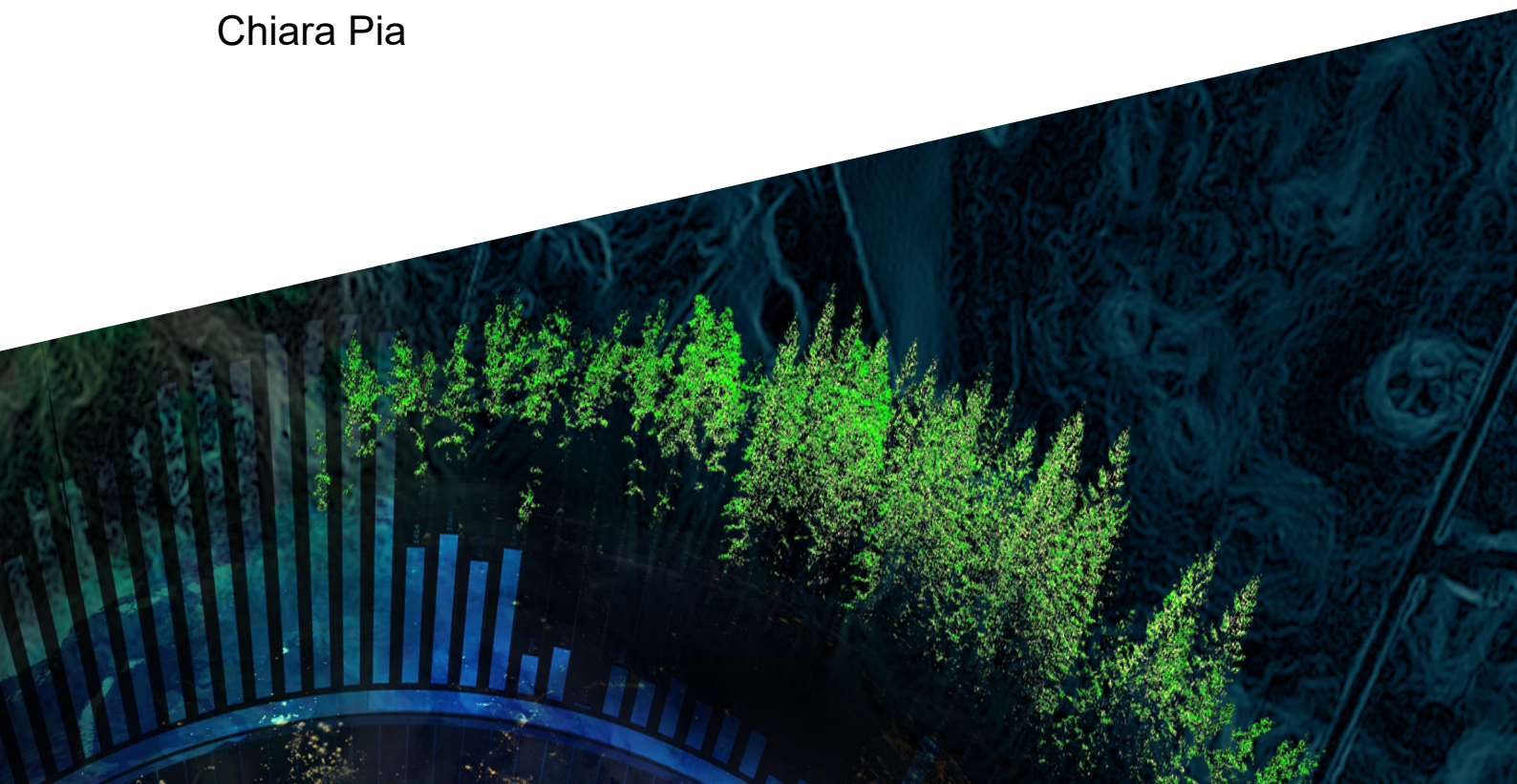


Agro-ecological diversification in meat and dairy farms

– barriers and drivers in the European and Swedish policy

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Abstract

Food systems are increasingly characterised by specialisation and separation between animal and crop production, as well as the use of food suitable for human consumption for feed. The regionalisation of production creates hotspots for environmental degradation and decreases the resource use efficiency. A concept opposed to this system is agro-ecological diversification, which creates links between animals and plants and seeks to harness the positive role that livestock can play in food production.

This thesis explores the relationship between agro-ecological diversification and the EU and Swedish agricultural policy to understand the role that policy can play, in the present and in the future, to enhance crop-livestock integration. Ten semi-structured interviews were conducted with actors working with the Common Agricultural Policy (CAP) and were then integrated with a literature and policy review. The results show the insufficient role that the CAP plays in encouraging agro-ecological diversification, especially due to conflicting priorities and an increased market and productivist orientation. Direct payments to farmers do not seem to have a direct effect, but they might deviate resources to agro-ecological diversification measures. Nevertheless, some positive measures were found, such as investment support, support for organic production and promotion of short food supply chains. Voluntary Coupled Support might also create, in Sweden, the prerequisites for a more diversified system. From these findings, it is recommended that Swedish policy makers tailor their policy measures and priorities towards an integrated production, the promotion of crops for human consumption and the correction of market externalities.

Keywords: agricultural policy, agro-ecological diversification, CAP, feed-food competition, integrated crop-livestock system, policy analysis, Rural Development Programme

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Abbreviations

CAP	Common Agricultural Policy
EC	European Commission
EFA	Ecological Focus Area
EU	European Union
GHG	Greenhouse gas
ha	Hectare
RDP	Rural Development Programme
SWOT	Strength, Weaknesses, Opportunities, Threats
UNISECO	Understanding and Improving the Sustainability of agroecological farming systems in the EU
VCS	Voluntary Coupled Support
WHO	World Health Organization

1 Introduction

During the last decades, the agricultural and food systems in Europe have changed considerably. On one hand, agricultural intensification has increased yields (Wezel *et al.* 2018) and specialisation has allowed to profit from the economy of scale (Abson 2018). On the other hand, significant environmental threats have emerged, such as loss of biodiversity, nutrient leaching and pesticide contamination (Wezel *et al.* 2018, p. 2), leading to climate change and impacting the livelihoods of food producers. There is a growing consensus among researchers that it is not sufficient to make superficial changes in the current food system; it is only possible to halt the climate crisis, provide adequate livelihoods for food producers and nutritious and sufficient food for consumers through a structural agricultural and food system transformation (WEF 2020). To change this course, many have brought forth, on an institutional and non-institutional level, the concept of agro-ecology (cf. Gonzalez de Molina 2013; Levidow 2015; Wezel *et al.* 2018).

This thesis focuses on the concept of agro-ecology and, in particular, agro-ecological diversification. According to Gliessman (2016, p. 187), agro-ecology is “a way of redesigning food systems, from the farm to the table, with a goal of achieving ecological, economic, and social sustainability”. Measures to obtain this overarching goal are decreasing the use of external inputs on farm by substituting them with practices such as organic composts and use of natural control of pests, but also connecting producers and consumers through a change of cultural and economic practices (*ibid.*). FAO (2018a) employs a similar definition, saying that agro-ecology is a response to the unsustainability of the present agricultural and food systems and a way to produce enough food in the future while ensuring a fair system in its social aspects. The peculiarity of this concept – compared to other sustainable development approaches – is that it is based on the integration between science and traditional local knowledge, a bottom-up local learning process, and an increase in the autonomy of the rural communities by giving them the capacity to change their production (*ibid.*, p. 2). FAO (2018a) also provides the definition for diversification, one of the ten elements of agro-ecology. Agro-ecological diversification comprises many practices at the farm level, such as mixing crops, forests and other shrubs to achieve vertical diversity; intercropping with different species; crop-live-stock systems where animals and plants are integrated in the same farm.

Agro-ecological diversification is also the goal of the Swedish case study in the project UNISECO (Understanding and Improving the Sustainability of Agro-ecological Farming Systems in the EU) (UNISECO, n.d.). UNISECO is a European Union (EU) project that comprises 15 case studies in as many countries, each with a different objective in the realm of agro-ecology (Prazan & Aalders 2019). The Swedish case study seeks to study agro-ecological diversification in ten beef and dairy farms, specifically through the increase of crops grown for human consumption. The case study investigates the potential of diversification in feeding more people per hectare, reducing climate impact and improving the economic resilience on farm level as well as a range of sustainability aspects (Resare Sahlin & Rööf 2019). With the global population predicted to rise to around 10 billion by 2050 (WEF 2020, p. 4), it will be more important than ever to reduce the land use demand of our diets, particularly in the West; one of the ways to achieve this is to shift our diets away from meat and to increase the share of plant-based foods (Hallström *et al.* 2014).

The aim of this thesis is to contribute to the objectives of the UNISECO project by analysing the role of policy in enhancing (or hindering) agro-ecological diversification at the European and Swedish level. To reach this aim, the following research questions have been formulated:

- What are the policies, in the CAP and Swedish implementation, that can enable or hinder agro-ecological diversification in meat and dairy farms?
- What are the possibilities for Sweden to implement agro-ecological diversification practices in its policies?

This research is in line with one of the objectives of the UNISECO project, which is to “enhance the understanding of socio-economic and policy drivers and barriers for further development and implementation of agro-ecological practices in EU farming systems” (Prazan & Aalders 2019, p. 7). Furthermore, the World Economic Forum (WEF 2020) recognises that changing the policy pathway could be the most relevant tool to transforming the food system, especially public policies, which can drive farmers’, markets’ and consumers’ behaviours. Similarly, FAO (2018a) identifies the presence of a responsible governance as a crucial element to the development of agro-ecological practices.

To answer the research questions above, ten semi-structured interviews with policy makers and experts working in agricultural in Sweden was undertaken. A discussion will then integrate these results with a literature review of policies and provide recommendations for policy makers. The scope will be limited to considerations about the Common Agricultural Policy (CAP), both in the present and in the future; in fact, this policy includes most of the agricultural regulations both at the EU and Swedish level (Flygare & Isacson 2011; Smith *et al.* 2016).

2 Background

This chapter will give an overview on the role of livestock in the food system, the concepts of agro-ecology and diversification, and some basic information about the European CAP and the Swedish implementation of it.

2.1 The role of livestock in the food system

The livestock sector plays a central role in today's food systems, representing about one third of the world's agricultural GDP and being a significant influence in environmental, economic and social changes (HLPE 2016). In the last years, the debate on livestock has increasingly revolved around its role in sustainable production, for example, for sufficient nutrient supply for humans, employment generation, and economic growth, but also for depletion of natural resources, zoonotic diseases and climate change (FAO 2018b). Livestock systems are tightly interlinked with the crop sector through feed and by-products, and they have a strong influence on agricultural markets, livelihoods at the farm level and human health on the global scale (HLPE 2016).

Livestock systems can exist in different ways, from intensive facilities to extensive grazing areas, and many systems in between them (HLPE 2016). Beginning in the 1950s, the agrifood system experienced a shift in the crop and livestock sector, with a large portion of grains being used as feed. This enabled a process of intensification of production and contributed to the increased meat consumption in developed countries (Clapp 2012). This was also made possible by the production on an industrial scale, from the 1930s on, of nitrogen-based fertilizers, which dramatically increased cereal yields and allowed for an increase of meat and dairy consumption, especially in the West. The application of this revolutionary discovery, called the Haber-Bosch process, is considered to be responsible for feeding nearly half of the population by 2008, one century after it was first invented (Erisman *et al.* 2008, p. 636). Other three factors, namely population growth, urbanization and increased income concurred to an increase in consumption of animal products, both overall and at the individual level. The corresponding increase in production was enabled by a parallel structural transformation from small-scale, mixed crop-livestock systems to large-scale, specialised farms (Magnusson 2016).

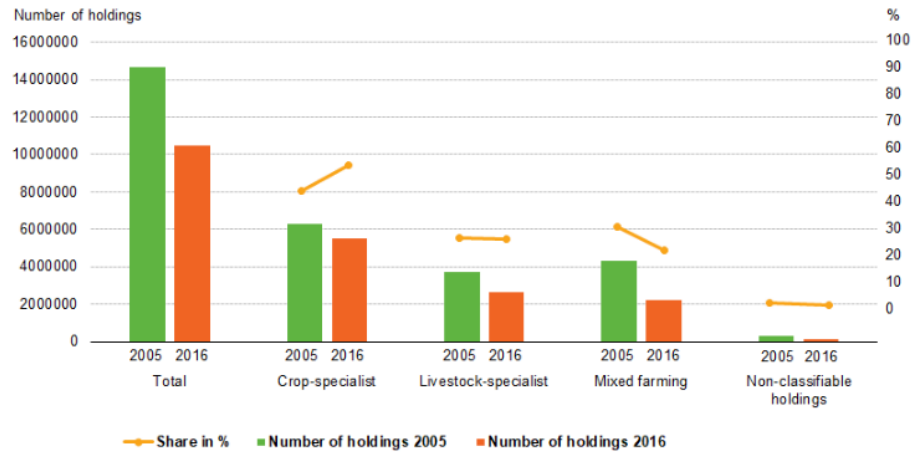
Already in the 1970s, the main environmental issues with the intensification of livestock systems were identified (Clapp 2012). Modern food systems are characterised by high specialisation of production and, often, intensive livestock rearing. These systems have significant consequences on natural resources; despite the high productivity, using grains as feed is less energy-efficient than using them directly for human consumption. It also requires more water, land and fossil energy (UNEP 2016). At the same time, the large-scale expansion of pastures and cropland in natural ecosystems and the production of few crops for animal feed contributes to the decrease in biodiversity (Willett *et al.* 2019). It is estimated that livestock is responsible for 14.5% of man-made greenhouse gas (GHG) emissions, of which the biggest share comes from enteric fermentation from ruminants' digestion (Garnett *et al.* 2016, p. 17). Other sources of GHG are emissions from manure, land-use change and feed production (*ibid.*).

