the principles of club theory can be usefully applied.

Club theory forms the theoretical basis for the Tiebout hypothesis, which refers to the view that 'voting-with-the-feet' will reveal people's preferences for various public good packages. Communities compete for citizens by offering bundles of publicly provided services. This will lead to the efficient allocation of local public goods, because citizens partition themselves among communities in which their demand is exactly satisfied. The Tiebout model is very simple, yet very powerful. Ideally, it can be used to analyse optimal allocations of population among communities with diverse packages of rural amenities.

Club theory and the Tiebout model are one way of organising information to help guide decisions on nature and rural landscape policies. Valuation of nature and landscape is another economic tool in the politics of the rural environment. That is, economists can contribute to the design of policies by demonstrating the potentially high benefits of nature and (rural) landscapes, and reveal more clearly the economic and social pressures that threaten them (for more details and examples, see van der Heide and Heijman 2013). Moreover, as there is a limited budget for policy measures, it is also a task of economists to assist in setting priorities among alternative nature and rural policy and management options. So, the role of economists in protecting the rural environment is far more significant than appears on first consideration.

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CHAPTER 8

Market Mechanisms and the Provision of Environmental and Social Services

Floor Brouwer, Chris Short, Simone Sterly, Janet Dwyer, and Anne Maréchal

8.1 Introduction

European agricultural land is a vital resource for the production of food, feed and fibre. Moreover, rural land is also a major source of environmental and social services. Society depends on these services provided from agricultural land, including climate regulation and carbon sequestration, biodiversity values, water quality, soil functionality, flood management,

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cultural landscapes and recreation (Haines-Young and Potschin 2018). However, land-use decision makers and society might be unaware or underappreciate, and often under-value these. In addition to these environmental services, there are more social-targeted public goods including food security and rural vitality (Cooper et al. 2010).

Different types of action ensure the provision of environmental and social services provided by agriculture, including (i) private action and market-led approaches (agri-food chain, retail, consumers) through commercial marketing; (ii) local action/initiatives (public or private); and (iii) governance or political action (e.g. public policy legislation, institutional settings). Land managers are the primary actors who operate in the context of public policies with regulatory and supportive measures. They increasingly operate with other private actors (including the agri-food chain, other industries) and civil society organisations. There is evidence of shifting societal 'norms' in relation to expected environmental or social behaviour. Farmers pay attention as 'caretakers' of natural resources and therefore as service providers.

The chapter aims to stimulate more effective provision of public goods and ecosystem services from EU farmland. Related to this, the chapter explores how best to improve the social and ecological resilience of farming in the EU through enhancing the sustained provision of environmental and social benefits.

8.2 Concept of Environmental and Social Services in Agriculture

Public Goods and Ecosystem Services: Environmental and Social Services
Within agriculture and agri-environmental policy domains, public goods are used in two main ways: as an economic concept, and/or a socio-political concept. In neoclassical welfare economics, public goods are

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Table 8.1 A classic economic categorisation of types of goods

Characteristics of goods	*Excludable*	*Non-excludable*
Rival in consumption	Private goods (e.g. *loaf of bread)*	Common pool resources (e.g. *an aquifer)*
Non-rival in consumption	Club goods or toll goods (e.g. *a film or music appreciation club)*	Public goods (e.g. *a lighthouse)*

Source: Own presentation

basically defined by two key characteristics of non-rivalry and non-excludability (Cornes and Sandler 1996). Non-rivalry means that one person's consumption of the good does not prevent others from consuming it. Non-excludability means that when a good is provided to one, it is automatically provided for all or it is impossible or prohibitively expensive to exclude non-payers from its consumption (Table 8.1). These two characteristics will generally be associated with inappropriate supply and pricing of these goods in conventional markets, and they are often therefore described as leading to market failure, which is a common argument for some kind of public intervention.

Whilst economists recognise non-rivalry and non-exclusion as sources of market failure in farming and forestry, the diagnosis has stimulated a variety of ideas about how it can be corrected. Three kinds of recommendation are usually suggested for correcting market failure:

1. Intervention by the state to provide the goods directly (e.g. compulsory purchase and management of a nature reserve).
2. The use of market instruments to try and internalise costs and benefits so as to move provision closer to a social optimum (e.g. a tax or incentive payment/subsidy to increase the private supply of public goods, alongside the production of private goods).
3. Regulation in order to re-define property rights or reshape institutions so as to place public or societal responsibilities more centrally (e.g. prohibition on certain types of land use or management, for sites or assets of specific public value; or requirements for consultations and permissions, to act).

In political science, and particularly political philosophy, the term 'public good' refers more to what is good for people and what people want for their collective well-being than to specific characteristics of certain items. A variety of economists has also used this socio-political definition (Harribey 2006, 2010; Dardot and Laval 2010, 2014; Cordonnier 2012; Favereau 2010; Laville 2003, 2008). These writers consider the collective (or public) dimension of good results from collective and institutional choices about what is considered as a collective (common) benefit. In this sense, a public good refers to the public interest or public utility derived from a particular asset, state or service which may merit public intervention or public oversight, concern and/or governance (Divay 1980; Coulomb 1991; Foisneau 2007), or forms of collective action (Olson 1965; Ostrom 1990) simply because society demands it.

'Ecosystem services' has emerged as a concept used to convey the importance and value of, natural systems to society and the economy (Ehrlich et al. 1977; Ehrlich and Mooney 1983). It embraces the functioning of hydrological, chemical, ecological and other biophysical elements and systems in the environment as well as a range of functions resulting from the combined effect of natural and cultural processes, such as landscape quality.

The Millennium Ecosystem Assessment (MEA) defines ecosystem services as 'the benefits people directly or indirectly obtain from the environment' (MEA 2005) and uses the term to include both goods and services that are provided by ecosystems. It classifies ecosystem services into four broad types: provisioning, regulating, supporting and cultural services. As widely reviewed elsewhere (Lele et al. 2013; Schröter et al. 2014; Fisher et al. 2009), the MEA (2005) has been critiqued (Costanza 2008) on the basis that it mixes its ends with means.

Fisher et al. (2009) provide a useful overview of the main characteristics of ecosystem services, which are pertinent to developing their classification, assessment and decision making. Ecosystem services also make explicit reference to socio-cultural aspects and values. Cultural services are defined as the non-material benefits obtained from ecosystems through spiritual enrichment, cognitive development, reflection, aesthetic experience and include things like social relations, aesthetic values and human well-being (Bieling and Plieninger 2013; Plieninger and Bieling 2012).

According to De Groot et al. (2005), many writers on ecosystem services recognise the legitimacy of socio-cultural services and some (Paracchini et al. 2014) have made serious attempts at devising methodologies to capture and value such services, often in a specific landscape context.

Having emerged in policy discussions relatively recently, the explicit use of ecosystem services as a concept or tool for analysis within the context of CAP reform has so far been relatively minor. However, it has gained increasing prominence in the arena of environmental reporting and state of the environment 'classification' and 'diagnosis' exercises (e.g. Haines-Young and Potschin 2013; Paracchini et al. 2014; Van Oudenhoven et al. 2012; MAES 2013; MAES 2014; Snäll et al. 2014). Among environmental agencies and non-governmental organisations, the concept has also been widely used alongside public goods as a way of seeking to make more tangible, the dependence of various social and economic activities on the continued functioning of natural processes and maintenance of environmental assets (Rutz et al. 2014).

From Public Goods and Ecosystem Services Towards Environmental and Social Services

As the previous section has shown, both public goods and ecosystem services approaches recognise that social and ecological factors interact in the production of marketed and non-marketed products from agriculture and forestry. Dwyer et al. (2015) explored ways of bringing the two conceptual frameworks together within a broader architecture as 'environmental and social benefits'. This is not a replacement for the insights of both the public goods and ecosystem services concepts; rather it seeks to embrace the full set of dynamic relationships between natural assets and processes and human social and cultural assets, actions and their respective drivers. The actions of farmers and others engaged in managing or influencing the management of rural land are particularly relevant here. Their regular land management decisions have a direct impact on the provision—or non-provision—of a range of environmental and social services.

As a result 19 environmental and social services were selected for assessment of their provision in Europe. They were:

- Food security (maintenance of sustainable resource base for food production)
- Water quality
- Water availability
- Air quality
- Greenhouse gas emissions
- Carbon sequestration/storage

- Fire protection
- Flood protection
- Soil functionality
- Soil protection
- Species and habitats
- Pollination
- Biological pest and disease control
- Landscape character and cultural heritage
- Outdoor recreation
- Educational activities
- Health and social inclusion
- Farming and animal welfare
- Rural vitality

These services are understood to be those outcomes in the environmental and social spheres that are delivered by agriculture and forestry and which benefit society. This term thus includes:

Ecosystem services, and their resulting benefits, that have public goods characteristics (services from the environment)

Social and cultural services delivered by farming with public goods characteristics—this includes 'cultural' ecosystem services as defined in the Common International Classification of Ecosystem Services (CICES) framework

Located at the crossroads between the public goods and the ecosystem services concepts, the term environmental and social services brings forward the essential ideas that are at the core of the chapter. It captures the insights from both concepts viewed through a societal prism, which determines what does or does not contribute to human well-being. The scope of the chapter is on services that are beneficial to society, with 'beneficial' used in a broad sense as it embraces not only those positive practices enhancing the provision of these services but also those reducing the occurrence and impact of negative practices that actively reduce the level or quality of their provision. The term is also a reminder that the chapter is concerned with both the environmental and social dimensions of agricultural land management.

Agricultural activities are very diverse and they can have both positive and negative environmental and social impacts (so-called negative externalities). The impact of protection may vary considerably depending on the management systems and practices being implemented, the individual management operations undertaken as well as a range of other factors, notably the local biophysical context. Negative impacts often may not be intended to be damaging; the perception of the actions concerned are diverse. Ironically, some negative results may arise from positive intentions. With this in mind, mitigating the impacts or occurrence of practices that have a negative impact on the provision of environmental and social services is as important as enhancing practices that have a positive impact. Both are considered within the frame of this chapter.

8.2.1 Public Services Arise from Valorisation Process, Including Awareness, Appreciation, Valorisation

Although not straightforward to quantify, there is evidence to demonstrate that the environmental and social services delivered by agriculture are valued by society and as a result, that there is societal demand for the beneficial outcomes concerned (Cooper et al. 2010; Bureau and Mahé 2008; Van Berkel and Verburg 2014). This can be determined in a variety of different ways (Fig. 8.1). The chapter hypothesises that although in many situations the current level of provision or supply of environmental and social goods and services does not meet the level of societal demand in the EU (EEA 2015) (e.g. when policy targets are not being met), there is potential to address this shortfall.

Societal demand for environmentally and socially beneficial outcomes delivered by these sectors can be represented as a cascading process in which the different elements of what we decide as a valorisation process are expressed along the successive steps within a value stream (Fig. 8.1).

In the first step of the valorisation process, awareness refers to the extent to which both the public as a whole and local stakeholders (including land managers) are aware of the presence of the environmental and social services being delivered by activities on agriculture land in their areas. This applies both to the supply and demand side. Land managers are citizens with their own awareness, knowledge and preferences which is relevant to their capacity and willingness to deliver environmental and social services.

Awareness could also refer to the recognition of the potential for this delivery in areas where under-provision has occurred. In fact, the local population in localities where there is an abundance of environmental and

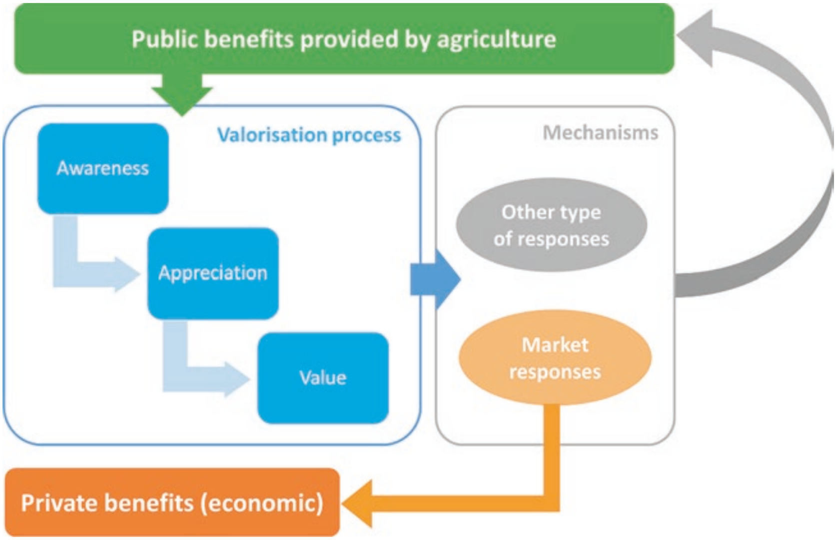

Fig. 8.1 Cascading 'valorisation' chain for the environmental and social service delivered by agriculture. Note: Valorisation is understood in this context to be the process by which an existing good or service becomes more valuable in someone's perspective (i.e. individuals in society) through actions which result in its value being more recognised and enhanced. The valorisation process refers particularly to increases in stakeholder awareness, interest/appreciation and the value attributed by society to the environmentally and socially beneficial outcomes delivered by agriculture. (Source: Brouwer et al. 2018)

social goods and services ('hotspots') may or may not realise the multiple benefits they receive from the provision of these goods and services, whereas the under-provision of environmental and social services often triggers awareness that they are lacking. Therefore, although awareness is in principle likely to be greater in hotspot areas, it is not limited to these areas; as awareness of the benefits of environmental and social goods and services is not necessarily correlated with their provision in a particular locality.

Public awareness is closely linked with an active interest and appreciation of the provision of environmental and social goods and services and the recognition that society benefits from them. Raising awareness is a prerequisite for the appreciation of public goods and ecosystem services by society as well as their supply by land managers. Education or training can play a key role in this regard. Creating partnerships of local stakeholders (including private sector, NGOs, experts and public sector regulators) can also be an important means to strengthen the appreciation of public goods (e.g. WBCSD 2012). Public awareness and appreciation are also greatly impacted by policy discourses, media attention and social networks. Such interactions should be based on robust evidence to ensure that the discussions and conclusions drawn by those involved are scientifically sound. Typically, public appreciation is greater for tangible goods and services such as water quality or species-rich habitats (e.g. woodlands, meadows) than for intangible benefits such as carbon sequestration or reductions in greenhouse gas emissions, the effects of which are invisible and impact at the global scale.

8.3 Environmental and Social Services in Practice

8.3.1 Introduction

Different private sector actions and market mechanisms may emerge to valorise the environmental and social services from agriculture. Examples of the environmental and social services generated or sustained with private sector involvement are presented in Table 8.1. They help to connect people and businesses with policies targeted at the provision of these services.

Market mechanisms encouraging the provision of environmental and social services may include a premium for a certified product, at times combined with a certification process required by the buyer, or by involving payments or investments to land managers by private companies (Maréchal et al. 2018). Examples offering a premium for certified products include the organic farming label (Austria), grass-fed beef (Estonia), grazing systems in dairy production (the Netherlands) and traditional orchard meadows (Germany). Certification schemes are provided in Italy (processed tomato supply), while payments or investments are involved in France (Volvic water company), the Netherlands (farmer, beer and water) and in the UK (river basin management). The environmental and social services and the main valuation mechanisms of these cases are summarised in Table 8.2.

Innovation and motivation are key factors for the successful adoption of market-driven approaches supporting the provision of environmentally and socially beneficial outcomes from farming. Figure 8.2 does distinguish

Table 8.2 Case studies with private sector involvement

Title of the case study	*Environmental and social services*	*Main valuation mechanisms*
Organic farming label in the Murau mountain region (Austria)	Species and habitats, landscape and cultural heritage	Price premium for high-quality milk
Grass-fed beef (Estonia)	Species and habitats, landscape and cultural heritage, animal welfare, rural vitality	Whole value chain approach (production-processing-marketing) of grass-fed organic beef
Grazing systems in dairy production (the Netherlands)	Soil functionality, species and habitats, landscape and cultural heritage, animal welfare	Price premium is paid for branded outdoor grazing systems, marketing of branded cheese 'Beemsterkaas'
Traditional orchard meadows in Hesse/Baden-Wurttemberg (Germany)	Species and habitats, landscape and cultural heritage, education	Price premium for regional and organic juices; alternative supply chain
Processed tomato supply chain in (the tomato district) northern Italy (Italy)	Water quality, water availability. Soil functionality, soil protection	Interregional supply chain; integrated production, controlled irrigation and environmental certification to increase efficiency
Volvic water company, land management agreements and Agri-forestry (France)	Water quality, water availability, species and habitats, landscape and cultural heritage, rural vitality	Incentivising land managers to introduce technical innovations through subsidies and support
Farmer, beer and water—Sustainable agriculture and sourcing in Limburg province (the Netherlands)	Water quality, water availability, soil functionality, soil protection, species and habitats, landscape and cultural heritage, outdoor recreation, rural vitality	Social platform (farmer, beer and water) initiates sustainability projects aimed at conserving groundwater resources
WILD river basin management initiative (United Kingdom)	Water quality, flood protection, species and habitats, landscape and cultural heritage, soil functionality	Enabling farmers and local communities to develop the understanding, commitment and actions needed in integrated river basin management

Source: Own presentation

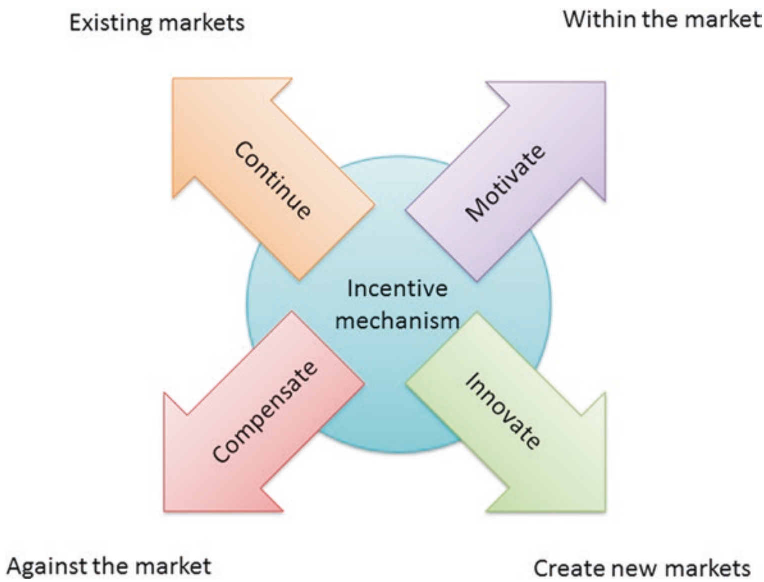

Fig. 8.2 Incentive mechanisms for the provision of environmentally and socially beneficial outcomes provided by agriculture. (Source: Prepared by authors)

between markets and different incentive mechanisms. The features of private sector approaches are compared to more public sector–driven approaches to stimulate the provision of such goods and services.

8.3.2 *Premium for a Certified Product*

The private sector can be an important driver and change agent for the provision of environmental and social services through a market price incentive, which is also apparent in several case studies.

8.3.3 *Organic Farming in the Murau Mountain Region in Austria*

Mountain farming in the region Murau supports the preservation of mosaic landscapes and biodiversity. Milk production and livestock breeding are the dominant farming practices (Nigmann et al. 2017). The production of haymilk is an extensive type of farming in which grass is dried and is the main base to feed the cows. Since 2006, it has been recognised as Traditional Specialty Guaranteed (Council Regulation (EEC) No 1948/1993). An organic quality certification and marketing mechanism ('Zurück zum Ursprung') (ZZU) ('back to origin') is implemented to mark haymilk production to both organic and mountain farming. Some 150 milk producers in the mountain region Murau agreed to enter into the labelling of organic haymilk while producing environmental and social services including biodiversity and cultural landscapes, as well as rural vitality, animal welfare and greenhouse gas mitigation (Nigmann et al. 2017).

The ZZU brand is a private sector initiative launched by a consultancy company, and responsible for setting standards for production methods (including quality assurance and a traceability system of the label), and also providing extension services. It brings together representatives from the private sector (farmers, retail chain and consultancy firm) and targeted to valorise region-specific assets (e.g. biodiversity and cultural landscapes). The ZZU brand offers a premium payment of some 0.21€ per kg of organic haymilk. In addition to this price premium, the agri-environmental payment under Pillar II offers an incentive to farmers to move into the production of organic haymilk.

8.3.4 Grass-Fed Beef in Estonia

Diverse environmental and social benefits are ascribed to extensive grazing practices in Estonia: maintaining biodiversity (Estonian Ministry of Environment 2013), landscape character and cultural heritage, contributing to climate change mitigation, preserving and enhancing rural vitality and high levels of animal welfare. The farmer NGO Liivimaa Lihaveis (Beef of Livonia) initiated a whole-chain approach for organic grass-fed beef in Estonia, with the aim to become more independent from mainstream processing and marketing system and to achieve better prices. It developed a national food quality scheme 'grass-fed beef' in 2014, which units 43 farmers producing beef on 16,000 ha of land (as of 2016). In 2016, some of the founders became owners of a meat processing private limited company where all the meat is processed. The products are marketed under the quality label in different retail channels and directly to restaurants and schools; about half the production is currently exported to Latvia and Sweden. The producers realised that in order to be able to maintain extensive beef production and thus contribute to maintaining, biodiversity, landscape and rural vitality in the areas, they needed to cooperate (Peepson and Mikk 2017). They do this through cooperation between the NGO Liivimaa Lihaveis as beef cattle provider, Nordic Beef as distributor and Luha Lihatööstus as processor. Organic certification is a key activity contributing to achieve a higher premium. These activities are combined with events and campaigns to raise consumer awareness about product quality, food preparation options and production system benefits.

8.3.5 Grazing Systems in Dairy Production in the Netherlands

Grazing is the main feature of dairy farming in the Netherlands and an important public service of the dairy sector (RLI 2011). There had been a declining trend in grazing, which has recently reversed. The number of dairy farms with grazing in 2018 is slightly above that in 2012 (source: Stichting Weidegang). Farmers build their grazing strategies on all four incentive mechanisms presented in Fig. 8.2. A premium payment to brand cheese produced from outdoor grazing systems was introduced in the Netherlands in 2002. It guarantees to consumers that products are based on farming systems with grazing for at least 120 days per year (at least 6 hours per day). The premium started at a level of €0.50 per 100 kg of milk and increased over time to reach a level in 2017 of €2.00 per 100 kg of milk. This premium is argued (CONO 2016) (i) to secure a fair price to farmers for grazing, (ii) to acknowledge how pasture grazing adds to the taste of cheese and (iii) to increase animal welfare. Moreover, landscape features that have a public good character are used in the marketing of cheese. The premium payment is a measure to *motivate farmers* towards specific practices. In addition, the premium for grazing is embedded in a *marketing strategy* for meadow dairy products: products that are sold not only on the national market but also on the international market (e.g. Germany). It supports agri-food companies to differentiate their products in the market (Brouwer et al. 2017). Private and public measures can be devised to maintain or enhance grazing on dairy farms. These policies should counteract the trends towards full-time housing of cattle and improve the image of dairy farming which was hitherto becoming increasingly industrial. Grazing makes dairy farming visible in the landscape and is therefore nowadays seen as a crucial element for dairy farming to maintain a positive image in society (e.g. Outdoor Grazing Covenant, *Covenant Weidegang*, 2012). The covenants are a voluntary negotiated agreement between the government and sectors of industry (see Bressers et al. 2011). Following a qualitative analysis of pasture grazing, drawing from a literature review and interviews, complemented with data from the national census and the Farm Accountancy Data Network, the report states that farmers appreciate private payment schemes as they acknowledge product quality and the provision of environmentally and socially beneficial outcomes from agriculture.

8.3.6 Traditional Orchard Meadows in Hesse/Baden-Wurttemberg (Germany)

As a response to a drastic decline in the traditional orchard across Germany, nature conservationists founded in 1989 the Support Association for Regional Traditional Orchard Cultivation (Fördergemeinschaft regionaler Streuobstbau, FÖG) to help 'conserve through use'. Studies (e.g. NABU 2015) have shown that traditional orchards are contributing to maintain biodiversity in terms of ecological diversity and genetic diversity (old varieties), landscape character and cultural heritage. Nowadays, the association covers about 125 ha of traditional orchards in the southern part of the state Hesse and the North-West of the state Baden-Wuerttemberg; and consists of producing and supporting members (54 respectively 35 members in 2013). The main mechanism to valorise environmental and social services are producer premiums realised for their organic and regionally produced apple juice (Hülemeyer et al. 2017). Different members in the association organise organic certification of the orchard meadows, or negotiate prices with the press house. Besides that, they also organise tree planting events or pruning courses. Despite the fact that general conditions regarding policies as well as market dynamics are increasingly supportive for orchard meadow initiatives, the association has been facing critical issues with the commitment of members, and with leadership hampering the achievements of their set objectives. At the same time, other internet-based networks with similar objectives are very successful in Germany (e.g. 'orchard savers'). The case illustrates that even initiatives successful in valorising environmental benefits are facing negative developments in organisational life cycles and competitive societal dynamics (e.g. new forms of participation).

8.3.7 Quality Certification Process

Processing Tomato in Northern Italy

Intensive tomato production is contributing to the environmental pressure on the Po valley in Northern Italy and is at the same time an important economic sector in these regions (25% of European processed tomato production). Collective action of all supply chain actors fostered the adoption of farming and technological innovation (integrated production and micro-irrigation technology) from the early 1990s onwards. In 2007, the Producer Organisation, processing firms, and representative associations, local institutions and local research centres founded the Inter-branch Organisation, which facilitates the integration of the supply chain and standardisation of criteria and procedures. Through the reduction of pesticide use, the actors in the region contribute to maintaining healthy soils and water quality. However, the introduction of micro-irrigation not only reduced the costs of irrigation (and benefited the availability of water) but also lowered the cost of plant protection as lower moisture reduced the pressure of mildew development. Besides the resulting increases in cost efficiency, the producers were able to achieve higher prices for certified and quality tomatoes. Key to the success of this initiative was the collective action of different actors in the tomato supply chain with the creation of the inter-branch organisation (Forcina and Mantino 2017). Through that, the actors were also able to positively influence policies in the regions and benefit the environment.

8.3.8 Payment or Investment for Land Managers

Volvic Water Company, Land Management Agreements and Agri-Forestry in France

In 2007, Danone, who owns the Volvic water company, developed a strategy in partnership with the local public authorities to maintain high and constant mineral content levels in this valuable watershed and to manage water contamination and shortage risks. The key actors are the towns within the Volvic water catchment area and the Volvic Source and Volcanoes intercommunity, the local water board, local managing authorities, Danone/Volvic water company, farmers, private and public forest owners, and environmental organisations. The area consists of mixed forest (53%), which is mainly unmanaged, and agricultural land use consisting of pasture for beef production and some cropping. Clearly Danone has significant interest in maintaining its brand reputation and credibility. As a result the farmers feel the way local interventions are designed and implemented is rather top down (Depres and Pham 2017). Farmers have economic concerns and a desire to receive sufficient compensation for environmental services they provide. Currently the project relies on Pillar 2 support for Areas of Natural Constraint, also agri-environment measures and organic farming. The public-private partnership does not offer payments for ecosystem services as such, because it would likely be too costly for local public authorities to maintain this payment over a longer period of time. Rather, it pays for land-related activities which support farmers in the maintenance of extensive practices. Maintaining the current extensive agricultural practices contribute to preserving a high water quality. The viability of the agricultural sector in the area largely depends on public support, mainly from the rural development pillar of the CAP. Crucially, farmers are key actors but not full members of this governance structure, which affects their commitment to it.

8.3.9 Farmer, Beer and Water in the Netherlands

Farmers and beer producers may operate in the same region and compete for limited water resources. They also have a common interest to maintain the quality of groundwater resources and secure their availability. A brewery and a group of farmers have established a network with other public parties to manage freshwater resources sustainably (van der Heide and Polman 2017). The network includes awareness raising regarding the provision of environmental and social services. In extreme weather conditions with long periods of drought, farmers are compensated by the beer producer for the loss of crop production. This is part of the agreement established in the network. Farmers and the beer producer jointly cooperate to manage the effects of drought, among others by reusing the process water from the beer production and the deployment of new technologies to improve water quality. Increasing social cohesion of the local community is one of the main side-effects of the platform.

The platform Farmer-Beer-Water aims to motivate farmers towards sustainable management practices; projects are developed and funding opportunities are explored. Corporate Social Responsibility is a major motivation for the beer producer to join the platform. There are intrinsic motivations for the parties to cooperate and achieve a common purpose to maintain water quality standards, and the common interest to sustain groundwater resources. Barley from local farmers is used for the supply of premium beer and adds to the quality of landscapes in the region. Farmers are *motivated* to use the water resources more sustainably. Farmers also are encouraged to provide barley that is locally produced for the supply of premium beer. Such quality produce needs to comply with the requirements of the premium brand. Otherwise, it might be used in lower-priced markets (e.g. feeding dairy cows) (Bavaria 2015).

8.3.10 WILD River Basin Management Initiative (United Kingdom)

The Water and Integrated Local Delivery (WILD) uses a facilitation-based approach to help meet Water Framework Directive objectives through a lasting multi-stakeholder partnership. The key actors include farmers, 18 local communities, the main private water company, three government agencies, three NGOs, local government and the local university to develop an understanding and commitment to manage a 200,000 ha catchment in a more effective way. The catchment is mostly commercially arable with some grazing land and small amounts of private woodland. Multi-species grass leys to improve soil functionality and other land management initiatives have been introduced to increase water quality and flood protection aid rural vitality with associated benefits for biodiversity, landscape and cultural landscapes. Farmers are the main private actors involved through various engagement activities (e.g. 100 farm visits a year, advice and training) as well as direct communications with the water company and local authorities and government agencies. There is a strong element of collective action (Short et al. 2017), including voluntary contributions and high levels of public support, which increases the value of the project. Farmers use AECM and other Pillar 2 measures to adjust land management to benefit water quality and reduce flood risk as well as complementing this with Pillar 1 mechanisms (cross-compliance and greening options) to increase the synergistic approach of the initiative. The development of contact points and networks, including the Guardians of the Upper Thames, promotes accountability and develops trust, which is vital for the discussions with local communities impacted by flooding. The involvement of both the private sector and public bodies working alongside local advisors and facilitators has strengthened the project and helped developed a Payment for Ecosystem Services framework between the water company and farmers and land managers.

8.4 Future CAP and the Provision of Environmental and Social Services

From the examples presented and discussed here, we can see that market mechanisms operate effectively under particular conditions, which can be fostered or assisted by public policy. It is not the case that these initiatives operate without relevant policy conditions 'in a free market'; rather, the market and policy conditions and instruments support one another in a synergistic way. Certain environmental and social services (e.g. animal welfare and biodiversity) can be achieved through the involvement of market mechanisms (motivating farmers within existing markets) and/or farmers who innovate to enter new markets. Consumer awareness and appreciation are critical factors. By contrast, factors like soils and climate seem less easy to use as marketable phenomena associated with particular food products. Nevertheless, policy such as the CAP can help to foster more effective and efficient supply of public services through market mechanisms, in a number of important ways.

Under the CMO for fruit and vegetables, the CAP encourages producers to come together in collective bodies—both Producer Organisations (PO), and also Inter-Branch Organisations which link a number of POs. Such collective identity and action can foster the creation of strong branding which is linked to Operational Programmes supported for fruit and vegetable POs which incentivise the introduction of higher environmental standards in production, as is seen in the case of tomatoes in the Po Valley. This creates a clear opportunity to link environmental services with specific branding and market advantage.

In the case of mountain milk in Austria, the organic pasture management from which the dairy cows benefit is supported by significant payments under the CAP's Agri-Environment-Climate Measure (AECM), helping to maintain its viability and thereby ensuring the continued supply of high-quality milk to the specific marketing channel which gives a premium price to producers.

In Estonia, the group of beef farmers who established this specific supply chain developed a certification scheme and formed a cooperative; both activities which can benefit from CAP support under Pillar 2 Rural Development Programmes.

These few examples highlight how policy can help to encourage market-linked solutions. In particular, Measure 16 which fosters new forms of cooperation between producers or between different supply chain actors, in very flexible ways, appears useful. Measures for training and advice can also be important to assist the development of quality criteria and branding among groups of producers, as well as helping to raise awareness of potential market opportunities to link public service provision and specific agri-food products.

Recognition of the potential for synergistic relations between market and policy may also be important for the future CAP, to encourage greater efficiency in a climate of reduced overall resources. In this context a continuing or increased emphasis upon measures which encourage collaboration and collective action, support training and the development of marketing skills and enable farmers to innovate with new products and branding initiatives in order to promote enhanced environmental and social services is needed.

Public support delivered through the CAP and other sources of funding (rural, environmental, regional policy, etc.) needs to be sufficiently flexible and joined-up to provide support to a variety of actors, institutions and value chains beyond the individual farmer. Funding for collaborative action needs to be increased in the next programming period, with the EU framework in a revised CAP signalling the priority to be given to a new approach, taken forward by the Member States in their Strategic Plans.

This requires a coherent mix of well-targeted and coherent measures, maintained over a sufficient timeframe and able to be tailored to the local situation. Within this mix, payments to farmers for environmental land management remain essential, but may increasingly become complemented by private funding. The delivery culture has to match new ambitions as well as the measures employed. A larger share of funding should be allocated to focussed advice, facilitation, cooperation, knowledge-sharing, demonstration and encouraging institutional innovation and partnership building as well as piloting new approaches, all of which have proved effective levers of change. It is to be hoped that these considerations will get the attention they deserve in the proposed reform of the CAP post-2020.

8.5 Conclusions

The case studies indicate market mechanisms are often directly linked to environmental services (e.g. through education), whereas social services tend to be more indirectly addressed. Rural vitality, for example, is seen as important and recognised in the marketing strategies of companies (e.g. through regional produce) more commonly than in the specific attributes of one product.

As noted above, the combination of policy support with the private sector and market mechanisms can be particularly effective. On the one hand, market approaches are able to motivate suppliers to enhance the operational performance, either by (i) innovation to establish new markets or, alternatively (ii) strengthening operation in existing markets. On the other hand, compensatory payments in the CAP help address persistent market failures and investment aids can overcome the transaction costs and information asymmetries associated with market innovation and development processes. Together public and private measures foster enhanced outcomes.

This chapter has shown that initiatives to encourage greater engagement across territories, public:private boundaries, suggest that a more flexible and results-based approach to policy is possible, working with the motivations and interests of those people who are best placed to take action. The case studies reveal that farmers, foresters and other land managers are willing to engage in innovative and collective approaches. However, it is also essential to engage further actors in the food or timber supply chains and those concerned with the management of natural resources more generally. A new approach based on cooperation and the engagement of multiple actors could have greater ambition with regard to scale, longevity and coherence of action. Helping to build capacity, including by knowledge-sharing, facilitation and advice therefore becomes a priority for policy.

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CHAPTER 9

Nature Conservation and Agriculture: Two EU Policy Domains That Finally Meet?

