Is the CAP Fit for purpose?

An evidence-based fitness-check assessment

Leipzig, November 2017

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List of Acronyms

AECM	Agri-Environment-Climate Measures (formerly Agri-Environment Measures, AEM)
AES	Agri-Environmental Schemes
ANC	Areas facing Natural or Other Specific Constraints
AoA	Agreement on Agriculture (of WTO)
AU	Austria
BD	Biodiversity
BFP	Biodiversity-friendly farming practices
CAP	Common Agricultural Policy
CAPRI	Common Agricultural Policy Regionalised Impact (model)
CBD	Convention on Biological Diversity
CC	Cross Compliance
CH	Switzerland
CMEF	Common Monitoring and Evaluation Framework
CMES	Common Monitoring and Evaluation System
COPI	Costs of policy inaction
DE	Germany
DP	Direct Payments
EC	European Commission
EEIG	European Economic Interest Grouping

EFA	Ecological Focus Areas
ESPG	Environmentally sensitive permanent grasslands
ESS	Ecosystem Services
EPI	Environmental policy integration
EU	European Union
FADN	Farm Accountancy Data Network
FR	France
GAEC	Good Agricultural and Environmental Conditions
GHG	Greenhouse Gases
HNV	High Nature Value
HNVf	High Nature Value farmland
IACS	Integrated Administration Control System
IAMO	Leibniz Institute of Agricultural Development in Transition Economies
IPBES	Intergovernmental Platform on Biodiversity and Ecosystem Services
IPCC	International Panel on Climate Change
LFA	Less Favoured Area
LPIS	Land-Parcel Information System
LSU	Livestock Unit
MDG	Millennium Development Goals
MS	Member State
MT	Mega ton
NMS	New Member States
OECD	The Organisation for Economic Co-operation and Development
PCD	Policy Coherence for Development
PO	Poland
PT	Portugal
RDP	Rural Development Programme
SAPS	Single Area Payment Scheme
SDGs	Sustainable Development Goals
SDI	Sustainable Development Indicators
SI	Slovenia
SO	Standard output (of an agricultural product, crop or livestock)
SPS	Single Payment Scheme
SW	Sweden
TE	Technical Efficiency
TEEB	The Economics of Ecosystems and Biodiversity
TFEU	Treaty of the Functioning of the European Union
UAA	Utilised Agricultural Area
UK	United Kingdom
UNFCCC	United Nations Framework Convention on Climate Change
WFD	Water Framework Directive
WTO	World Trade Organization
WTP	Willingness To Pay

1 Executive Summary

Is the CAP fit for purpose? Key findings:

Agricultural landscapes in the EU are undergoing fundamental changes in **land use, farm structure and management**, and these in turn impose socio-economic and environmental impacts. It is often difficult to isolate the impacts of the Common Agricultural Policy (CAP) from other co-acting drivers, but a large number of studies attempt to do so. The literature indicates that the CAP has **minor effect on land-use changes**, mostly reinforcing existing trends. CAP seems to **slow down the speed of changes in farm structure** (increase in farm size) but provides insufficient support for maintaining small farms. **Effects on farm management are mixed**, as the CAP both supports intensification and enhanced agrochemical use (especially in new Member States (MSs)) and limits them by regulations and financial incentives like Agri-Environment-Climate Measures (AECM).

Socio-economic performance of the CAP:

- **Effectiveness is mixed:** CAP has a positive effect in supporting farm incomes. Direct Payments (DP), however, create dependencies on subsidies, influence some production decisions, and reduce farm efficiency. Market distortions have been reduced and integration into world-markets is improved (so that prices now follow global markets), but consequently farmers are more exposed to risks of high price volatility.
- **Efficiency is very low**: Distribution of direct payments (DP) is highly inefficient and poorly justified. There is no clear link between objectives and instruments. There are insufficient or missing indicators on farm incomes and assets of farm household, and consequently, no indication that DP reach those farmers needing support. Payments are insufficiently targeted to lower income farm households, and leak from the farming sector to land rent. The efficiency of the rural development programmes is mixed.
- **Internal coherence is low:** Contradictory objectives and conflicting instruments weaken policy design and implementation. Insufficient indicators and monitoring makes some trade-offs and conflicts between CAP instruments non-transparent. Contradicting policy instruments such as DP that are decoupled or recoupled to production, combined with too high flexibility at the national level, undermine effective implementation of CAP-targets especially in pillar I.
- **External coherence depends on the policy field assessed:** For trade policy, there are synergies with trade liberalisation due to decoupled payments. Access to EU markets has improved for middle income non-EU countries, but a negative effect through an erosion of preferential trade is noted for least developed countries. There is a shift in the type of trade barriers toward market standards. We observed a relative coherence with cohesion policy. Still, there is little coherence with respect to nutrition (food policies) and health as well as sustainable consumption.
- **Relevance is low:** Objectives are unclear and partly fulfilled or outdated – for instance, enhancing agricultural productivity (Obj 1) relates to post-war Europe and can be considered as already fulfilled and largely outdated within the EU. Public demand for food quality instead of cheap food

is not reflected. Direct payments for income support are strongly questioned, insufficiently monitored, and do not match public preferences. Public acceptance has eroded. Indicators have recently been updated but essential indicators for farmers' economy (farm household) and wellbeing remain weak or missing.

- **EU added value is mixed:** The CAP has an added value for market issues, for a uniform legal framework within the EU, a positive contribution to farmers' standard of living and a (more) balanced territorial development. We found no evidence of an economic added value of the CAP compared to national policies. CAP is insufficiently adapted to local socio-economic contexts and needs (e.g. accessibility to funding by smallholders), particularly with regard to new MSs' conditions.

Environmental performance of the CAP:

- **Effectiveness is mixed at local levels but low at the EU level**: There are local and regional successes of targeted CAP instruments (primarily agri-environment-climate measures, AECM), but they fail to scale up to the EU level and the CAP as a whole. Main inhibitors are limited budget, low uptake, and poor design and implementation of AECM. Greening design and implementation is insufficient to reverse negative trends due to broad exemptions, low requirements for crop diversification, lack of management criteria and the inclusion of ineffective options for Ecological Focus Areas (EFA), comprising 75% of EFA area. Climate measures are insufficient, hardly targeting livestock production and nitrogen fertilizer use as the main sources of greenhouse gas (GHG) emissions. Effects on soil and water are partly positive, partly negative.
- **Efficiency is very low:** The largest investments are made into the least effective measures from a biodiversity perspective. The expansion of agri-environment measures (AEM) to include climate action (now AECM) yet with concomitant budget erosion has reduced their efficiency. Administrative burdens bias farmers' choices to less effective measures, with highest uptake of EFA options that offer no return (i.e. no environmental improvement) for the greening investment. A comparison between regulatory law and direct payments for ensuring minimum ecological requirements for agriculture illustrates that regulation is generally more efficient than subsidies.
- **Internal coherence is low:** Conflicting CAP objectives (production versus conservation) weaken internal coherence. Non-transparent trade-offs occur due to absence of specific indicators and monitoring. Competition between greening and AECM, both in terms of budget and actual implementation, has eroded AECM. The potential for bottom-up integration of farmers, stakeholders and the public is largely unfulfilled.
- **External coherence is low:** Complementarity in terms of objectives exists with the Nitrate- and Water-Framework Directive. Some environmental standards are employed through Cross Compliance (CC). Overall, however, insufficient implementation maintains conflicts between the CAP and key policies for biodiversity (CBD, Nature Directives) and climate (UNFCCC, emissions trading). Global footprint effects due to EU consumption and feedstock imports remain largely ignored.
- **Relevance is mixed:** New environmental priorities are clearly relevant to large segments of the public but are not yet resolved. Appropriate indicators to support policy assessment and outcomes are often still weak or missing and monitoring is insufficient. The CAP does not take up the most updated criteria, tools and knowledge to address environmental issues. Public concerns over animal welfare in many parts of the EU are weakly addressed.

- **EU added value is mixed:** EU-wide environmental standards and requirements exist. Flexibility allows for adjustment to national/local conditions but weakens overarching goals and achievements, as well as the commonality of the policy, due to variations in national-level design and implementation. Over-simplistic thresholds (e.g. for crop diversification) do not match conditions in most MSs, i.e. in southern, central and eastern Europe.

Can the CAP deliver on the UN's Sustainable Development Goals? Key findings:

Socio-economic SDGs:

- The CAP **contributes to achieving SDG 1 (no poverty) and SDG 2 (zero hunger) inside the EU.** However, food security or extreme poverty are no longer central challenges in most of the EU. Effects of the CAP outside of the EU have improved considerably but remain complex and mixed.
- While the CAP supports the expansion of organic farming, it also supports other, unsustainable farming systems, thereby strongly **limiting its potential contribution to** achieving **SDG 8** (**green growth**).
- Availability of CAP subsidies supports (more) balanced territorial development, areas with natural or other specific constraints are supported and young farmers receive special support. Notwithstanding, the CAP does **not adequately contribute to achieving SDG 10** (**reduced inequalities**) due to the highly unequal allocation of payments, and remaining low accessibility of funding for smallholders.
- The CAP **makes insufficient contributes to SDG 12 (responsible consumption and production)** and is **inadequate in addressing SDG 3 (good health and wellbeing)**: challenges of overproduction and waste remain an issue. The CAP lacks the mechanisms to address unhealthy diets, obesity, and health issues relating to these, and animal products receive an over-proportionally high funding.

Environmental SDGs:

- Although designated instruments such as AECM and CC offer the potential to address **SDG 6 (clean water) and SDG 15 (life on land),** their budget and extent are **too limited to reverse overall trends** of environmental degradation and biodiversity loss. AECM have eroded in the last reform, whereas the design and implementation of greening measures is too weak to address these SDGs.
- Although the CAP includes instruments with respect to climate, they address neither key sources of GHG nor global exports of land-use changes. CAP is therefore **incapable of achieving SDG 13 (climate action)**.

Key emerging lessons

- The CAP has gone through a series of reforms since 1992, leading to better market integration and coherence with (some) development goals. The introduction of decoupled Direct Payments (DP) has resolved various challenges but created new inconsistencies within the CAP.
- Current trends and CAP's performance indicate that **sustainability**, along the axes of social, ecological and environmental dimensions, **has not been achieved and is unlikely to be achieved** under current conditions.
- **CAP does not adequately address the most relevant SDGs** associated with it, namely SDG 3 (Good health and wellbeing), SDG 6 (clean water), SDG 8 (Green Growth), SDG 10 (reduced

inequalities), SDG 12 (responsible consumption and production), SDG 13 (climate action) and SDG 15 (life on land). Even SDG 1 (no poverty) and SDG 2 (zero hunger) are challenging if examined from a global perspective beyond Europe.

- While **distortions** of **global markets** have been **reduced successfully**, the EU's **global ecological footprint keeps growing** and is not addressed adequately by the CAP.
- **CAP lacks a clear** set of internally and externally coherent, overarching, well-justified **objectives** as well as **instruments and indicators** aligned with them. This hampers effectiveness and particularly efficiency.
- Interactions between policies and stakeholders, and impacts on developing countries, demonstrate that policy fields are interdependent. **The CAP lacks policy packages that would link diverging objectives and instruments.**
- **Direct Payments** as income support receive the largest budget allocation without sufficient justification or clear links to CAP objectives. High criticism is also directed towards inefficiency and inequity of DP distribution, which **do not reflect farmers' needs and the public opinions** as expressed for example in the 2017 Public Consultation.
- **The CAP's effects on small farm holders are of high importance** for socio-economic and environmental success, particularly in Eastern Europe.
- The **environmental engagement of the CAP is insufficient** to halt environmental degradation, the decline of biodiversity and ecosystem services in the EU, and to cope with the challenges of climate change, with consequences for farming and farmers in terms of enhanced risks.
- **Available knowledge is often poorly incorporated** into the CAP design and implementation, for example through lack of landscape-level and community-targeted implementation to improve socio-economic and environmental performance, neglecting opportunities for GHG reduction, or the design of greening measures with insufficient uptake of existing knowledge and experience from AECM.
- **Administrative burdens represent important barriers** for successful implementation, especially in the area of biodiversity.
- **Power struggles among interest groups** reduce the effectiveness, efficiency and coherence, and seem to hamper public acceptance of the CAP.

Introduction

The next CAP reform will shape the post-2020 CAP. In preparation for its negotiations, the European Commission (EC) conducted a Public Consultation which gathered over 330,000 views and opinions about the potential modernisation and simplification of the CAP. In addition, EC is currently conducting an Impact Assessment, which, according to previous exercises, seeks to examine alternative scenarios for the future CAP. However, so far, the CAP has never gone through a systematic, evidence-based evaluation or a "fitness check". Such a process, proclaimed by EC to be the most advanced standard for policy evaluation, has been used for other policy fields (e.g. Nature Directives), but so far not for the CAP. Such an evaluation seems particularly important given the intensity of political negotiations, under contrasting requests by opposing stakeholders. It is fulfilled neither by the public consultation (which harvested opinions rather than evidence) nor the upcoming Impact Assessment.

This study therefore complements current activities by examining evidence regarding CAP's performance hitherto. We provide an **evidence-based Fitness-Check of the CAP**, **aiming to**

- ➢ compile evidence on the CAP's impacts on our society, economy, and environment;
- ➢ assess whether the CAP fulfils its objectives (**Box 1**); and
- ➢ evaluate the capacity of the CAP to contribute to meeting the UN's Sustainable Development Goals (SDGs; **Fig. 1**), which the EU endorsed in 2015.

Box 1: The eight key objectives of the Common Agricultural Policy (CAP)

A*rticle 39 of the Treaty of the functioning of the European Union (2009; own highlighting) "specifies that the objectives of the Common Agricultural Policy shall be:*

1. *to increase agricultural productivity by promoting technical progress and by ensuring the rational development of agricultural production and the optimum utilisation of the factors of production, in particular labour;*
2. *thus to ensure a fair standard of living for the agricultural community, in particular by increasing the individual earnings of persons engaged in agriculture;*
3. *to stabilise markets;*
4. *to assure the availability of supplies;*
5. *to ensure that supplies reach consumers at reasonable prices."*

In 2010 the European Commission delineated new overarching objectives (EC 2010):

6. Viable food production, including contributing to farm incomes, improving the competitiveness of the sector and compensate for natural constraints;

7. Sustainable management of natural resources and climate action, including support for the provision of environmental public goods, fostering green growth through innovation, pursing climate change mitigation;

8. Balanced territorial development, including the support of rural employment, promoting diversification, improving rural economy and allowing for structural diversity.

Because the three new objectives have not been constitutionalized, we refer to them as 'priorities'.

In order to generate a strong knowledge base to address these questions, this study focused on a desk-based analysis using a "rapid evidence assessment" process (as devised by Collins et al., 2015, "The Production of Quick Scoping Reviews and Rapid Evidence Assessments: A How to Guide").

The first stage of the assessment aimed to compile the evidence base. It was conducted between January and July 2017 and included a series of online meetings and two workshops. We established an interdisciplinary scoping committee comprising 18 members; defined key questions, evaluation criteria, and SDGs to target; and delineated the methods of literature search and a working protocol, addressing, for example, inclusion and exclusion criteria.

We searched available literature covering socio-economic and environmental aspects, trying to achieve a balanced knowledge base both thematically and geographically. We separated publications addressing baseline phenomena and trends relating to agriculture in general, from those providing a direct evaluation

of the CAP, its instruments and impacts. Our assessment included peer-reviewed scientific literature from 2006-2017 (i.e. after the Fischler-Reform of 2005), as well as reports and additional data-sources such as Eurostat, FAOSTAT, and national/EU/EC reports and data.
As a result, two databases were built. The first database lists all publications potentially relevant for the assessment, while the second database corresponds to the outcome of an in-depth assessment of a subset of relevant publications. Evidence was collated into the in-depth database either by our team, or via an online survey that was open for inputs between March and July 2017. The call for evidence was spread among many hundreds of experts across Europe and also linked to the EU-funded EKLIPSE project.

In order to categorise the collated evidence, we followed the EC's criteria for policy Fitness-Checks by adopting six evaluation criteria for the CAP:

1. **Effectiveness**: Do the CAP design, instruments, and implementation contribute to meeting its objectives?
2. **Efficiency**: Are the costs reasonable and in proportion to the benefits achieved, also compared to alternative mechanisms? Are the investments well-placed and distributed?
3. **Internal Coherence**: Do CAP objectives and instruments complement or conflict with each other in supporting its objectives and implementation?
4. **External Coherence**: Does the CAP support, complement, or conflict (with) other EU and international policies in terms of objectives and implementation, and/or effects?
5. **Relevance**: Is the CAP relevant to current challenges and the priorities set by EU citizens, farmers, and policy makers? Is it using (and supporting) the most updated criteria, tools, and knowledge?
6. **EU Added Value**: Does the CAP address challenges better than national-, regional- or local-level solutions?