For these reasons, there has been much debate on how to improve the environmental effects of ruminants in dairy and meat production. One suggested alternative is intensification, meaning improving the footprint per unit of output by, for example, giving more energy-dense feed (such as cereals and soy) and decreasing the amount of land, energy and water per unit of output produced. From this, it derives that grazing animals are the 'worst' production in terms of efficiency, because they have higher emissions and land use per unit of output (Garnett *et al.* 2017). However, these systems are measured only in terms of efficiency and GHG emissions, without considering that grazing animals can transform inedible biomass to nutritious food for humans. Some areas also benefit from grazing in terms of maintaining biodiversity and contributing to keeping the soil carbon in the ground (*ibid.*).

In Europe, pig and poultry are mainly reared in intensive systems, and this is partly the case for dairy as well. However, in the latter there is a high diversity in the production system, that span from extensive grazing to intensive farming dependent on imported feed (HLPE 2016). Following the widespread expansion of mineral fertilizer use, livestock numbers and soybean imports, there is a significant nitrogen leakage from agriculture that pollutes water and air. In the EU-25 (EU States minus Bulgaria, Romania and Croatia, plus UK), it has been calculated by Leip *et al.* (2013, p. 12) that ruminant meat has by far the largest nitrogen footprint, followed by white meats, eggs and milk. Nevertheless, the EU implements the Nitrates Directive, that from 1991 regulates the release of nitrogen by instituting good agricultural practices to reduce water pollution (EC 2019d), resulting in a significantly increased nitrogen efficiency (Westhoek *et al.* 2011).

The specialisation and intensification trends are well visible in Europe, with the consequent decrease in mixed farms and a regionalisation of production; this is accompanied by a progressively fewer and bigger farms (Figure 1) (Eurostat 2020). Larger farms also imply a concentration of livestock production in specific regions of Europe (Buckwell & Nadeu 2018), exacerbating its environmental unsustainability. Indeed, regions such as the Netherlands, Denmark and Western France have specialised in livestock rearing, while places such as East Germany and South East and Central France are highly involved in crop production (Peyraud *et al.* 2014).

Nevertheless, while the intensification has been significant in monogastric animals, the ruminant sector has seen a slower change, with a consequent decrease in production for the past three decades (Buckwell & Nadeu 2018).



Source: Eurostat (online data code: ef_m_farmleg)

Figure 1. Specialisation of agricultural holdings, change between 2005-2016, EU-28 (Eurostat, 2020, p. 2).

Regarding consumption, EU citizens eat twice the global average for meat, and three times the global average for dairy (Westhoek *et al.* 2011, p. 13). This amounts to an average of 51 kg/capita of meat per year in the EU, which corresponds to over half of the total protein intake. Dairy products present a yearly consumption of 236 kg/capita (Buckwell & Nadeu 2018, pp. 21-22). These levels are problematic since animal products have in general a higher environmental impact than plant-based protein foods. In fact, dairy and meat consumption account for around 10% of the GHG emissions in the EU (Westhoek *et al.* 2011, p. 28). In addition to that, the high level of animal food sources (well over the WHO recommendations) brings numerous health complications. Several studies found an association between consumption of red meat (especially processed) and risk for pathologies such as type 2 diabetes, cardiovascular disease and some types of cancer (Willett *et al.* 2019, p. 9.)

Sweden follows many of the European trends. As in the EU, Swedish farms are decreasing in number and increasing in size; this is less visible in the north of the country, where the climate and the dense areas of forest lead to smaller enterprises (SCB 2019). One of the most important lines of production in agriculture is animal husbandry, and within it, dairy cattle (*ibid.*). The number of dairy cows has been declining, but this has been partially offset by an increase in beef cattle. However, the increased size of the herds meant that some smaller farms do not have any more animals, thus leaving their pastures without grazing (Hessle & Kumm 2011). The abandonment of the pastures, in turn, can lead to decreased biodiversity (Jerrentrup *et al.* 2014). The trend of increased specialisation is present both in livestock and crop production, which has also led to increased regionalisation, with Västra Götaland and Skåne prevailing in animal production (Flygare & Isacson 2011). Regarding consumption, like other Nordic countries, Sweden has a much higher yearly consumption of dairy than the European average, going over 340 kg/capita

(Buckwell & Nadeu 2018, p. 21). The consumption of meat is also higher than the EU average, with a yearly average of 83,5 kg/capita (Jordbruksverket 2019).

2.2 Agro-ecological diversification

Diversification can have several meanings when applied to agriculture. It can be intended in a broad sense, as all those additional business activities that happen on the farm; it can only include activities other than agricultural production; or ‘alternative’ ways of production such as organic farming (Maye *et al.* 2009, p. 334). This array of activities often have the goal of enhancing rural development through the formation of tighter links with the local economic, environmental and social landscape (Granvik *et al.* 2012).

The diversification that is examined in this research is agro-ecological diversification. Here, a diversified farming system is one that “intentionally includes functional biodiversity at multiple spatial and/or temporal scales, through practices developed via traditional and/or agroecological scientific knowledge” (Kremen *et al.* 2012). Specifically, agro-ecological diversification encompasses several agricultural practices, such as the inclusion of non-planted strips, polycultures, or mixing crops and livestock (Kremen *et al.* 2012). The scale of agro-ecological diversification also varies, since it can both happen on the same farm or between neighbouring farms, for instance through the exchange of crop residues as feed and manure as fertilizer (Martin *et al.* 2016; Asai *et al.* 2018).

In this research, the focus will be on a specific type of agro-ecological diversification, which is integrated crop-livestock systems. Specifically, this research will focus on the integration between ruminants and the crops for direct human consumption.

2.2.1 Benefits of diversified farming systems

Agro-ecological diversification can provide multiple environmental benefits in European and Swedish production systems. First, it has the ability to use the synergies created to decrease the need for external inputs (IPES-Food 2016). For example, when animals are integrated with cropping systems for direct human consumption, animal manure helps maintain soil fertility in the fields. In addition, ruminants can utilise biomass that is not digestible to humans (Bonaudo *et al.* 2014), and convert this to meat and milk for human consumption. This crop-livestock integration can result in the reduction of external inputs, such as fertilizer and feed, through an improved recycling of manure from livestock and crop residues, such as cereal straws (*ibid.*).

Integrated crop-livestock systems can also contribute to lessen environmental issues in today’s agriculture. For instance, ruminants left to graze have the capacity to maintain biodiversity in grasslands, which in Europe are crucial to nature con-

servation (Jerrentrup *et al.* 2014). Moreover, a better distribution of crops and livestock has been demonstrated to increase nitrogen efficiency, mitigating the negative effects of concentrated crop and livestock production (Peyraud *et al.* 2014).

On a socio-economic level, diversified farming systems could make farmers more independent, as are often pressured by the food industry to specialise in one good, with specific methods of production, to respond to the needs of the global supply chain (Kremen *et al.* 2012). First, farmers can encounter an enhanced financial autonomy because of multiple revenue streams (HLPE 2019). The increased ecosystem resilience in the farms also keeps a stable productivity over time, is less susceptible to environmental disturbances, and recovers faster from shocks (IPES-Food 2016). Moreover, farmers might need to buy fewer mineral fertilizers if they optimise the use of animal manure; they can also feed ruminants an increased quantity of grassland and crop residues, shifting away from grain feed. This could lead to lower costs and relative insensitivity to commodities and inputs price fluctuations (Ryschawy *et al.* 2012).

2.2.2 The role of policy in agro-ecological diversification

After looking at the positive outcomes that can derive from diversification, the question arises as to how to achieve them. Indeed, only 16% of livestock in the EU is reared in mixed farms, while 82% of animals are reared in specialised systems¹ (Buckwell & Nadeu 2018, p. 26). Some of the reasons for the specialisation of farms comes from policy. The last decades have seen a series of measures that have shaped agriculture to be increasingly specialised (Garrett *et al.* 2017).

Farmers might shy away from crop-livestock integration for practical and economic reasons. Some farmers who focus on crop production do so because the costs of labour for animal rearing increase more rapidly than the costs for energy and mineral fertilizers used on crops; new regulation (such as new standards for facilities) can increase the costs keeping livestock; and the concentration in specific regions of industries processing animal products can make it harder to sell their products (Martin *et al.* 2016). On the other side, in regions that experience an economic and industry concentration, many farmers might abandon crops and specialise in the more profitable and accessible animal production (*ibid.*).

Seeing the reasons above, it is clear that farmers cannot radically change their production without powerful shifts in policy incentive (IPES-Food 2016). Policy can potentially invert these tendencies and help diversify the current food system; for example, it can remove the subsidies for artificial inputs and include externalities in the cost accounting (HLPE 2019). Selected measures can incentivize environmental benefits, value biodiversity and measure performance with parameters that account for ecological, economic and social impacts of the food system (*ibid.*).

¹ This distinction is made based on the activities that compose the farm income. Mixed farms are those where income derives from several farming activities, while specialised enterprises have one activity that accounts for at least two thirds of the business size (Eurostat 2020, p. 7).

Agro-ecological diversification can be fostered, for instance, by rewarding ecosystem services and increased biodiversity (FAO 2018a). Interventions such as public procurement can influence which foods are produced and consumed, set higher standards for health and sustainability for the whole chain, and change consumption patterns (WEF 2020). Lastly, it is essential to show farmers that changing their production systems will still lead to profitability, and that they will be supported during this transition (Marsh & Iles 2012).

2.3 The Common Agricultural Policy

2.3.1 A brief history of CAP

Nowadays, there is not a single policy in the EU that regulates the food sector, but multiple regulations. The largest and most influential one is the Common Agricultural Policy (CAP) (Smith *et al.* 2016), which is also the longest-lived policy in the EU (Pe'er *et al.* 2019). The policy was established in 1957 with the Treaty of Rome (Burrell 2009). The initial aim was to stimulate agricultural production while supporting prices and incomes (EC 2017). This resulted in 25 years of financing all agricultural support expenditures and deciding the sector's prices, keeping markets and farm incomes steady. However, criticism appeared from the trading partners of the EU, as production surplus appeared and was dumped outside the union borders (Burrell 2009).

During the Uruguay Round trade negotiations, international pressures prompted the 1992 CAP reform, called the MacSharry reform. This started the turn away from price support and a development towards direct payments. In turn, this prompted the need to simplify the administrative burden, resulting in decoupling direct payments from production (Daugbjerg 2009). The MacSharry reform also introduced the first so-called “agro-environmental measures” (Alons 2017, p. 1611), which required for States to pay those farmers who chose to implement certain environment-friendly practices. The following reforms instituted additional environmental schemes, including the 1999 reform that separated the CAP into “pillar 1”, comprising price and market measures, and “pillar 2”, which included rural development policies and environmental measures (*ibid.*).

2.3.2 The current Common Agricultural Policy

The current seven-year CAP plan comes from the 2013 reform and is set to last until the end of 2020. The European Commission's (EC) propositions aimed to integrate environmental measures across the two pillars. This was done by allowing Member States to move up to 15% of their budget from pillar 1 to pillar 2 (Greer 2017). The two regulations that are at the base of the direct payments (EU regulation 1307/2013) and of the rural development (EU regulation 1305/2013) have common objectives; guaranteeing food security, providing a variety of food produced in a

sustainable way, and keeping rural communities viable through local employment (EC 2010).

Pillar 1 is divided in direct payments to farmers and market measures. The latter decide on the criteria to intervene in the agricultural market, such as marketing rules and regulations on competition (Brady *et al.* 2017a). Most of today's CAP budget (72%) goes to direct payments (EC 2017, p.1) (Figure 2, EC 2020). In the last decade, almost half of EU farmer's income has come from these payments (ibid., p. 1). This is due to different

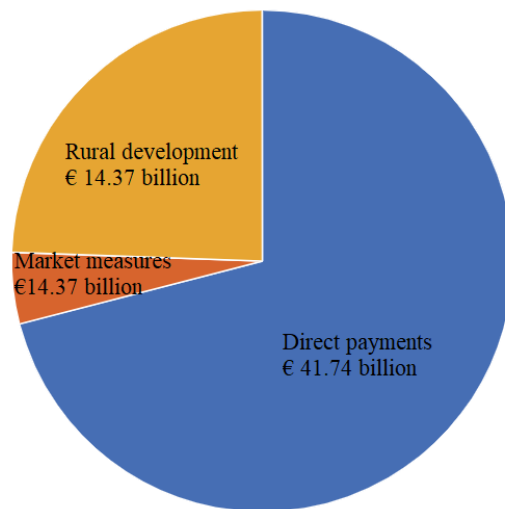


Figure 2. Distribution of CAP budget in 2018. (EC 2020)

factors typical of farming, such as dependency on weather, length in producing food and scarce demand elasticity in relation to price. The provision of these payment is given based on the number of hectares (ha) of farmland and subjected to cross-compliance, which is a series of requirements that have to be met by every farm (Jongeneel & Bezlepina 2008). The objective is to create a baseline of minimum standards among all EU countries for issues such as animal welfare, biodiversity, and soil quality. In other words, cross-compliance aims at maintaining the existing conditions in agriculture; if farmers want to receive additional payments for environmentally friendly practices, these practices have to go above and beyond the baseline of cross-compliance (ibid.).