Irene Bouwma, Yves Zinngrebe, and Hens Runhaar

9.1 Introduction

This chapter reviews EU policy for nature conservation and in particular focuses on its interaction with EU agricultural policy. Land abandonment, especially agricultural intensification, has had major impacts on European biodiversity, inside and outside agricultural landscapes (European Environment Agency 2015b; Henle et al. 2008; Ollerton et al. 2014; Sanderson et al. 2013; Stoate et al. 2001; Tanentzap et al.

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2015). EU agricultural policy has been an important driver of agricultural intensification but also includes some measures to protect agricultural biodiversity (Pe'er et al. 2017a; Runhaar et al. 2017). Therefore agriculture is of considerable importance for nature conservation in the EU. This relationship also works the other way around—think of the beneficial contribution of nature to farming practices (Kremen and Miles 2012). Examples are the role of natural predators for agriculture (Steingröver et al. 2010), the importance of bees for pollination of crops (Koh et al. 2016; Kovacs-Hostyanszki et al. 2017) and how nature might assist in reducing floods and drought also affecting agricultural land (Boelee et al. 2017). Nevertheless, in this chapter we focus on the relationships between the two policy fields primarily from the perspective of nature conservation.

The central questions this chapter addresses are:

What is the level of coherence between the objectives, instruments and implementation practices of EU nature conservation policy and EU agriculture policy

How can coherence be improved in order to enhance biodiversity inside and outside agricultural landscapes?

According to insights from literature (Nilsson et al. 2012; Volkery et al. 2011), we analysed coherence at the level of:

Definitions and objectives
Instruments and incentives
Implementation practices

In order to assess this, first a brief history and the current state of the development of the nature conservation policy is presented in Sect. 9.2. Second, we will review the contribution of the Common Agricultural Policy (CAP) to conservation objectives (Sect. 9.3). In Sect. 9.4 new approaches are discussed that look for ways to increase synergy between the two fields such as nature-inclusive agriculture and comparable alternative farming models. The chapter ends with an overall conclusion on the coherence between the two policy fields on the dimensions of objectives, instruments and implementation practices based on existing literature.

9.2 Nature Conservation Policy in the European Union

9.2.1 Definitions and Objectives

The development of EU nature conservation policy took place in the wider development of environmental policies in the early 1970s (Jordan and Adelle 2012), partly in response to the awareness of the environmental problems amongst others caused by agriculture.

The Birds Directive, adopted in 1979, marks the start of nature conservation legislation in the EU. This Directive calls upon Member States to protect the breeding and resting sites of birds and to ban or restrict the hunting on certain species. It furthermore requires the designation of protected sites for both breeding as well as migrating species (called Special Protection Areas). The Habitats Directive adopted in 1992 arranged a comparable protection for non-bird species as well as for specific habitats. This Directive arranges the protection of non-bird species by prohibiting the deliberate killing and destroying of their habitats, hunting and trade in specific species.

Apart from the two directives, being a party to the Convention on Biological Diversity (CBD) obliges the EU to design and implement a biodiversity policy. In 1998, the European Commission adopted its first Communication on a European Biodiversity Strategy. This strategy aimed to anticipate, prevent and attack the causes of significant reduction or loss of biodiversity. The third Biodiversity Strategy entitled '*Our life insurance, our natural capital: an EU biodiversity strategy to 2020 of the EU*' runs till 2020 (European Commission 2011). The overall headline target is *'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'*. As part of its 6 targets and 20 actions, the Biodiversity Strategy specifies the targets of the Birds and Habitat directives:

Target 1 To halt the deterioration in the status of all species and habitats covered by EU nature legislation and achieve a significant and measurable improvement in their status so that, by 2020, compared to current assessments: (i) 100% more habitat assessments and 50% more species assessments under the Habitats Directive show an improved conservation status; and (ii) 50% more species assessments under the Birds Directive show a secure or improved status.

In a nutshell, Target 1 aims to halt the deterioration in the status of all species and habitats covered by the Birds and Habitats Directive and achieve a significant and measurable improvement in their status.

Furthermore, the strategy has a broader aim than the Birds and Habitats Directives as it strives to protect biodiversity in general and mainstream it into productive sectors, such as agriculture and forestry. In this sense the target on agriculture specifies:

Target 3A Agriculture: By 2020, maximise areas under agriculture across grasslands, arable land and permanent crops that are covered by biodiversity-related measures under the CAP so as to ensure the conservation of biodiversity and to bring about a measurable improvement[1] in the conservation status of species and habitats that depend on or are affected by agriculture and in the provision of ecosystem services as compared to the EU2010 Baseline, thus contributing to enhance sustainable management.

As this target is explicitly linked to the Common Agricultural Policy, this is further addressed in the 1.4 section. Target 3A thereby directly translates target 7 (Aichi target 7) of the CBD strategic plan 2020 on sustainable agriculture into the European context.

9.2.2 Instruments and Incentives

In order to implement Birds and Habitat directives, EU Member States need to designate protected sites (Special Areas of Conservation or Special Protection Areas) for species and habitats. The protected areas established under both Directives are jointly called the Natura 2000 network.

Currently the Natura 2000 network comprises of more than 27.000 sites and covers over 18% of the EU territory (European Environment Agency 2015b). The Natura 2000 network contain around 11% (or 22.2 million ha) of the total agricultural land of the EU-27 (European Commission 2018c). Furthermore many species protected under the Birds and Habitats Directives live, breed or forage in agricultural lands outside of the Natura 2000 network. The protection regime differs for agricultural areas within or outside the Natura 2000 network. Outside the network the protection regime is restricted to the prohibition of deliberative capture or killing of particular species or deliberate disturbing or destruction

[1] Based on the six-year reporting under the Habitats and Birds Directive and specified under target 1 of the strategy.

them or their nesting/breeding sites or habitats. Within the Natura 2000 network an active conservation regime is required as Member States not only need to avoid killing of species or disturbing their habitat but also need to take appropriate action and/or ensure that the necessary conservation measures are taking to ensure that habitats are created and managed or remain in a good status and do not deteriorate.

Several species and habitats covered by the Birds and Habitats Directive are to a more or lesser extent dependent on (extensive) agricultural management. Over a third of the protected habitats are considered to be dependent on (extensive) agricultural practices (Halada et al. (2011); Fig. 9.1). Both abandonment of management and an increase in management intensity result in (usually irreversible) changes in the habitat structure and species composition. Examples of habitats dependent on extensive grazing by livestock are the Fennoscandian wooded pastures and meadows or Dehesas in the Mediterranean (European Commission 2018c). Most habitats dependent on agriculture are at present mostly located in the more hilly and mountainous parts of the European Union (see Fig. 9.2). Measures to ensure the conservation of the habitats range from a decrease

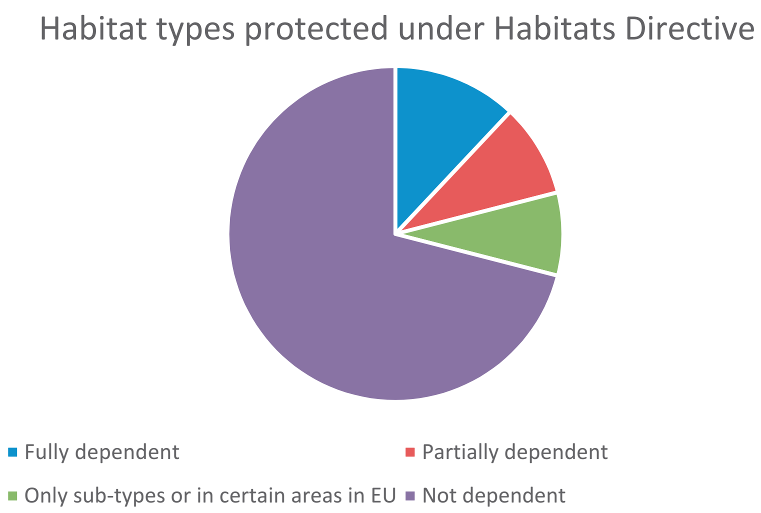

Fig. 9.1 Habitat types protected under Directive and their dependency on agriculture. (Source: European Environment Agency)

in the use of fertiliser and pesticides, suitable mowing and grazing regimes and a decrease in drainage of agricultural lands.

As instruments for strengthening Natura 2000 sites in agricultural landscapes, the Biodiversity Strategy mainly points to management plans and best practices to strengthen implementation (Action 1), increase finance (Action 2), increase stakeholder awareness (Action 3). As a consequence of a strong body of literature connecting biodiversity loss to agricultural intensification (European Environment Agency 2015a, b; Maxwell et al. 2016), the strategy aims at phasing out direct payments (DPs) as perverse incentive (action 8A).

The European Commission has introduced Prioritised Action Frameworks (PAF) to ensure that Member States use the EU funding programmes including the Common Agricultural Policy for Natura 2000 sites. PAFs are strategic multiannual planning tools, aimed at providing a comprehensive overview

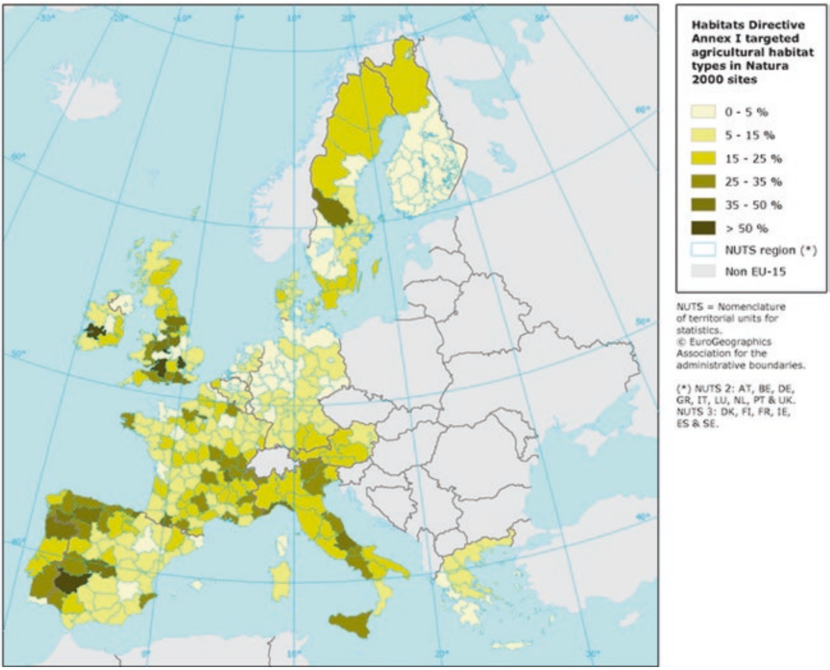

Fig. 9.2 Natura 2000 sites and agricultural habitats. (Source: European Environment Agency)

of the measures that are needed to implement the EU-wide Natura 2000 network and its associated green infrastructure, specifying the financing needs for these measures and linking them to the corresponding EU funding programmes. In line with the objectives of the EU Habitats Directive on which the Natura 2000 network is based, the measures to be identified in the PAFs shall mainly be designed 'to maintain and restore, at a favourable conservation status, natural habitats and species of EU importance, whilst taking account of economic, social and cultural requirements and regional and local characteristics'.

9.2.3 Implementation Practices

The nature conservation policy of the EU is based on the Habitats and Birds Directive that possess binding requirements to the Member States. The Directive requires that Member States 'establish the necessary conservation measures' or to take the 'appropriate steps' for the management for Natura 2000 sites. The Directive leaves the choice to the Member States how to arrange the actual management, and as a result implementation practices vary. As many of the Natura 2000 sites are privately owned, in practice many Member States develop management plans and provide subsidies for individual farmers to ensure that the required measures and actions are taken (Bouwma et al. 2016). In 2012 only 30% of Special Protection Areas (1624 sites) and 41% of Special Areas of Conservation (9271 sites) were reported to have management plans in place (European Environment Agency 2015b). However, most Member States started to develop their plans after this date, so it is expected that in the next reporting round in 2018 this surface has increased considerably given the progress in several Member States (e.g. the Netherlands, France, Hungary). Natura 2000 management plans in most Member States pose no legal restrictions for management undertaken by the individual landowner.

A review and comparison of French and Dutch Natura 2000 management plans shows that the plans mostly propose conservation measures that can be implemented by individual owners or users of the site and for which funding is available. The analysis shows that in both countries the selection of particular measures in the management plans is connected to other policies and funding, particularly from the Common Agricultural Policy (Bouwma et al. 2018). An analysis among German farmers shows that particularly location factors and the combination with 'dark green' agri-environmental measures lead to a stronger adjustment of practices under Natura 2000 regimes (Lakner et al. 2018).

Outside of the Natura 2000 sites there is only a basic protection regime that prohibits the deliberative capture or killing of particular species or deliberate disturbing or destruction of them or their nesting/breeding sites or habitats. Member States are responsible for the enforcement of this regime. In many instances the enforcement of EU species protection law lags behind, mostly due to insufficient resources in governments and lack of priority (Schoukens and Bastmeijer 2014).

The assessment undertaken by Member States for species for which Natura 2000 sites are designated shows that 259 species or subspecies are associated with agricultural ecosystems. These so-called key farmland species include 115 plants, 48 invertebrates, 4 amphibians, 89 reptiles, 21 mammals and 62 birds. Examples are the Carpathian Glossy Pink (*Dianthus nitidus*), Violet Copper (*Lycaena helle*) and the Corn crake (*Crex crex*). Like with the habitats also increased agricultural management possess risked for the conservation of many of the species. Pressures related to grazing or mowing management comprise the most significant pressure class, followed by fertilisation, cultivation, afforestation and hydrological changes (European Commission 2018c).

In 2015, progress in achieving the targets of the Biodiversity Strategy was assessed based on a comparison of the conservation status of the species and habitats associated with agriculture and protected under EU legislation in the period 2000–2006 and 2007–2012. The assessment showed that 4% of the assessments of these habitats showed an improvement between the two periods, whereas 39% of the assessments showed a deterioration. In relation to species protected under the Habitats Directive, 4% showed an improvement between the two periods and 20% of the assessments showed deterioration (European Environment Agency 2015b). Likewise, the last CAP reform has not provided improvements on the phasing of Direct Payments in favour of ‘public funds for public goods’ as envisioned by the Biodiversity strategy (European Commission 2015). The continuing decline in the status of species and habitats of EU importance associated with agriculture indicates that greater efforts need to be made to conserve and enhance biodiversity in these areas.

9.3 Relation of the Common Agricultural Policy with Nature Conservation Objectives

The relationship between biodiversity and agricultural is of a dual nature. Centuries of diverse farming traditions have resulted in the development of an intricate patchwork of semi-natural habitats across the landscape. This has, in turn, attracted a wide range of species. At the same time the increased intensification of the agricultural sector since the Second World War has changed the European landscape considerably and has resulted in the disappearance of species and habitats from formerly biodiversity-rich agricultural landscapes (Henle et al. 2008). Although differences in farm input intensity differ considerably across the EU (see Fig. 9.3) particularly in North-Western Europe agricultural intensity is high and has resulted in the disappearance of many species and habitats.

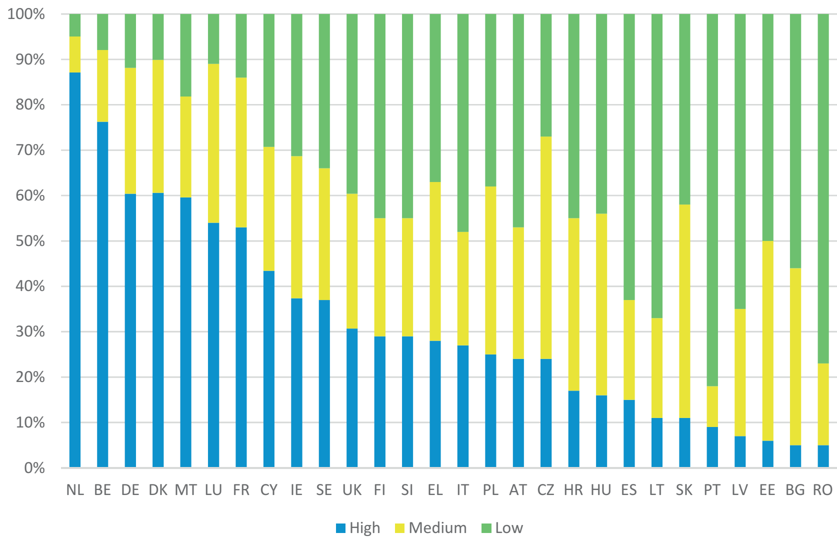

Fig. 9.3 Share of agricultural area managed with different farm input intensity, 2013, by country (%). Green = high intensity, orange = medium intensity, blue is low intensity Eurostat, 2017. (Source: DG Agriculture and Rural Development, European Commission, Eurostat, 2017)

9.3.1 Definitions and Objectives

Since the creation of the Common Agricultural Policy a shift can be noticed in its objectives. Since its establishment with the Treaty of Rome in 1957, the CAP was focused primarily on an increase of agricultural production, on strengthening rural development and on providing a secure livelihood for farmers (European Commission 2012). Despite the emergence of new elements and objectives calling for a liberalisation of the European market and introducing the concept of multifunctional landscapes with conservation as a critical element, the original, post-war productivist discourse has been strengthened during the last reform (Erjavec and Erjavec 2015). The focus on productivity has been closely connected to the call for intensification of agriculture in the EU (Sanderson et al. 2013). In 1992, the first agri-environmental schemes (AES) were introduced in the CAP (see below). The current policy (2014–2020) has three main objectives: A viable food production, sustainable management of natural resources and climate action and a balanced territorial development (see Chap. 13).

With the inclusion of the main objective of a sustainable management of natural resources the Common Agricultural Policy has become more in line with the EU policy for nature conservation at the level of overall objectives. The current CAP proposal by the EU Commission even explicitly introduces 'the protection of biodiversity' and ecosystem services as new objective (European Commission 2018a). Despite this addition of objectives, the dominant element of direct payments to farmers has been maintained leading to the judgement of CAP reforms as presenting 'old wine in new bottles' (Alons and Zwaan 2016; Erjavec et al. 2009).

9.3.2 Instruments and Incentives

The agricultural policy of the EU is based on regulations that use three implementation mechanisms; regulatory, mandatory and voluntary ones. The Direct Payments for agricultural practices beneficial for climate and the environment under Pillar 1 (so-called greening measures), determined at Member State level, are mandatory. While farmers are not obliged to make use of Direct Payments, competitiveness in the agricultural sector and resulting economic dependence of farmers gives Direct Payments a virtually regulatory nature (Rietig 2013). Despite this mandatory nature, these so-called greening requirements (permanent grassland, crop diversification and Ecological Focus Areas [EFAs]) have had limited benefits for biodiversity

(Pe'er et al. 2017b). Particularly administrative hurdles and missing economic incentives were identified as explanatory factors for the low uptake of effective 'deep green' measures as Ecological Focus Areas (Zinngrebe et al. 2017). Instead, farmers can meet greening obligations by registering already existing farm structures and by implementing 'light-green' measures providing additional benefits to production instead of biodiversity (Pe'er et al. 2017a; Zinngrebe et al. 2017). In the process of designing the implementation requirements for the specific measures, the EU Commission and Member States aimed at offering maximum flexibility to farmers and/or to ensure that controls are able to be carried out as simply and accurately as possible to avoid any risk of penalties (Ecorys, IEEP, and Wageningen University and Research 2016). Nevertheless, strong documentation requirements and the risk of penalties for inaccurate registration, as well as high costs for inducing new, ecologically important landscape elements, appear to deter farmers from implementing effective deep green measures (Zinngrebe et al. 2017).

Therefore much of the financing for management measures for nature and in particular for the habitats and species protected under EU legislation are part of the measures (agri-environment schemes) under the voluntary approach in Pillar 2 (European Commission 2019). Each Member State has to develop Rural Development Plans (RDPs; at national or regional level) to outline the foreseen spending of funding under Pillar 2. At least 30% of funding for each RDP must be dedicated to measures relevant for the environment and climate change. Currently 118 Rural Development Plans have been developed in the EU.

In the 2015–2020 CAP design, co-funding of pillar 2 measures and greening for providing additional incentives is not possible. As a consequence, the total costs for implementation, including transaction costs, uncertainties and risks were estimated to largely supersede the actual compensation payments (Fahrmann and Grajewski 2013; Prager and Posthumus 2010). Within the CAP—Pillar 2 there is a special measure for the management of Natura 2000 (Measure 12: Natura 2000 and Water Framework Directive). Bulgaria, Denmark, Spain, Estonia, Ireland and Portugal are amongst the Member States that have reserved budget from this budget line (Kantor Management Consultants 2015). Several of the Member States also use agri-environmental schemes to ensure the management of the Natura 2000 sites.

Within Pillar 2 so-called agri-environment schemes (AES) have been implemented. AES are subsidies for (groups of) farmers who voluntarily

Policy measure	Area (in Mio. Ha)	Public funds (in Mio Eur)	Relation funds to area (EUR/ha)
Greening: Ecological Focus Area (EFA)	8.00	12,638.21	789.89
Agri-Environment and Climate Measures (AECM)[1]	13.15	3250.92	247.17
Natura 2000 payments	11.65[2]	290.00	24.89

Fig. 9.4 Relationships between CAP Budget—Natura 2000 and effectiveness of measures. Notes: Including areas for organic farming but without payment to areas with natural constraints. Grassland areas in Special Areas of Conservation as reported by the European Commission. (Source: Pe'er et al. 2017b; Data: EC (91–94), Eurostat (95) BPI Yves Zinngrebe)

implement conservation measures, such as sowing and maintaining flower-rich field margins. The total agricultural area covered under AES is almost 47 million hectares, over a quarter of the agricultural area in use in 28 Member States (Eurostat 2017), although there are large differences between Member States regarding the size of assigned areas where AES apply. In the period 2007–2013 the EU expenditure on AES was nearly 20 billion EUR or 22% of the expenditure for rural development (European Commission 2019). Peer et al. (Pe'er et al. 2017b) showed that the most effective measures under the CAP for Natura 2000 sites receive the least support (see Fig. 9.4).

Member States can decide what measures can be implemented within AES. In the Netherlands for instance these measures are developed specifically for protecting Red List species and based on ecological expertise (Runhaar et al. 2017). Farmers participate in AES on a voluntarily basis and also often have substantial freedom in choosing among the measures they will implement. EU competition law prescribed that subsidies under AES cannot be more than costs incurred or income forgone (Runhaar et al. 2017).

There is mixed evidence about the ecological performance of AES (Batáry et al. 2010, 2015; Kleijn et al. 2006; Whittingham 2007). AES has not improved the conservation status of many species that rely on agricultural landscapes (European Environment Agency 2015b). In the literature we find various factors that contribute to low ecological effectiveness of AES. An important reason is the voluntary nature (Runhaar et al. 2017). Another often reported reason is that AES schemes are often not so rewarding or even lead to net costs (Runhaar et al. 2017; Westerink et al. 2015). Additional reasons are 'the prescriptive nature of the AES, inflexible payment conditions, poor targeting, and a low priority put on actual results' (Herzon et al. 2018, 348).

9.3.3 Implementation Practices

Research suggests AES are likely to be more effective if they are designed at the landscape scale (Riley et al. 2018). This requires a change in the existing approach of the CAP at the individual farm level as this requires spatial coordination of across multiple farm holdings and collaboration among governmental and other actors. The current CAP offers the opportunity for the new approach, and in the Netherlands, since 2016, agri-environmental schemes subsidies are no longer directly provided to individual farmers but exclusively to farmer collectives that contract individual farmers (Runhaar et al. 2017). Other examples of spatial coordination and collaboration in different Member States are the environmental cooperatives in the Netherlands that pre-existed the farmer collectives, the regional landscape initiative in Flanders, the former collective Contrats Territoriaux d'Exploitation (CTEs) in France, the Australian Landcare Programme, and collective nature plans in Denmark, the Higher Level Stewardship, environmental management option HR8 in England, United Kingdom and Stiftung Rheinische Kulturlandschaft (SRK) in Germany (Polman et al. 2010; Westerink et al. 2017). Another option is to direct Agri Environmental and Climate Measures payments to strategic groups of farmers whilst conditioning payments on ecological impacts (Hodge et al. 2015). Also clear, practical guidance by informal think tanks has been reported to induce ownership and leadership of farmers resulting in successful implementation (Persson et al. 2016).

Although both policy fields have different objectives and institutional structures, instruments and incentives from both policy areas interact throughout the farm level implementation process. In Fig. 9.5 the different instruments used in both policy domains are indicated. The figure distinguished between instruments that are developed and implemented at Member State level and at the farming level. Also it distinguishes between instruments that are based on a requirement from the European Union (compulsory) or those that are of a voluntary nature in which the

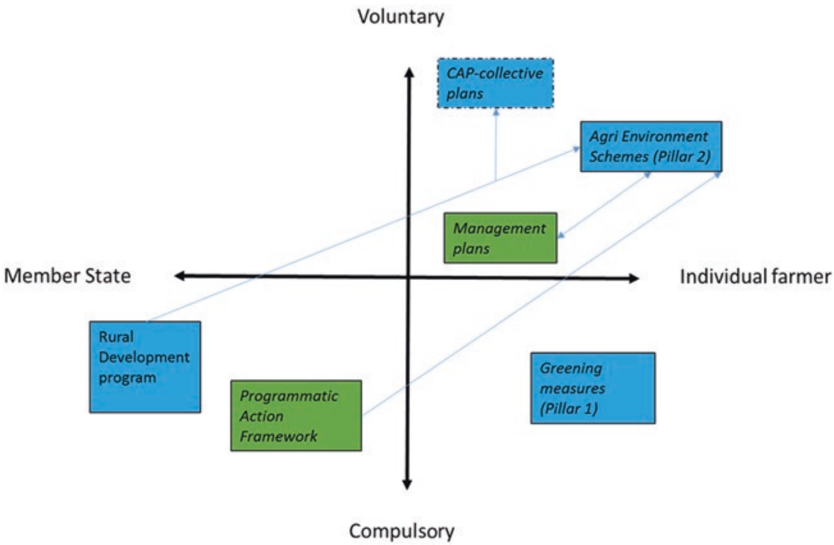

Fig. 9.5 Schematic representation of the various instruments of the EU biodiversity policy and Common Agricultural Policy and their relations. Notes: The figure shows the instruments of the BH Directives in green, the instruments for the CAP in blue. The matrix indicates whether the instruments are voluntary or compulsory and whether it concerns the individual farmer or Member State. (Source: Own presentation)

Member State or farmer can choose to implement them. It shows that there are several plans (national/regional/local level) and available subsidies aiming to influence the management of agricultural land at the farm level.

Given the voluntary nature of the nature conservation related measures under the CAP, the question is in how far European farmers use the available subsidies. Farmers were found to perceive themselves rather as food producers than providers of societal services, such as biodiversity conservation (Schiffer and Hauck 2010; Vuillot et al. 2016). The total agricultural land that is under management contracts supporting biodiversity and/or landscapes is estimated at 13% (European Commission 2018b). Very large disparities among Member States and regions exists (European Commission 2015). Some Member States like Austria have over 80% of their agricultural area under contract supporting nature of biodiversity whilst other such as the Netherlands are below 10% (see Fig. 9.6).

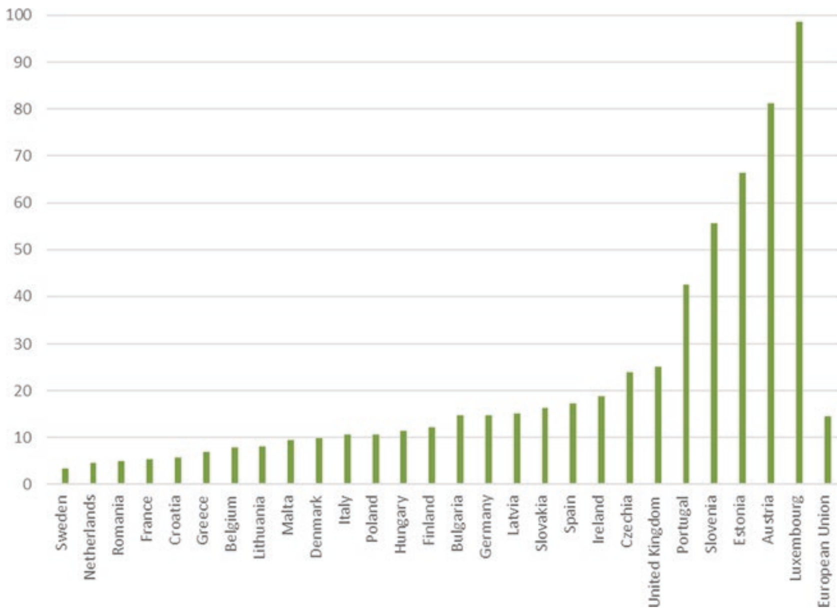

Fig. 9.6 R.07 Percentage agricultural land under management contracts supporting biodiversity and/or landscapes (focus area 4A) in 2017. (Source: Eurostat CAP Indicators, https://agridata.ec.europa.eu/extensions/DashboardIndicators/Biodiversity.html, 26 august 2019)

Table 9.1 summarised the coherence between the two policy domains. It shows that at the level of objectives and plans increasing coherence can be noted. However, at the level of subsidies and practices considerable inconsistencies remain.

9.4 A Way Out? Nature-Inclusive Agriculture and Comparable Alternative Farming Models

The continuing decline of farmland species in the EU shows that although agricultural and nature conservation policies might have become more coherent, farming practices are still not considering biodiversity enough. For more effective conservation, complementary policies are needed that address the driving forces of ecological degradation, particularly agricultural intensification. Many European farmers operate according to the

Table 9.1 Overview of the level of coherence between the EU biodiversity policy and Common Agricultural Policy

Level		*EU biodiversity policy*	*CAP*	*Coherence*
Objectives		'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'.	A viable food production, sustainable management of natural resources and climate action and a balanced territorial development Current proposal by the commission contains the following objective: Contribute to the protection of biodiversity, enhance ecosystem services and preserve habitats and landscapes	Increasing coherence at objectives level but focus on production objective has remained
Instruments	Plans	Inclusion of agri-environmental subsidies in management plans (Bouwma et al. 2018.) and development of Programmatic Action Frameworks	Inclusion of Natura 2000 areas in Rural Development Programs	More relations and increased synergy between management plans and PAF/RDP
	Subsidies/measures	Limited national funding not associated with CAP	Availability of targeted Natura 2000 subsidies en well as broader agri-environmental subsidies (EC, 2016)	Subsidies not targeted or specific enough
Practices			Low uptake of most relevant subsidies for nature particular in intensive used areas	Some MS have small area of their UAA under biodiversity friendly agricultural management

Source: Own presentation

'productivist' farming paradigm (Duru et al. 2015). This refers to farming practices that aim at high productivity whilst minimising costs, that are highly specialised (mono cropping, low variety in grass and cattle species etc.) and that strongly rely on external inputs such as fertiliser and pesticides (Duru et al. 2015; Erisman et al. 2016). Even though targets of biodiversity conservation are 'added' onto the agriculture agenda, there is a need for a complementary policy design and synergistic implementation processes to integrate diverging objectives and moderate trade-offs. Furthermore, without defining minimum standards on the EU level as well as specific process and impacts targets, policy measures run the risk of resulting in costly, inefficient and ineffective outcomes.

For ground level integration, alternative farming systems have been proposed that work 'with instead of against nature'. Agro-ecology is a well-known example. In Europe, an increased interest in agro-ecology has been observed, among research institutes and training centres as well as among bottom-up initiatives (Wezel et al. 2018). However, only the French government has implemented a specific policy to promote agro-ecology (Wezel and Bellon 2018). In the Netherlands, the Dutch government introduced the concept of 'nature-inclusive agriculture' in 2014 (Runhaar 2017). Similar to agro-ecology this concept is based on the utilisation of ecosystem services rather than artificial inputs such as fertiliser and pesticides, in order to contribute to environmental quality and functional and non-functional biodiversity. Instruments to promote 'nature-inclusive agriculture' thus far have a highly voluntary nature—subsidies and information. However, we observe that several regional authorities (provinces) have adopted the concept and are in the process of developing policies. And at least in the Netherland is has been observed that agrofood companies have started implementing reward schemes for farmers who contribute to biodiversity recovery (Runhaar et al. 2017). Experiences of pilot studies in the Netherlands have shown how local initiatives can incorporate practice knowledge and overcome an 'agriculture versus nature' discourse which generates power interests and conflicts on national and EU levels (Buizer et al. 2016). Whether this will help curb the trend of ongoing biodiversity loss is not clear yet.

9.5 Conclusions

This chapter reviewed the coherence between EU nature conservation policy and EU agricultural policy at three levels being objectives, instruments and implementation practices (see Table 9.1). Overall at the level of objectives at first glance coherence has increased since the 1990s. However this has involved adding objectives to the existing ones without integrating them sufficiently or without providing guidance on the trade-offs that occur in the process of combining multiple objectives. In recent years also more complementarity and synergy has been established at the level of plans such as the Rural Development Plans which now explicitly take into account Natura 2000, the Programmatic Action Frameworks which describe how funds can be best allocated as well as Natura 2000 management plans developed by various Member States. However, problems remain at the level of subsidies due to CAP implementation choices made by Member States. The greening of the CAP has not fulfilled its initial promise and not all Member States use the specific Natura 2000 subsidy. Payments for Natura 2000 implementation of deep green environmental measures, such as landscape elements or buffer strips, often only cover part of the costs, disregarding those, for example, technological change, administration, possible risks related to monitoring penalties or reduced economic value of land. In addition the budget allocated to these measures is low and uptake by farmers lags behind particularly in the intensively managed areas. Experiences suggest that effective performance of conservation in agricultural landscapes will depend on an adequate design of policy packages combining regulations with funding schemes. The institutional learning process enabling an improvement of policy instruments and adjustment to regional conditions is continuously undermined by political reforms that entirely restructure interdependent policy packages. New approaches such as agro-ecology and nature-inclusive farming try to change the current farming practices to create more room for nature-friendly farming practices. While these new approaches might lead to an improvement of the current state of biodiversity in agricultural landscape, the markets and policies that regulate the agricultural sector have been found to be very stable and resistant to change (Magrini et al. 2018). More nature-friendly farming therefore requires institutional change.

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CHAPTER 10

Public Policies for Social Innovation in Rural Areas

Nico Polman

10.1 Introduction

Social innovation is seen as a way to address different challenges facing stakeholders such as local communities, local third sector agencies and local and regional governments as they address the resolution of social problems and needs, stimulating community wind turbines as a way to deal with climate change and empower rural communities and promote inclusive economic growth (Neumeier 2012; Reynolds et al. 2017; Milley et al. 2018; van Wijk et al. 2018). Social innovation is acknowledged as potential means for development in agriculture and forestry (see for instance Détang-Dessendre et al. 2018; Slee et al. 2018), but also more widely across the whole rural economy. For this chapter we will follow the definition of social innovation as introduced in the Social Innovation in Marginalised Rural Areas (SIMRA) project: "The reconfiguring of social

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practices, in response to societal challenges, which seeks to enhance outcomes on societal well-being and necessarily includes the engagement of civil society actors" (see Polman et al. 2017).