In addition to these, we added a further question relating to the UN's Sustainable Development Goals (SDGs; **Fig. 1**), namely

7. **SDGs:** To what extent can the CAP contribute to meeting relevant Sustainable Development Goals (SDGs 1, 2, 3, 5, 6, 7, 8, 10, 11, 12, 13, 15)?

Figure 1: *Twelve of seventeen Sustainable Development Goals (SDGs) address agriculture directly and indirectly and are hence relevant to the CAP. The SDGs were re-organized thematically with respect to agriculture. Icon* ***Source****: UN SDG (http://www.un.org/sustainabledevelopment/sustainable-development-goals/)*

Following the evidence gathering process, from July to October 2017, we checked and expanded the database, addressed knowledge gaps and performed further data analyses with an expanded team. At this stage, we also sent the report to several external reviewers for evaluation and improvements prior to its completion.

As of October 2017, 791 publications were listed and evaluated as potentially relevant for the CAP's assessment. Over 350 of these were fully assessed, and 306 incorporated into the in-depth database. In order to produce this report we harvest information from the most relevant publications and the in-depth database. These publications cover 26 Member States, as well as impacts of the CAP in countries beyond the EU. Most publications addressed the criteria 'effectiveness' followed by 'efficiency', whereas 'internal coherence' was least addressed (**Fig. 2**). Our database is published and available online at https://idata.idiv.de/DDM/Data/ShowData/248.

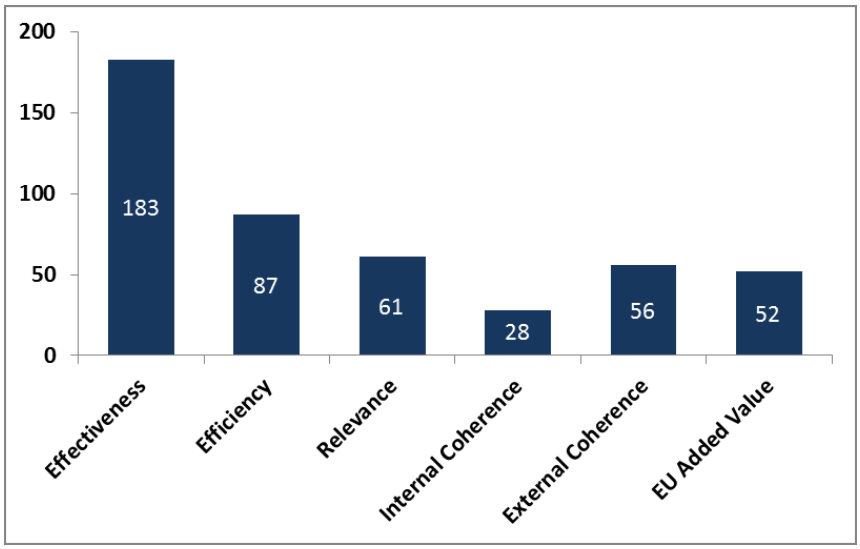


Figure 2: *Number of fully-assessed papers in our database, divided into fitness-check assessment criteria. Note: a given publication could address one or more criteria.* Source: own database.

Results

1. Land-use, farm structure and management

European agriculture undergoes a constant decrease in the number of agricultural holdings, whereas the total utilized agricultural area (UAA) remains stable, showing a trend towards large-scale farms (**Fig. 3**). A range of socio-economic and historical factors contribute to these trends, such as post-socialist changes in new MSs. The CAP has a mixed contribution: For instance, finances for modernization are offered, followed by increased productivity, intensification of livestock farming and crop management, and a reduction in human labour. Although the CAP slows down the decrease in farming employment, it provides insufficient support to small farms. In terms of farm management, agrochemical use has been decreasing in old MSs especially after 1990, while CAP incentivises agricultural intensification and supports an increase in agrochemical use in new MSs. Subsidies allow purchasing agrochemicals, while regulations and some incentives (e.g. through AECM) reduce them.

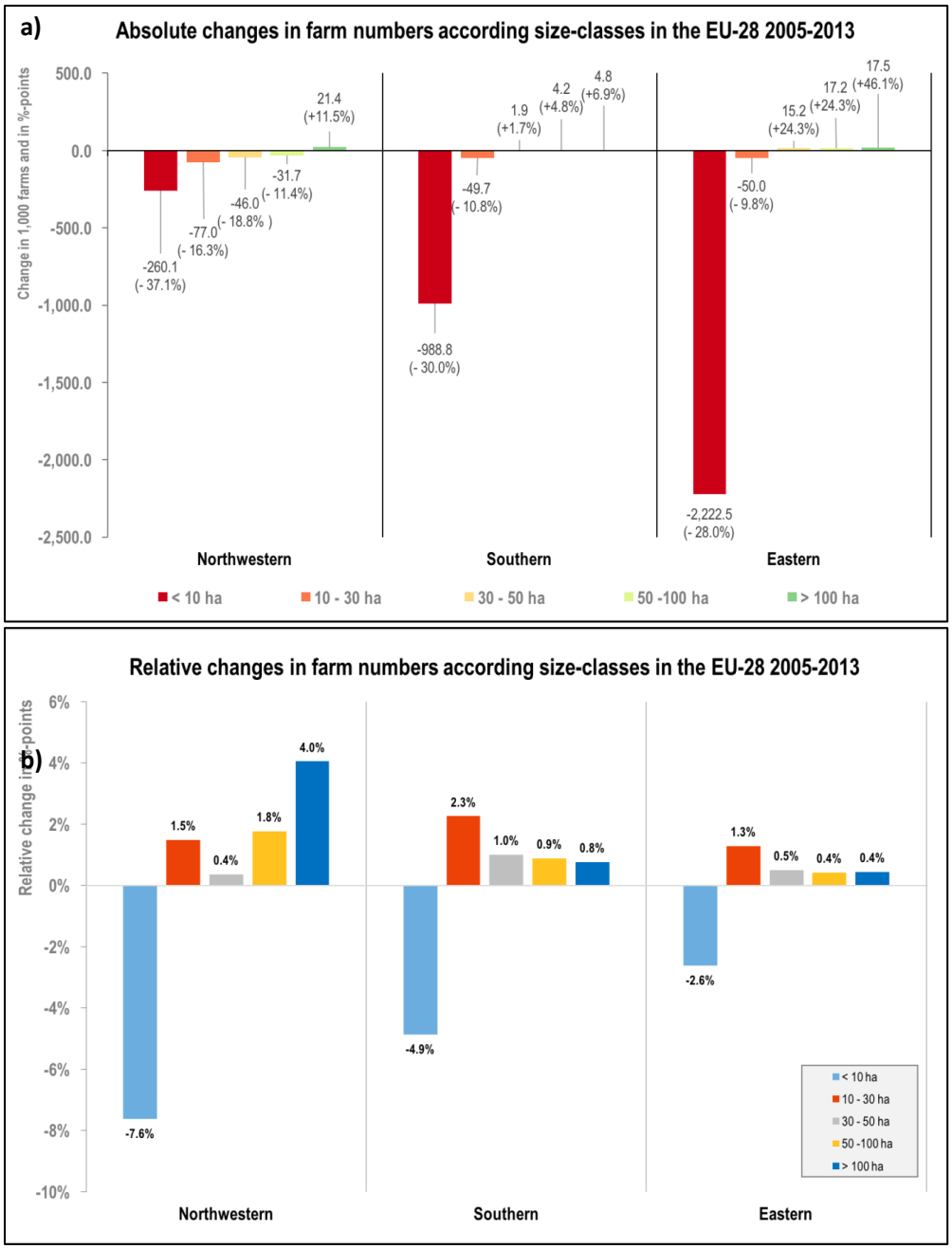


Figure 3: *(a) Absolute change in number of farms per farm size classes and (b) relative change in farm size classes across EU Member States between years 2005 and 2013.* Source: own calculations, data from Eurostat (2017). Note*: We divide MSs according to three regions: North-western EU: Belgium, Denmark, Germany, Ireland, France, Luxembourg, The Netherlands, Austria, Finland, Sweden, United Kingdom; Southern EU: Greece, Spain, Italy, Cyprus, (Malta), Portugal; Eastern EU: Bulgaria, Czech Republic, Estonia, (Croatia), Latvia, Lithuania, Hungary, Poland, Romania, Slovenia, Slovakia.*

2. Effectiveness

2.1 Socio-economic effectiveness

The CAP has positive effects on the income of EU farmers mainly through DP through Pillar I. Pillar II payments also contribute towards more balanced territorial development through additional incomes, yet very high variability among MSs. As shown in **Fig. 4**, countries associated with lower profit are generally associated with higher share of farm profit from DP, but the share is highly heterogeneous, ranging from 10 to 60% (with an average of 25.7%). Direct payments influence farmers' input choice and intensity levels such that farmers take less efficient management choices. As a result, DP still acts to reduce farm efficiency and distort production decisions, even if less than prior to the decoupling of payments from production. Parts of the DP translate into land prices, i.e. into income for landowners who are not necessarily farmers. Payments also lead to dependence of farmers on subsidies. Overall CAP impacts can therefore be defined as slightly positive but **effectiveness is low**.

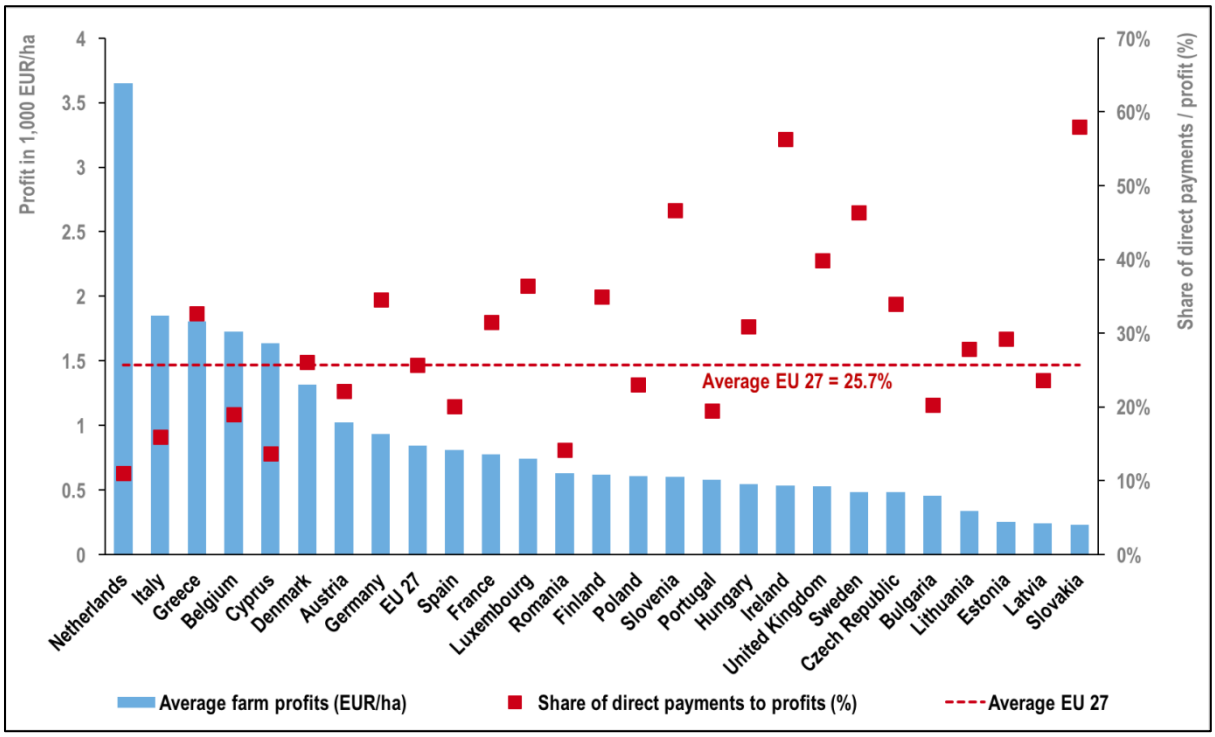


Figure 4: *Average farm profits (blue columns) and average share of direct payments to farm profits (red squares) per MS, between 2007-2013.* Source: Own calculations; Averages from public data base of Farm Accountancy Data Network (FADN) 2017.

Past CAP reforms have successfully reduced global market distortions so that prices nowadays largely follow global markets (for instance, wheat prices in Germany follow the world markets from 1992 onwards, as shown in **Fig. 5**). EU prices in many areas and sectors (with the exceptions of sugar-beet and beef) are mostly integrated into international markets, so that supply and demand meet on the international markets and prices are adjusted to the market rather than politically fixed. This can

seemingly bring more market stability, but it also enhances risks of high market volatility in the European markets, and exposes farmers to market risks.

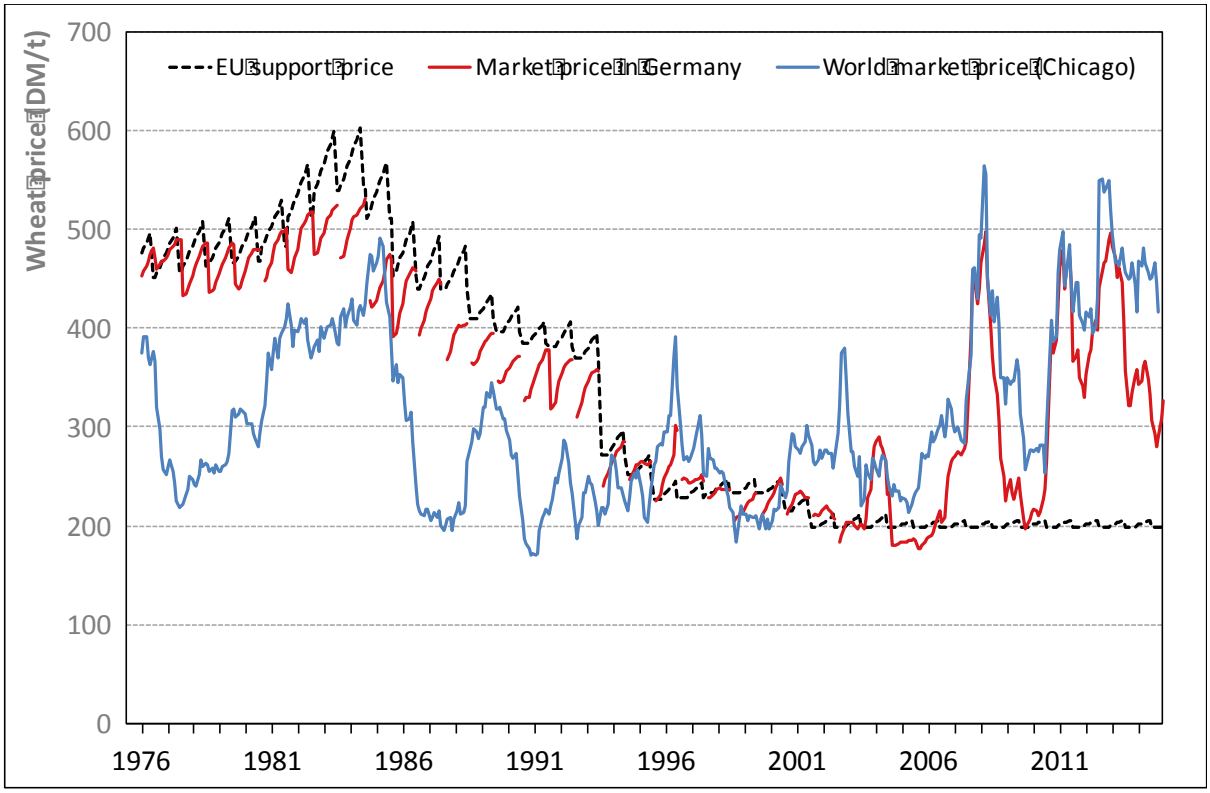


Figure 5: *Wheat Prices in the EU & World market and the EU intervention prices (in DM/ton). Source: Von Cramon-Taubadel & Ihle (2016), unpublished data based on data from Chicago Board of Trade (CBoT) for the world market price, Zentrale Markt und Preisberichtstelle (ZMP), and Agrarmarkt Info GmbH (AMI) for German data.*

2.2 Environmental effectiveness

The large body of studies on the effectiveness of **Agri-Environment-Climate Measures** (AECM) offer many examples of good implementation as well as barriers to effectiveness (low uptake, often lack of spatial design, less effective design and implementation). **Cross compliance** criteria seem to contribute to slowing down soil erosion and mitigate water pollution (the latter also through other policies), while the control of water uptake for irrigation remains weak. However, these specific instruments are too limited in extent to reverse the larger-scale impacts of other CAP instruments, supporting the ongoing agricultural intensification, abandonment, and environmental degradation. Accordingly, the decline in farmland biodiversity continues in all MSs (**Fig. 6**). The provision of ecosystem services linked to biodiversity such as pollination and biological pest control portrays a negative trend as well.