Voluntary Coupled Support (VCS) is an exception to the decoupling in regard to some products (EC 2017), as it's calculated by unit of livestock. VCS is given to certain sectors that may be struggling with the goal of maintaining the level of production; most Member States have linked it to beef and veal production, dairy production, and the goat and sheep sector (Hayden *et al.* 2019). All countries except for Germany have chosen to apply VCS to some of their products. States can allocate up to 13% of the direct payment budget to these sectors (ibid., p. 4).

The 2013 CAP includes also the establishment of the greening measures, tying 30% of the direct payment budget to three actions: crop diversification, ecological focus areas (EFAs) and preservation of permanent grasslands (Alons 2017). Crop diversification implies the production of at least two or three crops, depending on the area of arable land (over 10 ha or over 30 ha, respectively) (EC 2017, p. 8). The permanent grassland effort, namely not ploughing or converting these areas, is considered an important environmental measure, as it preserves a third of all European farmland. In the EFAs, farmers dedicate at least 5% of their farmland to preserving biodiversity. This can be done, for example, by planting nitrogen fixing crops, hedges or wooden strips along the property (ibid., p. 8).

The second pillar of the CAP, accounting for 20% of the CAP budget (ARC2020 2013, p. 2), is aimed at supporting rural development. It is co-financed by Member States and implemented at the national level in a Rural Development Programme (RDP) (ibid.). These programmes have to pursue at least four of the objectives set out by the EC. These objectives are to strengthen knowledge, increase competitiveness, advance organisation in the food chain, preserve ecosystems, encourage a resource-efficient economy, and foster economic development (EP 2020). These goals for the agricultural sector can be achieved through different measures proposed at the EU level, which are also chosen and structured in each national RDP. The most common instruments used are investments, agri-environment-climate measures (conservation of farming methods which bring positive environmental outcomes), and payments to areas with natural or other constraints. Other options include farm advisory services, knowledge transfer, and support for organic production (ibid.).

2.3.3 Critiques to the present CAP

The EC states that “protection of the environment is at the heart of the CAP” (EC 2019c, p. 3), citing cross-compliance, the greening measures and the rural development architecture. Furthermore, it denies supporting mostly intensive farming, as most payments are decoupled, and as it has additional measures in favour of alternative ways of production, such organic agriculture, which receives both EU funding and State co-financing (ibid.).

However, over 70% of today’s budget is destined to farm income and enhanced competitiveness (Pe’er

et al. 2019, p. 450) (Figure 3). Some observe that direct payments have been unequally distributed (Navarro & López-Bao 2018). Another study shows that they increase GHG emissions, slow down structural changes in agriculture, and the wide variety of land that they cover makes environmental measures and the provision of public goods ineffective (Brady *et al.* 2017a). Meredith & Hart (2019) observe that, despite the intention in the 2013 reform to increase its climate commitments, the lack of coordination and State pressures watered down the measures. Regulations in pillar 1 and 2 are not integrated, leading to incoherence and inefficiencies (ibid.). This is especially true for environmental efforts, where measures with little impact receive most of the payments (Pe’er *et al.* 2017). Farm Advisory Services are often not used by Member States as a way to improve their environmental indicators, but

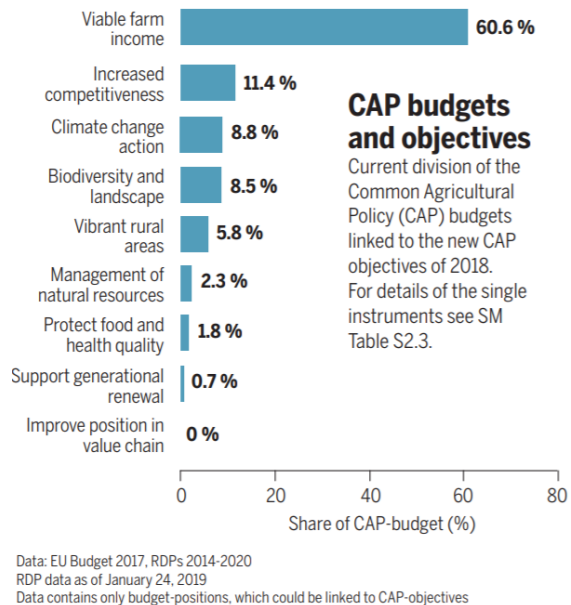


Figure 3. CAP budget and objectives for 2018. (Pe’er *et al.* 2019, p. 450)

mainly to comply to the mandatory requirements; this may also be because advisors not always have a thorough understanding of climate issues. Furthermore, a number of exceptions put in place to the greening measures significantly reduced the number of farms and areas included in the requirements (Meredith & Hart 2019). The European Court of Auditors (2017) concludes that both diversification and EFA had no impact on most of the farms analysed as they already fulfilled the criteria, and permanent grassland measures could bring higher environmental benefits if targeting were more accurate.

The VCS for beef production has received mixed results. Jansson *et al.* (2018) show that removing VCS for beef production would decrease production and total net GHG emissions, both in the EU and in total, but it would also create an opposite effect in third exporting countries and an increase in other meat consumption (pork and poultry).

Pillar 2 is overall considered relatively effective already since the 2007 reform. The doubts about the rural development measures depend primarily on its ability to achieve the ambitious environmental objectives with more limited funds (Swinnen 2016). A comprehensive assessment of these measures is also more complex, as each RDP is implemented nationally and they entail significant differences (Lataste *et al.* 2011).

2.3.4 The future of the CAP

The two main issues that the CAP 2021-2027 seeks to address are an enhanced environmental performance and a less complicated administration; this is the base of the proposition from the EC released on 1 June 2018 (EC 2019e). The goals that relate to the environment are three: contribution to climate change mitigation, sustainable use of natural resources, and protection of biodiversity and ecosystem services (*ibid.*). These are to be incorporated in one document for each Member State at the national level, called CAP strategic plan, which will include both pillars and a discussion on how a country will achieve each objective according to a national SWOT (strengths, weaknesses, opportunities, threats) analysis. Greening and cross-compliance will be merged into one mechanism, called ‘conditionality’, which will tie payments across pillars to a series of requirements without details or numbers (*ibid.*). Diversification will be replaced by crop rotation according to farmers needs based on national guidelines.

Payments for the environment and climate beyond conditionality will be delivered through the so-called ‘eco-schemes’, whose content and conditions will be decided by each country and financed through pillar 1. Member States will have considerable freedom regarding the environmental issues that these schemes should cover, the amount of the budget to dedicate to it and how to implement (EC 2019e). Some further practices that could be encouraged are preservation of permanent pastures and organic farming (Meredith & Hart 2019). Pillar 2 will not change significantly, though increased support for Farm Advisory Services is accentuated in the EC’s proposal (EC 2019b, p. 8). The EC’s proposition, however, still needs to

go through the legislative process which involves the European Council and the European Parliament. The main disputes are about the budget cuts, the role of the national strategic plans, a cap for direct payments per farm and the administrative burden for the new environmental requirements (Massot 2020).

Meredith & Hart (2019) recognise the potential of the eco-schemes to positively impact the EU's environmental performance, even leading to a potential system redesign. However, doubts remain as to whether member countries will want to commit to higher environmental standards. Furthermore, it is calculated that an overall decrease in budget is expected, with a 28% cut expected for pillar 2 and an 11% for pillar 1 (Pe'er *et al.* 2019, p. 450). Direct payments are still expected to make up for the majority of the budget, with no clearer environmental or social targeting (Grethe *et al.* 2018). A positive potential measure is represented by the increased importance of the Farm Advisory Services. The strengthening of advisory services could be useful for the implementation of all environmental measures, including the eco-schemes. However, the risk remains that, like in the previous reform, these services could mainly be used to advice on administrative aspects and basic environmental requirements (Meredith & Hart 2019).

2.4 The Swedish Agricultural Policy

2.4.1 A brief history of the Swedish agricultural policy

Small-scale, mixed production agriculture dominated in Sweden at the end of the Second World War. The policies that led the development from that point put modernisation at the forefront, which resulted in increased production and stabilised rural income, but also in emergent environmental issues (Flygare & Isacson 2011). Around the 1950s, the dairy sector also reached its peak production, with over 90% of farmers involved in dairy delivery to industries (Martii 2017, p. 9). The dairy sector was considered by the government as the best way forward for farmers in a society striving for industrialisation. After this period, both total production and the number of dairy farms declined, while average herd size and average yield per animal increased (*ibid.*). The progressive shift to large-scale production increased in the 1960s, with the mechanisation of cereal production. In the 1970s the Federation of Swedish farmers increased in importance, acting as the farmers' voice especially in regard to agricultural prices, as well as offering services such as legal and economic consults. The 1980s saw a comprehensive reform that put market liberalisation and deregulation at the forefront. By the time the deregulation was showing its results, Sweden joined the EU; from 1995 on, an independent Swedish agricultural policy disappeared (Flygare & Isacson 2011).

The application of the pillar 1 regulations in the national legislation is laid out in the Swedish regulation (2014:1101) and managed by the Ministry of Enterprise and Innovation (Ministry of Enterprise and Innovation 2014). This expresses the Swedish Board of Agriculture's responsibility in applying the EU regulations, as well as its role as controller over the County Administrative Boards (one for each of the 21 counties); the latter are responsible, for example, for receiving the applications that farmers submit to obtain the direct payments (ibid.).

Sweden has decided to set a minimum physical threshold to receive direct payments to four hectares, which is quite high compared to other countries, such as two hectares in Denmark or one hectare in Germany (Henke *et al.* 2015, p. 68). This means that farmers who have less than 4 hectares of arable land in Sweden are not qualified to receive the CAP direct payments. The relevance of direct payments on Swedish farms is quite high, with direct payments contributing to total farm income level from around 40-50% in the southern counties to over 50% in the northern counties (EC 2017, p. 3) (Figure 4). Among the optional measures in pillar 1, Sweden has decided to adopt the VCS for cattle (after one year of age) that encourages an extensive rearing (Soderberg 2016, p. 6). Sweden allocates the maximum amount permitted under EU regulations, 13% of the national direct payment budget, amounting to around 900 Swedish crowns per animal per year (Swedish Government 2018, p. 43). Just like the rest of the EU, Sweden has many exemptions for the application of the greening measures; this means that, in practice, only 5% of farmers needed to make changes when the greening regulations came in force, on an area amounting to barely 0.4% of farmland (Soderberg 2016, p. 23). Instead, it has foregone the option to move resources from pillar 1 to pillar 2 (*ibid.*).

Importance of direct payments for farm income

Average share of DP in FNI %

- ≤ 20%
- 20 - 30%
- 30 - 40%
- 40 - 50%
- > 60%
- No data

SOURCE:
DG AGRI – EU-FADN
TABLE:
2013
CGLS/IRIS/IS,
DG AGRI – IS
CA/ISS/IS/IS,
DG AGRI GIS-Team 05/2016

© EuroGeographics for the administrative boundaries

European Union
European Agricultural Fund for Rural Development
Rural Development Programme 2014-2020

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Programme after the EC's approval (EC 2019b). The main goals of the current RDP are to advance competitiveness in agriculture, safeguard the sustainable management of natural resources, and evenly develop the rural economy (Ministry of Enterprise and Innovation 2015). However, the order of priority for each measure are decided through the action plans for the RDP, which are drawn up at the national level by the Swedish Board of Agriculture, the Swedish Forest Agency and the Swedish Agency for Economic and Regional Growth. On top of these, regional action plans are drafted by the County Administrative Boards and the Sámi Parliament of Sweden (Swedish Board of Agriculture 2020). Overall, the Swedish Board of Agriculture is the administrative authority for the RDP (Swedish Board of Agriculture 2019). The six priorities set by Swedish Board of Agriculture are: 1) promote knowledge transfer and innovation in agriculture and forestry as well as in rural areas, 2) improve profitability and competitiveness in all types of farms and in all regions, and promote innovative agricultural technology and sustainable forestry, 3) improve animal welfare and the organisation of the food chain, including processing and marketing of agricultural products, 4) restoring, preserving and promoting ecosystems linked to agriculture and forestry, 5) promote resource efficiency and support the transition to a low carbon dioxide and climate-resilient agricultural economy, 6) promote social development and create economic development in rural areas (Swedish Board of Agriculture 2019, pp. 7-8). These priorities are further subdivided in focus areas, such as promoting lifelong learning; promoting competitiveness through short food supply chains; restoring, preserving and improving biodiversity (ibid.).

The total budget for the current programme period is € 3.8 billion, which includes over € 2 billion of national funding (EC 2019b, p. 1). The majority of the budget is allocated to payments to areas facing natural or specific constraints, and agri-environmental-climate measures (respectively € 893 million and € 849 million) (ibid., p. 3). Other measures to reach these different goals are the strengthening of knowledge, with the help of Farm Advisory Services and training; improved competitiveness through farm modernisation with the aim of strengthening the ties of farmers to the market; promotion of cooperation projects to promote environmentally friendly agriculture and investments; and 12% of the budget allocated to organic production. Other main parts of the budget allocation go to areas facing natural or other constraints and agri-environment-climate measures (ibid., p. 3).

2.4.3 The Swedish position for the future of CAP

An important factor when looking at the future of the Swedish agricultural policy is that the government's propositions are guided by the overarching goals of the Future Food Strategy for Sweden, which sets the food policy goals for Sweden until 2030 (Swedish Government 2018, p. 19). The need for this common orientation is due to the increasing challenges regarding environmental and climate issues and to an increased difficulty in competing on the global market (Ministry of Enterprise and Innovation 2016). Therefore, this strategy was set in 2016 to guide the food

sector towards a higher competitiveness. This will be achieved through an increased production, both in conventional and organic products, higher exports and a higher grade of self-sufficiency, and more knowledgeable consumers. One of the three strategic areas of action needed to support the Swedish objectives is ‘rules and regulations’. Policy should support the increase in productivity and competitiveness, make structural changes more accessible, encourage spreading of knowledge, develop crop production, and enhance livestock productivity (ibid.).