Public policies for social innovation can seek to stimulate the supply and/or demand for innovations as well as creating an environment in which they can develop. One of the public policy challenges is to identify (potential) innovations to take to a pilot stage and to select those pilots that are best able to improve on existing social practices. Then, selecting those pilots to be scaled up (or out) to achieve systemic change (see European Commission 2013). Investment in regional development can improve the collective asset base from which multiple localities may benefit (Bock 2016).

Social innovations in the European Union can take many forms in both (marginalized) rural areas (see, e.g. SIMRA 2019) and urban areas (e.g. WILCO 2019). In this chapter, in the public policy context, we will focus on social innovations as potentially contributing to development in rural areas (see also Bock 2016; Neumeier 2016). The European Commission has been a "leading proponent of social innovation in the last ten years" (Reynolds et al. 2017). It started in 2010 with the "Innovation Union initiative" as one of the seven flagships of the Europe 2020 strategy for smart, sustainable and inclusive growth. Later followed the "Social Investment Package" (2013) to prioritize social investments in Member States. Both programmes were meant to facilitate inducement, uptake and scaling up of social innovations (see European Commission 2018) through stimulating networking, organizing competitions for best social innovation ideas, funding social innovations, to improve conditions for social innovations, to gather evidence on impact, support incubation and research.

In the current guidelines on "Evaluation of Innovation in Rural Development Programmes" innovations can also be social (see European Commission 2017). The EIP-AGRI may also support social innovations. In 2013 the Commission recognized the role of social innovation to promote the competitiveness of the EU and its regions (European Commission 2013). In the same period the European Bureau of Policy Advisers (BEPA 2010) argued that social innovation represents an important (policy) option to be enhanced at different levels (local, regional, national, European) and across various sectors (public, private, civil). It was argued that regional policy strategies including social innovation are only beginning to emerge (BEPA 2014). As Slee et al. (2018) argue, the realization of local social innovations depends on appropriate institutional architecture and policy support. Rural development programmes can play an important role in removing barriers and enhancing emerging social innovations (see Slee et al. 2018).

The aim of this chapter is to discuss the relevance of social innovation in the context of rural and agricultural policies. We will not consider "policy as social innovation" (Reynolds et al. 2017) in which policies follow the path of social innovation but recognize the need for policies to support social innovation. In Sect. 10.2, we will position social innovation in the context of other innovations. In Sect. 10.3 we will introduce the concepts of the adaptive cycle and socio-ecological systems as a lens to analyse social innovations in rural areas that differ in the level of (relative) marginalization of socio-ecological systems (SESs; e.g. Nayak et al. 2014; Callo-Concha et al. 2014). People in SES can be marginalized due to environmental variables or ecosystem settings (Callo-Concha et al. 2014) and a criterion for ecological marginalization is the status of degradation (Nayak et al. 2014). Applications of the adaptive cycle have been discussed in Meuwissen et al. (2018) for European Union's CAP as a way of exploring the system of farm support and regulatory framework for the farming sector (e.g. environmental directives and the food traceability regulation). The chapter will finish with an evaluation of the potential of social innovations in rural areas as compared to other types of developments. The chapter will end with a discussion/reflection.

10.2 Social Innovation in the Context of Innovation

The understanding of innovations in the context of EU rural development has been rather broad (European Commission 2017). Rural development policy is designed or aims to foster technological, institutional and social innovation. Innovation is seen as an enabling factor for achieving the rural development objectives and priorities, and to address rural challenges. (European Commission 2017). In this Section, we address how social innovation can be classified. OECD/Eurostat (2018) argue that sound measurement of innovation and the use of innovation data can help policy makers to assess the contribution of innovation to their goals and to monitor the effectiveness and efficiency of their policies. OECD/Eurostat (2018) also aim at a better understanding of the impact of innovation on the firm and the market, but also the broader social context in which it operates.

The European Commission/Eurostat collects data on different types of business innovations in Europe. Data is collected by different regional, national and international institutions at different spatial levels and for different purposes. The Oslo Manual (OECD/European Commission/Eurostat 2005, 2018) essentially differentiates between two types of innovations:

1. Product innovation: is a new or improved good or service that differs significantly from the firm's previous goods or services and that has been introduced on the market.
2. Business process innovation: is a new or improved business process for one or more business functions that differs significantly from the firm's previous business processes and that has been brought into use by the firm.

Although process and organizational innovations may also develop social capital and, as such, support SI, product innovations are more likely to be directed towards (short term) profit making, although that is not always the case. It is thus not always possible to separate other types of innovation completely from SI because many innovation types include SI elements, whereas SI may also consist of something distinctly social unconnected to product innovation or business processes innovation in the conventional sense. For instance, business process innovations can be beneficial for disadvantaged groups in rural areas without being a SI. Hence, SI would be an additional category as compared to the two types distinguished in the Oslo Manual. Also, the approach of sustainability standard setting has a broader scope than profit making (e.g. Schouten and Glasbergen 2011).

The links between business innovation and SI remain unclear. The total set of innovations can be narrowed down in order to show how SI is separated from other types of innovations. For this purpose, we start from a general definition of innovation as "An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)" (OECD/European Commission/Eurostat 2018). This definition differs from social innovation in the sense that it is not in response to societal challenges or to enhance social well-being. In practice, an organization can introduce more than one type of innovation over the period of data collection which makes it more complex to disentangle effect of single innovations (OECD/European Commission/Eurostat 2018). Also, for SI it is important to collect information on multiple innovations as the response can refer either to different innovations or to a combination of more innovation types such as SI and business innovation.

The basic idea is that innovations can occur in every sector of the rural economy. The total set of innovations can be divided into public and private innovations (Fig. 10.1). The classification categories reflect the different fields of study: public innovations versus private innovations. Innovation in the public sector is defined "as the process of generating new ideas and implementing them within the public sector to create value for society, covering new or improved processes (internal focus) and services (external focus)" (see European Commission 2013). Examples are smarter public procurement, creating digital platforms and citizen-centric services. Different actors, including businesses, consumers, public sector and civil society, can drive innovations. Civil society includes the organizations that act in the public's interest but are not motivated by profit or government. Subsets are user-innovations and social innovations. The initiative and drive for carrying out the many different categories of innovation (social innovation, organizational innovation, process innovation, product innovation and market innovation) are not possessed by single actors but are actually the collective product of multiple actors. Obviously, in the case of businesses, they are more than the others aiming for profit (product-, organizational and market innovations), but civil society and consumers can influence also these innovations by establishment of social norms, among others (e.g. eco-labelling).

We do not assume that social innovations and business innovations are always strictly separated because innovations can have more than one focal objective (Pol and Ville 2009) like profit and quality of life. Statistics on SI are lacking, not least because there is such disagreement on definitions. It

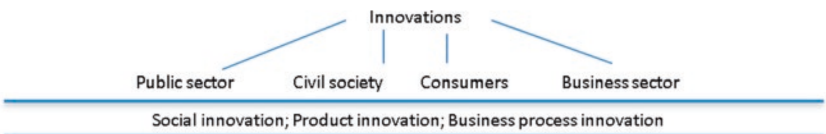

Fig. 10.1 Classification of innovations following sector of application. (Source: Own presentation)

will be argued that there is a need for collection of data on SI. This is also important in SIMRA. The Oslo manual states (page 61) that the same issues for measuring innovation outcomes in the government sector also apply to the non-profit institutions serving households (NPISH) implementing social innovation as defined "by their objectives to improve welfare of individuals or communities". NPISHs do not generate income or profit for the units that control or finance them, and they are not part of the government or business sector. Finally, it needs to be kept in mind that social innovation is also often a starting point for creating the social dynamics behind technological innovations (BEPA 2010). Social innovations do not grow in a social vacuum (BEPA 2010) and it complements traditional technological innovation methods (see BEPA 2014).

10.3 Innovation to Strengthen the Resilience of Socio-ecological Systems in Rural Settings: The Adaptive Cycle

Peripheral regions are often regarded as less innovative in comparison to agglomerations because of their often lack of human capital and innovation attitudes (Bock 2012). Many classifications of rurality of regions are available according to the diversity of areas (Price et al. 2017). In practice there is a continuum from urban to rural where also urban and rural areas overlap (Price et al. 2017) and where spatial data alone is insufficient to assess cause-effect relationships of landscape transitions, landscape structure and pattern (Van der Sluis et al. 2018). In this Section, we will focus on the dynamics of rural development of (marginalized) rural areas as it implies that the context for social innovation is continuously changing.

More than a decade ago the concept of the adaptive cycle was introduced in the literature (e.g. Holling 2001; Walker and Meyers 2004), and its use is still primarily descriptive and abstract (see Allen et al. 2014). The adaptive cycle concept is meant to capture the way systems persist and innovate (see Holling 2005). We will apply this concept to investigate dynamics in rural areas in relation to emergence of social innovations. The cycle was originally used to bring social and environmental sciences together, by linking social change with the dynamics of complex ecosystems in response to disturbance and change (Cote and Nightingale 2012). Holling (2001) discusses three core properties of the adaptive cycle:

1. An inherent potential, **a wealth factor,** which determines the actual potential of the system, and refers to the accumulated ecological, economic, social and cultural capital, and also potentially future mutations and inventions (Holling and Gunderson 2002). Following Daedlow et al. (2011) this potential of rural areas can for instance be "thought of as the range of accumulated resources such as knowledge, inventions, and skills that are available and accessible."
2. **An internal control system**, determining the extent to which internal variables and processes are connected, determining the degree to which a system can control its own destiny, which is opposite to being overwhelmed by external drivers. Social connectedness, for instance, may refer to skills, networks of human relationships and mutual trust. In other words, connectedness "reflects the strength of connections that mediate and regulate the influences between inside processes and the outside world – essentially the degree of internal control that a system exerts over external variability" (Holling and Gunderson 2002: 50). If internal control is high, the system is robust to external disturbances. In this respect, it is important to evaluate the possible role of relationships of power influencing resilience (Rawluk and Curtis 2016).
3. **An adaptive capacity**, referring to the resilience of the system, which is the actual opposite to vulnerability of the system. When resilience is high, the rural system is wealthy, tightly regulated, and has great ability, available resources and competencies to resist external disturbances, and finally involved social networks can innovate, and communicate, and persist beyond its adaptive and creative points.

Together these properties operate to shape the responses by, for instance, ecosystems, agencies, and/or people to a crisis resulting in four core SES stages or modes of learning and discovery (Holling 2005). These four stages of growth (r), conservation (K), release (Ω) and reorganization (α) proceed through the system of an adaptive cycle.

In accordance with the four stages, four possible policy leverage points are thus identified in a rural community's adaptive change cycle are highlighted (see Holling 2005). The system slowly moves in a so-called front loop from growth (r) to conservation (K) when ecological and social-economic properties increase and get integrated during progression. From r to K there is thus a gradual accumulation of, for instance, wealth, skills and techniques, strengthening the current system or trajectory of change

(Biggs et al. 2010). In the K stage, connectedness is high (dependencies) and the system's potential is very high. There is efficiency in resource use, specialization is increasing, and diversity is low. The systems connectedness increases until it eventually gets "over-connected in structural and organizational terms, hence more rigid (less flexible)" (Méndez et al. 2012) and vulnerability to control increases. Human organizations can accumulate rigidities to the point of crisis (e.g. environmental like a forest fire or social such as depopulation) and then attempt to restructure (Holling 2001). Méndez et al. (2012) link its fundamental properties to command-and-control approaches in which, for example, decision making is hierarchically, actor participation is narrowly and passively, power distance and individualism is promoted, and recurrent generation of structural entities. It meets a crisis or collapse, and in a so-called back loop, from release (Ω) to reorganization (α), it may recover through rapid reorganization; when new combinations encourage innovation and new opportunities. It may also fail for most people, due to unpredictability, uncertainty and vulnerable inherently in the "back loop." As such, the adaptive cycle operates in sequences through time; in the front loop it aims for production and accumulation, whereas in the "back loop" it aims for invention and re-assortment. Rural areas are in different states with overlapping loops with varying degrees of connectivity.

Resilience of this system is explained by a third dimension and appears highest in the move from release (Ω) to reorganization (α) (Holling 2001). Resilience in an ecosystem is high in the reorganization stage (α), but low in the conservation (K) stage when it reaches/approaches crisis/collapse. With the low resilience in the late K phase, even a small shock can initiate a collapse or release disintegration of the system (low functionality of the system, e.g. an ageing infrastructure and a stagnant rural population). Still, at the reorganization stage (α), social connectedness is low and internal regulation weak. In any time of change, the survivors will benefit from potential gains, while some will lose, and as such, this is also a stage of crisis to some, maybe many. Social resilience is thus weak in both dropping phases, to some from α to r and to all from K to Ω.

The adaptive cycle does not imply fixed, regular cycling. A system might remain in one stage for a long time, and the sequence of stages is not fixed (see Meuwissen et al. 2018). The adaptive and evolutionary nature of multiple cycles is nested within each other and across space and time (see Allen et al. 2014). Such a system state is called a panarchy, with the core rationale to attempting to rationalize the interplay between change and persistence, between the predictable and the unpredictable. Systems can move back from K to r, or forth and back from α to Ω. Cycles occur at a number of scales and SESs. The adaptive cycles are interacting across scales (see Walker and Meyers 2004). This has effect on the dynamics of SESs through defining different phases of SES development. A SES can be growing or be in a process of reorganization. The number of levels in a panarchy varies and will be dependent on the dominant scales present in a system (see Allen et al. 2014). In a pine-dominated system, for example, this could be needle, crown, patch and stand with an increasing temporal and spatial scale. The concept of panarchy, representing a nested set of adaptive cycles, is helpful in a number of ways (see Slight et al. 2016):

- It provides a lens to view the reaction of (marginal) rural areas to disturbances (such as hurricanes, forest fires or an economic crisis).
- It describes the ability of a marginal rural area to adapt to disturbances, often improving upon its previous state.
- It provides a framework for understanding the flexibility to change and the capacity to change (as a function of its resources) in rural areas.

Human systems like (marginal) rural areas differ from ecological systems at least in three ways (Holling 2001). First, human foresight and intentionality refer to abilities for predictions and defining scenarios. The human belief in a possible future thus impacts the adaptive cycle, sometimes adversely towards collapses. Second, the adaptive cycle is also impacted by humans having the ability to communicate ideas and experience, and third, human technology has accelerated over the years, with changing the rules and context for the adaptive cycle. The human component is of central importance in the context of social innovation in marginalized rural areas. Human capital as important element of rural capital (see Bosworth and Turner 2018) is often weaker in (marginalized) rural areas as compared to other areas. The success of territorial systems depends also on the "way individuals think and behave" (Capello et al. 2009).

So how does this link with rural areas? While the incremental innovations in marginalized rural areas (Table 10.1) taking place in the front loop fit the purposes of the natural as well as institutional setting, we may reach a point in K with, for instance, problems due to emigration of young people to metropolitan areas in search for jobs and a different life style. The example is general; in practice (marginal) rural areas differ in oppor-

Table 10.1 Combining socio-ecological systems (SES) and the adaptive cycle: the case of (marginal) rural areas (MRA)

		Adaptive cycle phases			
		Growth (r)	*Conservation (K)*	*Release (Ω)*	*Reorganization (α)*
Socio-ecological system components	Resource system	The MRA is providing resources itself, providing opportunities for stakeholders	The MRA system reaches its limits due to human activities	The MRA is due to, for instance, leaving young people, climate change	The MRA resource system is in critical need for recovery
	Resource unit	The extracted units can be extracted without problems	The extracted units MRA are about to reach limits of recovery	The MRA does not recover	The extracted units are not operational and in critical need for recovery
	Governance system	The governance as usual is based on institutional practices established for long period	Governance as usual, still hanging on to how it used to be	The existing institutional system cannot deal with the new dramatic challenges that an MRA faces	New governance structures emerge that in ways that can handle the dramatic challenges
	Actors	No problem is observed and human acting can proceed as usual	Acting as usual, still hanging on to how it used to be	Human acting has dramatic impacts on outcomes	Human acting is challenged and common practices must change, new power and poverty relations emerge

Source: Own presentation

Notes: In practice, MRA are diverse where socio-ecological systems and adaptive cycles differ tunities and endowments of resources resulting in a more context-specific outcome (e.g. social innovation will depend on the type of area, the socio-economic structures and the phase in which an area is in). Labrianidis (2006) argues that the human factor is of key influence for the exploitation of opportunities and confrontation of challenges in European countryside. In the radical innovation phase in the back loop, new institutional structures are established. For instance, new solutions may reveal: (1) inhabitants from other parts of the country to fill gaps, (2) new attractive opportunities to bring people back or (3) a system which does not see less people in rural areas as a problem because technological innovations can support jobs. Eventually, a drop from α to r, when resilience is low, will bring about new winners and losers.

10.4 Specific Challenges Observed in Marginalized Rural Areas and Opportunities Associated with Social Innovations as Compared to Other Types of Developments

While in the previous section we provide an example of how the adaptive cycle can be used to explain developments in rural areas, in this section the analysis will focus on social innovation which depends on the type of area, the socio-economic structures, the phase in which an area is in, and possible gamechangers like an economic crisis or new inhabitants in the region The evolution of MRAs in Europe shows emergence of a mosaic of opportunities in some place and a decline in others. Frequent features of rural areas are (Bock 2016) population decline and an ageing population, the narrowing down and centralization of services putting remote areas at a disadvantage, the consequences of globalization for networks, growing mobility of capital and people, and ongoing urbanization. The socio-economic context of rural areas is often characterized by a very limited access to resources (physical, human and financial) (Esparcia 2014) and a less diverse economy (Kratzer and Ammering 2019), although rural areas are not a homogeneous group.

The use of the adaptive cycle and that social innovation is context dependent. (Marginalized) rural areas differ throughout Europe. Social development is context dependent in the sense that MRAs evolve in time. The impact to disturbances will vary in time and will be different depending on the phase an MRA is in. In an exploitation phase the impact of disturbances will be limited, whereas in a conservation stage, areas will be more vulnerable, as explained by the commons and MRA examples in the previous section. However, Slight et al. (2016) translated the framework to socio-economic structures. In an exploitation phase, businesses, governance structures and social networks will be younger, the workforce retains and the infrastructure is new. The impact of disturbances will be limited compared to a conservation stage where businesses get older, the workforce is becoming older, infrastructure is ageing and population is stagnant. Different types of rigidities are present which need to be overcome before social innovation can become active. In a release phase, opportunities exist for rapid change in the system and novel recombination of components because human resources and material supplies are "released" into the system (see Slight et al. 2016).

A cycle will not always result in successes to anybody because many experiments and social innovations will fail. SI may have benefits for specific groups at the expense of others implying that the gains are not equally distributed in society. It could be beneficial to stimulate those experiments/innovations where the costs of failure are low. Innovations as developed by clever humans anticipating the future are often local. Others have identified ways to persist within existing structures in MRA, avoiding changes, even when change is needed (see Holling 2005; Scheffer and Westley 2007). Scheffer and Westley (2007) argue that "adult humans apparently have a tendency to stick to a certain mode of behaviour even if it is rationally a bad choice. This lock-in mechanism, caused by apparent self-reinforcing adherence to a mode of behaviour, tends to promote inertia, a lack of responsiveness to changes in the environment." Such a lock-in can be caused by different factors like economic (sunk-cost, see Peerlings et al. 2014) and maintaining the status quo or in preventing loss of prestige. Social innovation is path dependent (and contextual) and may well need to overcome established behavioural patterns and particular distributions of power (see, e.g. Moulaert 2009).

10.5 Reflection on Future and the Need for Policy Initiatives

At the end of the second decade of the twenty-first century, rural policies are on the cusp of change in Europe. Innovation has already been an important element of rural development policies for a long time (BEPA 2014). Social innovations are important for the European Union as a way to develop (marginal) rural regions. Social objectives need to balance economic and technical innovations (Détang-Dessendre et al. 2018). Innovation is expected to contribute to achieving the goals of rural development policies. Those policies include the European Innovation Partnership to improve agricultural productivity and to achieve sustainability. Stimulating networking activities like operational groups has been part of rural policies (BEPA 2014) and "effective LEADER groups have often been able to provide the nurture and support to kick-start and empower local activities" (Slee 2019). Also Bosworth et al. (2016) argue that the local scale and the bottom-up character of LEADER is important for mobilizing people in social innovation processes. Social innovations share many characteristics with other innovations and there is a need to evaluate the way they contribute to rural development.

The direct and indirect impact on social practices is often difficult to monitor. Neumeier (2016) argues that it will remain difficult to measure outcomes and performance of social innovation in a predefined or standardized way because many factors are determined by a case-specific interplay factors and shaped by cases. This rural context and capacity of the population is location specific, determined by regional natural and cultural resources, political and socio-economic conditions at different levels.

The adaptive cycle and socio-ecological systems show that the room to manoeuvre of a social innovation actor network (see Neumeier 2016) is dependent on the stage a region or locality is in. In some stages, different types of rigidities need to be overcome before social innovation is likely to change the area for the better to deal with social challenges. In other stages, opportunities exist for rapid reconfigurations of social practices and possible novel recombinations. In those stages, enhancing societal well-being can be easier and faster. These factors are open to European policies to stimulate social innovations considering the phase in which a specific rural area is in (context). The adaptive cycle and socio-ecological systems are approaches that can help to evaluate the tools needed to stimulate rural development via social innovation.

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CHAPTER 11

Rural Resilience as a New Development Concept

Wim Heijman, Geoffrey Hagelaar, and Martijn van der Heide

11.1 Introduction

In modern ecology the concept of ecological resilience plays an important role (see, e.g. Walker et al. (2006) and the website of Resilience Alliance: http://www.resalliance.org). Although resilience has been investigated through various conceptual prisms, it is more or less defined as the capacity

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of a system to absorb shocks and disturbances while still maintaining the same functions, structure and feedbacks (Walker and Pearson 2007). The concept of resilience in ecological systems was introduced in Holling in 1973. Since its introduction, the term resilience has emerged in literature on psychology, ecology, food aid and famine, resources management and health (Gardner and Dekens 2007). Debate on resilience as a new paradigm for rural systems is, however, a relatively recent development (Schouten 2013; Zwiers et al. 2018).[1]

Although rural areas are facing rapid changes and uncertainties in the agricultural, forestry and ecosystem services that affect their future, little attention has yet been paid to the resilience of these areas. Of course, the rural area can be considered as a (complex) social-ecological system and there is already a huge literature on the resilience of these systems (see Folke 2006). However, application of the principles of resilience in social-ecological systems to the analysis of specific rural issues seems to be the 'poor relation' among resilience research. And that while rural areas have also robust-yet-fragile dynamics and are able to cope with moderate amounts of stress but fail spectacularly in the face of rare, unanticipated ones (Zolli and Healy 2012).

Rural resilience may be defined as the capacity of a rural region to adapt to changing external circumstances in such a way that a satisfactory standard of living is maintained. This also includes the capacity to recover from management or government mistakes. As such, rural resilience describes how well a rural area can simultaneously balance ecosystem, economic and cultural functions. In particular, it refers to a rural area's ability to cope with its inherent economic, ecological and cultural vulnerability. The rural resilience perspective is based on, and consistent with, the idea that ecological, economic and cultural systems become increasingly entangled, and interactions between these systems are increasing in intensity and scale. Consequently, it makes less sense to think of them as separate and

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[1] Curtin and Parker (2014) provide a comprehensive and timely review of the history of resilience thinking, which is helpful in a better understanding of the resilience concept in the context of contemporary science.

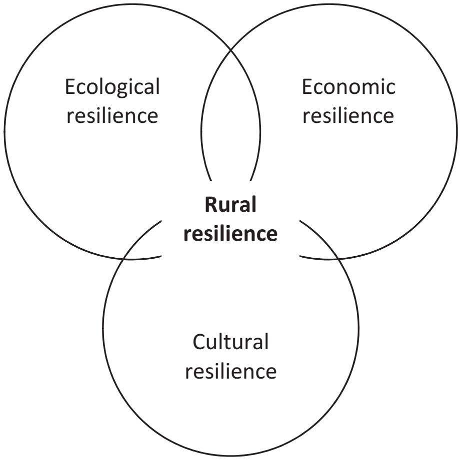

Fig. 11.1 Rural resilience. (Source: Own presentation)

more sense to regard them as overlapping components. Not surprisingly thus that rural resilience builds on the interface of other types of resilience, in particular economic resilience, ecological resilience and cultural resilience (Fig. 11.1).

This means that changes in one domain of resilience can affect resilience in the other domains, and consequently also in the rural system as a whole. If a region would not be economically resilient—meaning that the region is vulnerable to economic shocks, such as a reduction in wealth, a sudden substantial rise in interest rates or increase job insecurity—the population would gradually move away and vulnerability increases. Due to this increased vulnerability it takes progressively smaller shocks to cause chaos and crisis in the rural system. If the region would not be ecologically resilient, conditions for agriculture or green services would deteriorate and—again—vulnerability of the rural system increases. Finally, if the region would not be cultural resilient, the presence of sufficient human capital (and thus of manpower) in the region cannot be assured—with possible consequences for the liveability of the area.[2]

All in all, reducing resilience—be it economic, ecological or cultural—increases vulnerability, exposing rural systems to greater risk of uncertainty

[2] The concept of cultural resilience is otherwise known as social resilience. Adger (2000) reserves the term social resilience for what is generally denoted as the ability of human communities to withstand external shocks to their social infrastructure, such as environmental variability (e.g. agricultural pests or the impact of climatic extremes) or social, economic and political upheaval.

and surprise. Vulnerability is the flip side of resilience. Or more explicitly put: resilience is an antidote and countermeasure to inherent vulnerability. Therefore, we believe that building and enhancing resilience should be part of the agenda of rural spatial planning and design, as rural resilience emphasises all aspects of rural risk management from prevention to understanding future risks.

11.2 Aim and Scope of the Chapter

Rural areas have the potential to fulfil various functions simultaneously. The multitude of these functions can be grouped into three main categories:

1. Agriculture. Generally speaking, the agricultural function is the most important activity in rural landscapes. This category consists of the supply of primary agricultural (and marketable) products, such as food, livestock and fibre.
2. Rural services. These services are defined as non-agricultural services linked to rural areas, for example, rural tourism, landscape management, water storage, cultural heritage and nature management. This category refers to the joint benefits of non-food outputs, and these are important features from agriculture to sustain the rural countryside. The concept of multi-functionality—which is, roughly speaking, the joint production of commodities and non-commodities—is often implicitly connected to the supply of these rural services (Brouwer and van der Heide 2009).
3. Nature. This category includes the possibility to designate the rural area as a nature reserve, where agricultural and other economic activities are limited or completely forbidden.

In this chapter, we restrict ourselves to the first two categories. The reason for this is that the concept of rural resilience is pre-eminently applicable to areas where economic, ecological and cultural dimensions are closely connected. In a rural area that is primarily devoted to nature conservation, economic and cultural resilience—two of the three pillars of rural resilience—are not or only marginally relevant. Analysing specific issues in these nature areas by applying the concept of rural resilience does not provide more distinguishing information than by using the concept of ecological resilience. That is, in these areas, rural resilience closely corresponds, and is more or less limited to the notion of ecological resilience.

Because of external economies of scale, the functions that fall into the first two categories—agriculture and rural services—can only be fulfilled in an effective and efficient way if they are embedded in clusters. A concentrated cluster of agricultural structures, the so-called agro-cluster, includes activities associated with primary production. Likewise, rural service clusters involve activities that are self-evidently related to the supply of rural services.

The rural landscape is the carrier of these two functionally specialised clusters. However, both types of clusters require different types of landscapes. The agro-cluster requires a landscape aiming at agricultural production in the first place, whereas the rural service cluster functions best in a landscape that focuses primarily on rural services. Because of this difference in landscape requirements, regional specialisation occurs in accordance to a natural allocation of resources and endowment (but is of course also due to social, political or institutional circumstances). Moreover, spatial economic theory suggests that, in general, the presence of agglomerations and clusters increases regional competitiveness and enhances rural wealth on the basis of external economies of scale.

The complexity of the relations between rural resilience, regional competitiveness, regional specialisation and landscape design is shown in a schematic way in Fig. 11.2.

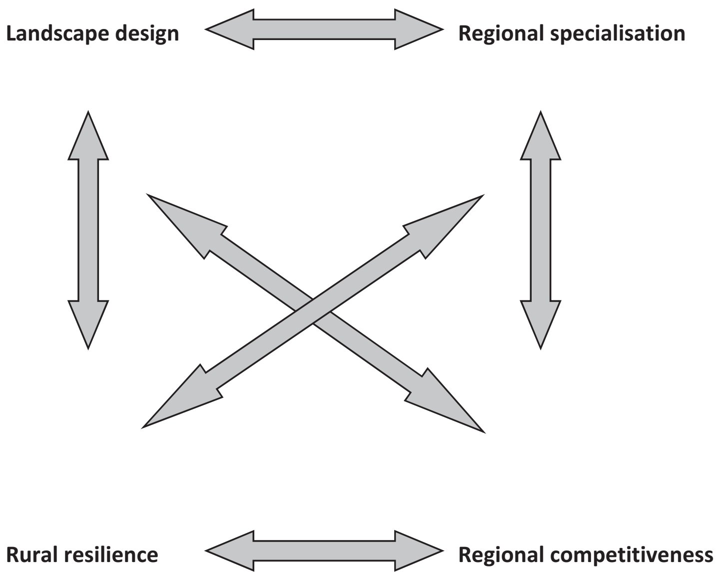

Fig. 11.2 The various links between landscape design, rural resilience, regional specialisation and regional competitiveness. (Source: Own presentation)

What this chapter aims to do is to further explore the links between the various attributes depicted in Fig. 11.2. To that end, it synthesises information on rural land-use configurations that (1) optimally support the two types of clusters and (2) promote resilience in rural settings. To do so, we consider the rural area against ecological, economic and cultural changes in view of its resilience, and clarify the effects of changes on the rural system as well as the mechanisms through which they appear to buffer external shocks. We also elucidate some guiding principles for rural landscape planning and design.

Crucial for rural resilience is the system's flexibility to adapt to (significant) external shocks, or, to put it in more prosaic language, its ability to transform from one state to another when an external disturbance occurs. Indeed, as Gabella and Strijker (2019, 1) rightly say: 'resilience emphasises that to persist in the long term, a system needs to be able to change' (see also Darnhofer et al. 2016). With this notion in mind, resilience is a necessary condition for the continuation of the rural system as it contributes to strengthening and maintaining the capacity for renewal in a dynamic environment (see also Sect. 11.3.2).

This means that—if we continue this line of reasoning—rural resilience *also* creates a kind of 'buffer' or 'cushion of safety' that protects the system from (the failure of) management or policy actions. The change of the Common Agricultural Policy as a possible result of the negotiations within the framework of the WTO provides such an external change. As a consequence, in a number of rural regions, primary agriculture might not be able to provide a decent or satisfactory standard of living for future generations. This triggers the need for change in the direction of the production of rural services. The ability of the rural system to transform in that direction is a clear criterion for rural resilience. In this respect, it should be noted that adaptability of the rural system implies the capacity not only to respond within the cultural and economic domain, but also to respond to and shape ecosystem dynamics in an informed manner.

Landscape design and planning has a crucial role in a rural system's ability to withstand external shocks without losing controls on it structures and functions. The question is, however, how to accomplish such a landscape. Nowadays, it is widely acknowledged that society is full of inspiration and ideas on how to create the 'perfect' landscape. Based on this notion, we argue that the necessary information to (re)shape the rural landscape is available in the region itself, and only to a very limited extent at higher governmental levels, so that for the design of a landscape that shows resilience in the face of change, the participation and involvement of regional stakeholders is necessary (see, for instance, Stobbelaar et al. 2018).

11.3 Rural Resilience: Key Terminology and Concepts

This section describes several features of the concept of rural resilience, as well as some theoretical ideas that are necessary for a deeper understanding of the concept and its usefulness. These are discussed in two subsections. The first (11.3.1) addresses the (expected) relationship between diversity and rural resilience, and the second (11.3.2) deals with the question of how rural resilience underpins the sustainability of rural areas.

11.3.1 Diversity and Rural Resilience

In the last decades, many ecological studies have shown the coupling between diversity and resilience (e.g. Tilman and Downing 1994; Hilborn et al. 2003; Tilman et al. 2005). Most ecological studies on this subject suggests that an increase in species richness means an increase in complexity, with profound implications for the ecosystem's total productivity, stability and resilience in the face of environmental changes and disturbances. And although the three authors of this chapter have no background in natural sciences, they feel pretty safe to say that nowadays the conventional wisdom is that the greater the richness of species in a system, the greater its resilience.

The question relevant to the present chapter is whether a similar relationship can be found between diversity and rural resilience. Is there a resemblance between the ecologists' prescription for ecological systems and the recipe for improving resilience in rural areas? Or more general, how does diversity influence rural resilience? Does high rural diversity—whatever this may be—confer strong rural resilience? To answer this question, it is necessary to know what is meant by the glowing term 'rural diversity' and how it can be measured. 'Rural diversity' can, for example, refer to the number of different farm types in a given geographical area, or to the number of income-generated activities within different categories of farms, but also to the (bio)diversity under the ecological system. Promoting and sustaining diversity in all forms (ecological, cultural and economic) would therefore enhance rural resilience, because system components can replace or compensate for each other in times of disturbances (Schouten et al. 2012; Schouten 2013).

That being said, it is important to realise that rural resilience is often context specific. This means that, in an operational sense, building resilience involves specific measures and not a one-size fits all approach. Closely related to this is the notion that resilience can be observed and conceived at different spatial scales.

11.3.2 Sustainability and Rural Resilience

While it is true that sustainability has become mainstrain (see, for example, the 17 Sustainable Development Goals), this is not the case with the notion of resilience. Nevertheless, according to Carpenter et al. (2005), resilience theory provides, from a practical standpoint, a conceptual basis for sustainability. If we assume that 'sustainability is the ability of a system to maintain productivity in spite of a major disturbance, such as caused by intensive stress or a large perturbation' (Conway as quoted by Lien et al. 2007, 541), then we see strong similarities between the concepts of sustainability and resilience.

Both resilience and sustainability deal with the future—they are by definition forward-looking. Because the future is unpredictable and uncertain, and surprise is likely, it is important or even essential to explore the resilience of a system as a key aspect of its sustainability. In our view rural resilience is a crucial condition for sustainability. It opens up the idea that there are different balances possible within a rural area. Depending on the gravity of the disturbance, stakeholders can opt for maintaining productivity within the same system or altering the system in search for a new balance between ecology and economics. In this way sustainability is reached through a change in the system.

So, without resilience and thus without the ability to tolerate change or to reorganise around a new set of structures and procedures, sustainability remains a theoretical concept that is difficult to implement in practice. Conversely, sustainability management (and its policy governance) needs to be focused on building resilience (Folke et al. 2002) in order to avoid vulnerability of the system. Indeed, sustainability and rural resilience are two sides of the same coin.