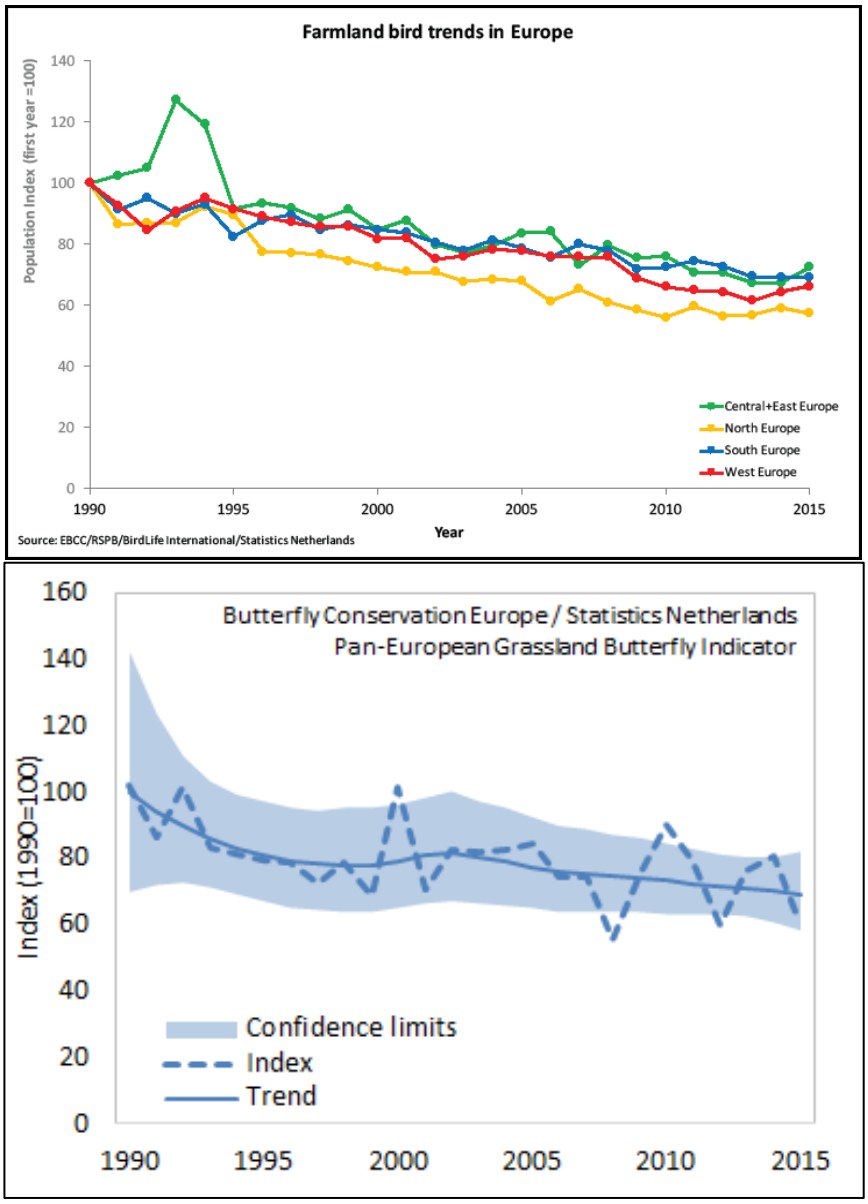


Figure 6: *a) Farmland Bird Index values across time in western (yellow), northern (blue), southern (green) and central + eastern (red) EU MSs. b) Pan-European Grassland Butterfly Indicator. Sources: a) EBCC/RSPB/BirdLife International/Statistics Netherlands and b) Butterfly Conservation Europe/Statistics Netherland.*

Pillar I greening measures (EFA, crop diversification, permanent grasslands): **Low effectiveness** due to a) broad exemptions and low demands requiring little or no changes in practice (especially for crop diversification but also for EFA), b) inclusion of ineffective options for biodiversity (EFA), and c) insufficient

management criteria for all three measures. Particularly crop diversification seems to allow further conversion into monocultures rather than maintaining or increasing crop diversity, or promoting crop rotation. Farmers mostly take up productive EFA options (73-75% of area, at EU level) which are simpler to employ yet with the lowest effectiveness for biodiversity.

High Nature Value farmland (HNVf) areas, providing some of EU's highest biodiversity value, receive insufficient support. As subsidies are not well tailored towards HNVf, and most farmers are not eligible for support, HNVf continue to be degraded or lost.

Very limited contribution to climate change mitigation. Since 2005, agricultural greenhouse gas (GHG) emissions are stagnating, while earlier reductions were side-effects of other policies. Spending on climate measures within AECM is marginal. Targeted action based on existing GHG mitigation potentials is missing, particularly for livestock farming which is responsible for over ⅔ of agricultural GHG emissions. Nitrogen fertilizer use as well as drainage and intensive land-use on high organic soils (peat soils) are also among the most important GHG sources. Emissions outside the EU caused by deforestation due to feedstock imports are not tackled by the CAP. This further contributes to a negative global climatic footprint of the EU.

3. Efficiency

Our analysis reveals **very low efficiency** since costs are disproportionate to the benefits incurred, and investments are not optimally distributed (socially, economically and geographically).

3.1 Socio-economic efficiency

The literature offers **strong evidence that efficiency is very low**. First, payment distributions are inefficient: if analysed according to farm size, the level of payment inequality (as represented by the GINI coefficient of inequality) is heterogeneous and sometimes decreasing in old MS (e.g. The Netherlands), but higher or even increasing in some new MSs (**Fig. 7**). Some of the changes observed in new MSs may relate to post-socialist developments (structural changes resulting from rapid intensification) and shifts in farm sizes following the accession to the EU, as well as to the phasing in of the CAP's direct payments (DP). Some of these influencing factors are independent of the CAP. However, the uneven distribution of DPs, and the high (and even increasing) levels of inequality, cast serious doubts whether this distribution of DP is appropriate and efficient toward fulfilling a) the CAP's objective with respect to fair standard of living (Art 39(1)b), and b) the 2010-priority of reducing disparities in rural development especially in new MSs and other disadvantaged regions.

Additional inefficiencies result from leakages of DP to increased land rents (meaning that large proportions of DP do not necessarily support farmers). The applied indicators also fail to reflect the actual economy of farm families and households (see below, "Relevance"). Thus, payment distribution, utilisation, and indicators do not match with real needs. Studies also indicate insufficient justification by the EC as to why and which farmers need income support and whether lump-sum income support is the most efficient means to an end.

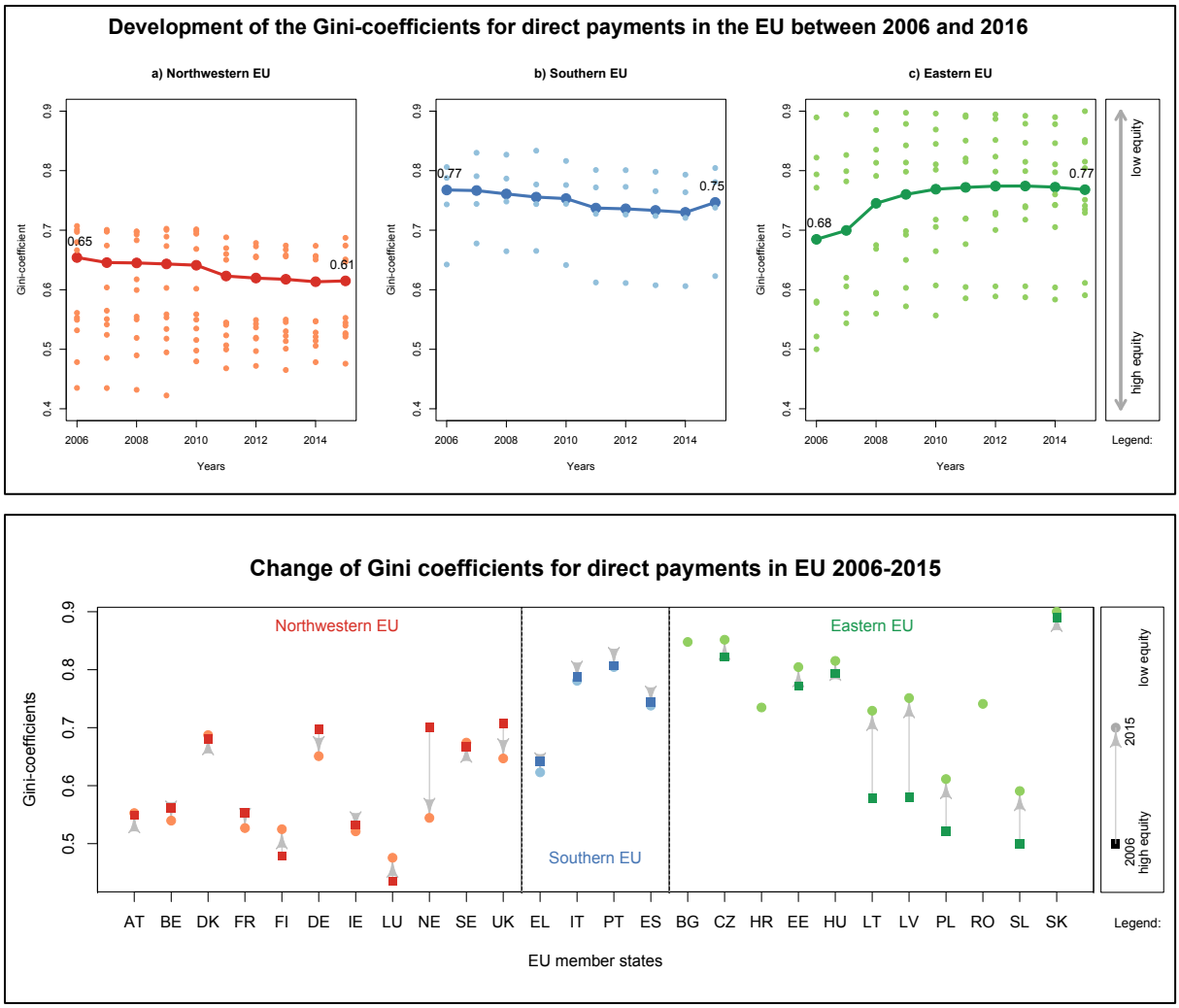


Figure 7: *Distribution of direct payments in the EU 2005-2015 according to farm size, as summarized using the Gini-coefficient of inequality – higher values indicating higher inequality (i.e., less equity in payment distribution). a) Development of the Gini-coefficient in West, South and East EU, b) Changes of the Gini-coefficient from 2006 to 2015 in the member states.* Source: Own calculations based on data from the EU Commission 2005-2016. *Note: The GINI coefficient is a measure of inequality, ranging from 0 to 1. The higher the value is, the more uneven is the distribution of payments across farm-size classes.*

3.2 Environmental efficiency

There is **strong evidence that the CAP is largely inefficient regarding its environmental objectives**. First, there is a negative relation between the effectiveness of the different CAP instruments and their budget (**Table 1**). The largest proportion of budgets and investment per ha is put into EFAs (with contested effectiveness), about three times lower for AECM (shown by the literature to be somewhat effective but also with some mixed outcomes, especially in new MSs), and thirty times lower for Natura 2000

grasslands (in which case payments are dedicated toward protecting biodiversity and therefore more effective than other CAP instruments).

Efficiency of AECM is hampered by competing payments with much lower environmental standards (see also internal coherence). The inclusion of new climate objectives into AECM (formerly AEM) during the 2013 reform, alongside an erosion in budget (**Table 2**), has further reduced efficiency.

Notably, in some countries both in and out of the EU, some environmental objectives are also achieved through regulations instead of payments, with lower costs for similar benefits.

The efficiency of greening measures (EFA, permanent grasslands, crop diversification) is very low as well: a) a high proportion of farmers is already complying with the basic requirements, and therefore payments for production-oriented EFA options offer gains with no actual costs ("windfall gains"). b) lack of spatial design entails that payments are spatially disorganized and lose efficiency; and c) Collaborative measures for greening implementation were taken up by only two Member States.

Overall, investments in natural habitats fail to reflect the non-monetary benefits of public goods and particularly the insurance value of natural ecosystems against environmental risks (floods, droughts, erosion, etc.).

Table 1: Area and spending of the EU for different environmental instruments in 2017.

Policy measure	Agricultural Area (in Mio. ha)	Public funds (in Mio. EUR)	Relation funds to area (EUR/ha)
Greening: **Ecological Focus Area (EFA)**[1]	8.00	12.638,21	789.89
Agri-Environment-Climate Measures (AECM)[2] (Including areas and payments for organic farming, but without payment for areas with natural constraints)	13.15	3,250.92	247.17
Natura 2000[3] (Grassland area in SCI reported as by the EU commission)	11.65	290.00	24.89

Source: Own presentation; **Data** (EU Commission 2015, 2017b; Eurostat 2010) **Note 1:** The sum of all EU national ceilings per year is on average 42.127 Mio. EUR. If multiplied by 30% we get 12.638 Mio. EUR. The 8.00 Mio. ha are real area, so before applying weighting factors. We are assuming, that only 50% of the Greening payments of 12 billion EUR goes into EFA. Otherwise, the payment per hectare would have been 1.579,78 EUR/ha. **Note 2:** Payments are without national co-funding.. **Note 3:** Natura 2000 and Agri-environmental programmes are partly overlapping in terms of area and funding. Eurostat lists 11,652,978 ha as SCI targeted agricultural habitats.

Table 2: Changes in Agri-environmental & Climate Measures (AECM) funding as share of Rural Development programmes (RDP) over the last reform.

Funding	RDP 2007-2013[1]		RDP 2014-2020		Change	
	Spending (in bn. EUR)	Share (in %)	Spending (in bn. EUR)	Share (in %)	Spending (in bn. EUR)	Share (in %)
Sum Rural Development Programmes	22,115		22,228		+ 0.113	+ 0.51%
Agri-environmental & Climate Measures [2]	5,375	24.3%	4,915	22.1%	- 0.461	- 8.57%

Source: Own calculation; Data 2007-2013 are from EU Commission 2010; Data 2014-2020 are from country sheets for the RDP 2014-2020; **Note 1:** Figures are average yearly expenses for the EU-27. Croatia is not included. The RDP-figures are including Co-financing by member states and include technical assistance. Budget increases of the Mid-term-review-reform 2009 are not included. Note also that figures are not deflated. Therefore, this decrease is a 'conservative estimate'. **Note 2:** The figures for Agri-environmental & climate measures include the payments for organic farming but they do not include payments for less favoured areas (LFA, now referred to as "areas facing natural or other specific constraints").

4. Internal Coherence

The literature offers **strong indication for a low internal coherence** primarily due to the multitude of objectives, and even more so instruments. Some instruments conflict each other, others target similar objectives in a way that leads to competition among each other. Integration of different instruments for national and local implementation remains problematic.

With the growing number of CAP objectives and priorities, new functions and instruments were added without sufficient integration of their design and implementation procedures. This has reduced effectiveness and particularly efficiency, and added high administrative burdens. The absence of clear targets and indicators attached to instruments lead to conflicts and (often non-transparent) trade-offs. For instance, farmers can receive similar levels of payments with or without adhering to environmental standards, thus creating competition between instruments with diverging objectives.

Flexibilities on the national level and contradicting policy instruments undermines the European implementation of CAP-targets especially in pillar I. For example, following the 2013-reform there is a low coherence between DP that are decoupled from production or re-coupled with it. In the case of the milk market, for instance, coupled support of milk producers on the one hand, and buying out excessive milk quantities in in 2016 on the other hand, show low coherence of instruments even within pillar I.

Literature also identifies potential complementarities between different CAP mechanisms, especially focusing on DP, AECM, Cross Compliance (CC) and Greening. Progress has been attested incentivising certain forms of land-use, such as organic farming or fallow land, but other objectives such as biodiversity conservation or restoration, and the reduction of GHGs, have failed due to insufficient integration of policy instruments. Notably, the levels of complementarity of different CAP instruments vary across regional settings and thematic foci and lack transparent guidance. *De facto* the multitude of political targets, and particularly the attempt to combine production and conservation objectives, has resulted in conflicts of interest and led to policy measure designs that compromise effectiveness and efficiency. For instance, it could be shown that the design of greening measures has led to a decline of AECM budget by at least 8.6% (as a conservative estimate; **Table 2**).