Following the above objectives and the EC’s proposal, the Swedish government welcomes the increased flexibility for Member States and a more result-oriented CAP, even though it believes that a further simplification would be beneficial (Ministry of Enterprise and Innovation 2018). For that, it sees positively the elimination of the greening measures, but is sceptic of the new basic obligations for the environment. Another suggestion is to phase out direct payments, seen as detrimental to efficiency and to the entrance of new farmers in agriculture, and to overall decrease the CAP budget. Goals that are in line with the EC’s proposition and the Food Strategy are increased sustainable productivity and increased market orientation, positively seeing a possible reduction in VCS, whose support should be kept only for environmental reasons, which will have to be proven to the EC (ibid.).

3 Methodology

3.1 Research approach

This qualitative research is guided by a worldview that is part constructivist and part transformative. From the former, it puts the individual's experiences at the centre of the study, and it focuses on the reflections and the understanding that the respondents construct (Creswell & Creswell 2018); in this case, in relation to what they consider to be a barrier or a driver for agro-ecological diversification. There are also transformative features, such as the departure from a social (and environmental) issue, and the linkage of it at the policy and political level (*ibid.*). The transformative worldview usually also presents an agenda of change; although this is not clearly defined in the study, the inquiry still aims to provide suggestions to future change at the political and institutional level, as well as in the food chain.

These worldviews inspired the chosen cross-sectional research design (Bryman 2012). Properties of this design are the simultaneous collection of the data, the research of correlations among different information, as well as the aim to understand the interaction, of causes and effects (*ibid.*). Here, the objective is to identify elements in policy that can further or hinder agro-ecological diversification and identifying elements that the actors interviewed consider relevant to the issue.

The method of semi-structured interview has been chosen because of its qualities when exploring different insights into what people think and how they argue about a topic such as agro-ecological diversification. With the use of semi-structured interviews with open-ended questions, the respondents are asked to explain how they interpret different aspects of the reality around them (Bryman 2012).

3.2 Selection of respondents

The selection of the participants was made purposefully, meaning that participants are not selected casually, but based on their knowledge and position. This allows to gather valuable information and help the researcher answering the research questions, as well as present different views and position on the study subject (Sargeant 2012). Respondents need to be different enough to capture different perspectives on the subject (*ibid.*); this was achieved through choosing respondents

from research on the major institutions and organizations involved in the development and application of the CAP in Sweden (see section 2.4). At the same time, they need to be numerically enough to create data saturation, which happens when new interviews do not produce additional views (Sargeant 2012, p. 1). In this study, there was not a number that was decided beforehand, but a minimum of 5 interviews were considered satisfactory if they included different types of actors.

All contact with the potential respondents was carried out by email. The selection of the participants started from a few actors that had already been involved in the UNISECO project and had previous contact with the thesis supervisor. They were asked if they had any suggestions on possible respondents that would represent a broad range of opinions, using what is called the snowballing sampling technique (Bhattacharjee 2012, p. 70). To increase the number of the participants, further research was then made on the websites of organisations involved in the CAP according to the technique of expert sampling (ibid., p. 69). One of the respondents was chosen to be an independent consultant and farmer, to have an additional view-point that could be compared with the other respondents, and a researcher and policy advisor from AgriFood was interviewed as well. This brought the total number of interviews to ten. Table 1 presents the respondents as well as their code number used in the results and discussion sections.

Table 1. Respondent codes and information

Respondent code	Institution/organisation	Role
R1	AgriFood (SLU)	Researcher and director of research studies
R2	Federation of Swedish farmers	Lobbyist specialising in issues around CAP
R3	Swedish Board of Agriculture	Agricultural economist, specialised in CAP pillar 1
R4	County Administrative Board of Stockholm	Rural development division and National Food Strategy
R5	Swedish Board of Agriculture	EU program division, agriculture and analysis
R6	Ministry of Enterprise and Innovation	CAP negotiations and national implementation
R7	County Administrative Board of Uppsala	Greppa Näringen, coordinator farm advisors
R8	Ministry of Enterprise and Innovation	Responsible for Swedish RDP and future strategic CAP plan
R9	County Administrative Board of Stockholm	Responsible for agricultural payments
R10	Independent	Consultant for environment and agriculture and farmer

3.3 Research method

The first step in the research process was to conduct a literature review. This was done following the two macro-areas of interest: agro-ecological diversification and agricultural policy. The first part of the research was dedicated to reading about the

principles of agro-ecology and agro-ecological diversification. Then, after researching the broad topic of agricultural policies, I decided to focus on the CAP, as it contains the main regulatory framework in the sector, and it guides national policies in the EU. I then looked at Sweden and identified another policy that was considered relevant to food and agriculture in many scholarly articles, the National Food Strategy for Sweden. Several Swedish regulations were initially taken into consideration, but the respondents only focused on the National Food Strategy. The last step was to unite the two broad themes and identify the articles that were already present on the subject; a gap was identified in the literature (Bryman 2012) in regard to the influence of policy on agro-ecological diversification.

After the literature review, an interview guide was formulated. This is designed in such way that it covers the research questions well. Before the questions, there is an explanatory paragraph to clarify the key concepts and goals of the interview; see Appendix 1. The explanatory paragraph makes the goals of the interview clear and specifies the concept of agro-ecological diversification. This is helped by some examples taken from real-case Swedish farmers participating in the UNISECO project in order to give a demonstrative list of the policies of interest. The first questions of the guide are introductory and then they dive deeper to explore barriers and drivers to diversification in the EU and Swedish context. Question seven is formulated to give concrete examples of the subject; some barriers to diversification that had been identified during one of the UNISECO project workshops are transposed in the guide. The second part of the interview relates to the future of CAP after the 2020 reform, in line with the second research question of the thesis. A brief explanation in italics is present after each question.

A first version of the interview guide was then tested in a pilot interview. The respondent is a teacher and researcher from SLU involved in the UNISECO project that has also experience with agricultural institutions. The aim of this pilot was to pre-test the guide to see if the questions lead to answers in line with the research questions, if the concepts are understandable, if all questions are relevant and if the timeframe of the interview is acceptable (Chenail 2011). The result was satisfactory, and some small modifications were made to improve the interview flow. During this pilot, it was also decided to conduct the interviews in Swedish, as this would enable respondents to express their positions better (more on this in the validity section).

3.4 Data collection and analysis

In-person interviews were scheduled in Uppsala, Stockholm and Jönköping. Unfortunately, with the increase in coronavirus cases in Sweden in the weeks before the interviews, arrangements were made to complete the interviews remotely, selecting the platform based on the preference of each respondent. Around a week before each scheduled interview, the explanatory paragraph and interview questions were sent out by email. Below, it is possible to see some specifics of each interview

(Table 2). Each interview was recorded with permission and then transcribed manually on the computer to have a clearer picture of each interview and understand better the opinions of each respondent (Bhattacharjee 2012).

Table 1. *Interviews details*

Respondent code	Interview date	Type of interview	Recording (minutes)
R1	23/03/2020	Zoom meeting	55:26
R2	25/03/2020	Microsoft Teams meeting	39:42
R3	30/03/2020	Phone interview	50:54
R4	01/04/2020	Skype for business meeting	43:48
R5	01/04/2020	Skype for business meeting	48:05
R6	03/04/2020	Skype for business meeting	47:28
R7	03/04/2020	Skype for business meeting	63:16
R8	14/04/2020	Skype for business meeting	35:53
R9	15/04/2020	Skype for business meeting	34:15
R10	23/04/2020	Skype meeting	70:00

The transcripts were then coded, meaning that each relevant section was given a definition that summarises the essence of that data (Saldaña 2013, p. 3). Since coding is not an exact science, but an interpretive process, the choice of codes is subjective. The origin of the codes is both emergent and a priori. A priori codes are pre-defined before the analysis, and in this case comprised all the policies and measures examined (e.g. direct payments, investment support, VCS). Emergent codes are those who emerge from the data and are not pre-defined, and make up the bulk of this analysis (Elliott 2018). This is in line with the inductive nature of this research, that does not present any theory as a starting point, but rather seeks to find connections between policy and agro-ecological diversification based on the experiences and opinions of the respondents (Bryman 2012).

Nevertheless, there are different methods that a researcher can rely on to code, depending on the aim of the study, the type of answers sought, and the type of information coded. At the beginning of each interview I used attributive coding, meaning collection of personal data, to classify relevant personal information of each respondent (used for Table 1). The use of structural coding relates different topics (the essence of the phrase) to the research question (Saldaña 2013, p. 84). This helped, for example, dividing the information about the two research questions, separating the affirmations about the EU and Sweden, and pointing out barriers and drivers to agro-ecological diversification. Evaluation coding was used to pinpoint how respondents value a specific policy and judged its effectiveness (ibid., 119). Value coding, which identifies attitudes and values (ibid., p. 110), was used when respondents talked about farmers and their relationship with their farm and the environment. Each code was written as a comment next to the word document of the transcript, while an Excel matrix (codebook) was used to keep a comprehensive list. In the codebook, each code was classified by frequency, meaning how

many participants referred to that code (ibid.). This process resulted in around 70 codes.

The next step in the analysis was going from codes to categories; these group several codes into a more abstract concept that helps uncover the underlying patterns of the data (Saldaña 2013). For instance, the codes “profitability”, “economy of scale”, “role of consumers”, “specialisation”, were grouped under the category “the market and the economy”. The outcome of coding and categorizing finally resulted in themes, which have been used as the titles for the main paragraphs of the next chapter (policy instruments in pillar 1, policy instruments in pillar 2, policy priorities as a barrier or driver, the influence of non-policy factors on diversification, the relationship between CAP and production, future of CAP). These emerging themes are considered the “final” outcome, the emergent results that indicate the answers to the research questions.

Finally, a syntax detail to notice is that the pronoun ‘they’ has been used to refer to respondents to indicate participants without revealing their gender (Oliver 2018).

3.5 Validity

Validity, namely the veracity and trustworthiness of the study, is a key element of research (Creswell & Creswell 2018, p. 251), that can be achieved in different ways. One of these is triangulation: the comparison of different sources of data to justify the analysis. In this research, this is achieved by using of both interviews, literature review and consultation of the policy texts cited. A further triangulation is made by using some material from the UNISECO project, such as the material identifying barriers and drivers to agro-ecological diversification, as well as participating to a two-day workshop in March where many stakeholders shared their views on the subject.

Another way of increasing validity is member checking, meaning checking in with the respondent during the writing process to discuss about my interpretations of what was said during the interview (Creswell & Creswell 2018). This was done by sending the results chapter back to the respondents, together with their respondent code, via email, allowing them to make sure that they found the information that I wrote accurate, and to give them the possibility to make clarifications. I decided to send the whole chapter so that respondents could understand the context in which their interview was used. Some adjustments were made after these interactions (seven respondents replied and gave feedback).

All the actions above helped addressing the researcher’s personal bias, thus limiting the influence that past experiences and personal beliefs can have on the interpretation of the data. Self-reflection on my own values and beliefs can also contribute to minimise bias (Creswell & Creswell 2018); having a background in political sciences, I have the tendency to believe that policy can have a strong influence in every field, and that it can change the way food systems are constructed. Being aware of this, I tried not to push my idea on respondents who believed that policy had a marginal role in agro-ecological diversification. Chenail (2011) also points

out that one of the most common ways to address issues with an interview is to conduct a pilot interview, because the test respondent can give honest feedback on any questions that they feel is ambiguous or biased. Validity was also ensured through “qualitative reliability” (Creswell & Creswell 2018, p. 252) by maintaining rigorous documentation of the research process such as recordings and transcripts of the interviews.

Another factor to point out is the fact that the interviews were conducted in Swedish, even though my English is more fluent. The linguistic choice was made to allow respondents to express their positions with more ease. The interview guide was corrected by the supervisors to make sure that the terms used were the most suitable for the context. It was then tested through the pilot interview to see if I could keep up with the communication and ask the suitable follow-up questions. My understanding of the interview content was also aided by the audio recordings, so that if I did not understand something during the interview I could go back, listen again and search for any word that I did not know the meaning of. I then asked my supervisors for any idiomatic expression that I could not translate. Moreover, the respondents received the results of their interview already translated in English, so that they could verify if my translation kept the original meaning of what they said.

4 Results

4.1 Respondents' perceptions and opinions on diversification

All respondents stated during the interview or the email exchange that the questions in the guide were complex and required a broad set of knowledge. Nonetheless, all of the participants replied to all or most questions. It appears that agro-ecological diversification is a difficult topic to keep in focus because of its niche position in agriculture and because of the different meanings attributed to diversification. R2 states that diversification is “a bit of a difficult concept”, while R1 recognises that without the guide sent beforehand, they would not have thought about diversification in that way, but about the ‘greening’ diversification, or on-farm diversified activities as an additional income.

Another finding covers respondents' attitudes towards agro-ecological diversification. Some express a positive outlook on this concept and its implications. “Diversification is linked to different environmental goals, such as biodiversity and less nitrogen leaching, since it influences plant nutrient leaching. I have no problem justifying why one should diversify”, says R4. R1 acknowledges that, in regions where production is concentrated and there are high nitrogen losses, diversification and crop rotation should be rules to follow. R7 recognises that the 2018 drought might have led to fewer losses if farms were more diversified, but at the same time sees the difficulties in bringing it on a large scale because of the labour required. The same concern is expressed by R6, saying “it is not a solution for the Swedish food production. Should it be more than a niche, for example in this situation of crisis, then it would not work, no”.