11.4 Agro-clusters

According to Eurostat statistics, agriculture contributed 1.2% to the EU's GDP in 2017. The EU's agricultural industry (i.e. the various businesses involved in the food production processes) created a gross value added of EUR 188.5 billion in 2017. Agriculture and agribusiness are often regionally embedded in agro-clusters. The regional clustering of agricultural activities leads to a higher and more efficient production (Heijman 2004; LEI 2004). This is due to so-called economies of agglomeration (external economies of scale), which are the benefits that actors obtain by locating near each other. Both market mechanisms and governmental interference stimulate the development of these clusters. The competitiveness of these clusters on the market determines their success. The strong relationship between the larger part of primary production and other farm-related businesses indicates that agribusiness is not a footloose activity but is embedded in regional agro-clusters.

According to the new economic geography of Nobel Prize Winner Krugman (and other economists), a cluster develops and matures on the basis of cost reduction and innovation originating from the sharing of knowledge (Krugman 1999). Also Porter comes up with the idea that it is not so much the firm itself that is competing, but the region in which it is situated (Porter 1990). Of course, agro-clusters do not just use primary agricultural inputs from their own region. They will be global actors on the world agricultural commodity markets. This is supported by the statistics: the EU is the first trader in agricultural products of the worlds, both in terms of exports and imports.

The increase of rural services in certain areas may impede the development of regional agro-clusters and vice versa. This is especially the case in densely populated areas. In these areas agriculture tends to be intensive on the one hand, where the need for rural services is high on the other hand. Because of conflicting interests with respect to rural land use, regional specialisation either in agro-cluster activities (connected with intensive agricultural land use) or in rural services connected with low input organic agriculture should be considered. Normally these conflicting interests would be solved in the market, but because a large part of rural services have the characteristics of public goods they are usually not produced voluntarily through the market. Therefore, rural planning of these services is necessary.

11.5 Rural Service Clusters

Rural service clusters may boost economic development and can be initiated by both private (farmers and non-farmers) and public organisations alike (van der Ploeg et al. 2002). Whereas the agricultural function is primarily exercised by farmers, rural services can be provided by a range of different parties, such as nature conservation organisations, water boards and non-farming inhabitants of the countryside.

Rural services can be distinguished in:

1. Agricultural rural services. These services, such as agro-tourism, are supplied by farmers.
2. Non-agricultural rural services, such as the conservation of nature reserves, which are usually supplied by non-farmers.

Some rural services, such as agro-tourism, care farming and agricultural childcare, are so-called private rural services. Other rural services, including management of nature and landscape, water storage, and so forth, have a more public-good driven focus. However, this does not necessarily mean that the public sector was allotted sole responsibility for the provision of these goods. The private sector is already actively involved in securing the provision of these services, for instance through public-private partnerships. Intuitively, there is a strong link between public rural services (e.g. managing the landscape) and private rural services (e.g. services for renting bicycles): the last category is dependent on the first.

The whole of public and private regional rural services may be called a rural service cluster. The rural service cluster competes with the agro-cluster for land. Because of the public nature of a large part of the rural services, there is probably a lack of supply of these services. As shown earlier (see Chap. 7), the public goods characteristics of these services reduce the incentive to provide them. As a result, private markets will tend to underprovide these public rural services. The provision of public rural services through privatisation, collective action or governmental intervention is commonly seen as the way to solve this. For instance, 'public money for public goods' is often promoted as the key driver of future agricultural and rural policy programmes. This idea has underpinned much of the Pillar II programme of the Common Agricultural Policy (CAP).

11.6 The Landscape

Different types of economic clusters require different kinds of landscapes. A rural area that relies almost exclusively on high-production agriculture creates and is dependent on a landscape that differs considerably from an area in which rural services are the primary dimensions. The spatial pattern of the rural area is created through both chance and necessity. Through the design and planning of landscapes, augmenting rural resilience to external changes can be achieved. As such, landscape design and spatial organisation determine and influence system resilience at multiple scales, from the scale of a farm or village through communities to regions. Choosing the right landscape design is therefore of paramount importance, as it influences the different realms of rural resilience—the ecological system, the economic structure and the cultural domain. However, is there such a thing as the optimal design?

Traditionally, the knowledge of so-called 'landscape experts' has been regarded as objective and neutral, meaning that their knowledge seemingly provides an objective basis for developing landscape composition and structure. Nowadays, this view has been changed diametrically: the bald fact is that spatial design is highly subjective. What Winston Churchill said about architecture ('We shape our buildings, thereafter they shape us') also applies to landscape design. Designing the optimal landscape involves inherently subjective decisions. If several individuals are asked how to design a landscape, they will probably give many different answers, depending on their personal goals, motives, and social and economic backgrounds. For creating a resilient landscape, we stress the importance of an interactive and collaborative approach of spatial design. Society is full of inspiration and ideas on what the 'optimal' landscape is, and how it might be 'seen' and visually interpreted.

Of course, such a deliberative strategy carries the risk that different and possibly conflicting demands are put on the design of the landscape. Demands that are voiced by individuals or organisations who represent only (a part of) one specific realm of rural resilience. Nevertheless, we still believe that 'positive' changes in landscape design and spatial planning are more likely to be initiated when the attitudes, beliefs or preferences of the people managing or depending on the countryside are considered in the identification of problems and the development of solutions.[3] Such an approach also fits seamlessly with the growing awareness that government is not the only party that should take responsibility for public affairs. Also private actors and social organisations should contribute to the public cause. Resilient rural areas are after all a shared responsibility by all actors in the countryside. No one stakeholder group, whether business and industry, governments or society, can do this on their own. Collaboration and collective action are at the heart of the 'optimal' rural landscape.

11.7 Governance

It is only a small step from terms like 'stakeholder involvement' and 'participatory decision making' to the catch-all term of 'governance'. This so-called steering concept relates to the cooperation between parts of government, civilians, companies and interest groups (van der Heijden 2005; van Tatenhove et al. 2000). When adopting this concept to rural resilience, a number of practical questions arise, such as which (public and private) actors are involved in the policy network to develop a rural area?

As already indicated by Gunderson and Folke (2005), a major challenge in the context of ecological resilience is to 'build knowledge, incentives, and learning capabilities into institutions and organizations for governance that allows for the adaptive management of local, regional, and global ecosystems and to incorporate actors in new and imaginative roles'. This, of course, also applies to rural resilience. To that end, the concept of governance is crucial. Within a network of public and private actors, each actor contributes on the basis of their existing knowledge, responsibilities, policy domain or field of interest and resources. With good will on all sides, the outcome of such an endeavour is a combination of existing possibilities shared by actors of the network. Here, Nobel Prize Winner Elinor Ostrom enters the picture again (see Chap. 7). Her work offers many lessons for understanding institutional diversity and finding ways of building and achieving resilient rural landscapes that build on people's capacity for collective action.

[3] The importance and necessity of including individual and subjective perspectives in the planning and design of rural areas has encouraged the development of a range of approaches and methodologies, such as deliberative valuation, stakeholder-oriented approaches, and participatory decision making. Each of these methods has its strengths and weaknesses, see van der Heide and Heijman (2013).

Rural resilience is a policy object which can be characterised as a complex or as a wicked problem. Wicked problems are described as large, messy and complex (Rittel and Webber 1973; Dentoni et al. 2016). Such problems have no closed-form definition, and emerge from complex systems, in which cause and effect relationship are either unknown or are highly uncertain. Moreover, a wicked problem may have multiple stakeholders with conflicting, sometimes strongly held values regarding the problem (Weber and Khademian 2008). We label rural resilience as wicked because of the multi-disciplinary knowledge needed to understand this policy object, the possible conflicting norms and values of actors involved and the conflicting interests between them (see Roelofs 2000). Confronted with such a complexity, the problem-solving capacity has to be increased. Defining the most relevant policy questions and taking the right decisions and interventions, increasingly demands—not surprisingly—cooperation and consensus between actors concerned (Knippenberg et al. 2006).

For dealing with and managing wicked problems, Batie (2008) identifies the need to build new frames of reference amongst multiple actors. Such so-called cross-sector partnerships can generate a collaborative advantage and shared values by gaining and sharing information, knowledge and skills. This 'win-win' potential amongst multiple actors implies that organisations are forced to transcend their traditional relationship boundaries and that they have to (learn to) interact with multiple stakeholders that may have different goals and cultures (Batie 2008), different natures of core business/organisational activities, different organisational goals and a contrasting strategic intent (see Teece 2007). As a result, dependency between actors will arise because of the need for knowledge, coordination and adaptation of perceptions and expectations, and finally the adaptation of interests, activities and resources (see Molin and Masella 2016).

Building on the idea that rural resilience is typically subjected to governance (and also vice versa, that resilience is the 'guiding principle' of policy governance), one can suppose that the choice for a certain development, either agro-business or rural services, includes a different set of actors involved. Under these circumstances, a collaborative network seems appropriate for dealing with emergent complex social and public problems. A collaborative network[4] is reserved for the highest level of

[4] Next to this collaborative network, a 'cooperative network' (solely concentrating on the exchange of information among organisations) and a 'coordination network' (i.e. participant organisations more substantively align their policies to attain outcomes they could not realise without working with others) are identified (Lecy et al. 2014).

integration signifying a true interdependence among actors (Lecy et al. 2014). 'Collaborative' means not only bringing a diverse set of actors (individuals, organisations) together, but also moulding them and their resources into a different functioning entity underpinned by new ways of thinking and behaving (Mandell et al. 2017). Ultimately those actors have to agree on the combination of the type of landscape and the amount of land to be used for the specific function.

The assumption is that a certain strategy employed in a specific rural resilience situation will trigger a specific constellation of actors involved (see Todeva 2006; Hagelaar and Zuurbier 1996). Hence, the collaborative network of stakeholders and their individual interests will differ from situation to situation and from context to context. The consequence is that if a rural area changes from conventional agriculture to an ecological agro-cluster, the network of stakeholders, including their interests, changes as well.

11.8 Conclusions

In order to facilitate the efficient production of goods and services asked for by consumers and citizens, rural regions become more and more specialised either in products generated by the agro-cluster, or in rural services. But under what conditions is it optimal to adopt a more multifunctional land use across a wide area, compared with the option of farming intensively in agro-clusters in some areas while sparing land elsewhere from agricultural activity? Indeed, this is the so-called land sharing versus sparing debate, which attempts to find a balance between agricultural and natural rural areas. This chapter did not solve this question. Essentially what this chapter did was explain that economic specialisation/diversification, distinctive design of landscapes and a well demarcated, specifically composed policy network are all crucial aspects to shape rural resilience in a certain region.

Both agro-clusters and rural service clusters play an important role in the transition towards a sustainable countryside. This requires a full understanding of the two clusters within the context of changes in the physical rural environment, their governance, economic returns, societal demands and technological advances. Arguing that cluster formation may (or may not) play a central role in the resilience of rural areas, we propose a stress test for these areas. This tool should provide information about the weakest links that reduce the resilience of rural areas. As such, the stress test is decision support tool, because it can help (rural) policy makers to face the challenges ahead (such as European proposals on the CAP beyond 2020), and, hence, to strengthen proactive stress reduction. Tools of this kind help to flesh out the concept of rural resilience. The rural stress test is the subject of future research.

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CHAPTER 12

EU Rural Development Policies: Present and Future

Petra Berkhout, Kaley Hart, and Tuomas Kuhmonen

12.1 Introduction[1]

On September 6, 2016, the participants at the Cork 2.0 European Conference on Rural Development issued a declaration called *A Better Life in Rural Areas*, setting out ten guiding policy orientations needed for

[1] This chapter builds on Thomson, K., P. Berkhout and A. Constantinou (2010). 'Balancing between structural and rural policy', in: A.J. Oskam, G. Meester and H.J. Silvis (editors), *EU policy for agriculture, food and rural areas*. Wageningen Academic Publishers, 2010.

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an innovative, integrated and inclusive rural and agricultural policy in the European Union (EU). These orientations range from promoting rural prosperity, to preserving the rural environment to enhancing rural governance. In the proverbial nutshell, the declaration sets out clearly the challenges of policy-making for rural areas in the EU that have very different economic, social and environmental characteristics.

This declaration also illustrates the development of rural policy within the EU. What started in the 1960s as mainly national policies focusing on improving the agricultural sector—in those days an important driver of local economies—has over time evolved into a suite of European co-funded policies focusing on a wide range of objectives and no longer exclusively geared towards the agricultural sector. Over time, concerns such as the environment, landscape, rural viability/vitality and renewable energy sources have entered the equation reflecting the broader 'rural lens' that is nowadays common when developing rural policy.

This chapter considers the evolution of policy for rural areas within the countries of the European Union since the 1950s until the present day. It does so largely within the context of the Common Agricultural Policy (CAP), focusing on the second pillar, nowadays mainly referred to as rural development policy. Rural development policy within the CAP is located at the intersection of two major areas of concern to the EU. These two areas are (i) regional policy[2]—how to promote greater productivity, competitiveness and equity amongst countries, regions and sectors—and (ii) agricultural policy, concerned with competitiveness, incomes and environmental sustainability in agriculture as the largest land user and (still) an important occupation in (some) rural areas. In order to understand the rural policy in the EU as it is today, this chapter gives some consideration to the wider EU regional (including cohesion) policies as these have helped shape rural development policy under the CAP. National policies that may be equally important for the development of rural areas (like spatial planning policies) are not taken into account.

The chapter has four main sections. It starts by setting the scene, by describing characteristics of rural areas and the various economic, social and environmental challenges they face. Next it gives an overview of

[2] Regional policy refers to the policy delivered through the various so-called Structural Funds. These broadly comprise the European Fund for Regional Development, the European Social Fund and the Cohesion Fund. The Guidance part of the European Agricultural Fund for Guidance and Guarantee is also a Structural Fund.

policy-making for rural areas from the late 1950s to the first Cork declaration (1996), explaining the link with regional policy. The third section describes rural development policy/programming since 1999/2000 to date. The chapter concludes with discussion and conclusions on current policy for rural development under the CAP and the proposals for changes from 2021 onwards, as published in June 2018.

12.2 Setting the Scene: Characteristics of Rural Areas

While the term 'rural' is intuitively clear, it is a tricky concept to define for the purpose of science and policy. Manifestations of rural may take many forms depending on whether demographic, economic, social, spatial or administrative issues are concerned. The level of analysis and aggregation also plays a role, as larger rural regions may include a number of cities. Several typologies exist to delineate rural areas, and most of them reflect the key differences between rural and urban areas: population density and degree of remoteness. In this section, the evolution of rural areas and challenges is first discussed on a general level, then illustrated according to a number of rural typologies and finally alternative rural futures are discussed.

12.2.1 Evolution of Rural Areas and Challenges

Over the history of the EU, evolving rural challenges have been addressed, promoted and even created by EU policies. In the late 1950s when the CAP was introduced, rural areas were characterised by a very large agricultural workforce and low level of agricultural modernisation, productivity and incomes (Kuhmonen 2018). The establishment of the common markets with rather stable and high agricultural prices soon alleviated these socio-economic problems but led to gradually mounting agricultural surpluses until the 1980s. Common market policy, with only minimal structural or regional measures—accompanied by improved technology and know-how—led to intensification and regional concentration of agricultural production. New Member States with large agricultural sectors joined the Community in the 1980s and vast differences in the socio-economic development of the regions became an issue. Path dependency of agricultural policies together with the specialisation of farms and regions led to accumulating environmental problems in the most favourable agricultural areas, for example, pollution of waters and loss of agricultural biodiversity. These environmental concerns entered the common agenda in the 1980s, established in the policy measures in the 1990s and expanded to promote the sustainable use of natural resources in the 2000s. The enlargement of the EU eastwards in the 2000s revived the concerns about regional differences, as the new Member States were currently facing similar socio-economic challenges as the existing Member States sometime earlier. The portfolio of different rural structures and contexts of the EU became a mosaic, where economic, social, environmental and cultural concerns manifest themselves in very different ways.

Alongside the concerns, the societal role of rural areas has also evolved over the decades. In the early stages of the CAP, the outflow of the agricultural labour-force played a key role in the diversification of economies and division of labour, contributing to the rise in the standard of living. Rural areas comprised an important source of labour-force for the growing cities. Natural resources are located in rural areas and the everlasting role of rural areas as a source of raw materials has developed new significance and potential in the era of climate change, bio-economy and sustainability. Over time, the diminishing societal role of rural areas as a source of labour-force has been compensated by the increasing role of rural areas as a source of welfare. Many rural areas have taken steps from production areas towards consumption areas which host tourism, commuting, green care and many kinds of leisure activities. Nevertheless, agricultural production is still a very important function of rural land.

12.2.2 Typologies of Rural Areas

Various classifications and typologies have been used to define the specificity of rural areas. These capture only some aspects of the rural issues and provide snapshots of the long-term evolution discussed above, however. Some of the typologies have been very policy specific (e.g. Less Favoured Areas), some have emphasised divergent development patterns (e.g. leading vs. lagging areas, Terluin and Post 2000) and some have been very general. OECD has elaborated a general typology based on the population density of districts, including predominantly rural, intermediate rural and predominantly urban areas (Fig. 12.1).

Many of the differences in the characteristics of the three types of areas in the OECD typology are obvious. The predominantly rural areas host 19% of the EU population, yet comprise about 44% of the land area in 2015 (Table 12.1). The agricultural (primary) sector has the most

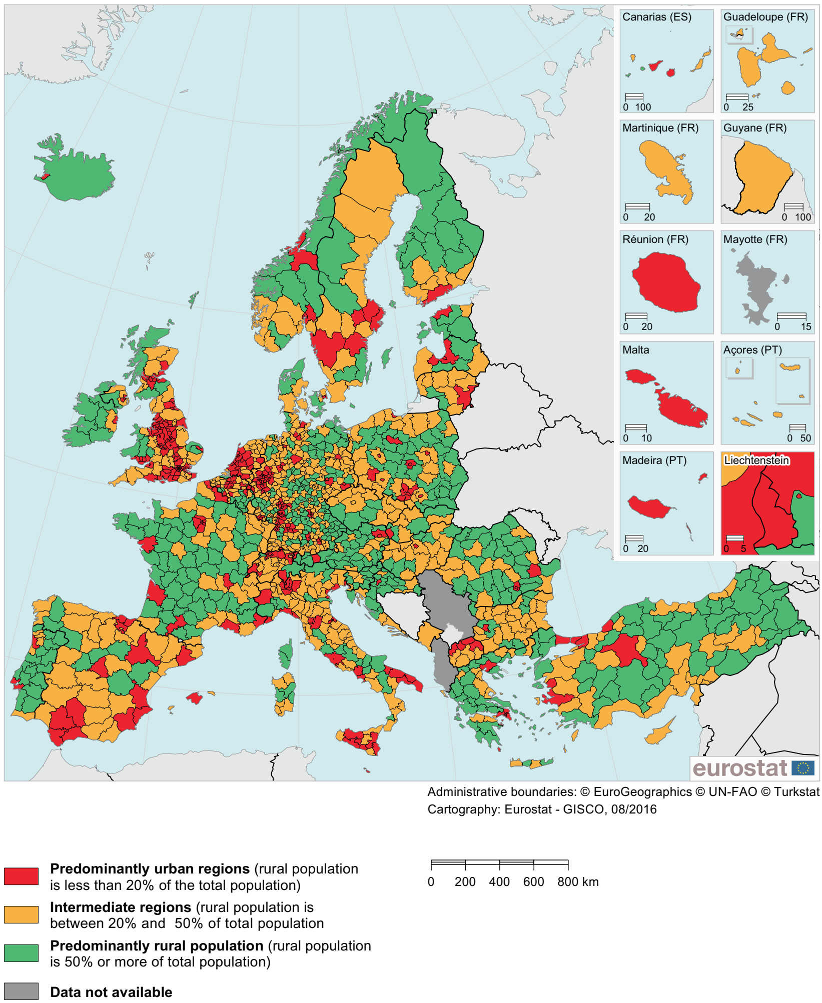

Fig. 12.1 Urban-rural typology for NUTS level 3 regions. Note: Based on population grid from 2011 and NUTS 2013. (Source: EUROSTAT, JRC and European Commission Directorate-General for Regional Policy)

pronounced role in the predominantly rural areas, the industrial sector in the predominantly rural and intermediate areas and the service sector in the predominantly urban areas. Agricultural and industrial products and related jobs are open to external and partly global competition,

Table 12.1 Indicators of predominantly rural, intermediate and predominantly urban regions in the EU-28, 2015

Indicator	*Predominantly rural regions*	*Intermediate regions*	*Predominantly urban regions*
Share in total population, %	19	36	45
Share in total land area, %	44	44	12
Employment structure, %			
Agricultural sector	13	6	1
Industrial sector	27	26	17
Services sector	60	69	81
Total	100	100	100

Source: Derived from Eurostat statistics

whereas the service sector is better protected by cultural and language requirements. By definition, the population density of the predominantly rural areas is low and the economic base is limited. Consequently, competitive pressures and fragile structures coincide, especially in the most agricultural and remote areas which lack touristic amenities.

The difference between the leading and lagging rural regions in terms of employment change derives from many factors (Terluin 2003). The leading regions tend to have stronger and more diversified human and social capital, a better balance between native residents and newcomers, a more pro-active attitude and better access to external networks than the lagging regions. Many of the leading regions are coastal regions. Furthermore, the differences in employment and population growth between the leading and lagging regions tend to be more pronounced among rural areas than urban areas. These and other findings remind us that a specific development path of a certain region is strongly affected by stock and interplay of economic, environmental, human, social and cultural capital.

Remoteness or proximity to large cities is critical to the challenges and opportunities facing rural areas. This aspect is elaborated in Table 12.2. During the last decades, many rural areas having large cities nearby—especially in densely populated countries—have benefited from counter-urbanisation which has been fuelled by the quality of life, low housing costs and good accessibility. Remote rural regions lack these opportunities and need to be more self-sufficient in jobs. As a conclusion, many kinds of typologies may assist characterisation of rural areas for the purposes of policy design and targeting.

Table 12.2 Challenges and opportunities by type of rural region

Type of the region	*Challenges*	*Opportunities*
Rural region inside a functional urban area	Loss of control over the future Activities concentrate on the urban core Loss of rural identity	More stable future Potential to capture benefits of urban areas while avoiding the negatives
Rural region outside, but in close proximity to a functional urban area	Conflicts between new residents and locals May be too far for some firms, but too close for others	Potential to attract high-income households seeking a high quality of life Relatively easy access to advanced services and urban culture Good access to transport
Rural remote region	Highly specialised economies subject to booms and busts Limited connectivity and large distances between settlements High per capita costs of services	Absolute advantage in the production of natural resource-based outputs Attractive for firms that need access to an urban area, but not on a daily basis Can offer unique environments that can be attractive to firms and individuals

Source: OECD (2016)

12.3 Early Policy-Making for Rural Areas[3]

12.3.1 Conference of Stresa

European rural policy has its origins in European agricultural structural policy.[4] During the 1960s, there was little progress in the development of this policy, despite the intentions already formulated at the Stresa Conference held in 1958 (EC 1958). At this conference, the following objectives for agricultural structural policy were emphasised:

[3] This section is partly based on Berkhout, P. and W. Schoustra (2013). 'EU-plattelandsbeleid en structuurfondsen'. In: Meester, Gerrit, Petra Berkhout en Liesbeth Dries (editors) (2013). EU-beleid voor landbouw, voedsel en groen. Wageningen Academic Publishers, Wageningen.

[4] In the early days of European policy-making, it was felt that European agricultural policy should address two main challenges, adaptation of agricultural structures and creation of a common market. See Hofreither (2007).

- Maintaining a close relationship between market policy and agricultural structural policy
- Increasing the productivity of labour and capital, with the family business as a standard
- Encouraging regional industrialisation to create alternative employment, with special assistance for regions whose development is lagging behind

Eventually, 'Stresa' yielded little for European agricultural structural policy. Progress on this front was confined mainly to the examination and coordination of national measures, such as state aids for farm reorganisation and modernisation. In addition, separate projects were cofinanced in Member States from the Guidance section of the European Agricultural Guidance and Guarantee Fund[5] (EAGGF) of the CAP from 1964 onwards. Although the Guidance Section was intended to cover one-third of total EAGGF expenditure (with 'matched' national funding to be added), this proportion seldom exceeded 10%.

12.3.2 Plan Mansholt

By the end of the 1960s, the establishment of CAP market support, along with rapid technological progress in farming and slow agricultural restructuring, was leading to severe problems of over-production, in particular for dairy products. In response, the Mansholt Plan of 1968 proposed a radical restructuring of the agricultural sector towards fewer, larger farming units through a substantial reduction of agricultural inputs:

50% reduction of the agricultural labour-force (through retraining and early retirement)
7% reduction of cultivated land (approximately 5 million hectares, mainly through afforestation)

12.3.3 Reducing the Dairy Herd and Removing/Clearing? Orchards

The Plan was violently contested in farming circles, and eventually abandoned. Instead, a set of three structural Directives (nos. 72/159–161) was adopted in 1972, dealing with, respectively: modernisation of 'main

[5] The Guidance section of the EAGFF financed rural development measures, and the Guarantee section financed the expenditure of the common organisations of the markets.

occupation farms' via various forms of aid; farmer retirement, releasing farmland to other farmers or for afforestation; and 'socio-economic' advice and training both for those leaving farming and for those remaining.

12.3.4 Common Actions (1972–1988)

From 1972 on, so-called common actions introduced a new type of regulation that replaced the aforementioned co-financing of national projects. A large number of directives and regulations came into being, some of which were valid for the whole EU, while others were specifically targeted at certain Member States or regions (Van der Stelt-Scheele 1990). There was a certain proliferation of schemes with limited scope, since they were often used to 'comfort' particular Member States for the outcome of the price negotiations of the CAP.

The main common actions were the three directives adopted in 1972 resulting from the Mansholt Plan. They were applicable throughout the EU, but the EU co-financing rate could vary based on the relative prosperity of the Member State and the region. All Member States were obliged to translate the directives into national schemes, which had to be submitted to the European Commission for approval. However, farmers' participation was voluntary. Another common action was Regulation (EC) 355/77 for the processing and marketing of agricultural and fishery products.

In 1975, following the accession of the United Kingdom, Ireland and Denmark, the first 'less favoured areas' (LFA) Directive (no. 75/258) was adopted—a significant break from the principle of a 'common market' within which economic comparative advantage should be pursued without geographical distinction. Farm producers in the LFAs—which eventually spread to over half the total area of the EU—received annual payments, typically per hectare, in order to compensate for natural handicaps and other difficult territorial conditions.

Almost all the content of the 1972 and 1975 Directives have been continued in some form or other into the present era.

12.3.5 Towards More Integrated Programmes

In the 1970s and 1980s, a small set of experimental 'integrated development programmes' (IDPs) were initiated. The 1972 directives only provided support at the level of individual projects and ignored the regional dimension of the problems facing an individual farm. It was recognised that a programme, based on the problems of an (agricultural) region and using a coherent mix of policy instruments, could circumvent these disadvantages and benefit from synergy effects. As a pilot, an integrated programme was set up in the Scottish Islands, Wallonia (Belgium) and Lozère (France), in which agricultural structural measures had to be implemented in conjunction with actions from the EU's Structural Funds in use to deliver regional policy. The programme included funding from the European Regional Development Fund (ERDF) and the European Investment Bank (EIB) both established in 1975; and the European Social Fund (ESF), already in place in 1958 and focused on retraining labour displaced from declining industries, including agriculture.

By the 1980s, with the Community of Ten again in severe over-supply of farm products, and manufacturing no longer absorbing surplus farm labour, structural problems in rural areas were again in evidence. A number of Directives were adapted to take account of this situation, for instance by limiting the possibility to give aid if this would increase production. Environmental concerns were also incorporated for the first time. In 1986, the further enlargement of the Community to include Spain and Portugal, and the adoption of the Single European Act—which formally recognised regional policy as a major tool in promoting socio-economic 'cohesion'—heralded a more serious attempt at addressing regional and rural problems within the 12.

12.3.6 'Delors I Package': First Reform of the Structural Funds

Following the Single European Act in 1986, regional policy—as funded by, for example, ERDF and ESF—was substantially reformed in 1988 and renamed as 'cohesion policy'. The underlying idea of this Delors I Package was to increase social and economic cohesion in the Union, especially with a view to creating the single market which was due for completion by 1993. Through the Structural Funds, a larger amount of money was made available to help regions or countries of the EU lagging in economic development prepare for this. Regulation 2052/88 set out six 'priority objectives'[6]; in order to use the funds more effectively, a 'Community

[6] The most lagging rural regions fell under Objective 1, while Objective 5b covered other lagging rural areas. Objective 2 was applied in regions with high unemployment compared to the EU average. Objective 3 (unemployment), 4 (youth unemployment) and 5a (adapting farm structures) applied throughout the Union.

Support Framework' was negotiated by the Member State with the Commission for each objective area and then a more detailed operational programme, specifying the particular measures to be applied. In principle, all resources of the Structural Funds (and in cooperation with them the Community loan instruments of the European Investment Bank and the European Coal and Steel Community) had to be spent within the framework of these objectives.

Objective 5a—applicable throughout the Union—continued EAGGF Guidance Section measures for agricultural development, and reflected three parallel concerns: the need to 'adjust' the supply of farm products (e.g. via early retirement, set-aside and afforestation schemes); to protect vulnerable areas (e.g. via 'special compensatory allowances' in LFAs and 'aids for environmentally sensitive areas'); and to promote farming competitiveness (e.g. processing and marketing schemes, farm improvement grants, producer group aids and research).

The year 1988 was notable also for the introduction of the LEADER instrument, as a 'bottom-up', locally driven (or 'endogenous') approach to innovation and development administered by local partnerships. In subsequent programming periods, LEADER—also known as Community-Led Local Development—has been continued and expanded as it is considered one of the most successful instruments to promote 'inclusive' rural development. LEADER represents an innovative policy design and delivery which is based on co-creation of activities rather than the adoption of measures. Consequently, LEADER has connotations with social capital, equality, place-based development and local democracy.

12.3.7 'Delors II Package': Second Reform of the Structural Funds

The 1992 Maastricht Treaty boosted EU regional policy yet again by reforming the decision-making procedure, with Parliament given a greater role, and provided for the creation of a Cohesion Fund through which aid could be channelled to the poorer countries of the EU (those with a per capita Gross National Income under 90% of the EU average).

In addition, the Maastricht Treaty provided for a new reform of the Structural Funds and paid special attention to the environment. A redefinition of the objectives took place. Just as the Delors I package was needed to achieve political agreement on the establishment of the internal market, Delors II (1993) was needed to establish political agreement on the European

Monetary Union. The 'Delors II package' of that year—though approved only in part—entailed an expenditure increase of 41% over the previous period, so that by 2000 such funding represented almost a third of the Community budget, compared to slightly more than half for agriculture.

Although CAP rural development policy as known today was not yet established at that time, this period initiated a sort of institutional rivalry between the CAP and regional policy as the most appropriate focus for rural policy in the EU.[7] From here on, many arguments would be based on the advantages and disadvantages of delivering rural development either via land-based and farmer-oriented agricultural directorates and Ministries, or via 'regional' authorities which might be expected to take a wider perspective but were perhaps not close enough to the often local businesses and populations in remoter areas. The rising importance of environmental considerations—and recreational interests in the countryside—added further complications to the dynamics of this debate.

12.3.8 Mac Sharry Reforms: Accompanying Measures

The Mac Sharry reforms of the CAP agreed in 1992 included not only major steps towards lowering agricultural price support and increasing direct payments to farmers instead, but, in the field of rural policy brought in 'accompanying measures' in the form of an early retirement scheme, an agri-environment scheme and a scheme for afforestation of farmland. These were designed both to reduce production capacity, to support farm restructuring and to encourage more environmentally friendly farming practices. The problems of 'agricultural adjustment' thus continued to be recognised, but were now more strongly linked to society's growing interest in environmentally friendly land management by farmers: Member States were now obliged to offer a relevant scheme to their farmers. Many of these first agri-environmental schemes were not well targeted, and a clear link to perceived environmental benefit could not always be established. A more critical approach towards the design of agri-environment schemes was adopted by the Commission in the next and subsequent programming periods.

[7] Also, regional policy tended to focus on funding large infrastructure projects and had a significant urban focus. Simultaneously worries about the multifaceted small-scale rural development started to increase, these worries grew gradually (manifested in Cork 1996) and were finally translated in Agenda 2000 in 1999.

12.3.9 Cork Conference 1996

A next step, in November 1996, was the Cork Conference attended by Franz Fischler as Commissioner for Agriculture and Rural Development, and resulting in 'The Cork Declaration: a Living Countryside'. One of the driving forces for rethinking rural policy was the dispersed nature of the support given to rural areas. As Commissioner Fischler put it in his opening statement to the conference, there were 62 Objective 1 programmes, 82 Objective 5b programmes, 101 LEADER programmes, 130 agri-environmental schemes, 36 Objective 5a programmes and various programmes for early retirement and afforestation of farmland. A more integrated approach was called for to move towards a genuine integrated EU rural development policy that would cover *all*[8] rural areas of the Union.

Alongside a 'multi-sectoral' or 'territorial' approach, and 'subsidiarity' in policy decision-making, the term 'sustainability' worked its way into the standard terminology in recognition of growing environmental concerns at EU and global levels. A further term growing in importance was the 'multifunctionality' of agriculture, reflecting the mixture of private goods and services (food and fibre products, and farm tourism) and 'public (or non-commodity) goods' (landscape, wildlife, etc.) provided by much of European farming. The practical importance of the Cork Declaration was not immediate: many Ministers of Agriculture were still not keen to shift the main focus of the CAP away from support for farmers and towards wider rural support. Decisions had to await the major Agenda 2000 negotiations leading up to the third programming period 2000–2006 for the EU as a whole.

12.4 Rural Development Policy Since 1999/2000

Agenda 2000 and the Introduction of Rural Development into the CAP

The creation of a new approach and commitment to rural development within the CAP finally came into being in 2000 under a new Rural Development Regulation (Council Regulation (EC) No 1257/1999). The intention of what became known as the Agenda 2000 reforms was to provide support for a greater variety of activities in the countryside, reaching beyond agriculture and forestry, and covering as much of the rural area

[8] The area-oriented measures of Objective 1 and 5b were only cofinanced by the EU in selected rural regions, and the business-oriented measures (Objective 5a and the accompanying measures) were cofinanced throughout the Union.

as possible and was intended to offer an alternative to the production-related farm policies that were dominant at the time. It combined measures that had previously been governed by a range of different regulations, for example, those for improving the efficiency of agricultural structures (Objective 5a, Council Regulation (EC) No 950/97), agri-environmental and other measures (Council Regulation (EEC) No 2078/92) as well as extending the coverage of measures for the non-agricultural development of rural areas to all rural areas of the EU (previously funded under Objective 5b).

In the event, there was strong opposition from some Member States to a large-scale transfer of funding from agricultural production support to rural development, and the budget attached to the new Regulation was tightly constrained. Nonetheless, the Commission was able to defend the concept of an integrated measure, which potentially could be expanded over time to account for a larger share of the CAP budget and merit the title of a 'second pillar'.

The common framework of the CAP was strengthened, but Member States had the responsibility for designing the specifics of their rural development support to address their own priorities and needs through the production of rural development programmes. Support for agri-environment schemes was the only element that was compulsory for Member States to put in place.