Some case studies and analyses of local implementation point to the potential of local innovation when instruments and objectives are adjusted to local conditions, and indicate an unfulfilled potential to integrate production and conservation objectives or at least diminish trade-offs.

5. External Coherence

Coherence of the CAP with other policies and directives depends on the topic inspected and dimension of impact assessed. Positive coherence levels and synergetic implementation of CAP objectives **with objectives of other policies was found for Cohesion Policy and the Nitrate- and Water-Framework**

Directives. Low coherence was found with other policy fields, such as conservation policy, health and nutrition, sustainable consumption and climate policy. In these areas, implementation on the EU, national and local levels results in constraints and trade-offs in effectiveness and efficiency of policies. For example, areas designated as Natura 2000 receive only 1 to 2% of CAP funds. Regardless of whether these payments aim at compensating farmers for income lost or the constraints set by Natura 2000 regulations, or whether they aim at providing additional incentives for the provision of public goods, these payments are **insufficient to address the conflict between nature conservation and production, and accordingly, between the CAP and the Nature Directives.** Some CAP mechanisms, especially AECM and cross-compliance (CC), have an attested potential to support targets of soil erosion, nitrate reduction, water management and biodiversity conservation, but show remaining shortcomings in policy design and conditions for implementation.

The indirect effects of the CAP on countries outside of the EU (by impacts on imports and prices) point to complex interrelations and important trade-offs, with **substantial shortcomings in meeting the EU principles for Policy Coherence for Development (PCD)**. Decoupling direct payments and phasing out export subsidies have reduced market distortions, and stabilised markets in the sense that agricultural commodities are traded almost at world market prices. The EU has thereby facilitated market access to the EU, with exporting middle-income countries as the main beneficiaries. On the other hand, exporters from least developed countries lose from the consequential erosion of preferential trading schemes and high market and product standards, thus hampering again the coherence with PCD. Furthermore, imports of agricultural products from developing countries sustain the overall high level of European consumption and feedstock-production. This results in exporting environmental footprints to developing countries, leading to deforestation, carbon emissions and environmental risks. These **collide with international biodiversity and climate agreements** (CBD, UNFCCC), the Habitats and Birds Directives, as well as principle set by the PCD.

6. Relevance

The CAP **objectives are vague and largely outdated**. Old objectives and new priorities exist in parallel and overlap, and specifications are often missing. Several of the original objectives have already been fulfilled or are less relevant to today's needs (**Table 3**). For example, CAP Objective 39d ("*to assure the availability of supplies*") originates from food scarcity in Europe after World War II and is no longer a prime EU challenge; and Objective 39e (*"ensuring that supplies reach consumers at reasonable prices"*) does not reflect the public's concern about food quality. Strong criticism in the literature relates particularly to the lack of a clear justification for income support by direct payments (with no related objective), representing the largest portion in the CAP's budget. At the same time, the 2017 Public Consultation indicated that both farmers and the general public seem to find investments under Pillar II more important than DP (**Fig. 8**).

Table 3: Relevance of CAP objectives and the 2010 priorities to current EU challenges.

Objective / priority	Relevance in 2017
Increase agricultural productivity (39a)	**Mostly fulfilled, thus outdated**, would need clarification
Thus Ensure a fair standard of living and increasing the individual earnings in agriculture (39b)	Views on the relevance of this objective are **highly heterogeneous**
Stabilise markets (39c)	**Mostly fulfilled, but remains relevant**. Clarification needed on relation to EU/world markets
Assure the availability of supplies (39d)	**Achieved and thus outdated**
Ensure that supplies reach consumers at reasonable prices (39e)	**Outdated:** CAP reforms actively acted to reduce market intervention and market distortions
Viable food production (2010 Priority 1)	**Not relevant *per se***: it is not clear what viable is and what is the relation to income support
Sustainable management of natural resources and climate action (2010 Priority 2)	**Relevance** not questioned, but not achieved
Balanced territorial development (2010 Priority 3)	**Relevant, but not well defined and integrated** with other policies

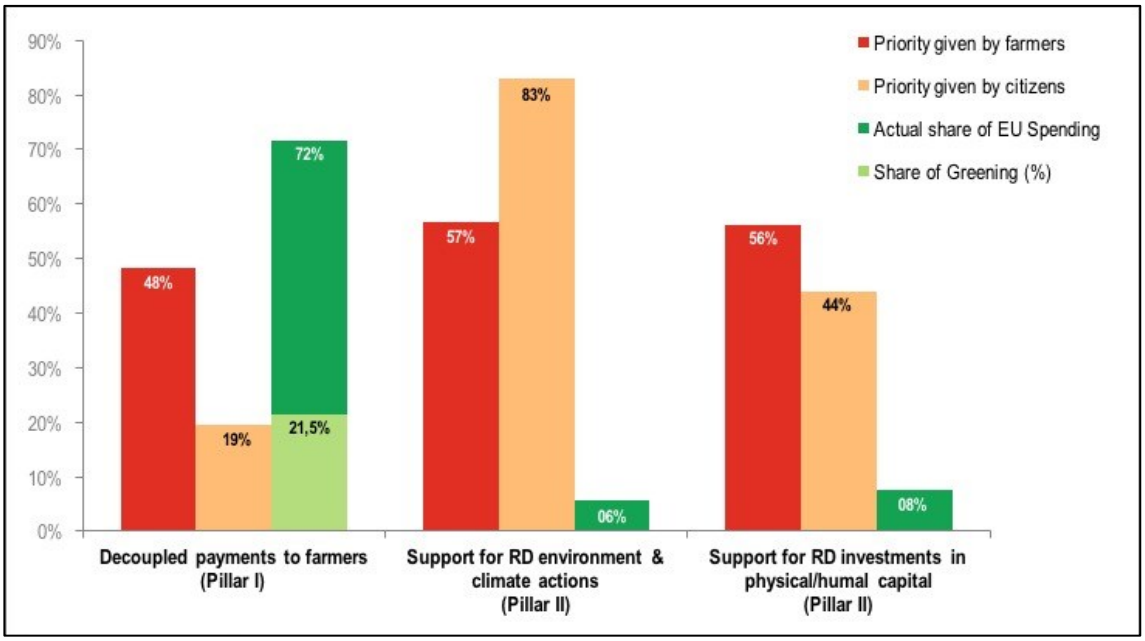


Figure 8: *Public Consultation outcomes with respect to the question which tools are best suited to meet challenges, as voted by farmers versus other citizens; and both of these compared to actual budget allocation (2014-2020). Note 1: only 52,000 respondents out of 330,000 chose to reply to this question; Note 2: 13.6% of farmers and 38.1% of citizens indicated regulatory approaches as an effective means to achieve goals. These cannot be compared to any budget allocation and is hence not presented here. Note 3: numbers do not sum up to 100% since respondents could potentially select up to three options.*

Two independent Eurostat surveys show that EU citizens still consider the CAP as an important result of the EU, but overall **societal acceptance of the CAP has recently declined**, possibly due to public criticism of the CAP's failure on the environment, versus farmers' criticism on recent increases in administrative burdens.

There is evidence that the CAP can be considered relevant in terms of support of technology and modernisation, but the literature indicates limited integration of available knowledge, novel concepts and tools into policy design. For instance, the design of Ecological Focus Areas did not take up from the broad experience gained through AECM, and integrated landscape management remains underdeveloped.

Despite strong criticism on the monitoring and evaluation of direct payments, it should be noted that EC has updated and expanded its indicators' list in 2015, and adopted advanced techniques and monitoring instruments such as LPIS (Land Parcel Identification System) and FADN (Farm Accountancy Data Network). However, remaining deficiencies remain, such as for indicators of farm economy, wellbeing beyond economy, biodiversity and climate. For instance, indicators of farm economy make insufficient differentiation between the income and wealth of landowners, farmers, and other workers in the agricultural sector, as well as actual capital - thus failing to reflect actual needs; and there is no in-field-monitoring of biodiversity across the EU-28.

7. EU added value

EU added value is difficult to define and assess, because of: **a)** lack of reference points, **b)** being part of the EU entails a set of policies, and **c)** the term "value" in itself is perceptual rather than factual. Nonetheless, studies addressed EU added value by inspecting temporal changes (e.g. responses to CAP reforms), processes after accession to the EU, comparing the situation in countries in and outside the EU, and conducting surveys and simulations to assess the potential outcomes of hypothetical changes (e.g. CAP abolishment). We found **mixed evidence on whether the CAP performs better than national, regional or local level policies in addresses relevant challenges:** There is an **EU added value in supporting farmers' fair standard of living and supporting (more) balanced territorial development**, but it is poorly suited to local contexts particularly in the New MSs, where most farmers are smallholders. There seems to be an EU added value for market regulations and for **a uniform legal framework within the EU.** We did not find evidence that the CAP delivers an economic EU added value.

From an environmental perspective, we found mixed results in terms of EU added value. Regulations, standards and the prevalence of funding and requirements for AECM and CC, as well as support for organic farming, offer a positive EU added value. The flexibility offered by the CAP has both positive and negative effects by offering the potential to adapt measures to local conditions in some regions (albeit still insufficient for new MSs, see above), but at the same time flexibility has been often used to reduce requirements or weaken implementation. The development of EU-wide thresholds has also had negative effects by leading to compromising the requirements and setting over-simplistic thresholds that do not match conditions in most MSs. For instance, the requirement for a minimum of 2 or 3 crops to satisfy the crop diversification measure are set below current crop diversity levels in most MSs, and the permitted loss of grasslands is higher than current rate of losses in some regions.

8. Does the CAP support sustainable development goals?

CAP has the **potential to make contributions to the relevant SDG goals, but in its current design and implementation it cannot fulfil this potential.**

CAP is partly capable of addressing **SDG 1** (no poverty) and **SDG 2** (zero hunger), but notably, evidence shows that food security or extreme poverty are not the key challenges in most of the EU. By contrast, the direct and indirect effects on developing countries, affecting food prices or leading to environmental degradation and consequent risks to local communities, are poorly considered.

SDG 10 (reduced inequalities) is partially supported but not addressed adequately due to the highly unequal allocation of payments, with 20% of beneficiaries receiving 80% of the payments; 1.5% receiving 32% of the payments (annually > 50,000 Euros/beneficiary); and 79% of the beneficiaries receiving annually < 5,000 Euros. In addition, there are indications for increasing level on payment inequities in Eastern EU Member States.

SDG 3 (good health and wellbeing) is poorly covered, and particular gaps relate to **SDG 12** (responsible consumption and production). The CAP is not well-designed to address challenges of unhealthy diets, obesity and health issues relating to these, while animal products receive over-proportionally high funding. It also poorly addresses overall wellbeing of farmers (beyond farm economy), as well as the externalities and waste emerging from overproduction. The number of publications addressing SDGs 3 and 12, however, was notably low due to the indirect nature of these impacts and the lack of objectives or instruments to address these challenges.

With respect to environmental SDGs, local successes obtained through specific CAP instruments demonstrate some positive outcomes on local levels. They are, however, too limited to reverse the more-broadly implemented instruments supporting environmental degradation or even rapid biodiversity declines. Therefore, the CAP has an unfulfilled potential to address **SDGs 6** (clean water) and **SDG 15** (life on land). Despite AECM, CAP has very limited capacity to deliver on **SDG 13** (climate action), due to the lack of instruments to address the most important GHG sources, such as GHG gas production from livestock production, and the export of land-use changes by importing feedstock such as soybean resulting in large GHG emissions overseas.

Finally, the CAP supports organic farming, thereby contributing to **SDG 8** (green growth), but it also supports unsustainable farming sectors, e.g. by incentivising intensification as well as through a disproportionate support of meat and dairy products.

Conclusion, limitations and outlook

Our work demonstrates a breadth of available evidence, with substantial potential to help identifying means for improvements as well as avenues for mitigating trade-offs and reconciling conflicts. The experience gained in years of research and implementation can therefore help avoiding political compromises where these might not be necessary.

To this end, the list of publications used for this assessment is publically available through https://idata.idiv.de/ and our team is happy to be informed of further studies and evidence.

The short time and limited resources to conduct this study entail a range of limitations. Some topics were left unstudied in this assessment, such as the CAP's support for forestry, the direct and indirect impacts of agriculture and the CAP on public health, or the impacts of standards and regulations relating to, but

extending beyond, the CAP. While some reports were used, we gave a prime focus to scientific studies published primarily in English. This entails that many further documents were inevitably left aside. We particularly acknowledge the room for further transferable results and experiences, which could be harvested from local studies and reports.

These shortcomings, and the breadth of potentially available literature, indicate a need but also a vast potential to gain from a broader evidence-based evaluation of the CAP and the gathering of recommendations, lessons learned and tools for optimization and means for conflict resolution.

We encourage the inclusion of this and further evidence in decision making and hope this report can promote a continued, informed, and rich science-policy dialogue to foster and support further advances toward a modern, simpler and smarter CAP in favour of a healthy and sustainable agriculture.

2 Introduction

2.1 The CAP objectives

The Common Agricultural Policy (CAP) was established in 1957 by the Treaty of Rome, in the context of low food supply consecutive to World War II in Europe. The five CAP's official objectives have not been revised since then. In 2009, the Treaty on the functioning of the European Union (Title III Agricultural and Fisheries, Article 39) confirmed these five objectives (European Union 2012):

a) *to increase agricultural productivity by promoting technical progress and by ensuring the rational development of agricultural production and the optimum utilisation of the factors of production, in particular labour;*
b) *thus to ensure a fair standard of living for the agricultural community, in particular by increasing the individual earnings of persons engaged in agriculture;*
c) *to stabilise markets;*
d) *to assure the availability of supplies;*
e) *to ensure that supplies reach consumers at reasonable prices.*

In addition to these five objectives, and in response to societal debates such as the demand to secure public goods (Zahrnt 2009), the European Union delineated three new overarching objectives of the CAP (EC 2010, Kull et al. 2014), namely to promote:

f) *Viable food production, with a focus on agricultural income, agricultural productivity and price stability;*
g) *Sustainable management of natural resources and climate action, with a focus on greenhouse gas emissions, biodiversity, soil and water; and*
h) *Balanced territorial development, with a focus on rural employment, growth and poverty in rural areas.*

While these latter three objectives have not been constitutionalized, they are presented in a reflection paper by the Commission (EC 2010), have been reflected in the 2013-reform, and referred to as "overarching objectives" in the European Commission's handbook on the monitoring and evaluation framework of the Common Agricultural Policy (EC 2015a). Therefore the performance of the CAP shall be considered against all eight objectives and assessed in this report. Nonetheless, to avoid confusion we refer to the new objectives as "2010 priorities".

2.2 The CAP and the sustainability context

In a context of rapid changes in human population, our socio-economy and the environment, sustainability has become a global concern. Following from the Millennium Development Goals which focused primarily on developing countries, the United Nations formally adopted the 2030 Agenda for Sustainable Development, including **17 Sustainable Development Goals** (SDGs) and **169 associated**

targets[1]. The SDGs offer a globally-accepted, unifying framework for promoting inclusive and sustainable growth. The EU has officially committed to implement these goals[2]. This commitment underpins all future EU policies. Acknowledging that many SDGs are linked to food, farming and land use, it follows that SDGs cannot be achieved without appropriate support from the CAP, or at least coherence with the CAP. This has been publicly acknowledged by Commissioner Hogan at the 10th Forum for the Future of the Agriculture in Europe. This, however, raises the question whether the CAP can indeed deliver, or help deliver, the SDGs and their specific targets - both at the EU and global levels.

On the basis of the SDGs' specific targets, 12 of the 17 SDGs can be regarded as relevant to agriculture, rural societies and economies, and therefore to the CAP (**Fig. 2.2.1**):

SDG 1: End poverty in all its forms everywhere

SDG 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture

SDG 3: Ensure healthy lives and promote well-being for all at all ages

SDG 5: Gender equality

SDG 6: Ensure availability and sustainable management of water and sanitation for all

SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all

SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

SDG 10: Reduce inequality within and among countries

SDG 11: Sustainable cities and communities

SDG 12: Ensure sustainable consumption and production patterns

SDG 13: Take urgent action to combat climate change and its impacts

SDG 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

Figure 2.2.1: *Twelve of seventeen Sustainable Development Goals (SDGs) address agriculture, directly and indirectly, and are hence relevant to the CAP.*

[1] www.undp.org/content/undp/en/home/sustainable-development-goals.html
[2] https://ec.europa.eu/europeaid/policies/sustainable-development-goals_en

Source: UN SDG website (http://www.un.org/sustainabledevelopment/sustainable-development-goals/)

2.3 The reform-path of the CAP since 1992

During its 60 years of operation, the CAP has gone through various changes, updates and reforms (Box 2.1). Given these multiple changes through history, a sound and comprehensive evaluation of the CAP must consider the reform-path especially since 1992, and particularly the changes following the Fischler-reform of 2005 that have substantially changed the field of agriculture in Europe. Accordingly, our evaluation focuses primarily on the period starting 2005 onwards.