4.2 Policy instruments in pillar 1

Several instruments present in the CAP were identified by respondents as influential for diversification. To ensure changes and increase the percentage of crops for human consumption within livestock rearing, farmers need to be given the conditions to do it, through increased support that would act as “carrots”, and push businesses to try something new (R9). The main measures mentioned in the first

pillar of the CAP are the direct payments to farmers and the voluntary coupled support (VCS) for cattle rearing.

4.2.1 Direct payments to farmers

When asked about direct payments, respondents generally said that they did not see a significant influence on diversification, neither as a barrier nor as a driver. In general, they are seen as having a positive role on an economic level, as they give the possibility to smaller farmers to survive and have a profitable business, especially if they specialise in niche crops (R10). R1 states that some farmers would not be able to survive if it were not for the direct payment, so it plays a positive role. R6 adds that a basic payment can help farmers develop their business, creating better conditions to increase knowledge and new techniques that ultimately increase efficiency and productivity on the farm. When asked about any connection between direct payments and agro-ecological diversification, some respondents observed that, since the payments are delivered by hectare of farmland, a more plausible consequence is that some farmers abandon their land or cultivate it very extensively (R2), especially if farmers are old or if they have other sources of income besides agriculture (R3).

An effect of direct payments that emerged in three interviews is the “hiding” effect that it might have on diversification (R2, R6, R10). In fact, due to the conditions needed to receive the direct payment, larger farms may decide to divide their property into different business, one for each for each type of production, separating different animals and crops from each other. In this way, if a mistake occurs in one business (such as a lost animal ear tag, R2), the payment is not entirely lost. However, different productions may be, in practice, fully integrated (R6).

The diversification in the greening payment scheme is deemed to have little to no impact on the Swedish agriculture (R3). This is because most farmers already had two or three different crops on their farm, and the many exceptions in the EU framework excluded other businesses that did not already have the greening diversification requisites (R3).

4.2.2 Voluntary Coupled Support (VCS)

Many respondents identify the VCS as relevant to agro-ecological diversification. In Sweden, this is reserved for cattle, “even though it could be applied to other productions, including legumes” (R1). The reason for this choice has been identified in the importance that cattle have for Swedish production and its low profitability (R1). There are also environmental reasons for this choice, with ruminants playing a paramount role in keeping the landscape open, thereby sustaining biodiversity (R1, R2, R7, R8). R1 and R2 also point out the role of ruminants in the conversion of inedible biomass to food suitable for human consumption. R8 adds the value in job creation, since the number of workers hired per Swedish crown of on-farm investment is higher in a dairy farm rather than in cereal production. R6

also identifies beef and dairy as “the most important sector in Swedish agriculture, that is at the base for the food industry”, which is another reason why it is important to sustain it so that production does not decrease too much.

4.3 Policy instruments in pillar 2

The second pillar of the CAP contains the rural development policies that are then adapted into the national RDPs. The main measures in the Swedish RDP are the payments to areas facing natural or specific constraints, and the agri-environmental-climate measures (EC 2019b). However, the two main measures that emerge from the interviews for their ability to increase agro-ecological diversification are the investment support and the Farm Advisory Services.

4.3.1 Investment support

One major form of support mentioned during the interviews is the use of investment support, which is present in pillar 2 and translated in each RDP (EC 2019b). Some respondents show trust in this mechanism’s ability to promote diversification. For instance, since there is no difference in investments for animal or crop production, investments can be used for agro-ecological diversification, if that is what the farmer aims for; for example, receiving support for the purchase of machinery or buildings to manage the cultivation of legumes (R4). R6 brings forth the prioritization of soybean cultivation in Sweden. R10 says that if two farmers were to submit a request for investment support, with one asking to enlarge their stables, and another opening another production branch on their farm, the latter would probably be prioritized. This is because a new production activity would be more in line with one of the goals in the RDP, namely rural economic development.

Nevertheless, there are also some barriers that emerge from the use of investment support. R2 and R5 highlight once again the priority of grazing animals, which receive the majority of investments. R6 affirms that investments such as small processing facilities for legumes would not be prioritized, as there are already actors on the market (e.g. Lantmännen) who work in the sector and could invest in that. R5 and R8 also point out the budget limitations of the CAP, with R7 and R9 linking this to the difficulty for new generations of farmers or newly immigrated to start up a new agricultural business, as the capital required to do so is very high. This in turn might hinder innovative people from entering the sector, as the capital investment would be too high. R8 also explains that, although farmers could receive compensation if they wanted to build a cold storage unit, mobile assets are usually not compensated, since they can be sold on the second-hand market.

4.3.2 Farm Advisory Services and training

One of the questions asked the respondents’ opinion about the lack of knowledge regarding the cultivation of crops for human consumption and the role that farm

advisors might play. The views on this topic were very different. R1 underlines the difficulty that farmers may encounter when they want to agro-ecologically diversify, since much new knowledge may be needed to be an innovator. Some think that there is a lack of competent advisors in agriculture; R3 believes that there is a lack of modern advisors, as well as the necessity to have advisors that are not lecturers but coaches that find solutions together with the farmer. R5 agrees and recognises the importance of giving good examples by organising farms visits; they also talk about the presence of support in the RDP to finance projects aimed at building networks and knowledge.

However, the majority of the respondents think farmers have access to enough resources in terms of advisory services and competence development. R6 affirms that there is a good advisory support for a farmer seeking a more diversified production, especially in the form of projects that can help farmers that want to meet consumers directly. R7 describes that there are group activities where experts share their knowledge in different environment protection and climate impact projects within Greppa Näringen, organic farming and a rich landscape (biodiversity) in a form of field visits, study tours and seminars, mostly free of charge. In depth consultations are also available, where advisors check, among other things, the nutrient balance of the farm and nutrient use efficiency (especially nitrogen, phosphorus, and potassium) and the energy use efficiency of the farm. They also assess if the farmers have purchased only the inputs they needed, or if they bought large amounts despite already having them on the farm. After the initial visit, a plan is made to provide more in-depth advice, depending on the needs of the farm. The same advisor whom the farmers met the first time, or a new but experienced advisor, comes back and reviews the farmers' progress. They also mention Uppsala County's efforts to increase vegetable production through group consultation and courses. Moreover, Uppsala's County recognises the lack of knowledgeable or experienced advisors with a background in soil and plant nutrition.

4.4 Policy priorities as a barrier or driver

From the discussions about policy instruments, one major theme emerged regarding the role of these measures in helping the development of agro-ecological diversification. The efficacy of the measures depends on how much priority is given to it, because it directly impacts how much support is given to each type of measure in the CAP.

4.4.1 Evolution of the environmental priorities of CAP

The CAP past is identified by some as influential in encouraging intensive production and specialisation (R1, R5). Others believe that past EU policies did not influence intensification, but rather followed the intensification tendencies already present on the market and further encouraged them (R10).

Nevertheless, many pointed to the increased interest in the environment in the CAP. R3 indicates the importance of the measures in pillar 2, and the will from governments to decrease direct payments in favour of environmental support. Important is also the role of cross-compliance, which sets standards for livestock production, for example how many animals one can have per hectare. “I think this is good. This is an important instrument that influences how animal production is managed” (R4). One respondent adds that it’s good to have subsidies because it keeps a higher percentage of the production in the EU as opposed to other countries, such as India and South America, where the production is less environmentally friendly: “if you took away all subsidies that come from policy, the global environmental strain would increase, because the EU and Swedish production of, for example, milk and beef is more environment friendly here than in the extensive animal production that is found in India or South America” (R6). Similarly, R10 thinks that the CAP has made agricultural production relatively less specialised than countries such as Australia and New Zealand. These countries have experienced a progressive deregulation while in Europe the CAP was developed, resulting in a more specialized production nowadays (R10).

Despite the increased environmental objectives that the EU has given to the CAP, this does not automatically translate in an increased attention to agro-ecological diversification. In fact, the CAP budget is limited. This is explicitly pointed out by R7, who does not see any opposition in the legislation to agro-ecological diversification and sees a possibility to expand diversified production. “But it is about the budget... we need to choose” where the budget is allocated. For example, farmers send out their application to receive investment support, which is accepted or denied based on the selection criteria set up at the political level (R5). R6, R8 and R9 also see this point as decisive, with R9 affirming “if I think that policy wants farmers to grow more crops for human consumption, they must give them specific indications”, as today there are not clear enabling conditions for farmers to produce more crops for human consumption.

On a European level, it seems that agro-ecological diversification is not high up enough on the list of priorities, according to the respondents. R10 is not optimistic about the political will in Brussels, noting that they are taking only small steps forward; “on the contrary, we would need a system change to achieve agro-ecological diversification; going from producing as much as possible with the lowest environmental damage, to a resource effective and environmentally friendly paradigm”. Additionally, most of the respondents only talked about the priorities present at the national level. This is because, while the European Commission lays the base regulation, especially for pillar 2, it is the individual country that decides which measures are relevant.

4.4.2 Swedish policy priorities

The respondents identified some of the same trends as on the EU level at the national level. Environmental priorities have become more important, with the

County Administrative Board beneficially applying cross-compliance (R4), with strong environmental objectives and high standards that were not on the radar before (R7). The environmental goals, together with an increased production, are the main objectives of the National Food Strategy (R6, R7), which also sets the main priorities for the Swedish food sector until 2030 (R2).

The priorities for the second pillar are set at the national level by the Swedish Board of Agriculture. However, since counties have different needs, each County Administrative Board can choose which priorities (among those set up at the national level) are more relevant to their own county; for example, some could prioritize tree fruit cultivation rather than cereal cultivation and distribute the investment support accordingly (R8).

There are some positive signals; “for example, now in the Uppsala County Administrative Board, we’re seeing diversification, locally produced, and crops that can aid with water supply and nutrient supply. They create a synergy with other crops and the rest of the farm” (R7). R9 has not heard much about diversification and an increased percentage of plants for human consumption, but says that within the National Food Strategy and in Stockholm’s county there are discussions to increase vegetable production. R10 also talks about a moderate interest in integrated production as a way to increase rural economic development. However, R10 believes that quantity is still more valued than quality.

In general, many counties still decide to prioritize ruminants over crops; this is because grazing animals are deemed to fulfil the goals of competitiveness, increased environmental performance by keeping the landscape open, as well as job creation (R8). Others share similar points of view (R1, R2, R6, R7). The priority to diversify agro-ecologically might also be lower because Sweden has a relatively well-integrated crop-livestock system compared to many countries in the EU (R4, R8). Finally, two priorities have been pointed out from the Swedish agricultural policy: organic production and short food supply chains, examined below.

4.4.3 Organic production

Some respondents talk about an overlap between farmers that implement organic production and agro-ecological diversification, but the opinions differ regarding the reasons for this connection. R2 says that organic production has a more holistic vision of the business and the production than conventional production, especially for the fact that animal and crop production are more integrated (even though they also acknowledge the presence of specialised farms in the organic sector in Sweden).

R1 explains that, in the EU, there are regulations that organic farms have to follow; among these, there is the requirement for organic livestock farms to produce half of the feed for their animals on-farm (either their own or neighbouring farms). This is considered by R1 as a positive practice, helped by the compensation present in the RDP. R1 also points out that there is no guarantee that feed production on farm would bring more integration of animals with crops for human consumption.

However, R10 brings forth the example of integration between animals and crops such as oats, that an engaged farmer might use both as food and feed as it requires the same machinery and processing. However, R10 and R8 think that the correlation between organic production and agro-ecological diversification does not necessarily depend on the characteristics of organic production, but rather on the personality of each farmer. “If you dare to invest in organic production, you dare to invest in other things such as diversification” (R10).

4.4.4 Short food supply chains

Some respondents highlight the importance of farm size in agro-ecological diversification (R1, R6, R10); they agree that large farms are able to diversify because they have the capital to invest and the space to bring all productions to a scale where it's profitable. On the other end, small farms might be able to diversify by setting up an on-farm shop or find other ways to sell directly to consumers. This can give a higher price to producers for their products and allow them to keep more products at a smaller scale, such as keeping both animals and crops for human consumption. R10 says that medium-sized farms (like their own) are stuck in the middle, as they have too much produce to sell on their property but are too small to enter into the majority of the retail channels, as retailers have centralised their logistics during the last decades. They may receive some knowledge support from CAP to organise the more complicated logistics, but they note that it does not eliminate the root problem, namely the concentration of processing facilities and wholesales.

Therefore, according to some, shortening food chains might enable more farmers to diversify their production. R5 says that this is one of the focus areas of the RDP, also at the EU level, but there is not much money allocated to it and it happens mainly at the farm level. R6 mentions the support to open on-farm shops and deals with producers such as ICA to create new products. It is also important to sustain small producers by creating short value chains, so that they can enter food boxes programmes and have direct contact with restaurants. “This would help produce more sustainably, if farmers knew how to build the connections, where to invest and what to have on their farm” (R1). A big problem in the production of some protein crops such as legumes is the lack of processing facilities near the farmers, which then have difficulties in selling their products without some initial processing (R4). R7 adds that the baseline of 4 ha to receive direct payments could be lowered, so that those who are starting their production in a small farm could receive some money, which would develop locally produced foods.