The principles of programming and evaluation—already put in place for the general Structural Funds—were also introduced in rural policy. Under the rural development regulation, each Member State or region had to demonstrate how they would use the measures in a coherent way to meet the needs and priorities facing their rural areas. The Member States drafted a rural development plan (RDP) for this purpose—setting out the rationale for which of the measures in the EU regulation would be transposed into national measures—and submitted it to the Commission for approval. As previously, the agri-environment measure was compulsory for all Member States to implement in their countries. The idea behind this programming was that the EU wanted to encourage Member States to use the business-oriented (Objective 5a and accompanying measures) and area-oriented (Objective 5b) measures to reinforce each other in the way in which they were used to help with the development of a rural area, instead of conflicting or overlapping. So 42 years after 'Stresa', agricultural structural policy became integrated with an environmental dimension and with 'regional' policy, even if the scope of (and the budget for) the regional elements of the policy was limited.

The simultaneous agreement and entering into force of the common rules regulation (Council Regulation (EC) No 1259/1999/EC) enabled those Member States which supported the Commission's longer-term vision for CAP reform to begin to shift resources from agricultural production (which continued to be funded via Pillar 1 of the CAP) to rural development[9] (using the modulation mechanism). France, Germany and the United Kingdom were the only Member States to take advantage of this option and all used it to expand their agri-environmental programmes. Although they all applied relatively modest modulation rates (up to 3%), even this amounted to a significant increase in rural development expenditure.

12.4.1 Structural Funds

The Agenda 2000 decisions entailed no significant increase in the EU budget for Structural Funds. The Regional Fund's objectives were limited to two.[10]

A special feature of the Agenda 2000 decisions was the preparation for EU entry by the New Member States, scheduled for 2004. In the field of rural policy, the SAPARD (Special Accession Programme for Agriculture and Rural Development) initiative was set up (alongside the parallel ISPA and PHARE instruments for structural and environmental infrastructure) to assist the implementation of the Community acquis in the Central European countries, primarily by building administrative capacity for supporting the enhancement of efficiency and competitiveness in farming and the food industry (about half of the available funding), and the improvement of rural infrastructure (about a third). The availability of this funding recognised that the New Member States not only faced significant structural issues in their farm-food sectors, but that public administrations

[9] Member States were given the option to transfer up to 20% of Pillar 1 funds to their rural development programme budgets, which then had to be co-funded. The use of these funds was limited to certain measures: early retirement, agri-environment, Less Favoured Areas and afforestation.

[10] Objective 1 for the development and adjustment of regions whose development is lagging behind; objective 2 for the economic and social conversion of regions experiencing structural difficulties. Objective 3 for the adjustment and modernisation of education, training and employment policies and systems was financed through the ESF.

would require help in putting together viable proposals for EU funding to create employment and sustainable economic development in rural areas. A more concrete incentive lying behind SAPARD was anxiety in the Commission that the New Member States would not have the capacity to prepare and administer the new programmes, with the risk that the allocated funds would not be absorbed.

12.4.2 Evolution of Rural Development Within the CAP

Over the subsequent decade, rural development became an established part of the CAP, although it has remained a second and more marginal Pillar, both financially and politically, with the first and more dominant pillar remaining focused on income support for the agricultural sector.

12.4.3 The 2003 Reform and the Introduction of the EAFRD

Over time the relationship between the two pillars of the CAP has evolved and the structure and nature of support provided under each pillar has changed. The first substantive change came about as part of the 2003 CAP reform. Under this reform, significant changes to agricultural support were agreed, decoupling support from production and introducing compulsory cross-compliance conditions requiring those in receipt of support to comply with a minimum set of environmental, animal welfare and plant health requirements (see Chapter 11 and 12, Volume I). It also made transfers of funding from Pillar 1 to rural development compulsory for the EU-15 (via compulsory modulation), rising from 3% in 2005 to 5% in 2007–2012. At the same time significant amendments to the rural development regulation were agreed, broadening its scope, with greater emphasis on achieving improved food quality, farm animal welfare and on assistance for farms adapting to Community standards on the environment, public, animal and plant health and occupational safety (amending Council Regulation (EC) No 1783/2003).

With the start of a new programming period in 2007, a restructuring of CAP financing took place, when the European Agricultural Guidance and Guarantee Fund (EAGGF), which had funded expenditure under the CAP, was replaced by two funds, the European Agricultural Guarantee Fund (EAGF) and the European Agricultural Fund for Rural Development

(EAFRD).[11] This further consolidated rural development policy as a core element of the CAP under Council Regulation (EC) 1658/2005.

The EAFRD was characterised by a new structure whereby measures were grouped together into Axes (Axis 1: economic; Axis 2: environment (agriculture and forestry); Axis 3: socio-economic; Axis 4: LEADER approach). New rules were introduced that required Member States to allocate minimum levels of EAFRD funding to each of these: a minimum of 10% on Axis 1 and Axis 3; at least 25% on Axis 2; and at least 5% on the Leader approach (which could be used to deliver activities under all Axes). This left a significant degree of flexibility for Member States to use different packages of measures to meet their specific needs and figures show the different strategies taken by Member States to address their needs, with some favouring the environment (e.g. over 70% of EAFRD funding was allocated to Axis 2 in Austria, Finland, Ireland and the United Kingdom), while others favoured economic or socio-economic priorities (e.g. many of the new Member States as well as Belgium, Greece, the Netherlands, Italy and Spain) (see Fig. 12.1).

12.4.4 The CAP Health Check

By 2008 it had become clear that the CAP required further modernisation, simplification and streamlining with respect to Pillar 1 to further decouple support from production to enable farmers to respond better to signals from the market (see Chapter 9, Volume I). It had also become apparent that environmental challenges were becoming more urgent, particularly in relation to agriculture's role in addressing climate, renewable energy, water and biodiversity challenges. What had started as a 'CAP Health Check' turned into a far more significant reform. In terms of rural development, the most significant development was the increase to the proportion of funding that Member States were required to transfer from Pillar 1 to Pillar 2[12] (albeit less than had originally been proposed) and the

[11] The Structural Funds were also restructured with the aim to concentrate funds on areas most in need and to simplify their implementation. Around 80% of the Funds were geared at convergence, focusing on regions with an average income less than 75% compared to the EU average. The remainder of the funds was available throughout the Union to stimulate competitiveness, employment and territorial cooperation.

[12] The final agreement allowed for an additional increase in modulation rates, over and above the existing rate, for the EU-15, of 5% by 2012 for all farms receiving more than €5000 in direct payments (rising from 2% in 2009, followed by a 1% increase in subsequent years). In addition, farms receiving over €300,000 in direct payments were subject to an additional 4% modulation.

requirement that the additional amounts transferred should be spent on a series of 'new challenges', namely climate change mitigation, renewable energy, water management, biodiversity, innovation in these areas and 'accompanying measures' for the dairy sector (introduced during the negotiations as a means to help farmers adjust to the phasing out of milk quota in Pillar 1 and any price volatility this may bring). It is estimated that the higher rates of modulation provided an additional €3.9 billion for Pillar 2 between 2010 and 2013 (EC 2010). Additional funds (around €1 billion) were also made available to some Member States via the European Economic Recovery Plan (EERP), to stimulate the EU economy in response to the financial crisis that has been affecting Europe since 2008. Member States responded in very different ways to these new challenges (see Fig. 12.2). For the EU as a whole, the largest proportion of funds was concentrated on biodiversity (31%) and water management (27%), with measures focused on climate change priorities and dairy restructuring both accounting for 14% of the total amount of additional funding. These

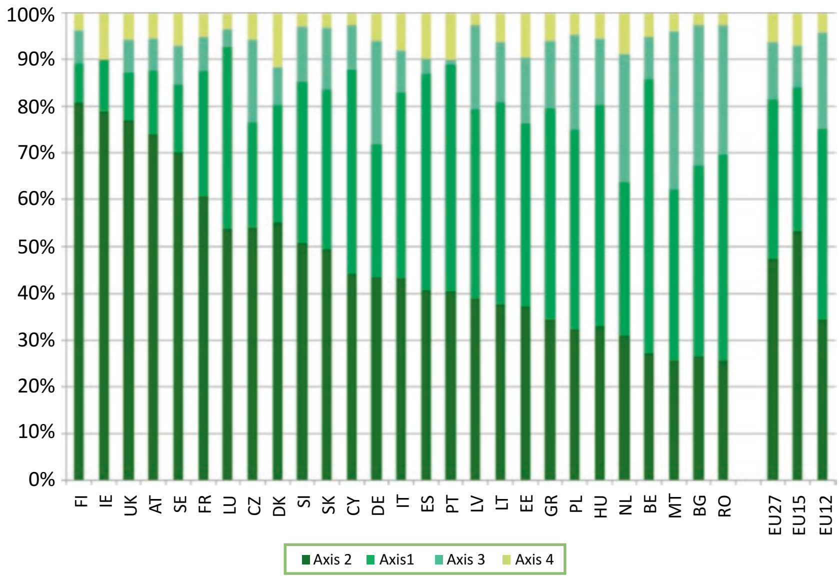

Fig. 12.2 Distribution of planned total public expenditure for 2007–2013 by Member State. (Source: IEEP calculations based on programmed expenditure within individual RDPs for 2007–2013, including additional health check and EERP funds)

overall figures mask some significant differences between Member States—for example, four Member States (Malta, Estonia, Hungary and Latvia) chose not to allocate funding to any of the environmental challenges, preferring to focus on dairy restructuring and innovation.

12.4.5 The 2013 Reform

The year 2013 marked the next significant restructuring of CAP support. Again the focus fell mainly on the structure of support for agriculture under Pillar 1 and the introduction for the first time of environmental measures within Pillar 1—the so-called green direct payments. The changes were influenced by a number of factors, including to address calls to make the distribution of direct payments within and between countries more equitable and to improve the legitimacy of direct payments by making the delivery of environmental public goods a more integral part of agricultural support (Swinnen 2015).

As ever, the reform was set within the context of changes to the financing of the CAP, agreed under the Multi-annual Financial Framework (MFF). The ongoing economic pressures facing the European economy influenced a significant change in direction of the trajectory of the CAP, with reductions to both Pillar 1 and Pillar 2.[13] This reversed the gradual growth in the rural development budget which had been the trend over the past two decades. The principle of allowing Member States to transfer funding from Pillar 1 to Pillar 2 of the CAP was retained; however for the first time Member States were also allowed to move funds in the other direction, another potential weakening of the rural development pillar of the CAP. In the end, because of the way in which the EAFRD was allocated between Member States and the possibility to transfer funds between CAP pillars, the overall result was a 3% increase in funds for rural development compared to 2007–2013 (in current prices). However, this masks significant differences between Member States, with reductions in rural development budgets in 11 Member States[14] ranging from 2% in Austria to 35% in Poland (see Dwyer et al. 2016).

[13] For Pillar 1, the overall budget was reduced from around €305 billion to €278 billion for 2014–2020 (a reduction of €27 billion or 8.8%). For Pillar 2 the reduction was smaller in absolute terms, but far greater proportionately (a 13% reduction) with the budget reduced from €98 billion to approximately €85 billion.

[14] BG, CZ, IE, CY, LT, HU, AT, PL, SI, SK and SE.

In terms of the structure and content of rural development support under the EAFRD, the changes were much less substantive than those for Pillar 1, but they did introduce more flexibility for Member States, removing the 'axes' that had characterised the previous EAFRD, to enable Member States to combine the full range of EAFRD measures to meet their overarching national or regional rural development priorities. While the core objectives for rural development remained similar to those that existed previously, namely to contribute to the competitiveness of agriculture, the sustainable management of natural resources and climate action and a balanced territorial development of rural areas, these were reflected in six priorities for action which were further subdivided into more detailed 'focus areas':

Fostering knowledge transfer in agriculture, forestry and rural areas
Enhancing the competitiveness of all types of agriculture and enhancing farm viability
Promoting food chain organisation and risk management in agriculture
Restoring, preserving and enhancing ecosystems dependent of agriculture and forestry
Promoting resource efficiency and supporting the shift towards a low-carbon and climate resilient economy in the agriculture, food and forestry sectors
Promoting social inclusion, poverty reduction and economic development in rural areas

In addition, 'innovation', 'caring for the environment' and 'contributing to climate change mitigation and adaptation' were proposed as common goals, which all aspects of future RDPs must reflect adequately through their actions under all priorities.

Amongst the changes to the content of the EAFRD, thematic sub-programmes could be introduced into RDPs to address specific issues or particular areas that require specific attention that could not be given adequately otherwise. Greater emphasis was also placed on community-led projects, cooperation and territorially focused approaches, including a new emphasis on delivering agri-environment-climate actions at the landscape scale. Member States were also encouraged to make greater use of Financial Instruments (specific tools which support access to finance) for rural development to enhance the leverage effect of rural development funds. Financial instruments include financial products such as loans, guarantees, equity and other risk-bearing mechanisms and can be an efficient way to support investments because the finance can be 'recycled' to support further initiatives.

At a strategic level, one new development was the introduction of a Common Provisions Regulation to inform the delivery of all EU structural and investment funds,[15] rather than separate programming for the general Structural Funds on the one hand and rural development on the other. This was an attempt to harmonise Member States' strategic planning for rural areas, requiring just one Partnership Agreement to be put in place in each country demonstrating how the different funds would work together to deliver investment in job creation and a sustainable and healthy European economy and environment. Also significant, to encourage innovation and the sharing of expertise between researchers and practitioners, EAFRD funding could be used to support the implementation of a new initiative, the European Innovation Partnership (EIP) for agricultural productivity and sustainability in Member States, as well as via a coordinating body at EU level.

Comparing the planned spend for 2014–2020 with the funding of the previous period, there is considerable continuity in priorities and patterns. Notable exceptions include a greater overall focus upon farm and forestry sector support and environmental management and investment, a good take-up of the new measure for cooperation, increased spending on LEADER which appears to be seen increasingly as the key EAFRD tool for broader rural development, and overall a decline in funding for broader rural development measures (Dwyer et al. 2016).

Based on the figures from the start of the programming period (2016), the majority (58%) of the funding continues to be spent on the physical investments measure (24%), Areas of Natural Constraint (previous LFA payments) measure (17%) and the agri-environment-climate measure (17%) (which remains compulsory for Member States to offer to farmers). Programmed expenditure by priority is shown in Fig. 12.3, with almost half allocated to the environmental priority (although this includes the

[15] European Structural & Investment Funds (ESIF) consist of five funds including European Regional Development Fund (ERDF), European Social Fund (ESF), European Agricultural Fund for Rural Development (EAFRD), the Cohesion Fund and the European Maritime and Fisheries Fund (EMFF). Together these funds contribute to the Cohesion policy of the EU, to the benefit of all regions but with higher co-financing from the EU-funds for regions with higher development needs. Funding is restricted to projects that help achieve one of the 11 thematic objectives for the period 2014–2020.

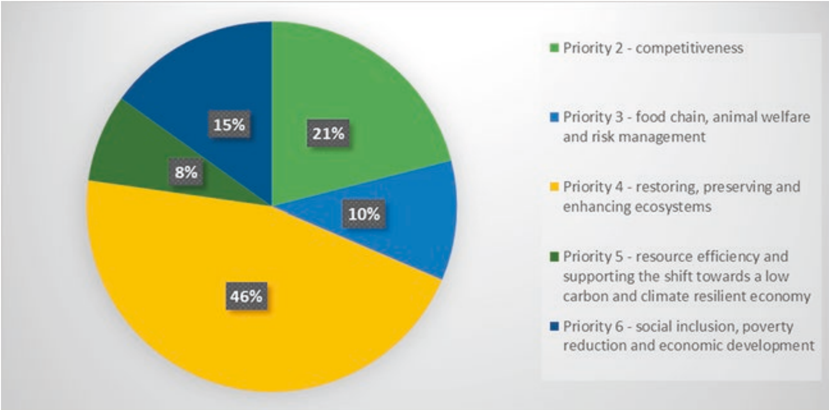

Fig. 12.3 Overall expenditure for RDPs by strategic priority, EU-282014–2020. (Source: Own compilation based on EAFRD implementation data in 2016 at the start of the programming period (ESIF data portal))

majority of expenditure for the measure for Areas of Natural Constraint which is not necessarily environmentally focused in reality). The focus of RDPs inevitably differs between Member States, with a greater proportion of funding allocated to the non-environmental priority areas than the EU average in countries like Poland, Romania, Bulgaria, Slovenia, Slovakia, Greece, Italy, Spain and Portugal.

12.4.6 Cork 2: Maintaining Rural Development as a Political Priority Within the CAP

In 2016 a second Cork conference was held, 20 years on from the first celebrated event that had marked the acceptance of the principle that rural development (including the environment) was a Pillar of the CAP rather than simply an accompaniment to the agricultural support regime. With the attention of agriculture ministers more focused on Pillar 1 of the CAP, crisis in the dairy markets, safety nets, greening, simplification and concern about the budget in recent years, the aim was to galvanise interest and enthusiasm for rural development, demonstrate the successes of the past two decades, identify the priorities for the future and generate some political energy and commitment to rural development for the future. The event culminated in a ten point declaration, underpinned by a shared sense that rural policy needed new vigour and a refreshed sense of direction to avoid the danger of it being relegated to a lower tier of EU priorities and a concomitant decline in its budget. Amongst the points it highlighted were that rural societies are not inherently backward and provide much more for society than is generally recognised, that rural identity should be celebrated with greater pride and stakeholders should work together more effectively to secure rural priorities remain on the political agenda at EU level. Importantly the declaration also made the case for extending the 'programming' approach that is the characteristic of rural development funding to the whole of the CAP, so that both Pillar 1 and Pillar 2 are tailored to address common objectives and locally identified needs.

The OECD biennial rural conference in April 2018 reaffirmed many of the points made in Cork in its policy statement highlighting the importance of rural areas to national economies and for addressing global challenges. In particular it stressed investment in innovation as a linchpin to both the competitiveness and sustainability of rural economies of the future. This assertion is not new, having been the focus of the OECD's New Rural Paradigm, developed in 2006 and extended and refined in the new Rural Policy 3.0, launched in 2018, as a framework to help national governments support economic development in rural areas. Amongst its recommendations, it calls for an integrated package of policies to 'mobilise assets and empower communities' to bring about social, economic and environmental improvements in rural areas, rather than focusing on subsidies for lagging regions which can 'lead to unsustainable dependencies' (Edinburgh Policy Statement on Enhancing Rural Innovation 2018).

12.5 Discussion

Over the years the EU policy for rural areas has evolved from a predominantly sector focused policy to a broader multi-purpose multi-sectoral policy. The traditional focus on increasing the competitiveness of the agricultural sector has shifted to a focus on increasing the vitality of a rural region. Also, the role of the farmer as manager of rural areas and as a potential guardian of nature and the environment has been increasingly emphasised, starting with the introduction of agri-environment measures in 1985 Regulation 797/85 when they were voluntary for Member States to implement, and then properly became a focus when agri-environmental measures became compulsory for Member States to offer to farmers in 1992. The development of rural policy thus addressed the concerns of many in Europe that the quality of rural areas and agrarian cultural landscapes was deteriorating and that the uniqueness of European agriculture with its multifunctional nature and diversity of agricultural systems—should be well maintained.

The current legal, financial and institutional framework for rural development policy under pillar 2 of the CAP is considered important both from a financial point of view and as a means to better target specific identified needs of European rural areas. This is not however conceived to contradict the continuation of other established EU policy intervention areas, notably cohesion policy which address the needs of wider economic development of Europe's regions, including those with a stronger 'rural' dimension. In fact, cohesion policy continues to support the development of (basic) infrastructures, human resources and administrative capacity, and the strengthening of partnership and multi-level governance, sometimes absorbing much higher levels of funding. The same goes for national policy in these areas. Balancing efforts and support between the different policy areas and coordinating their respective interventions in rural areas in a coherent way therefore remain an important issue.

While the justification for a focus on the 'rural' in a Europe of regions is not contested, harnessing the development potential of rural areas may require an approach based on qualitative rather than quantitative aspects of policy, such as successful governance and networking, improved delivery mechanisms, a better understanding of drivers of change, and a sustained effort to tap each region's territorial capital and endogenous development potential. Conceptualising the changing nature of 'rurality', coping with rural diversity through appropriate typologies to target assistance and ensuring a coherent coordinated implementation of rural policies at EU, national and regional levels are issues of major importance. Given current and foreseeable pressures on the EU budget, and difficulties in coordinating the substantial sums spent under the regional and rural funds to provide a coherent response to the needs identified, pooling of funds from different sources may be needed if rural policies are to rise to the challenges facing many rural areas in Europe.

12.5.1 Post-2020 CAP

Although at the time of writing (winter 2018) political debate on the post-2020 CAP and on the future EU rural development policy has not yet concluded, it seems that the two-pillar structure of the CAP will be maintained in the next period.[16] The main difference in the new CAP is that Member States will have to 'programme' both Pillar 1 and Pillar 2 together, so for the first time all support under the CAP will have to be designed and tailored (programmed) to address local needs to meet the overarching CAP objectives.

It has been clear for some time that 'new challenges' face the further evolution of the policy. Several of these challenges arise from wider social concerns, such as the mitigation of, and adaptation to, climate change (e.g. improved fertilisation, land use change and livestock management), the exploitation of biogas and biomass as renewable sources of energy, soil conservation, better water management in terms of both quantity and quality (e.g. anti-flooding, water-saving, wetland restoration, anti-pollution), and the preservation of biodiversity, especially via land and habitat management in areas of high nature value, and integrated and organic production. In addition, the increased volatility in the prices of major food commodities and the latest projections on global food supply requirements by the year 2050 have again put issues such as food security, protection and conservation of natural resources, and productivity-increasing research and innovation, back on the political agenda.

Land management and the delivery of public goods are important enough to find their place in any future policy framework, but, as in the case of farm-food investments, targeting becomes more important, and the additional environmental benefit above the obligatory baselines (with action against transgressions) needs to be clearly demonstrated.

One area of particular concern is the remuneration of environmental services delivered by farmers. The most common approach is to base the remuneration on the costs incurred and income foregone linked to changing the agricultural practice needed to produce the public good. This approach is in line with the WTO rules on payments for environmental services as set out within the agricultural agreement. The WTO legal framework offers ample room for paying for environmental services, as long as the payments are not trade or production distorting. The WTO rules do not specify the way costs should be calculated, type of costs that may or may not be included, reference periods to be used and so on, thus

[16] The Regional Development and Cohesion Policy for the post 2020 period will also be maintained, investing in all regions, with a focus on regions most in need in terms of relative wealth. Priorities for investment have been reduced to 5, compared to the 11 priority themes in the 2014–2020 period.

leaving room for interpretation. The available literature suggests that this room is currently not used to its full potential (see Berkhout et al. 2018). In addition, for long-term continuity, it is advisable to think about systems to reward farmers for the public goods delivered independently from agricultural production or subsidies.

It is important to recognise that economic, social and environmental needs of rural areas are interdependent. Agricultural and forest systems can, if appropriately managed, deliver many benefits for soil, water, air, biodiversity and climate, and the sustainable management of natural resources is critical to the long-term viability of agricultural systems. And both agriculture and forest management requires people—not just the farmers and foresters themselves, but all those involved in the whole food or timber supply chains (Maréchal et al. 2018).

12.6 Conclusions

The possible futures may look very different from the past developments for many rural areas. Rural areas may provide solutions to many global grand challenges: increasing demand for food, transition from fossil fuels to biofuels, increasing scarcity of fresh water, progress of climate change, degradation of the environment (biodiversity, pollution) and increased insecurity and instability. As a consequence, competitive advantages of many regions will face major transformations. The old paradigms and policies may become partly obsolete in the face of new roles and realities in many rural regions and activities. It is clear that the CAP's 'rural development policy' is nowadays well developed within the European Union. However, the task of this policy is a formidable one given the complexity of the problems and their interlinkages. Generally, the more concerns to be addressed by the CAP, the more conflicts and trade-offs there may be between the measures.

The above account suggests some general observations about policy-making for 'rural policy' in Europe:

- Deriving from its areas of competence under successive Treaties, the Commission has focused on the economic aspects of rural development, alongside the regulation of competition, and its more recent powers in relation to environmental management. The Member States (or their regions) retain a wide array of powers, including most taxation, and policies for housing, land use (spatial) planning, education, social welfare and so on; moreover, they have increasing flexibility to interpret and apply EU legislation, including direct payments of the CAP.

- Tensions inevitably arise between the basic EU objectives of (i) promoting economic efficiency via a 'common market' and Community-wide integration, and (ii) helping those disadvantaged by such competitive processes, whether by region or by social group, for example, redundant or retiring farmers, and farm household members. As pointed out in the OECD rural policy statements and the Cork declaration, it is important not to focus on supporting disadvantage but rather to move towards using the positive characteristics of rural areas to generate economic advantage.
- Confusion (and sometimes conflict) also exists between policy for regions (usually combinations of a central city and its hinterland of smaller towns and countryside) and policy for agriculture, which, as the traditional economic sector in rural areas, and with significant EC/EU funding, has often been an obvious channel for rural support, especially where farm incomes and/or land management have been sources of concern. To ensure a coherent approach to a territory, a better join up between policies is required. The requirement to write a National Strategic Plan for both Pillars of the CAP for the next programming period is a positive step in this perspective. For the first time Member States will have to consider how to plan agricultural support to farmers alongside rural development support. However, the fact that agricultural funds are no longer planned alongside the other (regional) funds—as was the case in the previous programming period—is a step backwards. Ensuring a coherent approach to rural areas, using the different policy mechanisms available, remains an issue that needs to be addressed.
- Policy has moved from 'top-down' project-based and sectoral support (whether for farming or for public infrastructure) towards a more 'integrated', 'bottom-up' and 'territorial' approach, which involves greater administrative costs and more difficult problems of evaluation, but also leads to projects being tailored to local situations and greater ownership of the projects from local stakeholders. This ultimately leads to greater longevity of the projects and their results. With increasing heterogeneity of regions and problems within the EU, this type of approach—also reflected in the growing importance of LEADER—will remain quite valuable.

- The most important questions for the future design of EU rural development policy are still open: the future financial endowment of the policy; its relationship with the First Pillar of the CAP, with regional policy and with national rural development policies; and governance issues. Concerning the latter, a joined up approach to policy for rural areas is essential. This goes beyond the CAP, including all policies affecting rural areas and involving all government departments and stakeholders.

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PART III

Bio-Based Economy

CHAPTER 13

Present and Future EU GMO Policy

Justus Wesseler and Nicholas Kalaitzandonakes

13.1 Introduction

Transgenic crops, popularly known as genetically modified organisms (GMOs), have continued to challenge the political economy of agriculture in many countries. Never before has a new technology in the field of agriculture been so emotionally debated among stakeholders. In some countries, groups of consumers, politicians and certain non-government organizations (NGOs) have opposed the introduction of GMOs, which they see as a threat to biodiversity, human health, the economy of rural communities, especially in the context of coexistence with organic crops, and as a source of monopolistic power among seed suppliers. Some also oppose them for ethical reasons. Yet in other countries, farmers, politicians and scientists have embraced GMOs which they see as a means to improved

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environmental and economic sustainability and greater food security around the world.

Amid the ongoing disagreements, consumers in some countries have often adopted a cautious stance towards GMOs while their governments have sought to manage potential risks and strengthen public confidence through regulations. The debate has recently gained public attention with the judgement of the Court of Justice of the European Union related to new plant breeding technologies (Purnhagen et al. 2018a, b).

In a global economy in which the introduction, adoption and international trade of GMOs continue to expand, biotechnology regulations must be able to handle such changes with a certain degree of flexibility. Otherwise, distortions in food and feed production and in international trade may arise, reducing social welfare.

GMO regulation in the EU differentiates between approvals for import and approvals for cultivation (see Sect. 13.2). Historically, relatively slow rates of approvals of new GMOs for import into the EU have caused market disruptions and friction with trading partners. An increase in approval and the adoption of new GMOs in many parts of the world along with a mired regulatory process in the EU promise increasing incidence of regulatory asynchronicity—that is, a situation when a new GMO has been approved for production in one country but not for import and use in the EU. The regulatory treatment of stacked events and new plant breeding technologies in the EU and their increasing significance in international markets will only add to the chance of asynchronicity of international and EU approvals.[1]

The zero-tolerance policy for the low-level presence (LLP) of such unapproved GMOs, which may be found in shipments to the EU, increasingly challenges international commodity supply chains and segregation systems for GMO-free food and feed products. In this chapter, we examine the potential future challenges in EU agriculture which may result from an increase in the GMOs entering international agricultural trade. We begin with a brief overview of the recent EU GMO policies, and then discuss the future challenges that lie ahead.

[1] GM crops with stacked events are developed by combining multiple individual biotech events (e.g. specific insect-resistant and herbicide-tolerant GMOs). As the number of new GMO events increases, the number of potential combinations increases non-linearly. In the EU, stacks of approved single events must be reviewed and approved separately. By contrast, in other countries, such as the United States, once individual GMO events have been approved, their combinations do not require separate regulatory approval. New plant breeding technologies often do not allow to differentiate between a GMO and a conventional plant.

13.2 EU Policy with Respect to GMOs

In June 1999, Denmark, Greece, France, Italy and Luxembourg declared that they would block new approvals of GMOs until the European Commission proposed additional legislation governing their risk assessment, market introduction, labelling and traceability (EU Environmental Council 1999). This gave rise to a temporary de facto moratorium on regulatory approvals of GMOs in the European Union both for cultivation and for import. In addition, the experience with 'mad cow' disease and similar food scandals resulted in the separation of risk assessment and risk management for food and feed products. Technical risk assessment is performed by the European Food Safety Authority (EFSA), while risk management, a political decision, involves standing committees, the Commission and the Council of Ministers (Fig. 13.1 summarizes the approval process for GMOs in the EU).

GMOs can be approved in the EU at two different levels (GMO Compass 2011): (a) as food or feed that is made from or contains GM plants (Regulation 1823/2003), pertains to imports but not to cultivation; and (b) for deliberate release into the environment, which may involve growing the plant within the EU or importing plant material that is able to reproduce (Directive 2001/18). In order to provide EU consumers with a choice, food and feed products derived from or containing more than 0.9% of authorized GMOs need to be labelled and traceable.[2] However, products derived from animals fed with GMOs need not be labelled (see Table 13.1 for details).

Currently, one GM crop is cultivated in the EU, the Bt maize event MON810 developed by Monsanto. MON810 was approved prior to the introduction of Directive 2001/18 and has been marketed since the late 1990s. GMOs authorized under the old regulatory process can stay in the market for up to nine years after their initial approval but a notification is required. Before the end of the nine-year period, a new application has to be submitted complying with the new regulations. A new application was submitted for MON810 and approved.[3]

[2] Such regulatory allowances recognize that perfect segregation of GMOs and conventional crops in the agrifood supply chain is impossible, and hence foods with accidental presence of traces of authorized GMOs need not be labelled.

[3] More details about the approval process are available at, for example, European Commission: (https://ec.europa.eu/food/plant/gmo/authorisation_en).

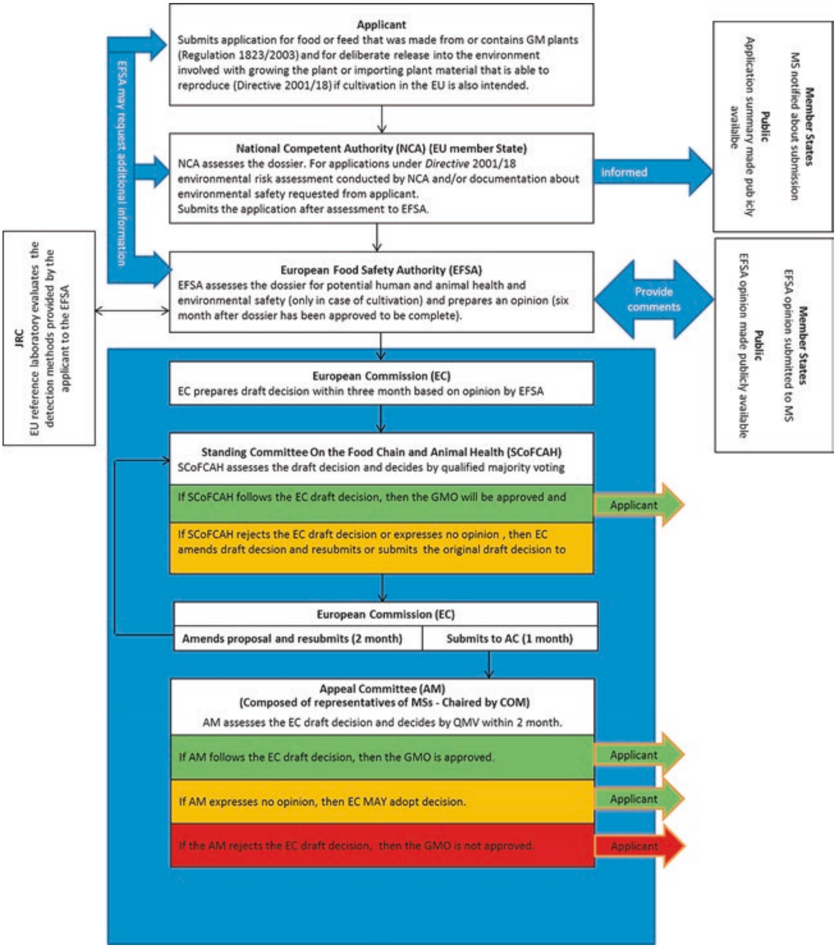

Fig. 13.1 Approval process for GMOs with a positive EFSA opinion and a positive draft decision by the EC. Note: Dark grey boxes imply rejection. (Source: Own presentation)

Despite these approvals, a number of EU countries have banned the cultivation of authorized GMOs by invoking the safeguard clause of Directive 2001/18/EC (Article 23). This clause permits Member States to ban the cultivation of an approved GMO if it poses a risk to human health or to the environment. Member States can use the safeguard clause

Table 13.1 Labelling requirements for GMOs in the EU

GM product	*Example*	*Labelling requirement*
GM plants, seeds, and food	Maize, maize seed, cotton seed, soybean sprouts, tomato	Yes
Food produced from GMOs	Maize flour, soybean oil, rape seed oil	Yes
Food additive/flavouring produced from GMOs	Highly filtered lecithin extracted from GM soybeans	Yes
GM feed	Maize	Yes
Feed produced from a GMO	Corn gluten feed, soybean meal	Yes
Feed additive produced from a GMO	Vitamin B2	Yes
Food from animals fed on GM feed	Eggs, meat, milk	No
Food produced with the help of a GM enzyme	Bakery products produced with the help of amylase	No

Source: Modified from EU Commission (2003a, b)

if they believe new scientific evidence provides support for claims of harm, but at times they have also invoked the clause for political reasons, even though GMOs that have received a positive assessment by EFSA have been shown to be substantially equivalent to their conventional counterparts (EU Commission 2010). Indeed, several EU Member States continue to ban the cultivation of MON810. The bans are often considered to be in violation of the EU approval process for GMOs as mentioned under Directive 2002/18 and Regulation 1829/2003.