Box 2.3: The reform-path of the Common Agricultural Policy (CAP)

Author: Sebastian Lakner

The CAP has gone through several important revisions and reforms since its creation, and particularly during the past 25 years (Cunha and Swinbank 2011, Tangermann & von Cramon-Taubadel 2013). In the 1980s, the CAP went through a crisis: High politically-fixed intervention prices led to overproduction, requiring the Commission to store and manage overproduction. This had led to high budgetary costs for the EU. The milk quota instituted in 1984 was not able to eradicate overproduction. The CAP started facing increasing pressures, both internally and externally. Internally, EU citizens criticized the agricultural sector for environmental problems and overproduction. Externally, trading partners in the GATT-negotiations (mainly the Cairns group) considered the EU's agricultural protection and the subsidization of surpluses as main obstacles preventing to reach a final trade agreement in the GATT Uruguay round after 1986.

Several EU commissioners for agriculture designed successive reforms: Ray MacSharry (1989-93), Franz Fischler (1995–2004), Mariann Fischer Boel (2004-10) and Dacian Cioloș (2010-14). These reforms substantially changed the CAP, resolved some of the old problems, created new problems or left some problems unsolved. Key alterations included the **reduction of price-support** scheme in 1992 as agreed upon in the MacSharry-Reform, and the introduction of compensation (direct) payments in order to counterbalance the resulting farm income losses. This also opened space to change the trade-policy, so reduce import tariffs and export subsidies and thereby fulfill the obligations of the GATT Uruguay Agreement.

The 'Agenda 2000' prepared the CAP for the EU East-enlargement (2004) and further reduced price support, however, without substantially changing the system. The 'Fischler-Reform' (2005) decoupled direct payments from production. The so-called Single Payment Scheme (SPS) was introduced. It allowed old MS to either allocate those payments on a *historical basis*, a *regional basis* or a combination of both (*hybrid model*). In the new EU MS, a so-called Single Area Payment Scheme (SAPS) consisted in regional area payments (OECD 2011: 56; OECD 2013: 136). Another feature of the Fischler-Reform was the introduction of 'Cross Compliance (CC)', which linked the payments to minimal environmental standards. The introduction of the 'Greening' in 2013 might be considered as a further step in this direction.

Since 1992, the CAP has been reformed along four key areas delineated in **Fig. 2.3.1**: a) Main instruments of farming support away from highly distortive price support to coupled and still production distorting direct payments and later on to decoupled direct payments; b) change in market interventions and trade policies; c) change in the income support; and d) development of "rural development programs" (Pillar II).

During the last twenty-five years, rural regions and agro-ecosystems have been strongly influenced by the "Rural Development Programmes", namely Pillar II of the CAP, which also includes the agri-environment measures - now agri-environment-climate measures. This whole policy field started as "accompanying measures" with the MacSharry-reform in 1992, became the so- called "second Pillar" with the Agenda 2000-reform and was consolidated by the new European Agricultural Fund for Rural development (EAFRD) with the Fischler-reform in 2005. It has been confirmed and further developed with the last CAP-reform 2013.

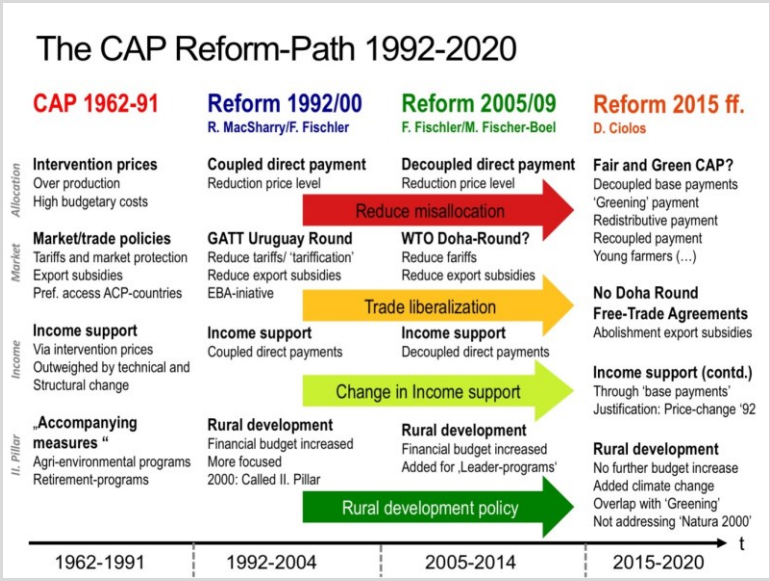


Fig 2.3.1 *Synthesis of the key components of the CAP's reforms. Source: Sebastian Lakner, adopted from Heinrich et al. (2013).*

Despite repeated revisions, the CAP has largely retained the following characteristics:

1. In spite of successive cuts, the CAP continues constituting the largest EU policy with a current share of 37% of the EU's budget.
2. There are more net-receiving countries than net-contributing countries (**Fig. 2.3.2**). As such, any substantial reform, and particularly the upcoming Brexit, will strongly affect the overall financial flow between and within Member States (MSs) in the EU as a whole. This is also reflected by the fact, that in many of the last reforms (e.g. the Agenda 2000, the Fischler-Reform, the CAP-Reform 2013), the finances were decided before the content of the agricultural policy and that the financial decisions influenced the content of the reform.
3. The CAP repeatedly undergoes deep scrutiny, reviews and modifications, partly in response to the rapid dynamics of agriculture and agricultural markets, yet this entails a dynamic policy with moving goalposts, instruments and implementation rounds.
4. The CAP-reform process remains politically complicated given the immense number of stakeholders involved or affected - including producers, retailers and consumers, all EU societies and countries, and even global markets and supply chains.

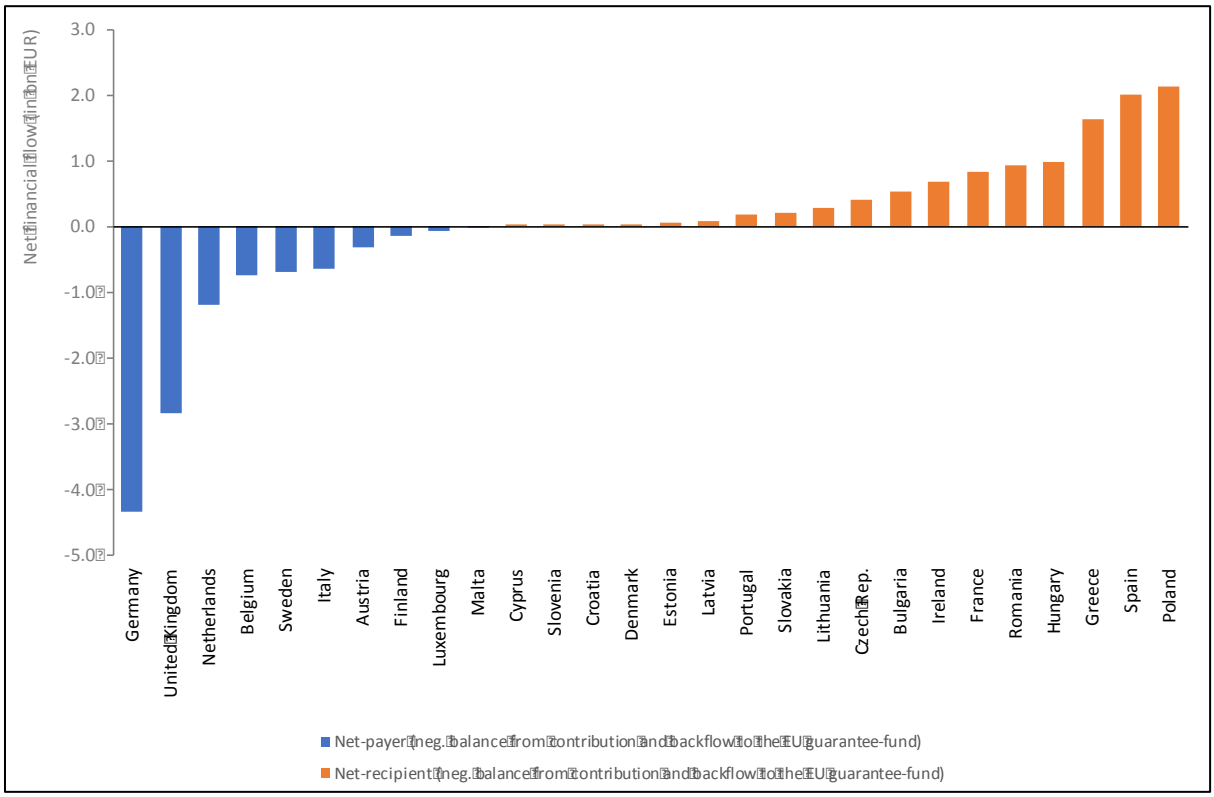


Figure 2.3.2: Net-contribution of the EU Agricultural Guarantee Fund (EAGF), known also as Pillar I, by member states in 2015 (in bn. EUR). Negative values on the left denote net-contributing countries, positive values on the right denote net-receiving countries. The most significant net contributors are Germany and the UK on the left. *Source: Ministry of Food and Agriculture Germany (2017).*

It is also important to take into account that the EU, and with it the CAP, has extended to a large number of countries since 1990. Austria, Sweden and Finland joined in 1995. Ten Central and Eastern European countries joined in 2004[3], Romania and Bulgaria in 2007, and Croatia in 2013. These 12 counties are hereafter referred to as new MSs. The CAP will also be influenced by the withdrawal of the United Kingdom ("Brexit"), foreseen for April 2019. This should have significant implications since the UK makes the second biggest net contribution to the EU's Agricultural Guarantee Fund (EAGF) financing Pillar I of the CAP, with a yearly contribution of 2.8 bn EUR (**Fig. 2.3.2**).

Additionally, it is essential to consider the broad socio-political, economic and environmental framework in which the EU, and accordingly the CAP, operates and reflects. Two relevant and somewhat conflicting discourses will undoubtedly affect the CAP: one the one hand, the current emphasis of the European Commission on jobs and growth (Juncker 2014), and on the other hand, rising expectations from society for fulfilling the EU's environmental commitments in terms of climate, air, water, and biodiversity.

Finally, the CAP has to comply with a number of horizontal objectives that apply to other EU policies – such as „the polluter pays principle", Policy Coherence for Development (PCD), and the subsidiarity principle, to name just a few. Therefore, an important task when evaluating the CAP revolves around the need to carefully disentangle the role of broad socio-economic factors that may extend beyond the CAP, from the role of the CAP itself.

2.4 The CAP components

The CAP in its current form consists of two pillars. The **Pillar I** includes direct payments and market measures and is financed by the European Agricultural Guarantee Fund (EAGF). **Pillar II** concerns rural development policy and is supported by the European Agricultural Fund for Rural Development (EAFRD).

For the Multiannual Financial Framework 2014-2020, the CAP amounts to 408.31 bn. € (circa 38% of the EU budget), of which 308.72 bn. € is allocated to the first pillar (**Table 2.4.1**). The current CAP introduced **inter-pillar flexibility** (Article 14 of Regulation (EU) No 1307/2013), allowing MSs to transfer up to 15% from Pillar I to Pillar II, or and up to 25% from Pillar II to I. The transfer from Pillar I to Pillar II over the 2014-2020 period concerns 18 countries and represents a net transfer of 3 bn. € (EU Commission 2015, see also p.107).

Table 2.4.1: CAP Budget in 2017**.**

	Commitments (in bn. EUR)	**Share of the budget (in %)**
Administration	135.3	0.2%
Market Interventions	2,806.8	4.9%
Direct Payments	39,661.7	68.9%

[3] The new accession countries of 2004: Estonia, Latvia, Lithuania, Poland, Czech Republic, Slovakia, Slovenia, Hungary, Malta and Cyprus.

Rural Development	14,355.5	24.9%
Pre-Accession Assistance	199.0	0.3%
Horizon 2020 - Program	237.1	0.4%
Other Expenses	142.4	0.2%
Sum	**57,537.9**	**100.0%**

Source: EC 2017b - Definitive adoption (EU, Euratom) 2017/292 of the European Union's general budget for the financial year 2017, Official Journal of the European Union, L51, Volume 60 28 February 2017.

2.4.1 Pillar I

Direct payments are annual payments to farmers to support their incomes and to remunerate them for their production of public goods. They were introduced to prevent a fall in farmers' incomes following the 1992 reform reducing the level of price support. They are composed of three compulsory components (basic payment per hectare, Greening payment and additional payment for young farmers) and three voluntary components (redistributive payment, additional income support in areas with specific natural constraints and a specific coupled support to some productions or areas) for MS implementation. A simplified payment replacing the above components may be set up for small farmers (additional details are presented in section 4.6.4).

Greening measures were introduced in the 2013-reform following the suppression of set aside requirements in 2009. Since 2013, 30% of Direct Payments are now linked to one or more of these measures (EC 2013c, Article 43: 1): *Crop diversification* requires farms with > 10 or 30 hectares of arable land to grow at least two or three crops, respectively. A measure to protect *permanent pastures* limits MSs to a maximum loss of 5% by 2020. Some MSs set a lower threshold than that. 3) Finally, farms with > 15 hectares of arable land are required to maintain 5% *Ecological Focus Areas* (EFA). A relatively large number of options could be selected by MSs and taken up by farmers. Examples include landscape features (up to 8 types), fallow land, buffer strips, nitrogen-fixing crops, catch crops and green cover (EC 2013c; 2014). The effective area of an EFA is calculated with a weighting factor: landscape features for instance are calculated as 1.5 ha for each 1 ha of actual feature, whereas 1 ha of nitrogen-fixing crops counts as 0.3. MSs could also choose to support other 'equivalent measures', as long as they deliver a similar or greater benefit for the environment and have been approved by the EC.

Cross-compliance (CC) corresponds to a set of rules farmers are required to respect in order to receive direct payments and some other forms of support. These rules concern food safety, animal health, plant health, the climate, the environment, protection of water resources, animal welfare, and the condition in which farmland is maintained. There are two components of these rule: statutory management requirements, and good agricultural and environmental conditions (GAEC).

Market measures accounts for 2.8 bn. € of the 2017 budget (EU Commission 2017). They are embedded within the single Common Market Organisation, which sets out interventions rules in agricultural markets and sector-specific support. They include rules on marketing of agricultural products, exceptional measures to prevent market disruption, specific sectoral programmes, measures in case of crisis in the agriculture sector and measures related to international trade.

The budget allocated to the different policy options within pillar I vary greatly among MSs (**Fig. 2.4.1**).