Another policy that might enable this process is the Unfair Trading Practices Directive of the EU Commission (R2, R3, R6), that has the main objective to reduce the concentration of power in the food chain. This directive, not tied to the CAP, but transposed in the Swedish legislation, aims at supporting producers and decreasing the concentration in the food chain as well as defining unfair business practices and increasing transparency.

4.5 The influence of non-policy factors on diversification

For many respondents, policy is not the main determinant of agro-ecological diversification. The main topics that are identified are economic factors, natural conditions, and farmers' attitudes.

4.5.1 The market and the economy

The influence of the economy on production, and consequently on agro-ecological diversification, is considered more important than policy by many respondents. One reason is that Swedish production is embedded in the global food chain, which leads to specialisation and increased scale of production to be able to compete on the global and European market; this is particularly important as Sweden promotes free trade (R8). It also gives more power to consumers, who can both increase environmental standards by demanding more sustainable and local products (R1, R3) or decrease them by pushing prices down (R2).

A further factor that hinders agro-ecological diversification is low profitability. "It's impossible to force people to do something that's not profitable for them. If the market shows they're interested in buying their product, farmers are ready to produce" (R1). R4 puts it simply: "it's just cheaper to produce on a large, specialised scale", and R8 adds that "the need to cut costs leads to specialisation". Low profitability can be the reason why many farmers have stopped producing in a more agro-ecologically diversified way, as outputs become too small to be profitable on the market (R2, R10). This opinion is shared by other participants, that see economy of scale having a prominent role against agro-ecological diversification. R3 brings the example of dairy cows, where 60 livestock units may be needed to be profitable; this concentrates the production because some parts of Sweden lack the natural pre-conditions for a larger-scale dairy production (i.e. smaller areas, more forest). On this note, R10 tells that their own farm had for years both animals and vegetables such as celery and garlic, which they could drive to ICA and Coop's distribution centres nearby. However, after the concentration of the facilities in a few large cities, they were forced to quit the vegetable production, as they were not large enough to cover the transportation costs.

However, not everyone thinks that the economy of scale only has negative impacts. For instance, larger farms have the possibility to pay for good farm advisors (R7). R6 affirms that specialisation and larger farm units correlate positively both with economic and environmental performances. R6 refers to their neighbour's farm, a large unit with pigs, cattle, and different crops. Their fully integrated production is possible because of their size, which gives them access to the latest technologies such as precision farming, knowledge, and investment in energy-efficient methods.

4.5.2 Natural conditions

Natural conditions are mentioned as influencing the possibilities for agro-ecological diversification. For example, Sweden has limited agricultural areas, which leads to relatively small farms (R8). R7 and R9 see natural conditions as an important factor in deciding how to diversify on each farm, such as integrating potatoes, root vegetables and crops with a shorter growing season in the northern regions (R9). R6 thinks that natural conditions, not policy, should decide which crops should be grown. R3 agrees, proposing natural conditions as the main factor for agro-ecological diversification at the farm level, as each farmer knows their own land and knows what is best to produce; this also leads to more economic profitability, as the property is used in the best way possible.

4.5.3 Farmers' attitudes

To the farm's natural conditions are added farmers' attitudes and beliefs. Some see it as a potentially negative factor, as farmers can be conditioned by traditions (R3, R9). However, most respondents see farmers as potential drivers of agro-ecological diversification. The existing diversified farms have developed because their owners saw "the bigger system, not only their farm" and dared to invest in an alternative form of production (R4, R8, R10). R1, R2 and R7 also highlight farmers' interest in the environment and their best interest for their land, for example getting involved in new projects on agroforestry or perennial crops (R7).

4.6 The relationship between CAP and production

The respondents believe that the largest influence on agro-ecological diversification comes from the market or on-farm conditions. Therefore, many think that encouraging agro-ecological diversification would entail that CAP should influence production in some way. The opinions on this diverged significantly.

The first decades of the CAP, with payments coupled to production, are seen as a reason to avoid influencing production, as it led to overproduction and high prices in the long run (R1, R3, R6). Involving policy in production would also lead to an incredible detailed legislation, which would hinder more than help farmers, respondents think. This is what has happened to the greening measures, which have brought a heavy administrative burden with no improved environmental performance. They believe this happened because each Member State and often region have different needs, and accounting for all results into regulations full of details and exceptions (R3). R6 affirms that intervening with policy might disturb more than support, as it often leads to what the respondent considers inefficiencies.

CAP policy is also actively trying to distance itself from the practices of price influence; the new measures aim to support farmers while giving a more prominent role to the market (R8). Furthermore, CAP has "nothing to do" with orienting whether a crop should go towards human or animal consumption (R1). R10 expresses pessimism in the possibility of policy to achieve significant changes; right

now, agricultural policy only acts on the “small details”, it does not have an influence on the systemic way food is produced.

Still, there are some suggestions on how CAP could change the path set out by the market. Politicians might change the CAP if they wanted to fulfil a sustainability goal, “since it is not just about the economy, but also about social and environmental issues” (R1). R4 suggests the possibility that, if the EU wanted to change their production, they could give a higher compensation to specific crops that would increase agro-ecological diversification; however, it is important to lay rules that are not too detailed, otherwise there could be inefficiencies and the effect could be only marginal. R9 notes that farmers face high starting costs for a new production; therefore, if they wanted to start new cultivations, it could be useful for them to receive some investment support at the beginning. This is especially true for some vegetables and potatoes, which require different machines and storage room facilities. R10 also thinks that the measures in pillar 2 are the ones who might make a difference by implementing new environmental and regional measures.

4.7 Future of CAP

4.7.1 Changes in the CAP post-2020

As the next reform is still underway, all respondents have answered to these questions with a grade of uncertainty. The process is only at the Commission’s proposition step, and the next steps might change the end results (R8). R5 tells that a SWOT analysis has been done at the national level, and now it is up to the national politics to draft a national strategic plan. R5 and R7 indicate the shrinking budget as a factor that will influence especially pillar 2, but without knowing exactly which parts will keep their full budget and which will not. R10 looks at the RDP budget, which decreased for the first time in the current programme period since the 1990s, as an indicator of a possible decrease after 2020.

Several respondents (R1, R3, R5, R6, R9) think that the next programme period will not lead to significant changes. One measure that will probably stay the same is the VCS for cattle, as the environmental value mentioned above will still be valid in the future (R1, R8). R3 sees an administrative change with the union of pillar 1 and 2 in one national strategic plan, but the guiding principles and support measures will remain.

Nonetheless, some possible changes have been identified. R8 talks about a possible increase in the environmental measures in pillar 1. R2 sees a possible capping of the support dependant on the maximum size of a farm, which may lead to more formal divisions of one business in different branches. R6 sees an increased interest in the environmental measures and in production; however, it will follow more the principles of sustainable intensification rather than agro-ecological diversification.

One of the themes that emerged from the post-2020 reform is the will to decrease the amount of details at the EU level and set the direction for the future agricultural

policy through goals, leaving more scope to each Member State. This is paired with an increased percentage of the budget coming from each country, which gives more manoeuvre on which instruments Sweden wants to invest in (R5). County Administrative Boards seem to be positive on this, as an increased autonomy and less detailed norms at the national level could ease their administrative burden, and possibly allow them to act more efficiently in their territory (R4, R7). This might be a way to include agro-ecological diversification as a way to realize some of the goals (R4).

4.7.2 The future of agro-ecological diversification in Sweden

Given the possible increased country autonomy in the next programme period, and the explicit will from the Swedish government to formulate their strategic CAP plan following its goals (Swedish Government 2018, p.19), it is not surprising that many respondents have talked about the National Food Strategy. R4 talks about two goals of the Food Strategy, being more self-sufficient and increasing exports, and recognises a potential goal conflict between the two, “which gives a clear example of how the political will does not match in reality”. There are doubts regarding whether the Swedish goals encourage agro-ecological diversification, even though the goal of strengthening the rural economy can be good for diversification. However, the Food Strategy does not discuss how and what to produce. “In practice, it is still a system completely dependent on external inputs, from machines to pesticides to feed” (R10).

R2 emphasises the goals to increase production together with the environmental efforts; but these goals will “probably be solved through new techniques, precision cultivation, new methods, rather than diversifying, as I see it”. This outlook is shared by R6, that sees the support of new techniques as key to improve Swedish agriculture. R2, however, also sees an increased support for organic production which “can be seen as diversification in a way”.

A way to achieve more agro-ecological diversification might be to achieve a more grass-fed, extensive meat production. However, if too many details are laid out in the regulations, this might lead to recreate the failure of the greening measures, which leads to doing the bare minimum to be up to standard (R3). R9 is positive towards integrating as much as possible of the Food Strategy into the next strategic CAP-plan, despite not being sure about how much leeway each country will have. “If we want to change what farmers produce, now is the time to try to do it. I think that we need to try and develop as much as possible the parts of the Food Strategy regarding rules and regulations, consumers and markets, and knowledge and innovation” and to focus on the parts of the CAP such as investment support and competence development, since there are more possibilities to influence businesses and their production than the regulations in pillar 1. R10 imagines that, if Sweden wanted to increase agro-ecological diversification, farmers could receive a premium if they were not dependent on mineral fertilizer and had their own nitrogen

fixation method. That would make conventional production a bit less profitable, and a circular production a bit more profitable “changing the rules of the game”.

5 Discussion

This chapter aims to answer to the two research questions set at the beginning of this research and is divided in two parts. The first part follows the organisation of the previous chapter; it examines the answers from the interviews in light of the policies examined in the background chapter, trying to identify the policies in the EU and Swedish legislation that could enable or hinder agro-ecological diversification in meat and dairy farms. The second part seeks to offer advice to policy makers, listing possible policy measures that could increase agro-ecological diversification in the Swedish food system.

5.1 Some considerations on the present situation

A preliminary observation to be made about the results is that the interviews were conducted in a very peculiar historical moment, in the midst of the coronavirus crisis, which might have influenced some answers. Nearly all respondents addressed the issue and acknowledged that it would bring relevant changes in the agricultural and food sector in the future, even though the direction of these changes is still unknown. It was also pointed out that this situation will probably slow down the legislative process to launch the new CAP.

5.2 The effects of pillar 1 policy instruments on agro-ecological diversification

5.2.1 Direct payments and agro-ecological diversification

As discussed, the majority of the CAP budget goes to direct payments to farmers (EC 2017), which have not been deemed by respondents to encourage nor discourage agro-ecological diversification. This observation can be considered valid, as payments are decoupled from production and therefore do not encourage production of any particular good. However, it is also true that Sweden has a relatively high physical threshold of 4 ha for farms to receive direct payments (Henke *et al.* 2015). This might have a negative effect on very small farms and new entrants, which have been regarded by some respondents as more prone to diversify their

farm, as they can sell many products directly if they have an on-farm shop. On the topic of farm size, Hansson *et al.* (2010) identify larger farms as more diversified; however, they also find a positive correlation between diversification and a younger age of farmers, which might be relevant for farmers smaller than 4 ha.

Some respondents have talked about the effect of extensification and passive farming since there is no need to produce to receive the direct payment. A study from Brady *et al.* (2017) recognise that up to 10% of the agricultural land in the EU is included in this practice and it is a phenomenon present in Sweden as well. However, they conclude that the land left passive has a very low production potential (*ibid.*), and therefore it is unlikely that it would be used instead to develop agro-ecological diversification. A related issue is the “hiding” effect of the direct payments on diversified farms: this is also an issue that has been identified in the literature (Flygare & Isacson 2011), and rules such as mislabelling of animals can be a reason for not receiving the full payment (EP & Council 2000): however, this has the effect of “hiding” some agro-ecological diversification rather than affecting it.

Nevertheless, as pointed out by some authors (Navarro & López-Bao 2018; Pe’er *et al.* 2019), allocating the majority of the CAP budget on direct payments could be a missed opportunity to distribute support to environmental measures, among which, can be argued, agro-ecological diversification. Grethe *et al.* (2018) also observe that the share of the budget allocated to the direct payments cannot be justified, since it is not tailored to keeping societal functions nor it meets the financial needs of farmers. Therefore, direct payments should focus on the remuneration of farmers for providing public services with their activities (*ibid.*). Similar results are obtained by Brady *et al.* (2017a), who point out that direct payments fail to take into account the variety of environmental and agricultural situations in the EU, and this leads to poorly targeted and inefficient measures.

5.2.2 Voluntary Coupled Support and agro-ecological diversification

A norm in pillar 1 that respondents identified as influencing agro-ecological diversification is the Voluntary Coupled Support of cattle. We have seen that Sweden has decided to allocate there the maximum budget (13% of pillar 1), as it is considered the cornerstone of Swedish agriculture and has a low profitability. Some respondents consider this positively in regard to agro-ecological diversification, as it helps biodiversity through pasture management. It is confirmed that the effect of the support benefits for the majority extensive rearing systems; according to the Swedish Government's (2018, p. 103), eliminating the VCS would disproportionately influence managed natural pastures, as Sweden would lose over 20% of managed pastures by 2030. Moreover, Jansson *et al.* (2018) suggest that eliminating VCS would lead to a small increase in pork and poultry consumption. If we hold true that VCS in Sweden encourages rearing in pastures, and noting that pork and poultry do not graze, VCS for cattle might be of help in agro-ecological diversification, as ruminants can be integrated with crops. Furthermore, Hansson *et al.* (2010, p. 279) find that extensive farms tend to be more diversified. Therefore, it

seems that the respondents' belief in the positive role of VCS in relation to agro-ecological diversification has a base. Nevertheless, Larsson *et al.* (2020) observe that, in Sweden, VCS for cattle does not directly impact farmers' decision to rear their animals extensively; rather, it is a question of profitability of the grazing method. Therefore, it would be more effective to allocate the VCS budget to further support the management of permanent grasslands (*ibid.*, p. 56).