13.2.1 GMOs in EU and World Agriculture

Despite the ban of MON810 in some Member States, four Member States cultivated Bt maize in 2016: the Czech Republic (75 ha), Portugal (7069 ha), Slovakia (112 ha) and Spain (129,081 ha). In total 136,337 ha were planted with GMOs in 2016 in the EU, or about 0.06% of the agricultural land. While this is a small amount, the agronomic potential for GM crops in the EU is significant (Demont et al. 2004; Wesseler et al. 2007).

The limited EU adoption is in stark contrast to the rapid adoption of GM crops in major crop-producing countries. In 2016, about 185 million hectares of GM crops were cultivated by approximately 18 million farmers in 26 countries (ISAAA 2016). GM soybeans, cotton, maize and oilseed rape represented 90%, 62%, 29% and 23% of their global area, respectively.

In the next decade, global adoption is expected to grow as the research pipeline for new events has substantially increased in a number of countries, including Brazil and China. Innovation with new products and processes is growing as the frontiers of genetic modification continue to expand. This widening gap in the adoption of GMOs between the EU and key producing countries creates uncertainties for Europe in terms of competitiveness and international trade.

13.2.2 Coexistence

The cultivation of approved GM crops within the EU is regulated by coexistence policies. Member States can design their own coexistence policies, while the European Commission provides general guidelines and has established a Coexistence Bureau, which develops crop-specific guidelines and supports Member States in their policy design. According to the European Coexistence Bureau: 'Coexistence refers to the ability of farmers to choose between the cultivation of genetically modified (GM) and non-GM crops, in compliance with the relevant legislation on labelling rules for GM organisms (GMOs), food and feed and/or purity standards.' National coexistence regulations and their impacts on the adoption of GM crops are quite diverse. While Spain uses existing regulations to govern the production of GM crops, other countries, such as Bulgaria, use coexistence regulations which effectively ban GM crop production. One might expect that additional regulations increase production costs, in particular those of GM crop production, and reduce adoption (Beckmann et al. 2010), but this may not necessarily be the case if regulations offer flexibility (Skevas et al. 2010).

An issue that has only recently attracted attention is the potential impact of environmental conservation policies on GM crop production. In many nature protection areas, such as the Natura 2000 network established as part of Council Directive 92/43/EEC of 21 May 1992, the cultivation of GM crops is banned, and in some countries a minimum distance between GM crops and a protected area is required. A dense network of such areas including the required buffers can substantially reduce the area available for GM crop production, or even result in a de facto ban on cultivation.

Banning the cultivation of GMOs via coexistence and/or environmental policies offers a legal solution to the deadlocked situation as regards the nationalization of approvals (discussed in more detail below).

13.2.3 Consumer Issues

The first generation of GMOs were herbicide-tolerant and insect-resistant crops which improved farm efficiency (Qaim 2009). As such, they have benefited consumers through lower food prices but such benefits are difficult for consumers to discern. In the absence of health and other direct benefits and in the presence of perceived risks, some consumers have maintained their cautious attitudes towards GMOs. European consumers are, generally, not opposed to biotechnology and support applications in the health sector; but its use in food production is opposed by the majority (see, e.g. Dannenberg 2009 for a meta-analysis) but not necessarily reflected in purchasing behaviour (Moses et al. 2008).

Consumer attitudes towards GMOs have been used by a number of NGOs to campaign successfully against GM food products in Europe. Similarly, the EU has implemented labelling regulations to provide consumers with the opportunity to choose between GM and non-GM food products (Venus et al. 2018). A similar development has been observed in the United States (Castellari et al. 2018). Many retailers and food manufacturers have also launched GM-free product lines and have demanded that their suppliers comply with such bans (Wesseler 2014). Negative consumer attitudes towards GMOs increase the social costs of introducing GM food products. Labelling requirements for GM food try to reduce these social costs, by informing consumers. Nevertheless, consumers often feel ill-informed about GM food and GM food policies (Moses et al. 2008). Finally, negative consumer attitudes can play an important part in regional, national and the EU Parliamentary elections and, without doubt, have influenced EU policies.

13.2.4 Trade Issues

The slow EU approval process for the importation of new GMOs prompted separate WTO complaints by Argentina, Canada and the USA in 2003. In 2006, the WTO ruled that the EU's GMO policies from 1984 to 2004 were effectively a ban on GMO products and illegal under the trade agreement. In 2009, Canada and the EU and in 2010 Argentina and the EU signed agreements ending their disputes. The EU and the US discussed the dispute in October 2008 and have allowed time for further talks although the US has retained the right to retaliate. All three countries continue to be concerned with market access (Austen and Kanter 2009) despite the fact that many more GMOs have been approved for import since 2004.[4] In any case, EU policies cause frictions in international trade and can result in temporary or sustained disruptions in feed imports, in particular, harming EU livestock farmers and consumers (Backus et al. 2009).

13.3 Future Challenges

Over the last decade, a deadlock in approving GMOs for cultivation in the EU has developed: The EFSA and the Commission, following the scientific assessment by EFSA, have supported authorization, while the standing committees and the Council of Ministers do not follow the scientific assessment (Smart et al. 2015). Even for the Bt maize event MON810 that has received a positive review and is regarded safe, the Council has been unable to reach an agreement as certain Member States have maintained their bans.

A proposal introduced by Commission President Barroso at the end of 2009 attempted to circumvent the rules of the qualified majority by shifting the authority of cultivation approval to the national level. This proposal was rejected by a number of Member States. Legal issues were invoked, including compliance with WTO rules and the Single European Market principle (EESC 2010). In the same spirit of creating regulatory flexibility, the European Union has passed an opt-out regulation that would allow Member States to ban GMO cultivation for different reasons but in line with the principle of the Single European Market (Directive (EU) 2015/412).

Trade issues can also be expected to increase in the near future, with more GM crops being approved internationally and instances of asynchronous approvals for import occurring more frequently (Yan et al. 2019). The introduction of new plant breeding technologies challenges the European Union and in particular the zero-tolerance policy.

It is very likely that certain EU imports of food and feed products will not be possible if a zero-tolerance policy for EU unauthorized GM food is maintained. The problem can be expected to increase with the development of new plant breeding technologies. This policy will at first affect food and feed traders, whose shipments will be rejected, but the effects will soon spread to the agricultural sector, as an increase in feed prices will increase production costs for livestock products, processed products, and,

[4] EU market access for GM seeds, however, remains restricted.

in the end, food prices. The increase in food and feed prices will increase the pressure for reforms. There is no doubt that reforms of the approval process will be necessary; the major question is when and the way these reforms will be implemented.

Reforming the approval process will not be an easy task considering the existing consumer and NGO resistance. One of the major challenges of the European Commission will therefore be to secure support from consumer lobby groups for the reforms needed (Shao et al. 2018; Swinnen and Vandemoortele 2010).

Further, the current EU GMO policy not only affects the agricultural production sector and consumers but also the European research sector. This policy has left the biotechnology industry with few good reasons for investments in the EU. One indicator of the deteriorating interest in research is the number of field trials, which has substantially dropped over the past years. Reducing the regulatory hurdles will do much to encourage a renewed interest in R&D investments.

The aforementioned asynchronous approval process is not singularly an EU problem. With Brazil and China increasingly active in the development of new GMOs, other countries such as Canada and the United States will have to decide how they will approve new events developed in those countries (Eriksson et al. 2019). Indeed, it is not clear at this time whether these countries will always seek deregulation of their GMOs outside their national boundaries. One can easily imagine that this could result in major frictions in international agricultural trade if countries on one hand ban imports of not-yet-approved GMOs and on the other hand use the approval process as a trade protection policy. In one way or another, the WTO will need to address the problem; a supranational institution that approves GMOs for international trade among WTO members may be a sensible solution.

13.4 Conclusions

The EU Member States are divided about the approval of GMOs for cultivation. The opt-out policy might offer a solution, but its success will depend on the implementation. An indirect ban of cultivation via coexistence regulation seems to be a feasible solution and in line with WTO policies, while direct national cultivation bans are more controversial.

Taken together, the current biotech policies in the EU threaten international competitiveness not only of its agricultural sector but of its bioeconomy as a whole. Reforms are needed that go beyond the current debate of nationalizing the approval process. This will be difficult as long as lobby groups are able to generate public resistance towards the technology. The most immediate challenge will be the pace of introduction of new GMOs in the global market place, as the pipeline continues to expand and additional countries become more engaged in their development and use. Considering the development of new GMOs in countries such as China and Brazil and the recent developments in genome editing, the implications of asynchronous approval processes on international trade may also affect other countries and could require a solution at an international level.

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CHAPTER 14

EU Biofuel Policies for Road and Rail Transportation Sector

Dušan Drabik and Thomas Venus

14.1 Introduction

Bioenergy can substitute some of non-renewable energy. This substitution can help the bioeconomy to grow by increasing the share of biomass as input for energy provision. At the EU level, a number of policies are in place to govern the provision of bioenergy. The specificities of their implementation are on the Member States, however. Because policies that work in one Member State may not simply be replicated in another, each Member State designed its own national Renewable Energy Action Plan.[1]

[1] The national action plans of EU Member States can be retrieved from URL: https://ec.europa.eu/energy/en/topics/renewable-energy/national-action-plans

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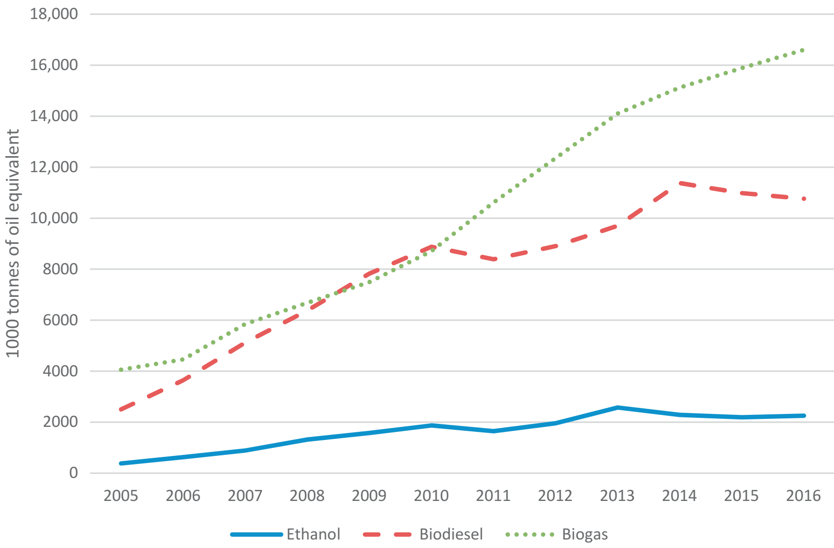

Fig. 14.1 Primary production of ethanol, biodiesel, and biogas in the EU-28. (Source: Eurostat 2017a)

The most important renewable energy in terms of primary production in the European Union is biogas (Fig. 14.1). The top five EU producers of biogas in 2016 were Germany, the United Kingdom, Italy, France, and the Czech Republic, with Germany accounting for almost half of the EU production. Because the focus of this chapter is biofuel policies related to terrestrial transportation, we do not discuss biogas in detail. We do note, however, that the electricity generated by biogas plants can be an important source of renewable energy for vehicles in the future, thus contributing to the overall target for the share of renewable energy in total energy used by the EU transportation sector.

Figure 14.1 shows that the production of biodiesel in the European Union significantly exceeds ethanol, and the gap has been steadily increasing. In 2016, for example, five times more biodiesel (in energy equivalent) was produced in the European Union compared to ethanol. The main reason for the dominance of biodiesel in the European Union is that EU transport uses a significantly higher amount of diesel compared to gasoline. In 2015, this ratio exceeded 2.5 (Eurostat 2019). The historical preference for diesel over gasoline is due partly to significantly lower fuel tax on diesel compared to gasoline. This pattern might change, however, with the recent Volkswagen's emissions scandal ("dieselgate") and the tendency in many large European cities to discourage the use of diesel cars.

14.2 Historical Overview of the EU Biofuel Policies

First biofuel policies in the European Union were enacted in mid-2000. They have been revised several times since then, and their complexity has increased. The complexity has three main dimensions. First, the biofuels production and consumption were regulated directly by the Renewable Energy Directive (RED) and indirectly by the Fuel Quality Directive (FQD) and other regulations (European Commission 2009a, b). Second, the European Commission, the Parliament, and the Council form a triangle in which the biofuel legislation is shaped after significant comments from numerous pro- and anti-biofuel lobby groups (e.g., the European Biodiesel Board; ePURE, representing the European renewable ethanol industry; Copa-Cogeca, representing European farmers and their cooperatives; Transport and Environment, Greenpeace, or Oxfam, which are against first-generation biofuels). Third, although the EU directives state general objectives and principles to be followed at the EU level, the actual implementation of the biofuel legislation differs across the 28 EU Member States.

Large-scale biofuels production in the European Union started only after the EU Parliament and the Council passed the Directive 2003/30 on the promotion of the use of biofuels for transport in May 2003. The objectives of this Directive were to replace diesel and gasoline in the transportation sector to contribute to (i) meeting the EU climate change commitments, (ii) achieving environmentally friendly security of energy supply, and (iii) promoting renewable energy sources. The Directive 2003/30 set an indicative target of 2 percent by 2005 for each Member State for the share of energy coming from biofuels and other renewable fuels in the total energy of fuels used in the transportation sector; the Directive also stipulated a target of 5.75 percent by 2010.

It is important to notice that the targets in the Directive 2003/30 were (and to this date are) expressed as energy shares, as opposed to volumetric shares used in other countries (e.g., the United States or Brazil). Most importantly, however, the targets were not binding. Article 4 of the Directive is very informative in this respect: "Where appropriate, Member

States shall report on any exceptional conditions in the supply of crude oil or oil products that have affected the marketing of biofuels and other renewable fuels." This implies that as long as a Member State was able to explain why a lower energy share of biofuels had been achieved, no consequences followed. To illustrate the non-binding character of the target, note that the share of biofuels in total transportation fuels in the European Union reached 1.65 percent in 2006 and 4.05 percent in 2010 (Flach et al. 2010), and that 22 out of 27 EU Member States failed to achieve their target in 2010 (European Commission 2013).

Another big milestone in the development of the EU biofuel policies was the year 2009 when the RED and the FQD became EU laws. The RED required (among other things) that by 2020 at least 10 percent of the total energy consumed in the EU transportation sector comes from renewable sources. Although it is expected that the lion's share of the target will be met by biofuels, other renewable sources of energy (such as renewable electricity) are also counted. Unlike Directive 2003/30, the RED of 2009 explicitly uses the term "mandatory target," albeit it does not specify any enforcement mechanism (European Commission 2009a).

Although the RED stipulates an overall blend target (i.e., ethanol and biodiesel combined, bar a small share of other renewable energy sources), each Member State specifies its own trajectory to achieve the overall 10 percent goal by 2020 and can set ethanol- and biodiesel-specific sub-mandates.

Another essential piece of legislation affecting the production and consumption of biofuels in the European Union is the Fuel Quality Directive of 2009. The FQD addresses the reduction in life cycle greenhouse gas emissions of transportation fuels by 6 percent by the year 2020 as compared to 2010. Concerning biofuels, it specifies criteria that need to be met for biofuels to count toward the mandatory consumption targets.

Perhaps the most important of these criteria is a requirement that biofuels should save at least 35 percent of greenhouse gas emissions compared to fossil fuels they are to replace. This threshold increased to 50 percent on January 1, 2017. Moreover, from January 1, 2018, the saving to be achieved is at least 60 percent for biofuels produced in plants that started production on or after January 1, 2017. It is important to note, however, that the specified greenhouse gas emissions savings above do not take into account carbon emissions from land-use change—a topic that gave rise to a heated debate on biofuels in the European Union after 2012.

Moreover, the FQD allows imports of biofuels or biofuel feedstocks only from countries that have ratified important international conventions such as the Convention on International Trade in Endangered species of Wild Fauna and Flora, the Cartagena Protocol on Biodiversity, or conventions of the International Labor Organization.

The food commodity price booms of 2008 and 2011 and the intensifying "food versus fuel debate" were an impetus for the reform of the EU biofuel policy (Euractiv 2012). In October 2012, the European Commission proposed to reform the EU biofuel policy. The Commission assigned indirect land-use change (ILUC) factors to different biofuels but failed to account them for the climate performance of biofuels (Ahlgren and Di Lucia 2014). Thus, the ILUC factors are used only for reporting purposes. In recognition of ILUC effects of first-generation biofuels, the Commission proposed to cap the use of these biofuels to five energy percent (European Commission 2012). Environmentalists, such as Transport and Environment—a Brussels-based environmental organization—were not happy with this proposal as it did not mean complete abolition of biofuels produced from food crops (Euractiv 2014; EUobserver 2016).

The reshaping of the EU biofuel policy continued in July 2013 when the European Parliament's Environmental Committee voted for the inclusion of the ILUC factors into the RED and for capping all first-generation biofuels at 5.5 percent. Later in September 2013, the European Parliament voted to cap the first-generation biofuels at 6 percent and placed a 2.5-percent minimum requirement to be achieved by 2020 for advanced biofuels from, for example, seaweed or certain types of waste (European Parliament 2013). In June 2014, the Council of energy ministers decided to cap the use of land-based biofuels to 7 percent and to put a 0.5-percent floor for advanced biofuels.[2] After long discussions, the European Parliament finally approved the Council's proposal on April 14, 2015.

The EU producers of first-generation biofuels did not agree with the 7-percent cap imposed on crop-based biofuels, arguing that commercial production of second-generation biofuels cannot be expected by 2020 and first-generation biofuels produced from domestic feedstock are the way to meet the targets and boost rural development (Euractiv 2017). The negative response of the first-generation is not surprising given that the 7-percent cap effectively reduced their potential production, which had likely been taken into consideration when making the initial investment. Moreover,

[2] http://gr2014.eu/sites/default/files/indirect%20land-use%20change_1.pdf

the absence of any biofuels-specific targets beyond 2020 in the original RED contributed to the regulatory uncertainty in the sector, thus limiting the number and volume of new investments (EUobserver 2016). It was not until the revised RED (RED II) was adopted at the end of 2018 that the biofuels targets were extended by ten years.

14.3 Renewable Energy: Recast to 2030 (RED II)

At the end of November 2016, the European Commission published a proposal for a revised Renewable Energy Directive. The agreement among the concerned EU institutions on the revised version was reached in June 2018, and the text was finally approved by the EU Parliament in November 2018.

The RED II sets the overall EU renewable energy target for gross final energy consumption to 32 percent by 2030. Relevant to our chapter is the provision that the Member States must require fuel suppliers to supply a minimum of 14 percent of the energy consumed in road and rail transport by 2030 as renewable energy. Each Member State can specify a trajectory to reach these targets in a national plan.

To be counted toward the overall 14 percent target, biofuels used in transport must meet certain sustainability and GHG emission criteria. Some of them are the same as in the original RED, others were added (e.g., sustainability for forestry feedstocks and GHG criteria for solid and gaseous biomass fuels).

Default GHG emission values and calculation rules are provided in Annex V and Annex VI of the RED II. The Commission can revise and update the default values of GHG emissions when technological developments make it necessary. Economic operators have the option to either use default GHG intensity values provided in RED II (Table 14.1) or to calculate actual values for their pathway.

Table 14.1 Greenhouse gas savings thresholds in RED II

Plant operation start date	*Transport biofuels*	*Transport renewable fuels of non-biological origin*
Before October 2015	50%	–
After October 2015	60%	–
After January 2021	65%	70%
After January 2026	65%	70%

Source: Renewable energy—recast to 2030

Biofuels, bioliquids, and biomass fuels from agricultural biomass must not be produced from raw materials originating from high biodiversity land (e.g., primary forests or highly biodiverse grasslands), high carbon stock land, and land that was peatland in January 2008.

Table 14.2 summarizes the key topics and related targets of RED II relevant to transport. RED II specifies a sub-target for advanced biofuels produced from selected feedstocks (e.g., algae, bio-wastes, straw). These fuels must be supplied at a minimum of 0.2 percent of transport energy by 2022, 1 percent by 2025, and 3.5 percent by 2030. Advanced biofuels will be double-counted toward the sub- and overall mandates (i.e., the amount in energy terms is counted twice toward the targeted amount). Moreover, biofuels produced from used cooking oil (UCO) and animal fats will be capped at 1.7 percent in 2030 and will be double-counted.

The maximum share of first-generation biofuels will be frozen at 2020 consumption levels plus an additional 1 percent, with a maximum cap of 7 percent of road and rail transport fuel in each Member State. If a Member State achieves the total share of conventional biofuels under 1 percent by

Table 14.2 Summary of key topics and related targets of RED II relevant to transport

RED II topic relevant to transport	*RED II targets*
The overall target for renewable energy in road and rail transport	14 percent by 2030
Advanced biofuels from selected feedstocks (algae, bio-wastes, straw)	Sub-targets as a share of transport energy: 0.2 percent in 2022 1.0 percent in 2025 3.5 percent by 2030
Advanced biofuels	Double-counted
Biofuels from used cooking oil and animal fats	Cap at 1.7 percent by 2030 Double-counted
Maximum share of conventional biofuels	2020-consumption level plus 1 percent Cap of 7 percent of road and rail transport fuel
Fuels from high ILUC-risk feedstocks	Cap at 2019 consumption level Complete phase-out until 2013
Renewable electricity in road transport	Counted four times toward the target
Renewable electricity in rail transport	Counted 1.5 times toward the target
Fuels in aviation and maritime	Option but no obligation to contribute to overall renewable energy target Counted 1.2 times for non-food feedstocks

Source: European Commission (2018a)

2020, the cap for that Member State will still be 2 percent in 2030. If a Member State imposes the cap on conventional food and feed crops of less than 7 percent, the country may reduce the transport target by the same amount, that is, 14 percent less the difference between the national cap and 7 percent.

Fuels produced from feedstocks with high ILUC-risk will be limited by a more restrictive cap at the 2019 consumption level, and will then be phased out to 0 percent by 2030.

Renewable electricity will count four times its energy content toward the overall 14 percent target when used in road vehicles and 1.5 times when used in rail transport.

Fuels used in the aviation and maritime sectors can opt in to contribute to the 14 percent transport target but are not subject to an obligation. The contribution of non-food renewable fuels supplied to these sectors will count 1.2 times their energy content.

RED II provides some flexibility to Member States concerning its implementation. For example, Member States can choose the ways to support renewables in transport (e.g., volume or energy mandates or GHG emission savings targets); set different limits for each biofuel category (e.g., a lower cap on oil crops than other types of food and feed crops); or set a different cap level for biofuels produced from selected feedstocks if justified by the local availability.

14.4 Differences in Biofuel Targets Among the EU Member States

Both the original and revised RED stipulate the biofuel targets as a percentage of the final energy consumption of the EU road and rails transportation sector. The differing energy densities of individual fuels have clear implications for the distance traveled by a fuel type (whether blended with biofuel or not). It is therefore important to convert all prices and quantities into a common energy-based unit to achieve an internal consistency of a model before assessing the market and environmental effect of the EU biofuel policies.

One of the flexibilities of RED II is that the EU Member States do not need to specify the biofuel targets only in energy terms. Table 14.3 documents that, for example, Belgium, Bulgaria, and the Czech Republic decided to pursue volumetric targets. Recall that the targets specified in the RED are minimum targets and fuel blenders in each Member State are

Table 14.3 Minimum biofuel use mandates in place in 2019 by EU Member State

EU Member State	*Unit (%)*	*Overall %*	*Biodiesel*	*Ethanol*	*Second generation*	*%GHG savings*[a]	*Cap on crop-based biofuel*	*Double-counting*[c]
Austria	Ener	5.75	6.3	3.4	–	–	–	Yes
Belgium	Vol	–	6.0	8.5	–	–	–	Yes
Bulgaria	Vol	–	6.0	9.0	–	–	–	No
Croatia	Ener	7.85	6.61	0.98	–	–	–	Yes
Czech Republic	Vol	–	6.0	4.1	–	3.5	–	No
Denmark	Ener	5.75	–	–	–	–	–	No
Finland	Ener	18.0	–	–	–	–	–	No
France	Ener	–	7.7	7.5	–	–	–	Up to 0.35% biodiesel and 0.3% bioethanol
Germany	Ener	–	–	–	–	4.0	6.5	No
Greece	Ener	7.0	–	–	–	–	–	No
Hungary	Ener	–	4.9	4.9	–	–	–	Yes
Ireland	Ener	11.1	–	–	–	–	–	Yes
Italy	Ener	8.0	–	–	0.6	–	–	Yes
The Netherlands	Ener	9.25	–	–	–	–	–	Yes
Poland	Ener	8.0	–	–	–	–	–	Yes
Portugal	Ener	10	–	–	–	–	–	Yes
Romania	Ener	10	6.5	8.0	0.1	–	–	Yes
Slovenia	Ener	7.5	–	–	–	–	–	Yes
Spain	Ener	7.0	–	–	–	–	–	Proposed after issuing detailed guidelines
Sweden[b]	Ener	–	–	–	–	–	–	–
United Kingdom	Ener	9.18	–	–	0.109	–	–	Yes

Source: USDA (2018)

Notes:
[a]Percentage of GHG savings of total fuel use compared to the hypothetic GHG emissions had all the fuel been of fossil origin
[b]In Sweden, biofuels policy is based on tax exemptions
[c]Double-counting is in some Member States restricted to specific types (e.g., cellulosic and waste biofuels, used cooking oil) or with specific approval

free to go beyond them. In practice, this possibility is not very likely, however, as biofuels are generally more expensive than fossil fuels (especially when converted in energy terms), which increases the marginal cost of the final fuel blend. Fuel blenders are therefore likely to blend as little biofuels as possible to minimize the price increase for consumers not to lose their market share.

Table 14.3 also reveals that some Member States provide more flexibility to blenders than others. Denmark, for example, requires blenders to blend 5.75 percent of biofuels in the final road and trail transportation energy consumption in 2019 but leaves it up to the blenders how they do it. On the contrary, France and other Member States require minimum percentages both for ethanol and for biodiesel. Austria represents the third group of countries, which not only specify minimum sub-targets but on top of that also an overall minimum target. Clearly, only one target can be binding in that situation.

Finally, Germany follows a completely different approach. Since 2015, its mandate has been based on a reduction of CO_2-equivalent (CO_2e) GHG emissions in comparison to the hypothetical GHG emissions had all fuel been of fossil origin. The German federal law of emission control sets the mandate at 3.5 percent from 2015, 4 percent from 2017, and 6 percent from 2020. The GHG emission savings are calculated based on the methodology specified in the RED. For example, default GHG emission savings from rapeseed biodiesel produced in the European Union are 47 percent without considering the net carbon emissions from land-use change. The emissions for fossil-based fuels are computed by multiplying a base value (83.8 g CO_2e per MJ) by the amount of fuel in energy terms. Instead of a base value, the emissions calculation of biofuels is based on calculated total GHG emissions of the production, supply, and use of biofuels. The total GHG emissions, E, are calculated as

$$E = e_{ec} + e_l + e_p + e_{td} + e_u + e_{sca} + e_{ccs} + e_{ccr}.$$

All emissions are based on standardized values for each biomass product. Table 14.4 describes the emission variables and provides examples of standardized values in gram CO_2e per MJ for biodiesel from rapeseed. Biodiesel from used cooking oil, for example, has zero emissions from resource cultivation and 13 g CO_2e per MJ for processing.

Table 14.4 Separate biofuels emissions for calculating the total GHG emissions of biofuels

Emission	*Description*	*Example: default values for rapeseed biodiesel in g CO_{2e} per MJ*
e_{ec}	Emission from extraction or cultivation of raw materials	32.0
e_l	Annualized emissions from carbon stock changes caused by land-use change[a]	
e_p	Emissions from processing[b]	16.3
e_{td}	Emissions from transport and distribution	1.8
e_u	Emissions from the fuel in use[c]	0
e_{sca}	Emission saving from soil carbon accumulation via improved agricultural management[d]	
e_{ccs}	Emission saving from CO_2 capture and geological storage[d]	
e_{ccr}	Emission saving from CO_2 capture and replacement[d]	

Source: European Commission (2018a)

Notes:
[a]See text above table for explanation
[b]Includes emissions from processing itself, from waste leakages, and from the production of chemicals or products used in processing
[c]Emission from using the fluid fuel are set to zero
[d]Commission guidelines, which shall be reviewed by the end of 2020, shall serve as basis for the calculation of land carbon stocks

The European Commission published guidelines (2010/335/EU) for the calculation of land carbon stocks to compute the carbon stock changes caused by land-use change, e_l; the calculation depends on the carbon stock of the relevant area, plant productivity (measured in energy terms of the fluid biomass per area unit and year), and a premium if the biomass is produced on an area that is certified to satisfy specific environmental sustainability criteria.

In Germany, there is also a cap on first-generation biofuels as well as a penalty for failing to meet the mandate. In case the energetic percentage of first-generation biofuels exceeds 6.5 percent, the base value of fuels will be used for the emission calculation. Each year, firms have to report the introduced amounts of fossil-based and bio-based fuels as well as the corresponding GHG emissions in CO_2e.

The different ways of stipulating the biofuel targets have implications for the comparison of the targets among the EU Member States. It is because, for a given volumetric percentage, the energy percentage is always lower. Consider, for example, the 8.5 percent volumetric target for ethanol in Belgium. Converted into its energy equivalent, it is only 6.1 percent. Belgium, therefore, requires a smaller share of ethanol in the gasoline blend than France, although it might not immediately be obvious from Table 14.3.

When in 2012 the ethanol blending requirement in the United States exceeded the 10 percent threshold in volumetric terms, market experts coined the term "blend wall." It described a situation when most of US car fleet driving on gasoline fuel blends was not able to tank up a blend with more than 10 percent of ethanol in it as doing otherwise could violate the conditions specified in the vehicle's warranty (Dineen 2007; Denicoff 2007). As a result, some ethanol had to be exported and was even sold at a discount to increase the ethanol sales to the owners of flexible cars (i.e., vehicle able to run on ethanol blends up to 85 percent).

As the US example suggests and Table 14.3 indicates, there might be a lesson also learned for some EU Member States. More specifically, the 7.5 and 8 energy percent target for ethanol in France and Romania translate to 10.4 and 11 volumetric percent. If the composition of the fleet of vehicles in those countries is such that most of them cannot tank more than 10 volumetric percent of ethanol (and if a sufficient number of flex vehicles are not available), then the blend wall could be an issue in those countries.

The biofuel shares in Table 14.3 represent targets to be achieved in 2019. However, to see if and to what extent EU Member States met the targets in the past, we need to look back. Figure 14.2 offers such hindsight to 2017. The height of each bar represents the total share of renewable energy (i.e., biofuels and renewable electricity) in road and rail transportation sector (eligible biofuels and renewable electricity have already been counted double/quadruple as specified in RED).

The figure shows that Sweden and Finland exceeded the 10 percent target already in 2017 (with a significant contribution of renewable electricity). Austria and France are close, but other Member States were short of the 10 percent target in 2017. Figure 14.2 indicates that most Member States could have difficulty achieving 10 percent of renewable energy in the terrestrial transportation sector in 2020.

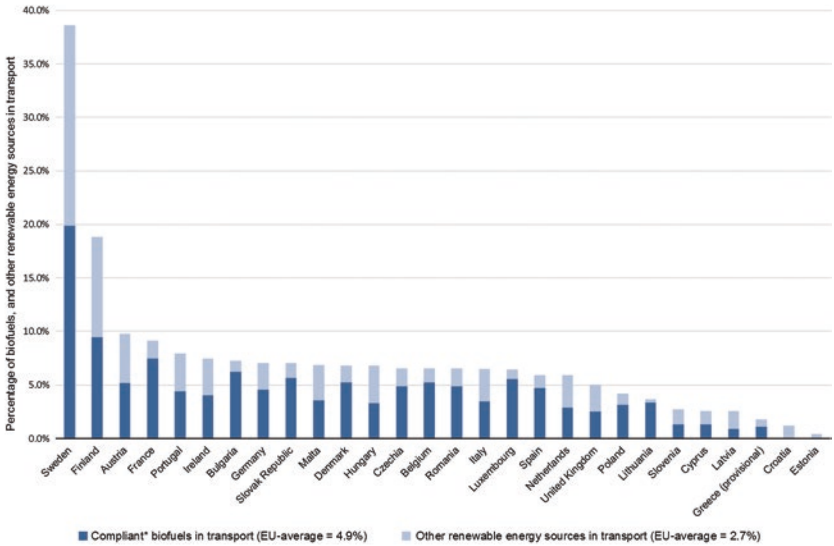

Fig. 14.2 Biofuels and other renewable energy sources as a share of gross final energy consumption in transport in 2017. Notes: Considers only those biofuels compliant with Articles 17 and 18 of Directive 2009/28/EC on the sustainability criteria for biofuels and verification of compliance. Other renewable energy sources include renewable energies in road and rail transport for which all calculation provisions set out in Directive 2009/28/EC are applied. (Source: Eurostat 2017b)

14.5 Double-Counting

Both the original and revised RED define the requirements for first- and second-generation biofuels in the European Union. While the consumption of the former is capped, the use of second-generation biofuels is encouraged by stipulating minimum targets and double-counting toward the overall mandate. This uneven treatment of both forms of biofuels leads to some unexpected effects.

The Directives provides an incentive to the Member States to use more advanced biofuels by counting the consumed energy of second-generation biofuels twice as much toward the mandate as the energy derived from first-generation biofuels. The European Commission does not provide a uniform measure to implement the double-counting; instead, Member States can choose ways of implementing it (Pelkmans et al. 2014). The two most used methods are substitution obligations and tax reductions.

Substitution obligations require a certain share of biofuels in transport fuels, with some biofuels counted twice to reach this target. Tax reductions mean reduced taxes for biofuels over fossil fuels with differentiated taxes (in some cases) for biofuels eligible for double-counting. Of the 21 Member States listed in Table 14.3, 14 have at least to some extent implanted double-counting in 2019. Several Member States (e.g., Austria) specify which products are eligible for double-counting (e.g., waste materials and residuals products from agriculture and forestry), others (e.g., Belgium) allow double-counting only with approval. France allows double counting only up to a defined share, which is 0.3 percent for ethanol and 0.35 percent for biodiesel.

In the case where there is no separate mandate for advanced biofuels, double-counting allows biorefineries to use a lower amount of ethanol to satisfy the required overall minimum mandate. Hence, the demanded ethanol quantity is supplied by the produced amount of first-generation and some hypothetical amount of second-generation biofuels, which is double the amount of what is supplied in physical terms. Hence, double-counting reduces the requirement for complying with the mandate and hence, it reduces the equilibrium quantity of ethanol and the equilibrium price.

Boutesteijn et al. (2017) develop a tractable partial equilibrium model to study the interactions between the EU biofuel policies (mandate and double-counting of second-generation biofuels) and first- and second-generation biodiesel production (biodiesel is a dominant biofuel in the European Union). They find that increasing the overall biodiesel mandate results in a higher share of first-generation biodiesel in total diesel fuel, but leads to a lower share of second-generation biodiesel. It is because first-generation biodiesel is less expensive than second-generation biodiesel.