For more information see: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32013R1307

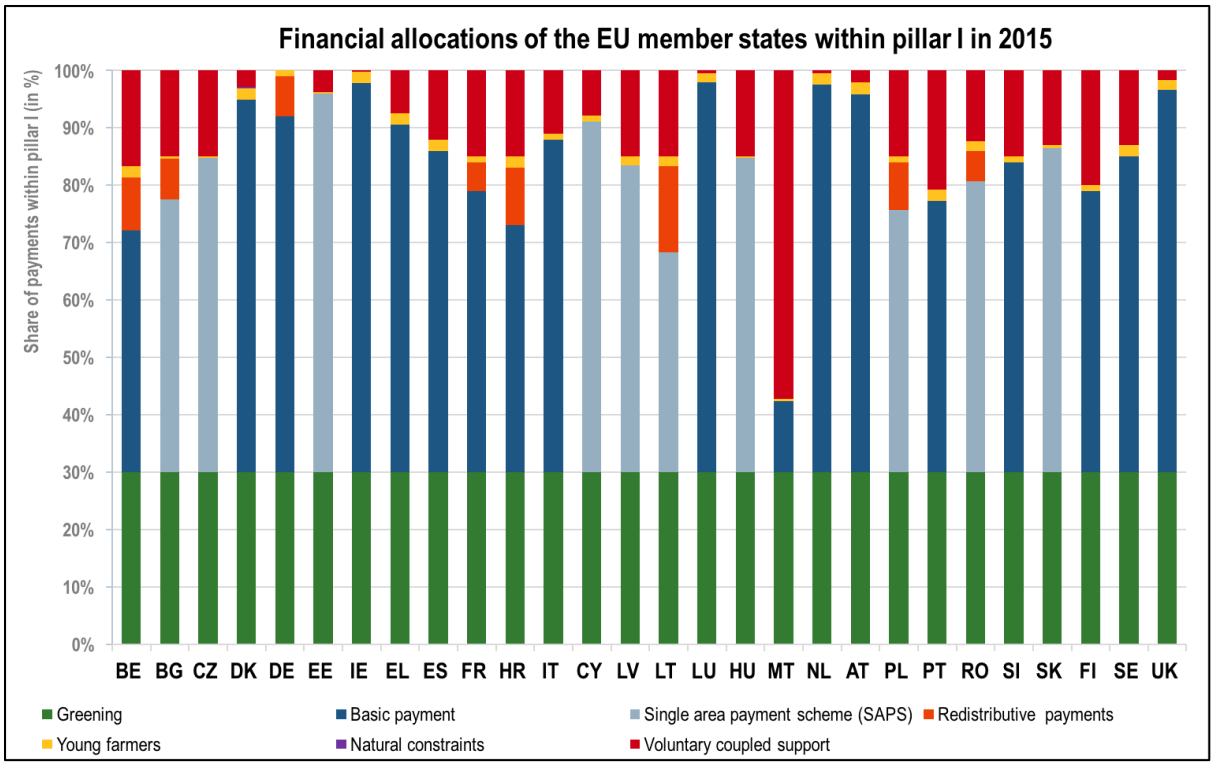


Figure 2.4.1: *Financial allocations within Pillar I for the different policy options decided by the EU member states. Source: EC (2015a, pp.7-9).*

2.4.2 Pillar II

Rural development policy (Pillar II) covers areas as diverse as farming and forestry, land use, the management of natural resources and economic diversification of rural communities. As a result, Pillar II includes an even broader range of instruments than Pillar I: AECM, organic farming, animal welfare, co-operation, investments, Areas facing Natural or Other Specific Constraints, farm advisory services, farm and business development, setting-up of producer groups and organisations, quality schemes, Leader approaches, forest-environment, risk management, etc.

For more information see: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32013R1305

National, regional and local authorities are responsible for designing and implementing their rural development programmes based on this list of measures. Here we elaborate on three key measures that are explored in this assessment.

Agri-environment-climate measures (AECM) are practices, undertaken voluntarily by farmers over a set period, that bring environmental benefits and/or help mitigate and adapt to climate change. AEMs have been introduced into the CAP through the MacSharry reform of 1992 by the EU regulation No. 2078/1992

(continued in 2000 by EU regulation No. 1257/1999). As a result of the Fischler-Reform of 2005, a joint European Agricultural Fund for Rural Development (EAFRD) was introduced by EU regulation No. 1698/2005 and continued by the CAP-reform of 2013 by EU regulation No. 1305/2013 (EC 2013a). Following the 2013 reform, climate-change mitigation has been added, expanding AEM to AECM (Gocht 2016, see also **Fig. 2.3.1.** above). In terms of implementation, AECM are designed by MSs and the regions, and have to be approved by the EC. Funding of AECM is provided jointly by MSSs and the EU with different levels and types of co-funding.

Organic farming is a holistic approach based on the objective of closed nutrient cycles, the development of fertile soils, wide crop rotations, a limited animal density, animal friendly stable system and the absence of synthetic pesticides and chemical fertilizer (Möckel 2015, Vogt 2007). Several CAP instruments contribute to organic farming, among which area payments for arable land, grassland and horticultural land, supported by AECM premium within the Rural Development Programmes of Pillar II (Sanders et al. 2011).

Animal welfare corresponds to a set of rules farmers are required to respect in order to guarantee the well-being of farm animals. Animal welfare rules are embedded into the principles and regulations related to organic farming which farmers in the EU are obliged to respect. The main CAP instrument contributing to animal welfare are the Statutory Management Requirements within CC, linking Direct Payments with the regulations for animal health and welfare (among others).

2.5 Necessity of this assessment

The CAP has seen its last reform in 2013 and currently operates within the financial framework of the 2014-2020 period. Presently, public discussions and negotiations have already begun, aiming to shape the CAP post-2020. Relevant milestones in the process include a public Online Consultation (completed in May 2017), a Communication anticipated in November 2017, an internal Impact Assessment conducted by the Commission (anticipated in spring 2018), and legislative proposals in 2018.

The European Commission performed an **Online Consultation** to harvest the public's opinions (both individuals and organizations) on how to modernise and simplify the CAP (ECORYS 2017). Among others, the aim of the public consultation, associated workshops and conferences was to support a structured dialogue, identify current difficulties and delineate the conditions, and means towards, modernisation and simplification of the CAP. The consultation ran for 12 weeks (February-May 2017) and received about 330,000 responses (about 50% of which from Germany). It gave farmers, citizens, organisations and other interested parties the chance to have their say on the future of the CAP (ECORYS 2017). As a public consultation it could theoretically offer an indication of the public's expectation from the future of the CAP, but the format and process in this case were not neutral. Participants were a non-random subset of EU's population (<0.01%), some of the consultation questions were reported by many individuals and organizations to be biased, and different lobby groups tried to influence the outcomes. Therefore, the consultation mostly indicated on the need of a broader dialogue, and particularly the necessity to critically inspect, using the best available knowledge, what elements of the CAP perform better or worse and what knowledge is there to help improving it.

An **Impact Assessment** is currently being performed by the EC. Based on previous assessments (e.g. EC 2011, Annex I), this assessment will likely focus more on the outcomes of alternative scenarios for the

future CAP, and less so on systematically evaluating the CAP's performance hitherto. We also note that ongoing EU-funded projects are currently engaged in evaluating the CAP, yet these are longer-term processes (6 years) and they, once again, do not evaluate the policy but rather its implementation and impacts. In addition to these, we are aware that DG AGRI has commissioned a series of external reviews from consultants as part of the newly-introduced monitoring requirements in the 2013 reform. Their contents and outcomes, however, are not known to us.

Although the Public Consultation allowed a range of individuals, organizations and stakeholders to express opinions about the CAP, and the Impact Assessment allows exploring scenarios, a more informed decision-making process based on facts and experience is complementary. **Hence, the present assessment complements other processes by offering a substantial body of evidence to support well-informed decision-making.**

The provision of evidence as a support to political negotiations can follow the procedures and standards developed by the European Union for evaluations of its own policies and directives, namely, by conducting a "**fitness check**". Such a process, proclaimed by the EC to be the most advanced standard for policy evaluation, has been used for other policy fields (e.g. Nature Directives; Milieu et al. 2016), but so far not for the CAP. Policy fitness checks usually include both evidence gathering and stakeholder engagement. The stakeholder engagement component can be considered as covered by the EU's public consultation, alongside associated workshops and conferences. However, as of this date, an independent, scientific, evidence-based assessment of the CAP remains to be conducted.

The potential importance of such an assessment is twofold. First, the European Court of Auditors highlighted in 2011 that there are few '*pockets of good monitoring practices'* with regard to the actual implementation of the CAP (agri-environmental policies, in this case, see also Geijzendorffer et al. 2016). The court concluded that there are deficiencies in data, appropriate indicators, evaluation and monitoring with regards to the implementation and effectiveness of the CAP (Court of Auditors 2011, 2012). This highlights a need of a closer inspection of the CAP's performance. Secondly, the intensity of the 2013 CAP reform (Zahrnt 2011a; Zahrnt 2011b; Rutz et al. 2014), and the broad response to the Public Consultation, indicative a sensitive political process. Under such conditions, it seems imperative that negotiations are founded on well-established, independent, reliable and relevant evidence.

2.6 Objectives of this assessment

The overarching objective of the present assessment was to conduct an independent, scientific, evidence-based assessment of the CAP, or so called a "Fitness Check". More specifically, our objectives were to assess the impacts of the CAP on the economy, society and the environment, indicate the available knowledge and highlight knowledge gaps. To this end, an operational objective was to develop a comprehensive knowledge-base to support informed negotiations and decision-making – as well as an ongoing gathering and uptake of knowledge.

Our assessment focused on three general questions:

1. To what extent does the CAP support or fulfil the objectives listed above?

2. Is the CAP "fit for purpose" according to the EU's fitness criteria?

3. To what extent is the CAP suitable for, or capable of, supporting the UN's Sustainable Development Goals?

With respect to the overall performance (or 'fitness') of the CAP, we adopted the EU fitness check criteria and adjusted them to the CAP's by addressing the following specific questions:

1. **Effectiveness**: Do the CAP design, instruments and implementation contribute to meeting its objectives[4]?
2. **Efficiency:** Are the costs reasonable and in proportion to the benefits achieved, also compared to alternative mechanisms? Are the investments well-placed and distributed?
3. **Internal Coherence:** Do CAP objectives and instruments complement or conflict with each other in supporting its objectives, implementation and/or effects?
4. **External Coherence:** Does the CAP support, complement or conflict other EU and international policies in terms of objectives, implementation and/or effects?
5. **Relevance:** Is the CAP relevant to current challenges and the priorities set by EU citizens, farmers and policy makers? Is it using (and supporting) the most updated criteria, tools and knowledge?
6. **EU Added Value:** Does the CAP address challenges better than national-, regional- or local-level solutions?

Based on the CAP objectives (including the 2010-priorities), SDGs and fitness check criteria, we focused this assessment - and especially the CAP's effectiveness - around twelve evaluation topics. These are elaborated in **Table 2.5.1**. Further justification and explanation on each topic can be found in Section 3.3.

Socioeconomy:

1. Growth of agricultural productivity
2. Fair standard of living for farmers
3. Market stability
4. Balanced territorial development

Environment:

5. Climate action and energy
6. Soil and water protection
7. Biodiversity and ecosystem services
8. Organic farming in the context of sustainable farming
9. Animal welfare

Overarching topics, also emerging from SDGs:

10. Health, sustainable consumption and production
11. Reduced inequalities
12. Global-scale effects of the CAP

The last topic may warrant further explanation. Article 208 (ex Article 177 TEC) of the Treaty on the Functioning of the EU [5](TFEU) states that *"Union policy in the field of development cooperation shall be conducted within the framework of the principles and objectives of the Union's external action*", "*The*

[4] We remind the reader that we refer to the CAP objectives listed in TFEU Article 39, as well as the new 2010 priorities as stated by the EU Commission (EC 2010) and reflected in the 2013-reform and the handbook on the monitoring and evaluation framework of the CAP 2014-2020 (EC 2015a).

[5] Part five: External Action by the Union, Title II: Common Commercial Policy) (Consolidated version of the Treaty on the Functioning of the European Union - 2008/C 115/01) - all this is a ref or footnote.

Union shall take account of the objectives of development cooperation in the policies that it implements which are likely to affect developing countries", and "*The Union and the Member States shall comply with the commitments and take account of the objectives they have approved in the context of the United Nations and other competent international organisations.*". In addition, Article 206 of the TFEU sets the aim to contribute to "*the harmonious development of world trade, the progressive abolition of restrictions on international trade and on foreign direct investment, and the lowering of customs and other barriers*". Accordingly, it is essential to address the potential socio-economic and environmental externalities of EU's agriculture, and identify impacts or damages that may be caused, or not prevented, by the CAP.

Table 2.5.1: Relationship between evaluation topics, CAP objectives and SDGs. *Italics* mark indirect relations between topics.

Evaluation topics	**CAP objectives**	**SDGs**
Growth of agricultural productivity	Objectives 39a; 39e and 39f partly included 2010-priority 1	8 (Sustainable growth)
Fair standard of living	Objective 39b 2010-priority 1	1,2,3,10
Market stability	Objective 39c, partly 39f 2010-priority 1	2 (No Hunger)
Balanced territorial development	2010-priority 3	10 (Reduce inequalities)
Climate Action	2010-priority 2	13 (Climate Action)
Soil and Water protection	2010-priority 2	6 (Clean Water)
Biodiversity and ESS	2010-priority 2	15 (Life on Land)
Sustainable farming systems: organic farming as an example	2010-priorities 1 and 2	All, especially 8 (Sustainable growth)
Animal welfare	*High importance to society; Protocol on Animal Welfare in Amsterdam Treaty; EU Animal Welfare Strategy*	
Reduced inequalities	2010-priority 3	5 (Gender equity) and 10 (Reduced inequalities)
Health and Sustainable Consumption/Production	*2020-priority 1*	3 (Good Health and Wellbeing) and 12 (Sustainable Consumption and Production)
EU's Global effects	*Required by TFEU Articles 206, 208*	

3 Methods

This rapid assessment represents **a desk-based analysis** following guidelines developed for the Production of Quick Scoping Reviews and Rapid Evidence Assessments (Collins et al. 2015). We adhered, to the extent possible, to the fitness check methodology outlined by the European Commission in the REFIT programme in its "better regulation" agenda.

While optimally one should conduct a systematic review and meta-analysis, such a process requires much more time and workforce than available here. Hence, this assessment did not attempt to comprehensively cover all literature available, but rather generate an overview of the extent of available knowledge, and to form a **knowledge base** that can help address at least some of the key questions depicted above. We placed larger emphasis on scientific (peer review) literature but this was also complemented with a range of reports and data (e.g. Eurostat, FAOSTAT, national reports). Our evaluation covered both socioeconomic and environmental aspects, aiming to the extent possible to achieve the most balanced knowledge-base, both thematically and geographically. We included stakeholders' opinions only when these had already been collected, analysed and published in survey-, interview- and questionnaire-based studies (e.g., *inter alia*, Eurobarometer and the 2017 Public Consultation).

The present assessment is based on the knowledge base gathered in a **database accessible online** at https://idata.idiv.de/DDM/Data/ShowData/248.

3.1 Methodological steps

Our assessment was based on five methodological steps: a) scoping, b) evidence gathering, c) analysis, d) reporting and quality control, e) database expansion, gap filling and report checking.

3.1.1 Scoping

We started in January 2017 with establishing an independent **scoping committee** comprising 17 scientists from 9 countries (DE, UK, AU, FR, PO, PT, SK, SW, CH), covering different regions of Europe and thus different national/regional socio-economic backgrounds; and with a balance between ecology (8 members), socio-economy (7 members) and other fields (agronomy, geography, policy). Members of the committee were asked to independently formulate a set of questions which the fitness check should address, in a way which should cover all CAP objectives, relevant SDGs, and fitness check criteria. A **half-day workshop** was conducted in Leipzig on 22.2.2017, to assess and merge the >200 questions into a shortlist of the 52 most relevant questions that guided the evidence gathering process (see **Appendix 1** for the list of all scoping questions). The scoping process also included the definition of fitness check criteria, SDGs, CAP objectives, the design of the database structure and protocol for data gathering (e.g. setting of keywords, search methods, inclusion and exclusion criteria, and analyses). These tasks were completed in a **two-day workshop** conducted 14-15.3.2017. The criteria used for considering publications as relevant are summarized in **Table 3.1.1**.

Table 3.1.1: Criteria for inclusion and exclusion of publications in the database component on "fully-assessed" publications.

Inclusion	Exclusion
Contribute to answering one or more of the questions identified during the scoping process	Does NOT contribute to answering one or more of the questions identified during the scoping process
Address one or more of the three evaluation criteria (CAP objective, SDG, Fitness check criteria)	Does NOT address any of the three evaluation criteria (CAP objective, SDG, Fitness check criteria)
Explicitly relate to the CAP (language or implementation). The publication has to specify impacts of the CAP (i.e. not of agriculture in general)	Papers that only offer recommendations and suggestions on how the CAP should be, but do not assess the CAP or its implementation itself
After 2006 (~2005). Earlier publications included only if clearly remain relevant, i.e., refer to issues that have not changed in the CAP	Before 2006 (~2005) or clearly referring to CAP instruments or impacts that are no longer relevant (i.e., prior to reforms)
Include non-EU countries if offering evidence of CAP impacts	Exclude non-EU countries if the publication does not provide evidence of CAP impacts
Evaluations based on well-defined evidence and methods, either quantitative or qualitative. Grey literature could be included where adhering to clear criteria or scientific robustness	Grey but not robust, i.e., does not meet basic quality criteria or does not include evidence
Reliable, validated data (e.g. Eurostat)	Opinions or invalidated data

3.1.2 Evidence gathering

We performed **literature searches** (see Appendix 2 for the list of all literature searches) using "ISI web of science" as prime search engine, complemented through other engines (e.g. Google Scholar). Because of the repeated revisions and reforms over the CAP's history (**Box 2.3**), with a significant reform in 2005; and in consideration of the large accession of new MSs especially from 2004 onwards, we focused primarily on evidence published in the last decade (2006-2017). Publications were scanned based on title and abstract to assess their potential relevance for the purpose of the present assessment. These papers were included in the first component of our database, listing "candidate" publications (**Table 3.1.2**).