5.3 The effects of pillar 2 policy instruments on agro-ecological diversification

As said in the background, pillar 2 gives the indications for each national RDP leaving considerable leeway to each Member State. Moreover, respondents mainly talked about the Swedish RDP. Therefore, this is what this section will focus on.

5.3.1 Investment support and agro-ecological diversification

The main instrument indicated by the respondents is the investment support. The order of priority for each investment is expressed in the competent authority's action plan (Government Offices of Sweden 2019, p. 225), as the respondents said as well. Taking this into account, some of the affirmations from the interviews are difficult to confirm. It looks like the lack of investments for mobile machinery is not confirmed in the RDP text, as many provisions specify the possibility to invest in mobile machinery (see *ibid.*, p. 218). It also seems that the Swedish RDP does not necessarily prioritize new activities on farm rather than the expansion of existing ones; for example, the first investment support to agriculture mentioned is

“new construction and reconstruction and extension of animal sheds, including permanent furnishing and facilities for milking, milk, feed, manure management and necessary staff space” (*ibid.*, p. 225),

followed by a list of measures that include both new constructions and remodelling of existing ones, without distinction among the two. This affirmation above also seems to confirm that livestock production is prioritised, as it emerged from the interviews; this predilection is also supported by the fact that each county's budget is partly allocated based on the number of grazing animals, both for meat and dairy (*ibid.*, p. 235). It also holds true that farmers can receive investments to develop processing activities, as one of the types of investments covers specifically this; the selection criteria are reduced climate impact and innovation and need of the applicant, while there is no specification of what crops or animal products can be processed (*ibid.*, p 218). No provisions were found for the support for cultivation of soybeans in the RDP and national action plan, but it might be present in one of the county action plans. In general, investment support looks like a good instrument to enhance agro-ecological diversification, but its focus on animal production might have a barrier effect.

5.3.2 Farm Advisory Services and Training and agro-ecological diversification

Respondents had split views on the state of farm advisors and their ability to help farmers adopt a more diversified production. Recanatì *et al.*'s (2019) review on the CAP efforts to address sustainability issues highlights the central role that farm advisors have in keeping diversity in the EU and developing specific strategies. Documented is also the role of advisors and training in helping farmers towards an integrated crop-livestock system, especially if it involves the collaboration with other neighbouring farmers (Martin *et al.* 2016; Asai *et al.* 2018).

Some respondents also point out the difficulties that farmers can face if they try to expand their production branches, since much new knowledge might be needed. The considerations above lead to think that these services could be exploited for agro-ecological diversification, but the extent to which this is done today is unclear. Regarding the budget and allocation, it seems that a considerable amount of resources is assigned to these two measures, and allocated in many different activities, not only to fulfil the cross-compliance measures but also for decreased climate impact, Greppa Näringen, small-scale processing and others (Swedish Board of Agriculture 2019, p. 67). However, it is difficult to see if these measures provide in practice a push towards agro-ecological diversification. For instance, Meredith & Hart (2019) research points out that Farm Advisory Services have been mainly used to help farmers fulfil obligatory measures.

5.4 Policy priorities

5.4.1 EU policy priorities and agro-ecological diversification

As mentioned in the background, the overarching goals of the 2013 CAP are to guarantee food security, to provide a variety of food produced in a sustainable way, and to keep rural communities viable through local employment (EC 2010). This seems to confirm what the respondents say; while the CAP has scaled up its environmental efforts during the last decades, there is no direct focus on agro-ecological diversification. On the opposite, there is still the prevalence of a productivity paradigm compared to a new environmental system redesign, as was highlighted by some respondents, and suggested in the literature (Alons 2017; Navarro & López-Bao 2018; Pe'er *et al.* 2019). Another point that the respondents point out is the lack of a specific goal orientation in the CAP; this is also suggested in the literature, that finds a disconnect between the goals of the CAP and the results that the CAP measures achieve (Grethe *et al.* 2018; Meredith & Hart 2019), as well as by the European Court of Auditors (2017), that points out that the budget allocation does not reflect the increased environmental effort described in the CAP objectives. This is deemed to slow farmers decisions about changing their production. These considerations about the CAP priorities point to a barrier to agro-ecological diversification.

5.4.2 Swedish policy priorities and agro-ecological diversification

Sweden's increased environmental and climate ambitions and its goal to increase production, expressed in most interviews, can be found both in its RDP (Government Offices of Sweden 2019) and in its National Food Strategy (Ministry of Enterprise and Innovation 2016). The uncertainty of the respondents regarding the presence of agro-ecological diversification in the Swedish priorities are also valid, since it does not appear to be directly mentioned anywhere. There could be a reference to it in the second priority of the Swedish Board of Agriculture action plan, which mentions "diversification within the agricultural sector" as a way to increase profitability and competitiveness (Swedish Board of Agriculture 2019, p. 7), but it does not specify which type of diversification.

However, clear references to agro-ecological diversification and crop-livestock integration seem to be missing. While the importance of grazing animals (in particular cattle) has already been highlighted in the previous sections, there are two other priorities that respondents identify as relevant to agro-ecological diversification: organic production and short food supply chains.

5.4.3 Organic production and agro-ecological diversification

The will to increase organic production is well highlighted in the EU regulations, in the Rural Development Programme, in the Swedish Agricultural Board action plan, and in the National Food Strategy, as underlined by some respondents. The link between organic production and crop-livestock integration brought forth by a respondent seems to appear in the Swedish RDP; the RDP links organic production to "increased biodiversity through a varied crop rotation" and affirms that

"the adaptation of animal density to feed production capacity provides a positive environmental benefit by providing an incentive for the farmer to maintain the plant nutrient resource contained in manure" (Government Offices of Sweden 2019, p. 452).

Not all respondents were convinced that organic production is automatically tied to agro-ecological diversification. As Kremen *et al.* (2012) observe, although organic production was originally based, among others, on agro-ecological diversification principles, the growth in demand has encouraged the cultivation of organic products in large-scale, monocultures and industrialised systems. Nevertheless, Seufert *et al.* (2018) suggest that agro-ecological diversification is still a base feature of the concept of organic agriculture. Regarding integration of crop-livestock systems, they observe that France and Italy have a higher degree of integration among organic producers than conventional producers, (although in Germany the percentage is the same) (*ibid.*, 439), showing a potential, although slight, encouragement towards crop-livestock integration in organic farms. At the regional level, meaning among close farms, the potential for integration in organic farms appears higher, partly because of the EU obligation of sourcing at least half the feed from the same farm or neighbouring ones (EU 2008, *ibid.*).

The EU regulation of acquiring at least 50% of the feed for ruminants from the same or neighbouring farms (EC 2008), mentioned in one interview, can also be reconducted to what another one of the respondents suggested; some livestock farmers already cultivate crops that can be used both as feed and food, such as oats. The EU regulatory framework might therefore enable what is defined by de Roest *et al.* (2018, p. 225) as “economies of scope”. The core of this concept is to diversify production while using the same inputs, lowering production costs. This might lead to an agro-ecological diversification by encouraging farmers to produce crops that can both be used as feed on-farm and sold on the market.

Respondents also talked about the role that farmers’ values play in their decision to produce according to the principles of both agro-ecological diversification and organic farming. Some studies (Kallas *et al.* 2010; Peterson *et al.* 2012) confirm that farmers’ attitudes and values are a factor when they decide to shift towards organic production. Nevertheless, Eyhorn *et al.* (2019) highlight a relevant feature of organic agriculture in relation to agro-ecological practice; the success history of organic production (and producers) can be showcased as an inspiration to shift agriculture towards more agro-ecological practices.

5.4.4 Short food supply chains and agro-ecological diversification

Shortening the food supply chain is a measure identified by several respondents as conducive to agro-ecological diversification. IPES-Food (2016) confirms the link between shorter food chains and increased diversity; even if it is not automatic, local food systems such as farmers’ markets and direct buying schemes can use diversity in production as a marketing point. Shorter food chains have the main objective of increasing competitiveness, but they also help bypassing traditional retailers and distribution channels, identified by a respondent as a barrier to agro-ecological diversification in small and medium-size farms.

Short food supply chains are a focus area of the RDP and one of the priorities set out by the Swedish Board of Agriculture (Swedish Board of Agriculture 2019). A considerable part of the measures planned to foster the shortening of food chains involve the Farm Advisory Services and training: increasing knowledge on small-scale processing, business management, marketing, and collaboration between actors in the food chain (*ibid.*, p. 16). The RDP also provides for investment support to shorten food supply chains through support for small-scale processing equipment, in order to add value to farmers’ products and therefore promote contact between producers and consumers, direct sales to stores, restaurants or local markets (Government Offices of Sweden 2019, p. 218).

This seems to confirm what a respondent said about the efforts being focused mainly at the farm level. It is also noticeable that the main focus is to increase processing of own products on the farm, without many resources allocated to expanding on-farm shops or strengthening the connection between different actors along the chain, which are problems identified during the interviews. Nevertheless, support for on-farm processing might help solve the problem that was brought up by

one respondent regarding legumes, because it would allow farmers to expand their production to legume crops that need processing before being sold on the market. However, it is difficult to see if the present application of the regulations encourages agro-ecological diversification in other ways as well.

5.5 The relationship between CAP, production and agro-ecological diversification

From the interviews, it emerged that not everyone agrees with the possibility that CAP should influence production, as it could lead to overproduction or to incredibly detailed norms. It is true that the “greening” experience was not conclusive to environmental benefits and too detailed (Soderberg 2016; European Court of Auditors 2017), and that the reason to introduce the greening measures was to support environmental farming practices that would not have been paid for by the market (Meredith & Hart 2019).

Nevertheless, other respondents were positive to measures that would influence production, if they were tailored to achieve social or environmental goals. This is in line with the economic theory of market failure, whereby positive and negative externalities, namely benefits or costs that affect a third party, allocate resources inefficiently (Jongeneel & Bezlepkina 2008, p. 25). This leads governments to intervene to rebalance the market, in this case by defining standards for environmentally and climate friendly practices in agriculture. In the CAP, examples of this are the cross-compliance norms (*ibid.*), but it can also be argued that the VCS for cattle is a way to rebalance negative externalities and encourage the conservation of pastures (*cf.* Swedish Government 2018, p. 140). Interestingly, some respondents were in favour of an increased market liberalisation, but at the same time had a positive outlook on VCS for cattle, which is based on rewarding production.

5.6 Future of CAP and implications for agro-ecological diversification

The objectives of simplifying the CAP and shifting from a detail-orientation to a goal-orientation, appear both in the interviews and in the post-2020 CAP propositions (EC 2019a). The ambivalence regarding the consequences of the eco-schemes and an increased country autonomy is also reflected in the literature (Meredith & Hart 2019). Since the new reform still has to go through many steps before it is definitive, the uncertainty of the respondents is motivated; even now, the two European Parliament’s amendments on the EC’s initial proposition have opposite directions regarding the importance of the environment (Pe’er *et al.* 2019). However, the steeper decrease in the pillar 2 budget compared to pillar 1 and the expected increase of the direct payments to 73% of the total budget by 2027 (*ibid.*, p. 450) seems to indicate the lack of a deeper transformation in the EU agricultural

and food system, as observed by one respondent. It also seems true what other respondents mentioned about Sweden's direction. Indeed, the Swedish government appears to follow the road of an increased market orientation. This is evident in the Food Strategy, which states that

“a market with efficient competition without unnecessary barriers that prevent new companies from entering the market leads to more efficient businesses with the opportunity to grow, thus forming the basis of sustainable growth and increased prosperity” (Ministry of Enterprise and Innovation 2016, p. 16).

However, there is a growing evidence that the current agricultural system based on growth is not sustainable (de Roest *et al.* 2018; Otero *et al.* 2020; WEF 2020). GDP trends are correlated with those of pesticide and fertilizer use, as well as demand for agricultural land (Otero *et al.* 2020). This is connected to the proposal by one respondent of encouraging farmers who are not dependent on mineral fertilizer but that use nitrogen fixation fixing crops, thereby making integrated production more profitable. This measure can be considered as a positive push towards agro-ecological diversification; one way to achieve this is to tailor direct payments to reward farmers who are self-sufficient, and to establish a mineral fertilizer tax for those who use external inputs, according to the Provider Gets and Polluter Pays Principle (Brady *et al.* 2017a, p. 155).

5.7 The future of agro-ecological diversification in Sweden: recommendations for policy makers

The discussion above suggests that the measures in place today and those planned for the future do not encourage agro-ecological diversification to their best potential. At the same time, we have seen the positive potential of an increased agro-ecological diversification (paragraph 2.2.1) and the unsustainability of the present system (paragraph 2.1). Therefore, below are listed some recommendations that could enhance agro-ecological diversification in Sweden (and in part for the EU).

- Shift part of the budget from direct payments to agro-ecological diversification measures. Even though direct payments do not seem to have a significant effect on agro-ecological diversification, they cover the majority of the CAP's budget, while at the same time they do not seem to provide sufficient financial security for farmers, nor to promote conservation or climate change mitigation (Grethe *et al.* 2018; Pe'er *et al.* 2019). A decisive change in direct payments will necessitate interventions at the EU level, but part of the budget could be redistributed already at the national level, given the increased country autonomy. Among the measures that foster a more agro-ecological agricultural and food system, for example moving part of the budget from pillar 1 to pillar 2 or dedicating the majority of the budget to appropriate eco-schemes.