Another key result of the Boutesteijn et al. study is that the double-counting policy supports the production of second-generation biodiesel at the expense of first-generation biodiesel and increases the consumption of fossil diesel as compared to treating first-and second-generation biodiesel equally. If both types of biodiesel were treated equally (i.e., no double-counting), then their shares in the final fuel blend in equilibrium would be determined by a point where their marginal costs of production would be the same and equal to the market price of biodiesel. The double-counting policy discriminates first-generation biodiesel vis-à-vis second-generation biodiesel and drives a wedge between their market prices. It also introduces “phantom” (i.e., not real but existing only on the paper) biodiesel to the system, and this gap is filled up by fossil-based diesel.

14.6 Crop-Based Biofuels and Protein Supply in the European Union

Protein is an essential element of the diets of agricultural animals and the demand for it in the EU agriculture is growing. Moreover, the European Union depends to a large extent on imports of protein from overseas, mainly soybeans and soybean meals (European Commission 2018b). Domestic production of biofuels increases the supply of protein, thus reducing the dependence on imports (Warwick et al. 2009). To explain how that happens, we take maize as an example.

Yellow maize contains protein and starch, which is storage of energy. If animals eat maize directly, the energy from it converts into fat, which farmers try to avoid and want to achieve growth of muscles. Biorefineries split the energy and protein and produce two separate products, each of which is valued by different markets. The primary product is, of course, ethanol. Ethanol constitutes approximately one-third of the corn feedstock. Currently, the main co-product of ethanol production is Dried Distiller's Grains with Solubles (DDGS) with a high protein content of around 30 percent. The DDGS also represents a third of the original corn, and the rest is water, gases, and waste.

Although corn ethanol producers in the European Union claim their production is important in reducing the dependency on protein imports, the official data of the European Commission show that the production of rapeseed meal from domestic rapeseed was three times higher in 2016–2017 than the production of DDGS (European Commission 2017). In terms of feed use, soybean meal is the most demanded with 29.4 million tons in 2016–2017, followed by rapeseed meal with 13.2 million tons. The total consumption of DDGS in the European Union in 2016–2017 amounted to 4.5 million tons. Part of the reason for the preference for soybean meals is its high protein concentration (up to 45 percent) compared to 33 percent for rapeseed and 27 percent for corn DDGS (European Commission 2018c). Farmers value the co-products of biofuels production (i.e., oilseed meals a DDGS) because they contain a lot of protein. Let us continue with our example of DDGS to see how the presence of a valuable co-product affects the price of the original feedstock (corn). The logic also applies to rapeseed and soybean.

Because the DDGS has a positive market value, the corn price is higher compared to if ethanol were not produced at all. Intuitively, there are two ways through which biofuels increased the corn and oilseed prices. First, the biofuel policies created an additional demand, which for a given supply of feedstock necessarily means higher prices. Second, the ethanol (and biodiesel) production have established a direct price link between ethanol and corn prices, in which the presence of the co-product plays an important role. The formula developed by de Gorter and Just (2009) for corn and ethanol prices indicates that because the feed market values DDGS approximately as much as yellow corn, the price of yellow corn is approximately 44 percent higher than in the absence of DDGS, everything else held constant.

With the advances in technology, the biorefineries are developing new co-products (e.g., food additives with high nutritional value) for which there could potentially be demand in the future (de Jong et al. 2010). The DDGS example suggests that the higher the market price of a new co-product, the higher the price that biofuel producers will be willing to pay for the feedstock. It is, therefore, possible that if the market value of a co-product increases relative to the biofuel, the biofuel will become a secondary product. If and when that happens, it will depend on the developments in the biotechnology and bioeconomy in general.

14.7 Controversies Over Imports of Biodiesel and Biodiesel Feedstocks to the European Union

Europe, India, and China are the biggest consumers of palm oil. In 2017, about half of the palm oil used in Europe was for biofuels (Copenhagen Economics 2018). Due to environmental concerns over deforestation of rainforests, in January 2018 the European Parliament voted to ban the use of palm oil for the production of biofuels in the European Union by 2020. A ban would most strongly affect Indonesia and Malaysia, which supply about 85 percent of all palm oil and export around 10 to 15 percent (around 4 percent of the global palm oil production) to the European Union (Morris and Lui 2018). Article 26 in the RED II specifies a phase-out of the highest-emitting biofuels; the law states that harmful biofuels cannot exceed each Member State's 2019 consumption levels and should start gradually decreasing from the end of 2023 to reaching 0 percent in 2030 (European Commission 2018a).

After the commitments made by the EU Parliament and governments, the EU Commission now has to publish a delegated act establishing science-based criteria of limiting the use of biofuel crops linked to deforestation. The European Parliament and the EU Member States can object to these rules before completion. In the meantime, the EU has stressed that it does not intend to phase out palm oil-based biofuels by 2030 entirely (European External Action Service 2018).

The second controversy relates to the subsidized exports of biodiesel from Argentina (and previously from the United States (de Gorter et al. 2011)). Argentina has a system of differential export tariffs whose objective is to process feedstock domestically and export products with higher value added. Argentina has therefore been taxing exports of biodiesel less than exports of soybeans. As the growing amounts of biodiesel originating from Argentina started entering the EU market, the EU biodiesel producers became concerned and filed a request with the EU Commission to investigate the Argentinian imports. After a period of investigation, the EU Commission adopted anti-subsidy duties for imports of biodiesel from Argentina in January 2019 (European Biodiesel Board 2019).

The third controversy is about how a price premium due to double-counting of second-generation biodiesel led to imports of used cooking oil (UCO) from abroad and even mixing it with regular vegetable oil to be able to claim the premium. Paragraph 63 of the special report of the European Court of Auditors documents it clearly (European Court of Auditors 2016) "it cannot be excluded that data on double counted biofuels might include quantities of biodiesel certified as produced from UCO, whilst, in reality, the feedstock may have been from virgin oil or fraudulently denatured virgin oil."

14.8 Conclusions

Although the history of EU biofuel policies is not long—probably only a decade and a half—it has seen several changes in course already. For example, while initially food crops were seen as a promising candidate for a renewable biofuel feedstock, later developments at the global scale got EU policymakers thinking about the possible adverse effects of biofuel policies on food commodity prices and indirect land-use changes. These considerations resulted in capping first-generation biofuels and recently promoting second-generation (advanced) biofuels instead.

The EU biofuel policies are associated with significant uncertainties at several levels. Biofuel producers have seen considerable changes in the direction of the policy and preference by the EU Commission for biofuel feedstocks in the middle of their operation when modifications of the production are either very costly or not possible at all. Naturally, these changes affect the return on investment of the incumbent producers and discourage newcomers from entering the industry. Another source of uncertainty is the absence of an enforcement mechanism to achieve the targets by 2020. While the United States uses the Renewable Identification Number system to achieve that, there is no counterpart to it in the European Union.

The revised Renewable Energy Directive (RED II) seems to emphasize second-generation biofuels. However, given that their current production at commercial scale is almost non-existent, it remains to be seen how much progress will be achieved through the preferential treatment of second-generation biofuels vis-à-vis first generation (i.e., double-counting and minimum targets). This all will happen in the environment of decreasing demand for fossil fuels (due to better engine efficiency) and increasing share of hybrid and electric cars.

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CHAPTER 15

EU Bio-Based Economy Strategy

Maximilian Kardung and Justus Wesseler

15.1 Introduction

The bio-based economy is the counterpart to the fossil-based economy that has shaped society in the past decades. The growth of the bio-based economy reflects the desire to go through a paradigm shift towards an economy that meets the Sustainable Development Goals (Morone 2018). It contributes to the challenge of ensuring food and nutrition security, managing natural resources sustainably, reducing dependence on non-renewable resources, mitigating climate change, and strengthening economic competitiveness (European Commission 2018).

Unlike the closely connected but broader concept of bioeconomy, bio-based economy focuses on the processing of biomass into bio-based products. Non-food and feed products that are produced entirely or partially from biomass provide an alternative to products based on non-renewable fossil resources. A clear distinction between bio-based economy and bioeconomy is presented in Chapter 15.2.

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15.1.1 Historical Development

The first appearance of the bioeconomy, in a similar way as it is used now, can be traced backed to the White Paper on Growth, Competitiveness and Employment (European Commission 1993), which demanded knowledge-based investments and an increased role of biotechnology. At that time, bioeconomy was introduced to touch upon the economic impact of advancements in the field of biology (Birner 2018). The next big step followed in 2005, when the European Commission organized a conference named 'New Perspectives on the Knowledge-Based Bio-Economy' to promote the concept within the EU. In total, 400 stakeholders from 40 countries attended the conference, which indicates that at this time it was already a global phenomenon (European Commission 2005). The conference emphasized the need for international collaboration as well as the combination of technologies from different fields.

The next milestone in the development was the Cologne Paper in 2007, which introduced the bioeconomy concept to a wider audience.[1] The Cologne Paper resulted from a high-level workshop with experts from research organizations and companies covering different sectors. It was a deliberate effort to promote the concept in Europe (Birner 2018). The Cologne Paper emphasized two different dimensions of the bioeconomy (European Commission 2007). First is the role of biotechnology innovations to achieve sustainable economic growth, a high level of employment, energy supply and to maintain the standard of living. Second is the use of biomass as an input to a range of products such as biofuels, biopolymers, and chemicals. The Cologne Paper already acknowledged the need for a government stimulus for an extended time because it was not yet in sight that bio-based products would be competitive on the market (European Commission 2007). Moreover, the design of the biorefinery, which in its essence is comparable to a petroleum refinery, was already mentioned with a focus on producing zero waste. The importance of inter-sectoral relations and interactions was recognized and prohibiting negative impacts on the environment considered a necessity. The further development of strategic

[1] Interestingly, no author has been mentioned. According to the publication available at https://dechema.de/en/2007+En+Route+to+the+Knowledge_Based+Bio_Economy+_+Cologne_Paper-p-125092.html it is a result out of workshops: 'Renowned experts from academia and industry were invited to contribute to an expert paper which outlines the perspectives of a KBBE within the next 20 years. The resulting so-called 'Cologne Paper' was published on 30 May 2007 in Cologne on behalf of the German Presidency of the Council of the European Union'.

policy documents by the EU and its member states can be partially credited to OECD's The Bioeconomy to 2030: Designing a Policy Agenda (OECD 2009). Here, the focus lies on biotechnological applications to primary production, health, and industry.

In succession, numerous bioeconomy strategies on a regional and national level were developed. Up to 2018, 49 countries have developed strategies related to the development of the bioeconomy (Bioökonomierat 2018). A majority of them were made in Europe, but also, for example, in the USA, South Africa, and Thailand. In countries without a designated bioeconomy strategy, many governments addressed the topic in related strategies. The more recent strategies since 2015 by Finland, France, Italy, Latvia, Norway, Spain, and the UK, highlight the synergies between bioeconomy and circular economy. The popularity of the concept is astonishing as it has spread globally, and official bioeconomy strategies are created and published outside of Europe as well. In the academic world, the concept has been trending in many different disciplines (Bugge et al. 2016).

Under the leadership of the European Commission, several factors were crucial for the emerging of the bioeconomy. At that time and until today, there is an urgent need for finding an alternative to the use of fossil resources as the main fuel for the economy. Biological resources are expected to offer the opportunity to fuel the economy in a sustainable manner with the use of innovative biotechnology methods and knowledge gained from other life sciences. The bioeconomy supposedly offers solutions to global issues that are essential for human well-being. Climate change is a more and more pressing issue, which the bioeconomy is expected to help to tackle by offering alternatives to fossil fuels. The sustainable use of natural resources is also an objective that the bioeconomy is expected to fulfil. Another more recent issue is the development of rural areas in many regions in the world. The bioeconomy could lead to higher and better employment in rural areas. The importance of the bioeconomy is further underlined by the challenge of meeting the COP 21 Paris Agreement and the Sustainable Development Goals 2030 (European Commission 2017).

Hence, it is clear that EU policymakers have placed a high priority on a sustainable and circular bioeconomy with the aim to reduce the use of petrochemicals, to mitigate climate change, to reduce the dependency on imports of natural resources, and to promote local economies. This stress on the bioeconomy is evident from a multitude of EU policy initiatives and research programmes, including the recent European Bio-Based Industries Joint Undertaking (Wesseler and von Braun 2017).

15.1.2 EU Bio-Based Economy Strategy

The recent EC Bioeconomy Strategy update (European Commission 2018) confirms that the bioeconomy is high on the political agenda. The update revalidates the five objectives of the 2012 Bioeconomy Strategy that align with the following societal challenges:

1. Ensuring food and nutrition security
2. Managing natural resources sustainably
3. Reducing dependence on non-renewable, unsustainable resources whether sourced domestically or from abroad
4. Mitigating and adapting to climate change
5. Strengthening European competitiveness and creating jobs

While the objectives remain the same compared to the 2012 version, the 2018 Bioeconomy Strategy is now being accompanied by three main action areas:

1. Strengthen and scale-up the bio-based sectors, unlock investments, and markets
2. Deploy local bioeconomies rapidly across Europe
3. Understand the ecological boundaries of the bioeconomy

Furthermore, The Joint Research Centre (JRC), European Commission's science and knowledge service, has set up the Knowledge Centre for Bioeconomy.[2] This serves as a hub for data, glossary items, publications, visualizations, events, and news related to the bioeconomy.

15.1.3 Monitoring and Measuring and Related Challenges

Statistics cover traditional sectors and products of the bioeconomy in Europe relatively well, even though there is room for improvement for the forest sector as well (Kallio and Solberg 2018; Buongiorno 2018). However, there is a lack of information and statistics for its emerging innovative bio-based industries, such as chemistry and materials sectors that process biomass into bio-based intermediate and end products. This

[2] https://ec.europa.eu/knowledge4policy/bioeconomy_en

includes (i) a lack of a comprehensive database with statistics for industrial uses of biomass—so far data among different databases are fragmented and non-comparable; (ii) a missing transparent methodology for data collection—so far bio-based data collection mostly relies on industry surveys and estimations of experts; and (iii) a lack of value chain integrated data and indicators illustrating flows from raw materials to industrial end products (Kardung et al. 2019).

The European Commission provides its monitoring results for the EU bioeconomy and single MS online at https://datam.jrc.ec.europa.eu. Several countries (Argentina, Australia, Germany, Malaysia, the Netherlands, South Africa, and the USA) are measuring the contribution of bioeconomy to their overall economy or country objectives (FAO 2018). Germany is working on a comprehensive approach to monitor the bioeconomy by a joint inter-ministerial undertaking with three research projects. In the Netherlands, a bio-based economy monitor protocol to quantify the size and monitor its development over was established already in 2013 (RVO 2013). But so far there is, except for the efforts by the EC, no common approach to monitor and measure the bioeconomy, and therefore it is not possible to compare the results between countries (FAO 2018).

To assess the future potential of the bioeconomy, the investments into physical capital and related non-physical capital are important as well as in research and development. In addition to the amount of private and public capital spent, another important aspect is to measure the impact and success of such kind of investments with patent applications being an important indicator in this respect.

For monitoring the bioeconomy, a sectorial perspective is a very useful approach. This has been followed by a number of previous projects. The EU monitors the developments of the bioeconomy and provides annual reports. They already provide useful information but a more regional disaggregation as well as disaggregation by products has been expressed as a need by stakeholders of the bio-based economy.

Monitoring and measuring non-traditional sectors and assessing implications on the environment such as changes in greenhouse gas emissions or changes in biodiversity is more difficult and specific methods have to be developed. For example, the Material Flow Monitor by CBS Netherlands contains information on the supply and use by industry and households of all type of materials including raw materials, end products, waste and CO_2 (Berkel and Delahaye 2019). One important indicator is the impact of bio-based products on the emission of greenhouse gases.

15.2 Scope of the Bio-Based Economy

In addition to the term ‘bioeconomy’, there exist several related terms, such as ‘bio-based economy’, ‘green economy’, and ‘circular economy’. Figure 15.1 shows a VENN diagram of the relation and overlap between the terms. The green economy is generally considered as being an umbrella concept (d’Amato et al. 2017) and is understood to ‘result in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. In its simplest expression, a green economy can be thought of as one which is low carbon, resource efficient and socially inclusive’ (UNEP 2011, p. 1). The bioeconomy is generally considered to be part of the green economy (Fig. 15.1). Generally, the bioeconomy is often more related to global economic growth and technological development (Pülzl et al. 2014).

The concept of the bioeconomy has early-on been linked with the concepts of the bio-based and the circular economy. The bio-based economy is seen as part of the bioeconomy and relates to the conversion of biological resources into products and materials. In some definitions of the

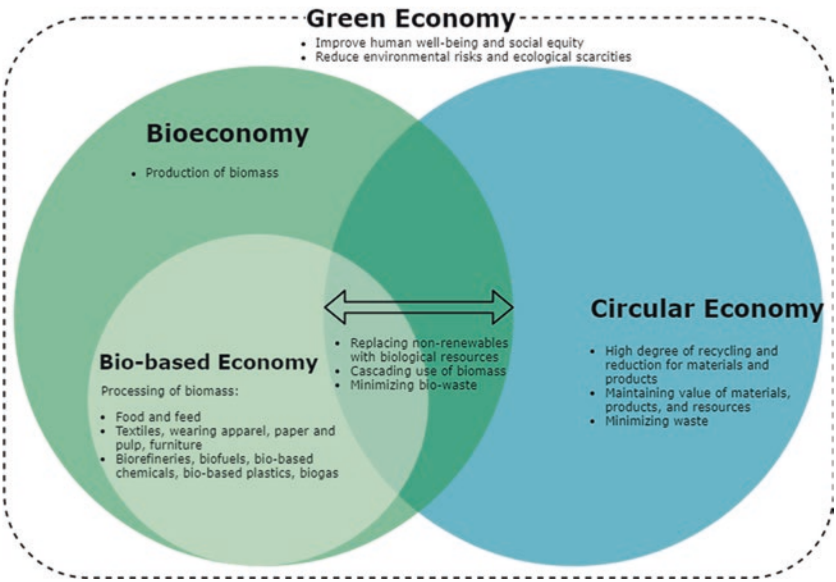

Fig. 15.1 VENN diagram of bioeconomy, bio-based economy, green economy, and circular economy. (Source: Based on Kardung et al. 2019)

bio-based economy, an emphasis is put on innovative bio-based products such as biopolymers and bioplastics (e.g. FAO 2016) while in others, traditional bio-based products such as bio-based textiles, wood products, pulp and paper are explicitly included as well (e.g. Carus and Dammer 2018). Figure 15.1 follows the last-mentioned definition of the bio-based economy and additionally includes the food and feed sector in the bio-based economy. The production of food and feed usually involves the procession of agricultural goods into processed foods and therefore fits into the bio-based economy. Further, many novel developments allow the conversion of and extraction from biological resources to biopolymers that can be used as a building block for wide a range of products including food, feed and other products. One example is the extraction of cyanophycin from biomass that can be used for producing bioplastics but also as an ingredient for food and feed (see e.g. http://www.sustainable-co-production.com).

The circular economy, which shares the rise in popularity and can work complementary to the bioeconomy (European Commission 2017), can be described as an economy in which products and materials used show a high degree of recycling and reduction, contrary to a linear economic model that builds on a 'take-make-consume-throw away' pattern (Bourguignon 2016).

The broad definition of the bio-based economy asks for a list of sectors that makes up the entirety of the bio-based economy.

In order to have clear and consistent sectoral boundaries, we use the NACE statistical classification of economic activities, used in the European Communities. NACE provides a four-digit classification with a hierarchical structure:

- The first level consisting of headings identified by an alphabetical code (Sections)
- The second level consisting of headings identified by a two-digit numerical code (Divisions)
- The third level consisting of headings identified by a three-digit numerical code (Groups)
- The fourth level consisting of headings identified by a four-digit numerical code (Classes)

Bio-based industries can be broadly assigned to three different kinds of economic activities to be linked with NACE:

1. Natural-resource based activities that directly exploit a biological resource (agriculture, forestry, fisheries) and provide biomass as input for other industries.
2. Conventional activities to further process the biomass from activity 1 (food, feed, beverages, textiles, wearing apparel, paper and pulp, furniture).
3. Novel activities to further process the biomass and/or biomass residues from activity 1 or use processing residues from activity 2 (biorefineries, biofuels, bio-based chemicals, bio-based plastics, biogas).

The first type of sectors cannot be attributed to the bio-based economy, but are part of the bioeconomy. However, from the second type of sectors, food, beverages, and paper and pulp are fully bio based and commonly linked to the bio-based economy (Table 15.1).

The main part of the bio-based economy can be located in Section C—Manufacturing. Divisions C10 (food products), C11 (beverages), C12 (tobacco products), C16 (wood and wood products), and C17

Table 15.1 Sectors of the bio-based economy

NACE		*Bio-based economy*
C10	Manufacture of food	✓
C11	Manufacture of beverages	✓
C12	Manufacture of tobacco	✓
C13	Manufacture of textiles	✓
C14	Manufacture of wearing apparel	✓
C15	Manufacture of leather and related products	✓
C16	Manufacture of wood and of products of wood and cork, except Furniture; manufacture of articles of straw and plaiting materials	✓
C17	Manufacture of paper and paper products	✓
C19	Manufacture of coke and refined petroleum products	✓
C20	Manufacture of chemicals and chemical products	✓
C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	✓
C22	Manufacture of rubber and plastic products	✓
C31	Manufacture of furniture	✓
D35	Electricity, gas, steam and air conditioning supply	✓
D3511	*Production of electricity*	✓

Source: Bases on Statistical Classification of Economic Activities in the European Community (NACE)

✓ = included

(paper and paper products) are conventional bio-based economy sectors that further process biomass. C13 (textiles), C14 (wearing apparel), C15 (leather and related products), C19 (coke and refined petroleum products) and C31 (furniture) are traditional sectors that to some extent use bio-based input. Like in most other studies, they are part of the bio-based economy, but only for their share of bio-based production. C20 (chemical products), C21 (pharmaceutical products), and C22 (rubber and plastic products) are sectors that include novel activities that further process biomass, often as a substitute for fossil-based raw material. This substitution is an important objective of the bio-based economy. Apart from the manufacturing sectors, there is D35 (electricity, gas, steam, and air conditioning supply), which uses processed biological resources.

15.3 Bio-Based Economy Clusters, Biorefineries, Bio-Based Product Development

15.3.1 Bio-Based Economy Clusters

The development of bio-based economy clusters, a geographical concentration of actors in vertical and horizontal relationships in the bioeconomy, takes up to thirty years. It passes through three main stages, typically taking fifteen years to reach the age of mature production (Fig. 15.2). As it takes considerable time from the launch of a new bio-based value chain/business model until it has achieved a mature stage, three stages can be distinguished (BERST 2015, p. 12):

- "Initial stage and take off: Introducing the bioeconomy in the regional planning agenda and creating the policy, socio-economic, and R&D landscape for its establishment and operation.
- Drive to maturity: The first competitive bioeconomy products are sold at the market. The cluster grows with the setup of new companies, cluster infrastructure (e.g. incubator, training centre) has been established, and the cluster attracts both private and public funding.
- Age of mature production: The cluster produces competitive bioeconomy products at an extensive scale."

However, the length of each of these stages varies among regions. The initial stage and takeoff last about five years, the drive to maturity about

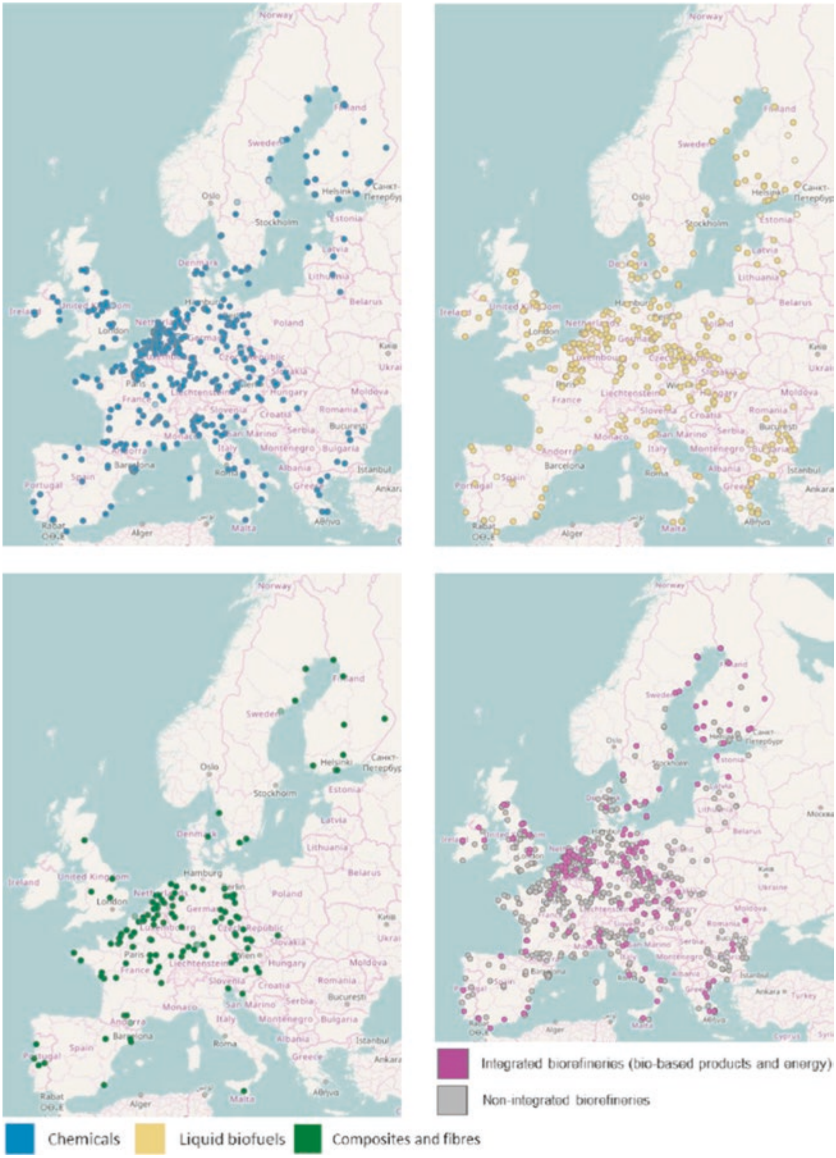

Fig. 15.2 Map of biorefineries producing bio-based chemicals (top left), liquid biofuels (top right), composites and fibres (bottom left), and aggregated (bottom right) in the EU. (Source: Parisi 2018)

five to ten years and the age of mature production ten to twenty years. These are estimates from a study by PwC (2011), which also found that at this time no bio-based economy cluster could be considered to be fully mature yet. However, some elements of clusters had reached the mature state of development.

New bioeconomy value chains have emerged based on the increasing use of natural and renewable resources. A central link for these new value chains are biorefineries, which have been defined as ‘a facility (or network of facilities) that integrates biomass conversion processes and equipment to produce transportation biofuels, power, and chemicals from biomass’ (Cherubini 2010, p. 1414). One example is the Äänekoski bioproduct mill in Finland, which combines the production of pulp with a broad range of other bioproducts, such as tall oil, turpentine, bioelectricity, product gas, sulphuric acid, and biogas. The biorefinery is an important part of the value chain of many bio-based products. Biorefineries have the advantage of operating at much lower temperature allowing for smaller units to be built in comparison to fossil fuel-based refineries (Clomburg et al. 2017).

In the European Union a considerable number of biorefineries have been established. A study by Parisi (2018) has identified 803 biorefineries, of which 507 produce bio-based chemicals, 363 liquid biofuels, and 141 bio-based composites and fibres (Fig. 15.2). The highest concentration of biorefineries can be found in Central Europe, particularly in Belgium and the Netherlands (Parisi 2018).

15.3.2 Bio-Based Product Development

Most of the new bio-based products are still in their early stages of development. Therefore policies and strategies aiming to bring these products to the market must follow a mid- to long-term innovation process in order to become effective (Negro et al. 2012). Studies on technical change in agriculture consider at least five years before technical or policy changes will be observable in the data and such changes may take even longer in the forestry sector.

New businesses follow an innovation process, that is, from ideas to pilots to business cases to new industries, a financing process, that is, from public funding to private investments; and a network process, that is, from early enthusiasts to a strong network of regional actors. The group of actors involved in the innovation process, that is, entrepreneurs, R&D worker, policymakers, investors, and other stakeholders, have to have the same ambitions, have to know each other, and must be willing to collaborate and align their efforts on innovation and business development. This means that a solid business innovation ecosystem has to be established in order to foster national and regional development of the bio-based economy; this is often referred to in the literature as the quadruple helix model.

Bio-based products and industries offer new opportunities for European rural and coastal regions due to their local biomass resources such as agriculture, marine ecosystems, and forests, which can be supplemented by municipal waste streams. Investments in new bio-based industries can be best planned at the regional level where efforts can be targeted and based upon regional attributes, strengths, and opportunities. At the regional level, the bio-based economy could endorse a positive impact in terms of job creation and building a circular economy. The regional dimension of the bio-based economy is especially supported by EU initiatives like the Bioeconomy Strategy for Europe (European Commission 2018), the EU Cohesion Policy, and the introduction of Regional Innovation Strategies for Smart Specialisation (RIS3).

Although many European regions have expressed ambitions to valorize agricultural, forest, or urban biomass and waste into new bio-based products (i.e. 100–170 regions have a bioeconomy related focus in their RIS3, depending on the selection criterion), to date, only few regions have successfully been through the development path and succeeded in establishing bio-based industries. Most of these success cases exist in regions with established chemical, energy, and paper and pulp industries, which provided the foundation for building new bio-based industries and clusters to attract investors and to bring sustainable bio-based products to the market.

A market study on bio-based chemicals in the European market by Spekreijse et al. (2018) found that 4.7 Mt./a of bio-based chemicals are produced in the EU. This represents about 3 per cent of the total chemicals sector, and this share is expected to increase in the following years. In monetary terms, the bio-based chemicals sector has a turnover of 9.2 million € per year (Table 15.2). The products with the highest turnover are surfactants, paints, coatings, inks, and dyes, cosmetics and personal care products, and man-made fibres.

Table 15.2 Prices and turnover figures for bio-based products aggregated to product category level

Product category	*Price (EUR/kg)*	*Turnover (EUR million/a)*
Platform chemicals	1.48	268
Solvents	1.01	76
Polymers for plastics	2.98	799
Paints, coatings, inks and dyes	1.62	1623
Surfactants	1.65	2475
Cosmetics and personal care products	2.07	1155
Adhesives	1.65	391
Lubricants	2.33	552
Plasticizers	3.60	241
Man-made fibres	2.65	1590
Total	1.94	9167

Source: Spekreijse et al. (2018)

15.4 Link with CAP and Rural Development and Other Policies

The Common Agricultural Policy (CAP) of the EU has shifted from a purely agricultural focus to support rural development in general. Rural areas in the EU face challenges such as depopulation and ageing, risk of poverty and social exclusion, unemployment, and lacking infrastructure and services.

The bio-based economy has the potential to provide new rural value chains going beyond agriculture (see Chap. 15.3). Therefore, it offers considerable growth and job potential for rural areas. Furthermore, it offers opportunities for farmers to diversify their businesses, hedge risks, and provide additional income. Biorefineries, one of the cornerstones of the bio-based economy, are considered as an important driver of rural development (Heijman et al. 2019). The post-2020 CAP therefore will encourage increased investments in the developing bioeconomy (Gafo 2018).

Agricultural, fisheries, and forestry policies are important drivers for the bioeconomy. They steer the primary production sector, which is influential to the whole bioeconomy. Furthermore, policies on both renewable energy and energy from fossil fuels are driving the bioeconomy. Renewable energy targets and subsidies generally result in an increase of bioenergy. The focus on bioenergy could also affect other parts of the bioeconomy, lead to distortions within the bioeconomy and hinder environmental benefits and cascading use of biomass. For further development, bioeconomy strategies take a big role as they outline visions and intentions of countries and regions.

Apart from direct effects by policies related to the bioeconomy, they can also have an indirect effect. For example, policies on fossil fuel use can have an immense effect on the bioeconomy because fossil fuel-based products can be substituted with bio-based products. For example, Tsiropoulos et al. (2017) find that fossil fuel prices are a key determinant of bioeconomy development.

15.5 Assessment

The bio-based economy receives massive policy support, which started mainly since 2007 and the Cologne Paper. Furthermore, it has large synergies with the circular economy, which is also high on the political agenda. The non-food/feed bio-based economy constitutes an alternative to the fossil-based economy and its undesirable externalities. Measuring the contribution to sustainable economic development with all its different dimensions is still at the beginning but investments in improvements have been made.

Similarly, many technologies used in the bio-based economy are still in its infancy and need investment and time to reach a maturity stage. Many of the investments still strife on government support. However, this also provides the opportunity for new jobs and incomes for rural areas today and possibly in the future.

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CHAPTER 16

Opportunities and the Policy Challenges to the Circular Agri-Food System

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16.1 Introduction

The circular economy is a concept with a long history in economics. It can be dated back to the Physiocrats of eighteenth-century France. The economic table of Francois Quesnay shows the circularity within the economy where households supply labour to firms that in return pay salaries which are used to buy the goods produced by firms. These tables have substantially improved over time and developed into today's national accounting systems and the related input-output tables. They are important inputs for applied general equilibrium models (McCarthy et al. 2018). The shortcoming of these models are economic values and the quantities not being directly visible. The advantage is results can be compared as they are all expressed in monetary units.

An accounting system on its own ensures that neither all issues that are of relevance are covered nor accounting results in improvements.

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Nevertheless, proper accounting is important for informing policymakers (Stiglitz et al. 2009) and as an input for policy modelling (McCarthy et al. 2018).

Cingiz et al. (2019a) provide a value-added analysis approach to measure the bioeconomy share of GDP with input output tables. First, they differentiate sectors in an economy as sector 1 (S1), which is agriculture, forestry, fishery, aquaculture and veterinarian services. And the rest of the economy as sector 2 (S2). Then, they calculate the downstream and upstream effects between these two sectors and calculate the part of the value added of S2 that is actually S1 which is part of the bioeconomy. Here the downstream and upstream effects move in a circular motion, as in the circular economy models. The growth of value added is shown in Fig. 16.1, which also illustrates one of the shortcomings. The share of recycling or the biomass being used and their flows are not visible. Data providing these information, with a few exceptions, are missing, and generating these data is an important part for monitoring the circular economy.