Table 3.1.2: Structure of the database component on "candidate" publications (included based on title and abstract)

Factor	Details	Comments
Metadata	1st Author, year, full citation, publication type, search code	
Status	Candidate / used in report / Fully assessed and included in database / checked by a second evaluator	Some papers were used in the report but not fully incorporated into the in-depth database
Relevance	What is the potential relevance of the publication for the study	Listed based on objectives, SDGs, and evaluation criteria

Relevant publications were then screened based on full-text, starting from the most recent to 2006. Simultaneously to our literature search, a call for evidence was distributed through expert-networks and professional scientific organizations throughout Europe from mid-March to mid-July 2017, via direct emails, emailing lists of professional societies, and the social media, reaching some thousands of scientists and other experts across Europe. The inclusion of papers collected through this call for evidence was complemented by an online survey (using the "Survey Monkey" programme; Symonds 2011). A parallel "call for evidence" was published as part of the EU project EKLIPSE. In total, 62 publications were incorporated into our database through the online survey by 48 contributors from 17 countries, and information on many other tens was sent to us by authors or their peers. A subset of the proposed list of publications was prioritized and included in the second component of our database, covering "fully-assessed" publications.

3.1.3 Data extraction

For each "fully-assessed" publication, we extracted the following data: a) meta-data (authors, year, full citation, whether it is a review or not, country(s) covered, etc.); b) CAP instruments, criteria, SDGs and topic assessed; c) CAP's impacts and quotes from the publication supporting this evidence; d) reference used for efficiency assessment, instruments/policies compared for coherence assessment; e) administrative level of impacts observed (EU, MS, regional level or implementation by farmers). Team members were asked to use information from the actual results presented in a paper, and avoid using results and conclusions that seem to reflect author's' opinions or other publications. In some countries (particularly the UK, Germany, Italy, Spain), the design and implementation of specific instruments is taken at a regional level (federal states, in the case of Germany). Therefore, we also examined at which administrative level the impacts were observed (EU, MS or region). The structure of the database component on "Fully-assessed" publications is presented in **Table 3.1.3**.

Table 3.1.3: Structure of the database component on "fully-assessed" publications (see inclusion criteria in **Table 3.1.1**)

Factor	Details	Comments
Metadata	Author, year, full citation, countries covered, keywords, abstract	
Topic	Topic addressed in paper	Considered as the "dependent variable", i.e., what does the CAP effect or what are the studied consequences of an action related to the CAP
CAP instrument(s)	Pillar I vs II, key instruments (e.g. DP, AECM) and sub-instruments (e.g. EFA within greening)	4 levels used, and considered as the "independent variable", i.e., which elements of the CAP shape or affect the outcomes observed
CAP objectives	For each objective addressed by a publication, details of the observed impact or outcome	Justification based on results only; one publication could address one or more CAP objective(s)
SDGs	For each SDG addressed by a publication, details of the observed impact or outcome	Justification based on results only; one publication could address one or more SDGs

Fitness Check criteria	For each criterion addressed by a publication, details of the observed impact or outcome	A publication could not be included without addressing at least one criterion
Efficiency compared to	What was efficiency compared to?	Baseline could be other instruments within the CAP or beyond it
Coherence pairs	What pairs of policies, regulations or instruments were considered in assessing internal or external coherence?	
Methods	Methods used in the paper	
Conclusions and recommendations	Conclusions and recommendations as proposed by the authors	
Conclusions and key lessons taken	Conclusions made, and key lessons, taken by our team	

We extracted additional data to conduct targeted analyses on specific topics (see details in **section 3.3**). Main data sources included Eurostat, Eurobarometer, FAOSTAT, FADN (at EU, national or federal state level), EU reports and national reports to the EU, as well as outcomes of the 2017 Public Consultation.

For each topic assessed, we summarized the outcomes of all relevant publications while organizing them from more general (e.g., EU-wide, reviews) to more specific (e.g. local studies). Once the overall outcomes were summarized, we conducted a joint expert evaluation with respect to the each criterion and topic assessed. To this end, a **3-day workshop** was held 16-18.10.2017, with 17 experts across the EU, to discuss the overall outcomes and agree on an overall scoring of effect. Scores were based on the balance between positive and negative effects, as emerging directly from the assessment (i.e., number of topics showing positive or negative effects, high or low performance), and hence included seven options: mostly positive (++), more positive than negative (+), mixed (+-, i.e. both negative and positive outcomes), no effect (0), more negative than positive (-) and mostly negative (--). The number of publications used to derive the results, clarity and strength of the message emerging from the literature, as well as the consistency of scoring given by experts, helped determining the level of confidence in the outcomes and reaching a final consensus on the final score of effect.

3.1.4 Quality control

Each publication was assessed by a single evaluator. We however cross-checked a random subset of publications in order to assess the quality of our data extraction. From 305 publications in our database, over 60 were re-examined and cross-checked by a second evaluator. We checked a) whether all (and only) relevant evaluation criteria had indeed been addressed by a given publication, and b) whether the statements were justified by evidence. This cross-checking step, as well as the consistency of conclusions obtained from our initial analyses compared to the outcomes after database-expansion and further analyses, offered a strong indication that the extent of our database and the quality of information therein are adequate for addressing the questions addressed in this assessment. Notwithstanding, when the number of publications was limited, or substantial inconsistencies were noticed in the literature, these were flagged and clearly marked in the results and/or discussion.

3.1.5 Reviewing

In May 2017 we presented the preliminary results in Brussels and distributed a first version of the report and executive summary among the scoping committee and other peers. The executive summary and presentation were also made public and attracted comments, aiding the process through of revising and expanding the database and the report. In October-November 2017, we sent the updated version of the report to four independent reviewers, and revised the report based on their detailed comments.

3.2 Evaluation criteria

Fitness check criteria have been adopted from the formal evaluation criteria of EU policies and legislation, as recently employed in the fitness check of the Birds and Habitats directives (Milieu et al. 2016). Nonetheless, some definitions remain vague or unclear. We developed more specific definitions of these criteria for the purpose of this study through discussions in several meetings and workshops during the scoping process. The conceptual background and methodological approach to address each topic are presented in the following sections.

3.2.1 Land use, farm structure and management

Impacts of the CAP on farmers (socio-economy) and the environment are often indirect and result from its contribution to changes in land use, farm-structures and farm management. Therefore, prior to the broader assessment of the CAP's performance, we allocated a stand-alone section which examined a) overall patterns and trends in land use (changes), farm structure and management, and b) how the CAP affects them, directly or indirectly. Papers were only assigned to the second category of "addressing the CAP's impacts" if they explicitly examined, or could demonstrate, specific contributions of the CAP to the observed patterns.

Changes in land use, farm structure and farm management are key to understanding both socioeconomic and environmental impacts of the CAP. Land use, farm structure and management practices are often tightly related. For instance, changes in farm size are often linked to socioeconomic changes (e.g. employment and rural vitality). Similarly, large-scale farming ("economies of scale") increases the demand for land and energy (Bartolini and Viaggi, 2012), often leading to negative impacts on landscape diversity and habitat quality, e.g. increased soil drainage (Regina et al. 2016). It is therefore essential to first identify overall trends in land use, farm structure and farm management and identify the direct impacts of CAP on these dimensions, before addressing the next level of consequences.

Several key socio-economic drivers of agricultural change operate independently of policy influences. First, technological changes and improvements allow farmers not only to increase yield but also to potentially produce more with less. These capacities drive structural and socio-economic changes, for instance, by putting pressure on farms to increase the productivity per person, in order to maintain labour productivity. Secondly, the global rise in human population is also accompanied by an increase in consumption per capita. Global changes in consumer behaviour and food choices, for example, towards higher meat consumption shape market processes that operate largely beyond policies. Consumers demand low food prices on the one hand, but on the other hand, require good quality and sound production. Such demands influence farm structures, choice of crops and management intensities, and lead to the development of (private) labels and certification systems. The growth of cities and the

demand for area for infrastructure (e.g. roads) influence land availability and prices, as well as markets especially in and around urban regions. On the other hand, depopulation of marginal areas, for a range of socioeconomic reasons, occurs in many regions.

We started by identifying key publications indicating overall trends in agriculture and farming in the EU, whether these are affected by the CAP or not. Against this background, we searched specifically for publications addressing the direct effects of the CAP on these trends – through payments, requirements, regulations, etc. For overall trends, we used official statistics (e.g. EEA statistics on land use change, EUROSTAT/FAOSTAT on farm structure and fertiliser use) and supplemented these by peer-reviewed articles on these topics. For farm structure, we analysed changes in farm size, farm type, economic farm size, and labour type farmer's age. For farm management, we primarily analysed changes in fertilizer use, pesticide use, livestock intensity and irrigation.

Keyword used: land use change, farm structure, farm size, farms, herbicides, pesticides, farming technology, fertilizer, set aside, irrigation, drainage, reclamation, precision farming, GPS, deep tillage, farm management, conventional farming, organic farming, water management (in combination with "Common Agricultural Policy" or "CAP").

3.2.2 Effectiveness

Effectiveness considers the performance (or impact) of the CAP with respect to its stated objectives and the SDGs. To distinguish between direct and indirect effects of the CAP, we separate between a background situation, namely the status or trends in agriculture regardless of the CAP, versus trends and impacts that can be attributed to the CAP itself. Notably, a large number of topics was addressed, and a large number of publications was identified, with respect to the CAP's effectiveness. Therefore, we divide it into a set of two general themes, namely socio-economy and the environment, and within them, specific topics and questions. The topics analysed, and methods to address each, are elaborated in **section 3.3**.

3.2.3 Efficiency

Efficiency in a political or broad economic context[6] considers the relationship between the resources used and the effects achieved. Resources for *the government and the administration* can be administrative, regulatory, time or money spent, staff needed in the administration. Efficiency has also to consider opportunity costs of *economic actors* such as costs for land, labour and capital. We analyse efficiency by relating the potential cost of a policy measure (for consumer, producer or the state) to its potential benefits achieved.

Publications addressing efficiency were considered relevant if they indicated either actual costs versus benefits (or their absence), or if they offered a comparison of efficiencies - either between different CAP instruments, or between those and the instruments used by other policies, directives or regulations. We

[6] Note that there is a different definition of efficiency in the scientific field of efficiency and productivity analysis, where efficiency is understood as the observed empirical performance of a farm in relation to modeled optimal performance. Studies in this area mostly use the term technical efficiency (Lakner & Breustedt 2017). In this study, we will mostly use the broader definition of efficiency, which relates financial resources to political outcomes.

note that the benefits accrued by public goods, as well as many social benefits (e.g. wellbeing) are hard or almost impossible to evaluate quantitatively (e.g. by assigning a monetary value[7]). Thus, both quantitative and qualitative indications of efficiency were considered. We also included hypothetical costs such as the costs of policy inaction (COPI), and studies indicating willingness to pay among farmers or the public.

Efficiency with respect to the environment was also analysed directly for the purpose of this report, by assessing the area, costs, and hence costs per hectare for areas under greening (e.g. Ecological Focus Areas - EFA), agri-environment-climate measures (AECM)[8], and Natura 2000 areas (focusing on payments relating specifically to grasslands as an example) - asking whether investments are proportional to the benefits as indicated by the Effectiveness results. Notably, the word "efficiency" in itself is often intermingled in the literature with effectiveness. In cases where the authors used this word but did not address costs or efforts explicitly, we regarded the work as more relevant for the section on effectiveness.

Keywords used: efficient, cost-benefit, impact, public goods, CAP efficiency, and social benefits. Searches made for specific types of efficiency analyses used the keywords "cost of policy inaction" or "COPI", "willingness to pay" or "willing to pay", "TEEB", or "neighbour bonus" (in combination with "Common Agricultural Policy" or "CAP"). Beyond literature searches, some key documents used were the REFIT report (2016), the work of Minviel and Latruffe (2017), the EEIG report (2011), the works of McCloud and Kumbhakar (2008) and Latruffe et al. (2017), and the TEEB report (2010).

3.2.4 Internal Coherence

Internal Coherence measures the extent to which different objectives, measures and instruments within the CAP are consistent and complement each other, or whether they are conflicting objectives or incentives which may compromise effectiveness and efficiency. It also assesses whether the implementation of the CAP across political levels result in complementary, efficient and synergistic processes and incentive structures while reducing administrative obstacles and transaction costs.

Analysing internal coherence sheds light on policy issues such as opaque trade-off decisions among CAP objectives, institutional and administrative hurdles resulting from uncoordinated implementation processes. Major policy instruments in Pillar I are direct payments, coupled support, cross compliance (CC), and the new elements from the last reform: young farmer scheme, small farmer scheme, Areas facing Natural or Other specific constraints scheme (ANC, formerly Less Favoured Areas, LFAs), greening (EFAs, crop diversification, permanent grassland). Pillar II measures include an even broader range of instruments, including, among others, AECM, basic services, village renewal, payments for natural constraints, advisory services, quality schemes, organic farming, and animal welfare (EC 2013d). To address this complex policy, the analysis has been divided into several sub-sections. The first analysis acknowledges the inherent conflict between (food) production and environmental protection (water, soil, climate, biodiversity). In this subsection we therefore focused on the coherence between environmental measures (e.g. AECMs, Greening, CC) with productivity support (e.g. direct payments). The following two

[7] One approach to assign monetary values to externalities has been done by the seminal paper of Pretty et al. (2000).

[8] Agri-environment-climate measures (AECM) were formerly Agri-environmental measures (AEM). In the 2013 CAP-reform, some options have been included to tackle climate change. Due to the still recent substitution of the term AEM with AECM, both names can still be found in the literature and we use both in the report synonymously.

sections analysed coherence within, and between, the two Pillars. In addition, we harvested experiences from the literature on the conditions for effective policy integration and bottom up approaches to integrated CAP implementation.

Keywords used: policy integration, coherence, Agricultural Fund for Rural Development, EAFRD, Pillar 1, Pillar 2, Pillar I, Pillar II, first Pillar, second Pillar, Rural Development, agro-environment(al), AEM, AECM, AES, agri-environment, direct payments, greening, subsidies, payments, small farmer scheme, trade-offs, conflicts, discourse, reform, implementation (in combination with "Common Agricultural Policy" or "CAP"). Searches were usually made in pairs of words, to identify publications addressing synergies and conflicts between instruments. Additionally, some papers were identified through other literature searches, offering indication regarding internal coherence.

3.2.5 External coherence

External Coherence measures the extent to which other EU policies, directives and agreements with overlapping competencies with the CAP are integrated and complement each other's implementation to produce coherent objectives and political incentives, without delivering conflicting incentives or compromising the effectiveness and efficiency (in producing one outcome) in favour of another. Relevant policies, directives and agreements operate at different levels, from global, through EU to national and sub-national. We structured our assessment according to evaluation topics as well as key policies and directives of the EU.

Key policies with socio-economic implications include the trade policy, the development policy and the regional and cohesion policy. The trade policy is one of the important EU policies, since the common European market is one of the main policy objectives of the European Union. The links to the CAP is given by the management of access to the EU markets for agricultural commodities. The level of tariffs and to what extent tariffs have to be reduced, is subject to the EU trade policy. WTO-negotiations and free trade agreements are negotiated by the DG trade, however, it strongly interlinks with the CAP. On the other hand, the export subsidies by the CAP also strongly interlink with trade policies. The development policy, which is strongly oriented towards sustainable development. Consequently, the EU Commission supports the process of "Policy Coherence for Development". Especially the old quantity management of subsidized exports had large impact on national and EU development policies. The regional and cohesion policy: The cohesion policies might interfere with balanced territorial development as one of the new CAP-policies. The cohesion policies are important in terms of Budget: In the financial period 2014-20, the EU spends 352 bn. € for cohesion policies, which is 32.5% of the EU budget in that period (EU Commission 2017c). The European Agricultural Fund for Rural Development (EAFRD) is part of the rural development policy, so there is a strong interlink between both policy areas.

In terms of environment, the CAP is anticipated to align with the EU's commitment to the Paris Agreement for Climate Action and the Convention on Biological Diversity (CBD). In the Paris Agreement of 2015, 195 countries adopted the first universal legally binding climate deal, with the intention to initiate a global action plan and limit global warming. Similarly for the CBD, 193 Parties agreed in 2010 on a ten-year Strategic Plan to combat biodiversity loss over the next decade, and the EU adopted the commitments in an EU Regulation by the European Parliament and the Council. At an EU level, the most relevant environmental Directives are the Birds-, and Habitats-, Nitrate-, and Water-Framework Directives as well as Natura 2000. The Water Framework Directive is a European Union directive which commits European Union member states to achieve good qualitative and quantitative status of all water bodies.