- Create a clear link between VCS for cattle and crop-livestock integration. A VCS that leads to a grass-based, extensive rearing of cattle can create the pre-conditions for agro-ecological diversification. However, more can be done to integrate this livestock production with crops for human consumption and to decrease the feed-food competition, such as encouraging farmers to grow vegetables with a production where animals can play a positive role.
- Tailor parts of the investment support measures towards crop production for human consumption. Investment support can be useful for farmers that want to diversify their production, but it does not differentiate between crops for feed and food and does not encourage integration between animals and plants. For example, an investment support for protein crops for human consumption might encourage farmers to increase their crop production, and a focus on the economy of scope (de Roest *et al.* 2018) might link it to a crop-livestock integration.
- Employ Farm Advisory Services and training to foster agro-ecological diversification. These services seem to have a considerable potential to steer farmers towards more environmentally friendly modes of productions (Martin *et al.* 2016; Recanati *et al.* 2019), and there are already some systems in place to improve practices such as nitrogen balancing and optimised use of inputs (such as those within Greppa Nürtingen). These good practices could be linked to the concept of integrated crop-livestock systems.
- Develop organic production while preserving its agro-ecological roots. As pointed out by (Kremen *et al.* 2012) and by some respondents, organic production does not automatically lead to a diversified production. Therefore, it could be beneficial to explicitly tie crops for human consumption and organic production at the regional level. Organic production is indicated both in the interviews and in the literature (Eyhorn *et al.* 2019) as a way to increase agro-ecological practices and diversification, especially if its original qualities are preserved to foster crop-livestock integration.
- Expand the scope of short food supply chains beyond small-scale processing and the farm level. There is an untapped potential in short food supply chains such as farmers' markets and direct purchasing schemes (IPES-Food 2016) that have the ability to increase agro-ecological diversification. More efforts should be made beyond the farm level to provide alternatives to medium-sized farms that are too small for retail and too big for on-farm shops, such as providing incentives to retailers to increase the number of their distribution centres.
- Integrate negative and positive externalities into the market to encourage agro-ecological diversification. For example, regulations could internalize the environmental costs of artificial nitrogen and phosphorous (Brady *et al.* 2017a) and reward circular methods of production with own nitrogen-fixing and fertilizers.

6 Conclusions

The goal of this research is to improve the understanding of policy drivers and barriers to agro-ecological diversification in meat and dairy farms in the context of the EU and the Swedish policy framework. The policy focus was kept to the CAP, the main agricultural policy at the EU and Swedish level, plus the National Food Strategy for Sweden, which guides the Swedish adoption of the CAP norms. Among the agro-ecological diversification practices, the accent is put on crop-livestock integration. The relevant policies are uncovered through qualitative interviews with key actors working with the CAP, many belonging to the main Swedish institutions involved in the agricultural policy application.

The first research question seeks to uncover policies, in the EU and Swedish legislation, that can enable or hinder agro-ecological diversification in meat and dairy farms. It is found that, despite some positive signals, agro-ecological diversification is still not properly enabled nor encouraged. Direct payments are not deemed to have a particular effect, but their lion's share of the budget might deviate funds from agro-ecological practices. VCS has a potential role in relation to agro-ecological diversification; on one side, it supports extensive and pasture rearing, potentially creating the conditions for agro-ecological diversification; however, it does not necessarily integrate livestock and crops for human consumption. The investment support can help farmers that wish to diversify, for example by providing funding to those who wish to buy new machinery or invest in a new activity, nor only support extensive systems. Nevertheless, it can also become a barrier due to its focus on livestock rearing more than crop production. Farm Advisory Services and training also offer some support, providing additional knowledge for farmers that wish to start a new production branch or increase their environmental performance. However, these instruments are also not focused on crop-livestock integration, and therefore their potential might not be fully exploited.

In general, the ability of the CAP to enhance agro-ecological diversification appears to depend on the policy priorities decided at the EU and Swedish level; so far, the main paradigm at both levels is to produce more of the same without a deeper transformation of the food system. Moreover, there is a call for liberalisation of the market, despite the existence of negative and positive externalities. Still, two priorities can encourage agro-ecological diversification: organic production and short

food supply chains. Organic production tends to be more integrated than its conventional counterpart and has the ability to enhance the adoption of other agro-ecological practices with its widespread uptake; the EU requirements to produce half the feed on-farm or in neighbouring farms might also foster crop-livestock integration. Short food supply chains might bypass the distribution issues and provide sufficient profitability, helping medium-size farms diversifying. Moreover, promoting small-scale processing facilities in Sweden might increase legume production. Still, focusing all the measures at the farm level leads to putting all the pressure to improve on the farmer, and does not fully take advantage of the possibilities for agro-ecological diversification throughout the chain.

The second research question looks at the future of CAP and the possibilities for agro-ecological diversification in the EU and Sweden. So far, the CAP post-2020 does not present many changes or positive outlooks, being still focused on direct payments and increased market orientation. However, the road to the next reform is still long, and some recommendations can be made to Swedish (and EU) policy makers; redistribute the budget to environmental measures, tailor the existing measures towards crop-livestock integration and production of crops for human consumption, incorporate positive and negative externalities and gear policy priorities towards a transformation of the food system, for instance by promoting economies of scope and circular, nitrogen self-sufficient methods of production.

This research has tried to give an overview of possible factors and actions for an increased agro-ecological diversification in the EU and especially Sweden. However, there are some limitations. The study focuses on the production side, but many actions can be made on the consumption side; for example, changing consumer attitudes towards the methods of production of the food they put on their table. Also, the focus on the CAP and its main policy texts and measures could result in an underappreciation of the work that the EU and Sweden might have done towards agro-ecological diversification. For example, the Unfair Trading Practices directive was mentioned, but it was chosen not to further investigate it as it lays outside the scope of this research. Moreover, there have been recent development in the EU environmental and food policy, such as the Farm to Fork Strategy, the Green New Deal and a new EU Biodiversity Strategy for 2030. Further research could also be done by taking a quantitative approach to the policies indicated, to have a clearer picture of their effect on agro-ecological diversification. Overall, agro-ecological diversification is a field that has potential for development in the European and Swedish contexts, and the possibilities to foster its principles through public policy present an interesting field of research.

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Appendix 1

Introductory paragraph and interview guide

This interview guide, together with the initial information, was sent by email to the respondents a few days before the interview was due. It was sent in Swedish, and the translation below is made by the author. Bold and italics were used in the original text as well.

What is the aim of the interview?
To research how the existing and future policy instrument influence diversification at the farm level in Sweden.
What do we mean with diversification?
In this study, it means the diversification of livestock farms (milk and meat, especially from ruminants) to include more crops for direct human consumption , with the aim of improving the sustainability performance and strengthen the economic sustainability on the farm.
What do we want to achieve with diversification?
<ul style="list-style-type: none">- That ruminants primarily achieve their agro-ecological role by eating biomass that humans cannot consume (grass, roughage) and transforming it into nutritious food, instead of eating food that humans can eat instead.- That animals play an important and meaningful role for the agricultural nutrient supply through their integration with the production of vegetables for human consumption.- To have both crops and animal production to feed more people per hectare, together to promoting a varied diet within the planetary boundaries.- To have more products on farm that can help increase farmers' resilience to environmental and economic changes.
What are some examples of a diversified farm? (existing farms in Sweden)
<ul style="list-style-type: none">- Farm 1: Instead of increasing the number of sheep to increase profitability, farm 1 decided to keep fewer sheep and instead invest in the cultivation of legumes and cereals for sale, rear some chicken and pigs, build a processing plant on the farm and sell all their products directly to consumers or through their on-farm shop.- Farm 2: They have a cattle herd that graze on pasture and only eat roughage. Through increased collaboration with customers, they have increased their production of protein crops for human consumption such as field beans, which are now sold for human consumption instead of feed.- Farm 3: It is a dairy farm which strives to be less dependent on concentrates and cereals through increasing the percentage of roughage in the feed, and instead using arable land to cultivate legumes and cereals for human consumption.

Which policies are in focus?
<p>The policies that are in focus in this project are the EU Common Agricultural Policy (CAP), the Swedish adaptation of the CAP, and also national regulations or strategies which can influence the food system. Some examples are:</p> <ul style="list-style-type: none"> - The National Food Strategy for Sweden - Regional goals for vegetarian food in public kitchens - National action plan for organic food in Sweden

Interview guide questions:

1. Why do you think that the agricultural sector looks like it does today? (*Specialisation both at the farm level and at the regional level, intensive animal production, monocultures, high environmental impact...*)
2. How do you think that the present agricultural policy meets the challenges that some from animal production? (*greenhouse gas emissions, nitrogen leaching, large use of crops that human could eat going to feed...*)
3. Today we see a quite specialised production – how has the present agricultural policy influenced this development? (*how much of this development is the result of politics, and how much is the result of the economy of scale and other factors...*)
4. Is there any type of support for farmers who have a dairy or meat farm and wish to diversify their production with vegetables? (*support to farmers, environmental and climate measures...*)
5. Are there any aspects in the CAP, both pillar 1 and 2, which can directly oppose to diversification? (*influence of which crops to produce and how to produce them, intensive animal production, feed production instead of food production...*)
6. Is there anything in the Swedish legislation that can further encourage or oppose diversification? (*CAP adaptation to the Swedish legislation, or other policies at the national level*)
7. The barriers to diversification below have been identified with the collaboration of different actors throughout the Swedish food chain in an EU project called UNISECO, with which this thesis is connected. How do you think that the agricultural policy could help farmers overcome these obstacles?
 - Market concentration in the value chain.
There are few powerful actors that have a large influence over the farmers and the prices of their products. Moreover, there is not a meaningful cooperation among the different actors in the chain.
 - Low profitability in primary production.

Farmers have experienced lower profitability during the last decades, with a concurring increase in costs. Furthermore, farmers often earn more by producing more meat and milk rather than growing crops for human consumption.

- Lack of processing facilities for legumes and niche crops.
Crops such as buckwheat and fava beans require processing facilities that are rare in Sweden, leaving farmers with fewer opportunities to sell these products.
- Lack of role models, advisors and networks for broader knowledge to a more diversified production.
Farmers that want to innovate often don't find role models and the practical knowledge on how to diversify their production.
- Taxation of labour and rules and requirements for employment.
Farmers already work long hours, and diversifying could mean needing more workforce. However, they incur in high costs when they want to employ new workers, as they face the high cost of labour, current tax regulations and the long-term commitments (e.g. if the employee becomes sick).
- High risk and lack of risk sharing.
Failure is common when trying new practices at farm level, and the high costs associated with it often deter farmers from innovating.

8. How do you think that the new guidelines for the CAP post-2020 will influence diversification? *(use of a national "CAP strategic plan" that unites pillar 1 and pillar 2; use of eco-schemes; more decision power to the Member States, change of crop diversification with crop rotation...)*
9. If Sweden wanted to implement diversification, what are the concrete steps that they would need to take at the policy level? *(for example, in the drafting of their CAP strategic plan and in the formulation of the eco-schemes)*
10. Can you give an example of a diversified farm that you have encountered in your work? How did they achieve that? *(combined vegetable and animal production, improved nutrient supply through this integration...)*

Appendix 2

Popular science summary

There is a good possibility that, in the last months or years, you have heard some media outlet, environmental scientist or popular actor talk about how bad meat is for the planet, especially beef. However, cows have also a great potential; they can transform grass, which humans cannot digest, into nutritious food. They can fertilize crops and can help us keeping biodiversity and open landscapes. Right now, this potential is not fully exploited. One of the reasons for it is that cattle and most animals, especially in the West, are reared in specialised facilities, meaning in farms that only practice one main production, and are often fed crops that human could eat instead. Specialisation also means that the production of crops for direct human consumption and animal products are often separated. The consequences of these conditions are an increased environmental degradation, the concentration of livestock production in some areas which creates pollution “hotspots”, a decreased resilience of the environment and of farmers, and the competition among animals and humans for the same food, such as grains and protein crops.

This research tries to understand how animals, especially cattle, can play again a positive role for our environment. A central concept for this is agro-ecological diversification; it is a different vision of agriculture and food, where animals and plants are integrated and fewer artificial fertilizers and grain feed are used, therefore creating a more sustainable food system. At the same time, agro-ecological diversification seeks to make farmers more resilient through the decreased dependence of external inputs (fertilizers, feed) and through the possibility to rely on more than one production activity.

To understand how to promote agro-ecological diversification, I have interviewed ten Swedish policy experts that work with the Common Agricultural Policy, one of the main policies in the European Union (EU). From their answers, I have found that the EU and Sweden are not promoting enough agro-ecological diversification, while they focus more on the market and an increased production. Furthermore, the largest share of the budget is allocated to direct payments to farmers, which are shown to not improve significantly environmental performances and to be unevenly distributed. Nevertheless, there are some positive policies that give support to farmers that want to make their farm more diversified, such as giving them financial support to invest in a new production branch, providing new knowledge in the shape of workshops and consultancy, or encouraging organic production and short food supply chains. The monetary support for cattle might also play a positive role in Sweden, as it might stop the decrease in the number of grazing animals.

This research shows that a better food system is possible, and that policy can have a positive role in creating it. The EU and the Common Agricultural Policy can create the right conditions so that Member States can have a more positive impact on the environment. In the case of Sweden, politicians can adapt the EU rules to support a more integrated production, for example giving more support to farmers that want to include crops for direct human consumption in their animal production,

supporting an organic production that is based on agro-ecological principles, and rewarding farmers that use fewer artificial fertilizers.

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