Current accounting systems have in particularly been criticized for not properly measuring natural resources, environmental pollution and other damages to the environment, as well as non-market goods (Stiglitz et al. 2009). Especially environmental pollution and other damages to the environment have raised substantial concern about the future of humankind. Strengthening circularity within an economy is expected to address these

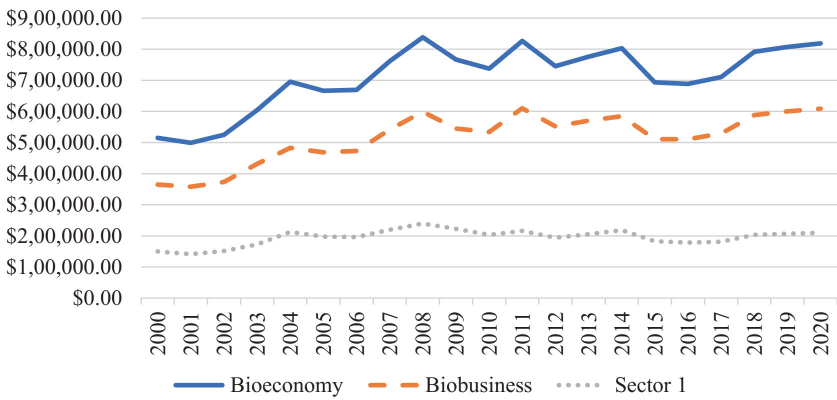

Fig. 16.1 The growth of value added (in millions) from 2000 to 2020 in the EU. (Source: Cingiz et al. 2019a)

concerns. Prominent examples include the recycling or substitution of plastic material and the reduction of greenhouse gas emissions. This often goes hand-in-hand with a call for moving from a linear economy towards a circular economy. Proponents stress more emphasis on the fact that policy level should be placed on policies that support the recycling of materials, the extension of product life cycles for durable goods and shortening supply chains over space. This requires for many a change in how we think an economy is organized, how economies are modelled and how policies are designed (Kalmykova et al. 2018; Korhonen et al. 2018a, b).

The circular economy concept is closely linked with the closed loop economy concept (Mathews and Tan 2011). A notable statement is dated back to 1848 of August Wilhelm von Hoffman that "In an ideal chemical factory there is, strictly speaking, no waste but only products. The better a real factory makes use of its waste, the closer it gets to its ideal, the bigger is the profit". An additional link is the "closed loop economy" of "spaceship Earth" by Boulding (1966), Stahel and Reday-Mulvey (1976). The concept of the closed earth economy is important as it highlights some important issues that need to be considered. The law of conservation of mass tells us that the mass of a system, the Earth, has to stay constant over time.[1] Circular economy addresses the problem that is related to the accumulation of matter over time and space. Accumulation of CO_2 in the atmosphere causes the problem of climate change; accumulation of nitrogen in the soil causes water pollution. Changing the carbon cycle by burning less fossil fuels, which have been produced over thousands of years from biomass where release is much faster than sequestration, is expected to reduce the human impact on climate change and develop into "closed loop economy" from "spaceship Earth."

In relation to this concept, Mathews and Tan (2011) state that the circular economy is the aim of eco-initiatives. One example is Karl-Henrik Robèrt (1991), the founder of non-profit, non-governmental organization the Natural Step, who states: "Most environmental problems are based on the same systemic error – linear processing of material. Until resources are processed in cycles either by society or by biogeochemical processes the global economy and public health will continue

[1] This is not exactly correct according to the mass-energy equivalence, but for the chemical elements of interest such as carbon or nitrogen, this simplification is acceptable.

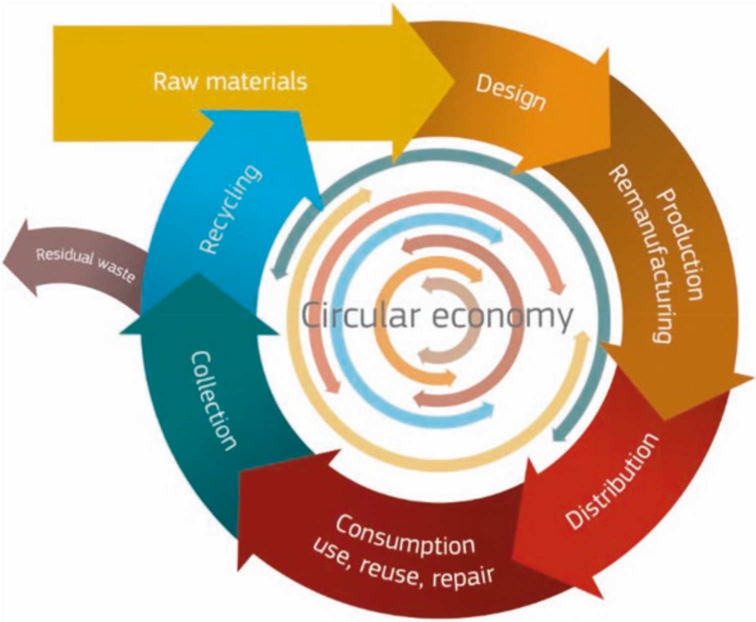

Fig. 16.2 Visualization of the circular economy by the EC. (Source: European Commission 2014)

to deteriorate. Consequently, we will never be in a better position than we are now to make the necessary changes; every minute we delay increases the final cost" (Lancaster 2002) (Fig. 16.2).

A strong driving force is the Ellen MacArthur foundation, a charity formed in 2010 with the mission "to accelerate the transition to a circular economy." They have since published a number of reports and case studies on the topic. They define the circular economy as "an economic system where products and services are traded in closed loops or 'cycles'. A circular economy is characterized as an economy which is regenerative by design, with the aim to retain as much value as possible of products, parts and materials. This means that the aim should be to create a system that allows for the long life, optimal reuse, refurbishment, re-manufacturing and recycling of products and materials." This is not the only definition for the concept. Kirchherr et al. (2017) find 114 definitions of the circular economy.

The call for strengthening the circular economy has entered the policy agenda of EU and OECD countries. Tables 16.1 and 16.2 show policy strategies/actions of EU and OECD countries published in English with

Table 16.1 Examples of policy strategies/actions related to bioeconomy of EU member states

EU countries	*Strategy document*
Austria	Circular futures—Austria's Circular Economy Platform
Belgium	Let's make the economy work by developing the circular economy in Belgium
Croatia	Environmental Protection and Energy Efficiency Fund
Czech Republic	State Environmental Policy
Denmark	The Advisory Board for Circular Economy Recommendations for the Danish Government
Estonia	Circular Procurement Congress "Mainstreaming Circular Procurement"
Finland	Finnish road map to circular economy—Sitra
France	50 measures for a 100% circular economy
Germany	German Resource Efficiency Programme (ProgRess II) Closed Substance Cycle Waste Management Act
Greece	Greece National Action Plan on Circular Economy
Hungary	Business Council for Sustainable Development in Hungary (BCSDH)
Iceland	Waste Management Policy 2013–2024
Ireland	Moving Towards the Circular Economy in Ireland—NESC
Italy	Towards a circular economy model for Italy
Latvia	Environmental Investment Fund
Lithuania	National Waste Management Program
Luxembourg	Climate Pact under the sign of the circular economy
Malta	TSS Malta, water recycling system
Netherlands	A Circular Economy in the Netherlands by 2050 Agriculture, nature, and food: valuable and connected
Poland	Mazovia Circular Congress
Portugal	Green Growth Commitment
Republic of Cyprus	Waste Law of 2011 (L.185(I)/2011) and the Packaging and Packaging Waste Law of 2002 (L.32(I)/2002)
Romania	ECOREG in Suceava County
Slovakia	Waste act
Slovenia	Roadmap towards the circular economy in Slovenia
Spain	Spanish Chamber of Commerce "Circular Economy: the role of business in developing the green economy"
Sweden	Smart City Sweden
Switzerland	Circular Cities Switzerland, Circular Economy Incubator
United Kingdom	LWARB circular economy report

Source: Own presentation based on national documents references to the circular economy indicating that EU and OECD countries in one or the other way pay attention to the circular economy from a policy perspective. The European Union has published a strategy document "Towards a circular economy: A zero waste programme for Europe" in 2014 and an action plan "Closing the loop – An EU action plan for the Circular Economy" in 2015. The Dutch Government has launched in 2016 the programme "A circular economy in the Netherlands by 2050" under the leadership of the Ministry for the Environment and Ministry for Economic Affairs. Germany's Resource Efficiency Program "Deutsches Ressourceneffizienzprogramm II" of 2016 emphasizes the circular economy approach for reducing waste and improving resource efficiency. In the United States, members of the Democratic Party call for a "Green Deal" including a circular economy approach (Table 16.2). While in the literature more than a hundred definitions of the circular economy have been found, there are major reappearing topics. They include:

Table 16.2 OECD countries, excluding EU member states, and their circular economy-related policy strategies/actions

OECD countries	*Strategy document*
Australia	Green Industries SA Strategic Plan (2018), a circular economy for NSW
Canada	Circular Economy Leadership Coalition
Chile	Circular Economy Forum of the Americas, Strategic Partnership in Chile—Innovation and Sustainability through Circular Economy
Colombia	E-waste Policy
Israel	Israel Sustainability Outlook 2030
Japan	Law for the Promotion of Effective Utilization of Resources
Mexico	Global Green Growth Forum
New Zealand	Circular Economy Accelerator
Norway	Unlimited opportunities in the circular economy
South Korea	Introduction of the Framework Act on Resource Circulation toward Establishing a Resource-Circulating Society in Korea
Switzerland	Circular Cities Switzerland, Circular Economy Incubator
Turkey	Türkiye Materials Marketplace (TMM) Project
United Kingdom	LWARB circular economy report
United States	National Bioeconomy Blueprint, Chamber of Commerce Circular Economy Summits

Source: Own presentation based on national documents

Table 16.3 Priority areas of the EU circular economy action plan

The EU action plan adopts production, consumption, waste management and boosting the market for secondary raw materials and water reuse. Priority areas include:
Plastics
Food waste
Critical raw materials
Construction and demolition
Biomass and bio-based products

Source: European Commission (2015)

- Substituting fossil fuel use
- Increasing resource use efficiency/reducing waste
- Increasing the rate of recycling

The concept of the circular economy is also closely linked with the development of the bioeconomy and can almost be used interchangeably as the objectives are very similar. An example is the bioeconomy strategy of the European Union (EC 2018) and the “Closing the loop – An EU action plan for the Circular Economy” (EC 2015, see Table 16.3).

16.2 Link Between the Circular Agri-Food System and Sustainability

In the economic literature, Arrow et al. (2012) introduced the concept of genuine investment as a measure for sustainable development. They define intergenerational well-being as the discounted flow of current and future generations’ utilities. Utility is derived through consumption of the economy’s stock of capital assets, including manufactured goods, services provided by nature, health services, and many more.

According to the genuine investment, the changes in an economy’s set of capital assets weighted at shadow prices, including the capital asset time, need to be positive for achieving sustainable development. Possible irreversibility effects are implicitly included and can be made explicit by modelling genuine investment as a stochastic process and where the shadow price of capital assets includes possible irreversibility effects. The link with a circular economy is that a circular economy is also expected to improve well-being by using resources more efficiently which would be the result of a social innovation that matches the genuine investment criteria.

The important issue is that both the genuine investment and the circular economy approach stress the importance of technical change. A circular economy strategy that relies on the substitution of fossil fuels in production processes can in principle contribute to sustainable development. Producing plastics from biomass (Cingiz et al. 2019b) can increase the possibilities for recycling but important trade-offs need to be considered. The biomass may compete with alternative uses and sources for food in particular. In a comparative-static setting, this will increase food prices with negative implications for less wealthy households. This has been in particular an issue in the debates on biofuel policies (Zilberman et al. 2018).

In a dynamic setting, social innovations such as technical change will not happen only within the processing of biomass for bioplastics but also the processing of biomass for food. Recent developments in food production such as clean meat (Shapiro 2018), closed aquaculture systems (Tacon and Metian 2018), animal protein from insects (Bukkens 1997) and urban farming are developments that are expected to increase the economic efficiency in food production (Thorrez and Vandenburgh 2019) and to move food production to metropolitan areas as it is less land dependent. Time and scale of these disruptive developments are difficult to predict precisely, but they are happening. They are expected to make food production more sustainable and to shorten food supply chains. Moreover, they may reduce the pressure on land for food production and provide opportunities for alternative uses of biomass such as the aforementioned bioplastics. The rate of technical change needed will depend on the resources allocated for further developing these technologies. Increasing the financial resources allocated to R&D can be expected to shorten the time needed, but expenditures on R&D are not sufficient enough. A supporting policy environment will also be needed. The recent judgement of the ECJ (European Court of Justice) on gene-editing technologies serves as a case in point where policies are expected to have negative implications on R&D for the circular economy (Purnhagen and Wesseler 2019).

If technical changes are realized, they can improve the efficiency and resilience of the agro-food system. The innovations will increase the portfolio of potential uses of biomass. An increase in the rate of recycling is expected to increase the efficiency in resource use. (The recycling of paper serves as an example.) But recycling per se is not necessarily improving resource efficiency. There is a long debate about soft drinks sold in glass versus PET bottles and resource efficiency. Beverage producers claim that the use of PET bottles requires less resources as the recycling of glass bottles requires more resources for collecting and cleaning the bottles than producing additional PET bottles. Packaging material for food produced from sugar cane might be biodegradable but have the properties compliant with food safety requirements or not having the properties needed for maintaining a long shelf-life of the wrapped product. Many of the different solutions will be case dependent, and one needs to be careful with generalizations.

There might also be potential trade-offs possible between the agro-food system and the move towards a circular economy. Market prices not only reflect the scarcity of a resource but are also affected by policies including taxation, subsidies, food and environmental safety standards and more. In some cases, differences in environmental and other taxes might result in prices that do not fully reflect all costs if environmental benefits or costs are not completely internalized. As a result, product prices might be biased. The difference in gasoline prices in the EU serves as an example. The price differences between countries cannot be explained by differences in transportation costs but are rather a result of differences in taxation and regulatory policies (Rietveld and van Woudenberg 2005). The price differences for resources between countries can be expected to result in differences in incentives for participants in the food sector to get involved in circular economy activities. In some cases, intermediate and final consumers might not be able to differentiate between products if the circular economy attribute is a credence good. Certification and labelling schemes can help to overcome resulting asymmetries in information between buyer and seller.

Many participants in the policy debates on strengthening the CE argue for taxes and other policies to internalize "externalities." One needs to carefully assess such kind of proposals as many "externalities" are internalized via a number of public policies. A tax is one possibility to address environmental concerns, but it is far from obvious that a tax (or subsidy) from an economic point of view is always the first best solution as implementation costs need to be considered as well. Hence, a number of possible solutions might be available and their benefits and costs need to be compared for identifying the most promising one (Coase 2006; Wesseler and Drabik 2016).

A stronger circular economy has the potential to increase sustainability, efficiency and resilience of the economy. If the solutions offered are properly priced and competitive, they will be adopted and be considered to be efficient and improve sustainability. As these are new solutions, they increase the portfolio of solutions to address the challenges mentioned and this increases the resilience of the economy. As with all new policy strategy ideas, the danger exists that they will come at the expense of existing strategies. Lobby groups might be able to change policies for their own benefit by creating biases that endanger sustainability, efficiency and resilience (Rausser et al. 2011; Shao et al. 2018a, b).

16.3 Link Between Circular Agri-Food Systems and Innovations in the Agri-Food Supply Chain

The diffusion and the adoption of an innovation are strongly correlated with critical mass. If such a threshold is satisfied, then the innovation becomes self-sustaining. A stronger circular economy means innovations with certain characteristics that match the society; strong interaction between agents in the economy through, for example, media; shorter time in innovation acceptance decision process and the norms of the social system in the sense that policymakers can influence in the right direction. All these effects help the society to reach the critical mass (Fig. 16.3).

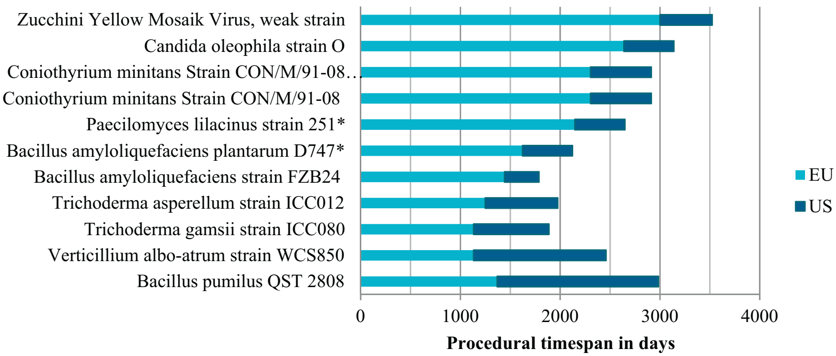

Fig. 16.3 Differences in time-length for the approval of biological control agents in the European Union and the United States. (Source: Frederiks and Wesseler 2019)

A possible trade-off for the diffusion and adoption of innovations may exist if policies introduce biases against specific forms of innovations that would be economical at firm or farm level but due to regulatory and/or policies, for example, too expensive to adopt. One case in point is the regulation of biological plant protection agents in the European Union. They are in general considered preferable over alternative synthetic control agents because of their environmental properties. A comparison of the approval processes between the European Union and the United States shows that the approval costs for the same agents and almost same environmental safety standards in the European Union are much more costly. Similar observations have been made for other innovations for the control of pest and diseases in agriculture (Smyth and McHughen 2008), while the innovations are considered to improve resource use efficiency.

New innovations for strengthening the development of the circular economy such as biodegradable packaging material, new fertilizing products or the recycling of waste may face similar problems. The example also illustrates that difference in regulatory standards can be a barrier for scaling-up circular economy technologies. The experience with the approval of GMOs, new plant breeding technologies and biological control agents mentioned before shows that cost for innovations can be reduced without compromising on environmental and food safety.

Several authors have stressed the importance of not only changing policies but also the norms and beliefs within society (e.g. Ritzén and Sandström 2017). This can have important implications for the diffusion and adoption of technologies as attention may shift. Developing business models that take this into consideration are a challenge. Processing of biomass at regional level may require more than just one farmer being involved. Cooperative structures where several farmers may own a facility, contracting supplies, licensing or franchising of production systems are some of the possible models. At local level a number of grass-root activities can be observed. Examples include weekly delivery of milk in bottles where empty bottles are returned to the supplier and refilled or the sharing of urban gardens. Other possibilities include leasing of durable household goods such as washing machines or dishwashers or agriculture equipment such as tractors.

Other models that are discussed include voluntary contributions for carbon emissions. A prominent example includes contributions for carbon neutral flights, where the voluntary contributions are used for investments in carbon sequestration. Another example is the afforestation of land where tourists or people in general buy land that will be afforested and receive a certificate ensuring a minimum lifetime of the trees and related carbon sequestration. In this case consumers are directly linked with projects. This carbon swap for nature has been established in the Federal State of Mecklenburg-Western Pomerania in Germany (http://www.waldaktie.de/). Possibilities for scaling-up such kind of projects from a regional to national to international level in general are possible. A challenge for scaling-up such kind of activities is maintaining the credibility of the projects. Auditing the implementation of projects can contribute to maintain credibility.

A reoccurring question is at what level circular economy should be assessed. Farms, local and regional communities are involved in international trade of goods and services. A change in products being produced may have trade implications as the inputs required and the products sold may change. Higher product standards in one country may reduce export opportunities in other countries with possible negative economic implications for the exporting country. The higher standards may also increase production costs and reduce the competitiveness of farms and firms affected and move production to countries with less costly production standards. In general, these effects should be considered for an economic assessment of the circular economy approach and models used should be improved to be able to model the circular economy. In this direction, improvements need to be made and in particular with respect to measuring the implications for natural resources.

Scaling-up the circular economy from regional to national to international level may at first sight look as a contradiction. The circular economy stresses the recycling of consumer goods and intermediate products, the strengthening of local production and shortening of value chains over space, the closing of nutrient cycles at farm level. The opportunities are not for scaling-up the production of specific products but for scaling-up business models for solutions at local level that can be replicated. In this sense, the circular economy approach will not so much contribute to international trade in goods but in services. Trade policies affecting the service sector will become important. As these are intangible assets, their value is in general more difficult to assess and they suffer from non-rivalry and non-excludability reducing private sector incentives for investment. The protection and trade in intellectual property rights (IPRs) will be an important factor and a challenge (Lele et al. 1999).

The international trade issue also relates to the scope of circularity within an economy. Supply chains have become more and more global as well as more and more integrated. This integration of supply chains allows to transfer value systems from one place of the world to another. Consumers can demand specific production standards to be met by the products they buy including for those parts produced abroad. Whether specific standards are met abroad will depend on a number of factors. The production costs for meeting the standards will be of high importance. Opportunity costs are another important factor. It might be just cheaper to not meet the standards and serve markets that require less cost standards. These issues will be relevant for waste-reducing strategies, biomass use for biodegradable products, as well as overall resource use efficiency. Stopping assessments of resource use efficiency at national boarders may generate biases in case of international trade as those effects from a material flow only can already be substantial. Often, only bilateral flows are considered but third country effects can also be important, and sometimes even more important (see Sect. 16.4).

16.4 Link Between the Circular Agri-Food System and Policies

Strengthening the circular economy will be in line with many current agriculture policy reforms towards a more environmental-friendly agriculture. The possibilities for recycling nutrition on the farm by processing products such as straw and other crop residues for bioenergy can provide additional on-farm income and reduce nutrient emissions and allow to develop new fertilizing products that can be traded. Fresh biomass can be used to extract valuable biopolymers that can further be processed and residues be used as high-protein animal feed or converted into fertilizing products. This all provides new income opportunities for in particular young farmers with a long-time perspective which is part of many agricultural policies. It is also expected that many of the technologies for converting biomass using biorefineries will be smaller in scale and more suitable for rural areas close to the biomass source (Wesseler and von Brown 2017). This is not only relevant for the agricultural sector but for rural development in general. Many OECD countries observe a decline in rural population challenging the provision of basic services. Providing new economic opportunities for rural areas might be able to stop and perhaps even change this trend. Many of the new opportunities mentioned are still in the development phase and the opportunities they generate will depend on their profitability. Some might reach the market earlier than others.

From this perspective, strengthening the circular economy will support such kind of agriculture policy reforms. This might also explain the strong support the circular economy strategy receives from agriculture policy. Agriculture and circular bioeconomy policies are expected to reinforce each other (strategic biomass vision for the Netherlands towards 2030, Visie Biomassa 2030). The circular economy strategy can strengthen the agro-food system. Prominent examples include by-products generated by biogas facilities that are used as fertilizers bringing back the nutrients previously extracted from the land. Other examples include the use of organic fertilizer and other fertilizing products.

Many of the strategies further down the supply chain results in further product differentiation. If those product differentiations will be combined with certification strategies, consumers will be able to differentiate and this might result in a higher willingness-to-pay, hence covering additional costs.

But there are also limitations to such kind of strategies. Revealed preferences often do not show a strong support for environmental good characteristics (Doorn and Verhoof 2015). The success of voluntary solutions might be limited. Consumers might not be against circular economy strategies, but they prefer those being implemented via policies as observed in other policy areas such as animal welfare policies (see, e.g. Uehleke and Hüttel 2019). This moves the choice from the consumer to the policymaker. The life of the consumer will become easier, she/he can simply choose on, for example, prices knowing their basic preferences are met via mandatory production standards, while the life of the policymaker will become more difficult, as she/he needs to identify the appropriate policies.

Policy examples include mandatory production standards such as minimum standards of biodegradable components for plastics and plastics for certain products to be 100% biodegradable. A comparison of benefits and costs as well as feasibility of such kind of policies requires further investigation, in particular from an environmental benefit-cost perspective. The policy choice can have implications for the development of markets. In general, voluntary labels for safe product attributes, such as the degree of biodegradability, are preferable over mandatory ones (McCluskey et al. 2018). The standards for labelling are also important: if they are too demanding, the label will not be used and products not produced according to the standard (Castellari et al. 2018; Venus et al. 2018). Labels that are considered signals to consumer environmental friendliness may not necessary hold up to that claim. Labelling policies can also be a result of pressure from different lobby groups as the case for GMO labelling in the United States and Europe illustrates (Bovay and Alston 2018; Kalaitzandonakes et al. 2018; Lusk et al. 2018; Zilberman et al. 2018). This relates to another important issue and that is the political economy of circular economy policies. Lobby groups do and will continue to influence circular economy policies and they will do this by serving their own interest, which is not necessarily in line with the objectives of circular economy policies.

Other possible policies include the geographical shortening of supply chains such as local purchasing. These policies can be supported by labelling of local products. The certification system at EU level for regional products is one example. These strategies may support the local economy from an environmental point of view, but this might not always be the case. Some products that are produced locally may require a higher quantity of resources being used than imported once. In agriculture differences are often driven by differences in production conditions. Growing cacao or coffee plants in Western Europe might be possible in glass house but requires a substantial higher amount of resource input than growing those crops in Africa or Southern America. The example of cacao and coffee is a special case, where the advantages of importing those products than rather producing them locally are obvious. For other products, the trade-offs are less obvious but need to be investigated as well for identifying the comparative advantages. There seem to be substantial gains to be made from a resource efficiency point of view by making those trade-offs visible. In many cases the benefits from exploiting comparative advantages are not obvious and masked by regulatory policies. A study by Felbermayr and Larch (2013) shows that not much could be gained by removing tariffs, but much more by removing non-tariff barriers (NTBs) to trade as a result of a Transatlantic Trade and Investment Partnership (TTIP) agreement.

The results of the study by Felbermayr et al. (2013) also illustrate one of the possible dangers of a move towards a circular economy, such as policymakers that are tempted to introduce regulatory hurdles that reduce the possibility of exploiting comparative advantages. One possible example is the requirement to use only inputs with a certain percentage of bio-based material. This might not necessarily improve resource use efficiency.

In 2018, OECD released the Policy Coherence for Sustainable Development with institutional, analytical and monitoring elements. They show, both nationally and internationally, the challenges and also the opportunities of the implementation of the Sustainable Development

Goals. The report states that integrated, coherent policies and strong institutional mechanisms lead to a sustainable and resilient society. Moreover, it provides eight building blocks for stimulation of policy coherence which are political commitment, policy integration which aims for interactions between economic, social and environmental policies, long-term planning horizons, the effects of policies in time and location, policy coordination, subnational and local involvement, stakeholder engagement, monitoring and reporting (OECD 2018).

Matthews (2007) states that to promote coherence for the agro-food system, countries need to take into account improvement in market access opportunities, financial and technical assistance for developing countries and integrated trade objectives to national development strategies. The OECD agricultural policy report and evaluation states the following policy recommendations (OECD 2019):

- Eliminating policies causing disincentives at increasing productivity, sustainability and resilience
- Redirecting the agricultural support in such a way that the society overall benefits
- Ensuring knowledge transfer and generation between public and private sectors on different levels
- The increased usage of information, education, regulation, payments and taxes, to achieve environmental and climate change goals
- Clear definition between normal business risks and catastrophic risks
- Farm-income support measures by critical evaluation of the overall financial and well-being situation of farm households
- Better developed policies to match the opportunities and challenges

Continuing policy reforms along those lines will also be to the benefit of a circular economy.

The success of the policy reforms supporting the transition towards a circular economy requires monitoring the transition. Monitoring the transition is not a trivial task. This requires a precise definition of what is meant by a circular economy, the identification of relevant indicators describing the state of the circular economy and the changes of those states over time for illustrating the developments. Defining and measuring the circular economy in general are well developed with respect to economic indicators. In most cases they lack the link with respect to the material flows. This results in the difficulty of expressing the contribution to the changes in the

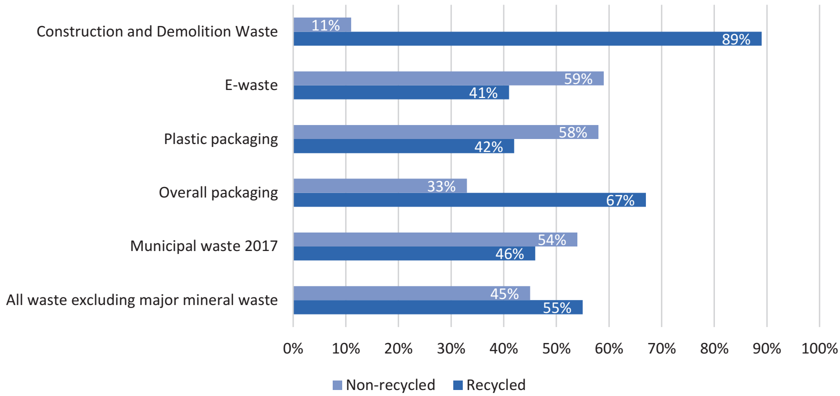

Fig. 16.4 Overview of recycling rates of different waste streams. (Source: EUROSTAT 2019. https://ec.europa.eu/eurostat/web/circular-economy/indicators)

emission of greenhouse gases, nutrients and more. Further, the rate of reuse of materials is also difficult to deduct from those numbers (Fig. 16.4).

Some steps in that direction have been made by developing and monitoring indicators. EUROSTAT (2019) reports on ten indicators grouped under four major topics: production and consumption, waste management, secondary raw materials, competitiveness and innovation. The information provides a first snap-shot on the development of the circular economy. These are indicators that are believed if increasing over time reflects a positive development of the circular economy. If this indeed is the case then it needs further investigation. An increase in recycling rates neither implies a reduction in resource use nor an improvement in economic efficiency. In particular, if some of the recycling activities or the conversion and reuse of biomass are not profitable, one needs to be sceptical if those activities improve overall well-being. This does not imply that those activities move into the wrong direction, but that further improvements (e.g. technical change) are needed. Assessments are complicated by international trade effects, leakage, indirect land-use effects and more.

16.5 Implications for EU Policies

The CE receives support at policy level in almost all EU member states countries and beyond. While the definition of what is meant by a CE differs, there are common elements in policy strategies.

Standardization and harmonization of products via certification and labelling systems are expected to increase the market potential for CE products. Standardization and harmonization of products at international level can further contribute to increase the size of potential markets. This might be in contradiction with some CE policies that emphasize local markets and can result in an important trade-off.

New business models for investing in the CE are mentioned by several authors in the literature (Reike et al. 2018). They are required as investments in the CE often require a substantial amount of investments and face markets characterized by a high level of uncertainty, including policy uncertainty. This substantially increases the investment threshold. Business models that reduce market uncertainty can increase the stimulus for investment by lowering the investment threshold. Policies can also help lowering the investment costs by simplifying approval systems for new technologies. Appropriate policies include setting voluntary standards supported by a certification and labelling system that is harmonized as much as possible among EU member states. This is expected to increase the market for circular economy products.

Another important policy is to increase investments in research and development of the circular economy. The circular economy very much depends on technical innovations that increase efficiency in resource use, the substitution of fossil-fuel-based products such as the plastics by bio-based products, and to increase the recycling rate in the economy. The generation of innovative ideas requires investment in specific human capital. This also includes investment in education at university level by providing bachelor and master programmes.

For many of the new products developed, new business models will be needed. While this is primarily a task of the private sector, government policies can support by making it easier for starting new business by removing regulatory hurdles. The business models provide opportunities for scaling-up. As these models are intangible assets, the protection of intellectual property rights in international trade and the pros and cons of different models to protect IPRs will become important (Hoenen et al. 2014).

A circular economy strategy also requires monitoring for checking if policy objectives are achieved. Monitoring the circular economy is not a trivial task as many of the objectives are difficult to measure. Monitoring requires defining the scope of the circular economy and a set of indicators.

In particular deriving indicators that measure circularity is a challenging task. Some indicators have been proposed, but they still have a number of shortcomings. Efforts in improving methodologies and providing databases for applications are required.

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CHAPTER 17

Future Developments in the EU Bio-Based Economy

Justus Wesseler

17.1 New Developments in Gene Editing

In the recent 15 years, substantial improvements in plant and animal breeding have been made (Sprink et al. 2016). The new technologies such as CRISPR-Cas, zinc finger printing, TALEN or oligonucleotide-directed mutagenesis (ODM) allow higher level of precision and saving of time in breeding and are expected to substantially reduce costs (Purnhagen and Wesseler 2019). Nevertheless, they are conversely discussed in the EU and elsewhere. As mentioned in Chap. 13, the recent decision of the Court of Justice of the European Union (CJEU) has generated substantial doubt among the scientific community about the possibilities of applying the technology within the European Union (Purnhagen et al. 2018). While mainly the plant breeding sector has expressed concerns, the implications of limiting the application of the technology in EU will be far beyond the plant breeding sector. The gene-editing technologies are so fundamental that

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they can provide improvements beyond plant breeding. They are used for developing bacteria that produce widely used enzymes for biorefineries. Applications include the cleaning of wastewater, conversion of biomass into bioenergy, a range of biopolymers, and more. These are key technologies for developing the bio-based economy, and constraining possible solutions will reduce the potential of a circular bioeconomy.

The applications in plant breeding itself are of high importance. The new gene-editing technologies allow to improve pest and disease resistance of crops and in particular to increase the potential of biological control (special issue of Pest Management Science on Natural Products in Pest Management: Innovative approaches for increasing their use, 2019). This not only increases crop yield and crop quality and reduces the ecological footprint of agriculture production but also allows to improve adaptation to climate change. Increasing the costs of gene-editing technologies by stringent regulations that are not justified by safety arguments but are a result of lobbying and political correctness endangers not only application of the technology in the European Union but the development of those technologies in the first place. A recent study by Martin-Laffon et al. (2019) indicates this to be the case for the CRISPR-Cas technology. Therefore, it is not surprising that a number of initiatives by industry groups (e.g. EuropaBio), scientists (letter to the European Commission) and students (Citizen initiative) have started to urge the European Commission to revise the approval process for new plant breeding technologies as it is seen as no longer being fit for purpose.

17.2 Food Products Derived from Cell Cultures and Alternative Proteins

Another important trend is the production of food products from cell cultures. This includes meat and fish. Companies like Finless Food (the United States), Memphis Meat (the United States) or Mosa Meat (the Netherlands) are examples of food companies investing in these technologies. While the products address a number of consumer concerns such as animal welfare (raising of animals), conservation of biodiversity (fish) and environmental impacts of animal production, the products still seem to be far away from reaching the market. Nevertheless, the impact can be expected to be huge.

Other technologies have already reached the market. This includes burgers based on protein from insects or plants. Companies like Redefine

Meat (Israel), Bug Foundation (Germany), Beyond Meat and Impossible Food (both the United States) or Protix (The Netherlands) are start-ups that have entered the market. One among other hurdles for the companies entering the European food market is the novel food regulation. The Bug Foundation, for example, launched their insect burger in Belgium and the Netherlands but faced delays in Germany (see company website).

17.3 Urban Farming

The new developments in food production mentioned require much less land and have the advantage of establishing production facilities close to the consumer in urban areas. Food production moves closer to urban areas. The trend towards urban farming is further supported by technological changes in vegetable production. More efficient LED lightning allows to produce vegetables in containers year round in closed systems. Improvements in salt-water quality allow to produce high-quality shrimps the year round in closed systems. Similar solutions are under developments for other aquaculture products.

Overall, some of the urban food production systems such as plant protein-based meat substitutes are already on the market; others will still need some time. Nevertheless, these developments have the potential to revolutionize food production. They are considered to be environmental friendly, result in less greenhouse gas emissions, and are animal welfare friendly.

The move of food production towards urban areas will be a challenge for rural areas. Alternatives to food production will be needed generating value added in rural areas. This stresses the importance for further developing the circular bioeconomy to provide jobs and economic growth for rural areas to avoid an increase in the urban-rural welfare bias.

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