Several CAP instruments can contribute to the implementation of the WFD: Cross Compliance, statutory management requirements, good agricultural and environmental conditions, rural development measures. Natura 2000 is part of the conservation policy of the European Union, however with strong links to the agricultural policy, since parts of the Natura 2000 are supported by the AECM, whereas other parts of this policy is financed by the LIFE fund (EC 2013e). Natura 2000 is a network of sites selected to ensure the long-term survival of Europe's most valuable and threatened species and habitat. CAP instruments represent key sources of funding for the management of farmland in Natura 2000 sites. These include instruments from Pillar I (basic payments, greening payments, payments for Areas facing Natural or Other Specific Constraints, voluntary coupled supports, small farmers scheme) and Pillar II (AECM; farm advisory services, farm and business development, setting-up of producer groups and organisations, quality schemes, Leader approaches, etc.). There is a considerable overlap between High Nature Value farmland areas and farmland in Natura 2000, as the farmed areas hosting habitats and species of interest are identified as HNVf.

The CAP must also operate harmoniously with world trade, according to articles 206 and 208 in the Treaty of the Functioning of the EU (TFEU). The EU's commitment to Policy Coherence for Development is institutionalised in the Consensus for Development[9] and points to the EU's obligations to support developing countries and particularly the Least Developed Countries (LDCs) in their endeavour of sustainable development. The consensus requests the EU to "prioritise support to the least developed and other low-income countries (LICs; Article 10) and support agriculture and rural development as central pillars for poverty reduction (SDG 1) and growth (SDG 8), while "respecting the capacity of ecosystems" (Article 83) acknowledging its responsibility to ensure environmental sustainability (hence SDG 15) and compliance with related international agreements (Article 105). With respect to Article 206 and 208 of the TFEU the European Union seeks to support a harmonious development of world trade and a progressive reduction of barriers to trade. The WTO Agreement on Agriculture (AOA) established common rules for agricultural trade. Constraints for domestic support were introduced to limit the use of measures that directly affect production decisions and distort trade. An updated Consensus for Development directly pointing towards the SDGs has been proposed by the EU commission and is currently being discussed by parliament and council. We therefore assess the degree to which CAP and other EU policies produce coherent incentives to global markets and along value chains that support the global implementation of the Sustainable Development Goals, particularly in developing economies, without delivering conflicting incentives or compromising the effectiveness and efficiency (in producing one outcome) in favour of another.

The level of external coherence was assessed per theme (policy arena), seeking to identify possible synergies and trade-offs, as well as political conditions and outcomes. External coherence was always considered in terms of "pairs" of policies or directives, assessing coherence or conflicts in objectives, instruments, or implementation. We also analysed conflicts of interests between related instruments or political processes and how they may emerge from, or affect, both the design and implementation of the CAP.

[9] see EU Commission. 2006. "The European Consensus on Development", European Union 2006/C 46/01, url: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ%3AC%3A2006%3A046%3A0001%3A0019%3AEN%3APDF

Keywords used: cohesion policy, biodiversity, policy integration, coherence, trade-offs, conflicts, growth, world trade, trade distortion, trade effect, distorting, decoupling, impact and trade, climate, greenhouse gas, GHG, health, organic farming, animal welfare, water, soil, volatility, conservation, policy coherence for development, PCD, footprint (in combination with "Common Agricultural Policy" or "CAP"). For the case of the Nature Directives, we used information on coherence also from their respective Fitness Check (Milieu et al. 2016). With respect to water, we assessed the Fitness Check of EU Freshwater Policy (EC 2012). We further searched for publications addressing both CAP and each of EU policies in related fields, e.g. "Nitrates directive", "Water Framework directive", "cohesion policy", "birds directive" and "habitats directive". Additional publications were identified through references and other literature searches for other topics (e.g. soil and water) and fitness check criteria, offering further inputs on external coherence.

3.2.6 Relevance

Relevance refers to the ability to address current challenges, needs and priorities as perceived by society (farmers and other citizens), policy makers, stakeholders, science and scientists. It also evaluates the ability to make use of the most updated criteria, tools and knowledge for policy design, implementation and evaluation. Assessing the CAP's relevance requires considering various interests, perceptions and needs of individuals, groups and stakeholders, and must reflect on current societal and political discourse and ongoing discussions. Since questions of relevance and public acceptance are challenging to address scientifically, our assessment of the CAP's relevance relied more on reports and statistics, and less on scientific articles. We first assessed the relevance of the different CAP objectives, key instruments, and the overall division of budgets. We then inspected recent Eurobarometer about the CAP as well as the recent EU consultation on the CAP. Finally, we evaluated the CAP's current design and evaluation framework. This was done by asking a) whether the CAP's design and implementation follow the best available knowledge, b) whether it has the right level of flexibility to respond to evolving needs, and c) whether CAP's monitoring is adequate. We evaluated adequacy of the CAP monitoring framework based on a selection of topics: income support, biodiversity, climate change and High Nature Value Farmland.

Keywords used: relevance, relevant, objectives, new objectives, public, questionnaire, survey, opinion, acceptance, perception, monitoring, evaluation, indicators (in combination with "Common Agricultural Policy" or "CAP"). Additional key documents used for this assessment were the Technical handbook on the monitoring and evaluation framework of the Common Agricultural Policy 2014-2020 (EC 2015a), the Special Eurobarometer 440 (EC 2016), the regular Eurobarometer surveys (conducted twice a year among circa 30,000 EU citizens) and the 2017 Public Consultation (ECORYS 2017). Among these sources, Eurobarometer provides a more representative and unbiased results throughout the EU-28 and should therefore be considered the better source to analyse public perceptions with respect to the CAP.

3.2.7 EU Added Value

EU added value refers to the value of having a certain policy at the EU rather than at the national level. We considered "added value" in a holistic manner referring to the different CAP objectives as well as the economic sense. Identifying and quantifying the EU added value requires a baseline for comparison. We mainly followed Heinemann et al. (2013b) who suggests the following potential baselines: 1) spatially, through studies comparing countries inside and outside the EU (e.g. Switzerland, Norway, Ukraine, Turkey); and 2) temporally, by following the development path of countries before and after their EU accession, with the most relevant event being the accession of 13 new MSs since 2004. Such comparisons,

however, must consider that non-EU countries differ significantly in terms of their economy (and relation with the EU); and that accession to the EU entails more than just the implementation of the CAP.

We assessed the possible EU added value for different objectives of the CAP, based on the comparison of CAP and No-CAP situations, mainly in the context of EU accession of New MSs. We also considered surveys and modelling exercises assessing what may happen under specific scenarios, such as abolishing the CAP. We note that literature relating to the potential value of EU's standards and regulations, either in terms of overarching standards across the EU or their adoption in other countries beyond the EU, were not actively assessed in this study.

From an economic perspective, the added value can be understood as the potential value of each Euro spent by the European Union rather than by a national state. Based on Heinemann et al. (2013b), a positive EU added value requires two aspects: a) "*positive net benefits, i.e. the benefits should exceed the costs of public spending",* and b) that the "*net benefits of public spending at the European level should be larger than those at the national level*". We analysed the CAP's economic added value separately.

Keywords used: EU added value, added value, standard, regulation, accession, abolish, no-CAP, nationalize, scenario, pan European, transboundary, new member states, Eastern Europe, transition, post-soviet, post-communist (in different combinations and in combination with "Common Agricultural Policy" or "CAP").

3.3 Evaluation topics

We identified 12 evaluation topics based on the intersection between CAP objectives, SDGs and Fitness Check criteria. We used these topics to structure our evaluation of the CAP effects within each criteria.

3.3.1 Growth of agricultural productivity

The first CAP objective is to increase agricultural productivity (Art. 39 (1)). In Article 39a, the EU states as second objective that the CAP should "increase agricultural productivity by promoting technical progress and by ensuring the *rational development of agricultural production* and the optimum utilisation of the factors of production, in particular labour". In summarizing the outcomes from the literature, one must pay careful attention to the difference between production, which refers to the amount produced in a given field or farm (= outputs); and productivity which is defined as the relation between output and input (Fuglie 2012). Since the EC 2010 Priority "viable food production" does not define viability, we focus here only on the question of productivity. We also note here that increased agricultural productivity entails that examination of the EU objective (39a) must be done not against productivity *per se* but to 'Productivity-growth'. A key element of productivity, as reflected by much of the literature, relates to 'Technical Efficiency (TE)' which is the capacity of a farm to make efficient use of the existing technology, that is, either to produce at the maximum level with a given set and level of inputs or to use the minimum level of inputs to produce a specific level of output (Minviel and Latruffe 2017). Reduced efficiency has a negative influence on output and, in the short term, can outweigh productivity (Minviel and Witte 2017). Technical progress can increase technical efficiency and/or improve productivity over time. We investigated the extent to which CAP measures, in particular Direct Payments, affect or distort production decisions, i.e. to what extent they influence production decisions made by farmers, influence or incentivise growth of agricultural productivity.

Keywords used: technical efficiency, productivity, technical change, technological progress (in combination with "Common Agricultural Policy" or "CAP").

Data analysed: We used data from the main system describing the degree and type of policy support is the OECD's "Producer Support Estimate (PSE)" (OECD 2013, 2017) in order to analyse the potential influence of the CAP on production decisions and production distortions. We also analyse European data for "Standard Output (SO)" on production (Eurostat 2017) and USDA data on total factor productivity (TFP; USDA 2016).

3.3.2 Fair standard of living for farmers

The second objective of the CAP is to "secure a fair standard of living" and individual earnings (Article 39 (1) b)). Interestingly, fair standard of living is linked to productivity growth. The 2010-priorities somehow highlights a different dimension by defining "*viable food production*" as the first new CAP objective. These two partially-overlapping objectives (fair standard of living and farm viability) relate to SDGs 1 (reduce poverty), 8 (decent work and economic growth), and 10 (reduce inequality). We assessed whether direct payments, the main CAP instrument addressing income objectives, allow achieving a fair standard of living, individual earnings or viable farm income. We used farm income as an indicator to assess the CAP effectiveness, and the level of equity in the distribution of payments (GINI-coefficient of inequality) as an indicator to assess the CAP efficiency in terms of air standard of living, individual earnings or viable farm income. We analysed data on the distribution of direct payments for different farm size classes from 2004 to 2016 as well as the share of direct payments in farm income based on data from the European "Farm Accounting Data Network (FADN)".

Keywords used: farm income, subsidies, decoupled direct payments, decoupling, rural poverty (in different combinations and in combination with "Common Agricultural Policy" or "CAP" or "Europe", "EU" and "policy").

Data analysed: We used data on direct payments from the EU commission and data from the European "Farm Accounting Data Network (FADN)".

3.3.3 Market stability

In the past decades the interpretation of market stability has significantly changed. Prior to recent reforms, market stability was interpreted as having domestic prices fixed and production quantities managed at levels which were based on political decisions. This was ensured by a) public intervention, b) variable export refunds, c) variable import levies, and d) production quotas. Together with the objectives of Article 39 (1) d) to assure the availability of supplies and e) to ensure that supplies reach consumers at reasonable prices. These topics cover parts of SDG 2 (Zero Hunger) which aims to "*achieve food security and improved nutrition* (…)". Several reforms have addressed these market distortions: Nowadays a stable market is rather interpreted as a functioning market which is integrated into the world market, where price signals can be transmitted to domestic producers and consumers. This was achieved by the reduction of public intervention to safety-net levels, abolishment of export refunds, reduction of import tariffs and the ending of production quotas. We note that agricultural markets are also affected by bilateral and multilateral trade agreements, e.g. the Uruguay round of the "General Agreement on Tariffs and Trade (GATT)" in 1994, the negotiation of the WTO Doha round, which was not concluded yet, as well as by the growing number of

bilateral free trade agreements with third countries. These, however, are beyond the CAP. We therefore asked to what extent the recent CAP reforms brought domestic prices (price movements) in line with international prices (price movements), and what are the consequences of these changes.

Keywords used: stable markets, price volatility, price transmission, market access, market integration (in different combinations and in combination with “Common Agricultural Policy” or “CAP”). We additionally used grey literature and official reports identified through EU and OECD. In total, 23 publications were used (19 scientific papers and 4 reports).

Data analysed: We used price data for wheat in Germany and on the world market, as an example to demonstrate long term price developments at the national versus global levels (von Cramon-Taubadel & Ihle, 2015). As a key indicator, we used the amount of EU export subsidies, documented in the WTO subsidies database (WTO 2017).

3.3.4 Balanced territorial development

One of the three objectives formulated by the EC in 2010 is to achieve a “balanced territorial development, with a focus on rural employment, growth and poverty in rural areas”. Safeguarding of agricultural jobs is also one of the main rural development goals for 2014-2020 (Regulation (EU) No. 1305/ 2013). This objective is related to SDG 10 (reduced inequality). Achieving a balanced territorial development implies promoting the social fabric of rural areas, preventing the migration of young, motivated people, supporting agricultural employment and labour, and maintaining the structural diversity of farms and rural livelihoods (European Commission 2011). It also implies providing adequate access of all local actors in rural communities to the entire spectrum of CAP benefits (Holzer et al. 2015). While most CAP instruments and measures may contribute to a balanced territorial development, some are likely to play a major role: 1) Direct Payments, because they represent the largest proportion of CAP payments; 2) Pillar II payments aiming at diversifying farms and rural areas, leading to new opportunities, e.g. tourism and other off-farm-activities, and therefore providing indirect support for employment and labour; 3) the measure designed to help “setting up young farmers”, particularly in remote areas; and 4) the measure on Areas facing Natural or Other Specific Constraints - formerly known as Less Favoured Areas (LFAs) - which targets mountain regions and other areas with biophysical constraints. We placed particular emphasis on the support for remote rural areas, poorer countries and new MSs. We also analysed how the distribution of income support payments can contribute to a balanced territorial development. Most important sources of literature were peer-reviewed articles presenting quantitative case studies (econometric modelling, descriptive statistics, multivariate and regression analysis). We also included findings from several peer-reviewed articles presenting qualitative case studies (interviews).

Keywords used: employment, labor, labour, rural development, migration (in different combinations and in combination with "Common Agricultural Policy").

Data analysed: We analysed the distribution of direct payments across farm size classes and calculated Gini-Coefficients for all member states for 2006-2015. We calculated the contribution of direct payments to farm profit based on FADN. We analysed Eurostat data on the development of agricultural employment over time.

3.3.5 Climate action and energy

One of the new 2010-priority of the CAP is to achieve a "sustainable management of natural resources and climate action". This objective complies with the EU's obligation under the United Nations Framework Convention on Climate Change (UNFCCC; Article 208). It is related to SDG 13 (Climate Action) and, to a lesser extent, to SDG 7 (Affordable and Clean Energy). The topic of energy use and efficiency is strongly related to climate action. Given this strong link and the paucity of publications on the effects of the CAP on energy per se, the two topics were clustered in our analyses. The three main sources of agricultural GHG emissions reported by the EU to the UNFCCC are 1) soil emissions of nitrous oxide (N_2O) originating from organic and mineral nitrogen fertiliser, 2) enteric Methane (CH_4) emissions from livestock digestion processes, and 3) methane and N_2O emissions from manure management (storage of animal manure). Other sources related to agriculture, but not reported in these categories, have a comparable effect on GHG emissions, including land use within and outside the EU, as well as energy used by farms. Although we acknowledge that climate change adaptation is an important issue, there were too few publications on this dimension. Our analysis therefore concentrates on climate change mitigation. The CAP is likely to influence GHG emissions: 1) indirectly, through N-fertilizer management (Cross Compliance with Nitrates Directive, WFD) and instruments influencing herd size; 2) via the inclusion of climate into AECMs in the 2013 reform; and 3) though secondary effects of greening measures. We quantified agricultural GHG emissions and analysed the reasons for changes in the past. We evaluated the most important categories of GHG sources and relevant CAP instruments (if existing). We analysed what the CAP potentially could achieve, by evaluating references on possible targeted measures and marginal abatement costs (the cost of reduction per ton of CO_2).

Keywords used: GHG, greenhouse gas, methane, N_2O, CO_2, enteric, climate change, mitigation, adaptation, energy, bioenergy, energy crops, renewable energy, sustainable energy, clean energy, energy use, energy efficiency (in different combinations and in combination with "Common Agricultural Policy" or "CAP"). For our evaluation of overall trends, official reports were the most important sources (e.g. EEA 2017, report to UNFCCC on EU GHG emissions). Peer-reviewed articles included case studies and modelling approaches. Grey literature was particularly important with respect to the effects of specific CAP measures on climate.

Data analysed: We used data from EEA (2017), Eurostat and van Doorslaer et al. (2015) to analyse trends on GHG emissions.

3.3.6 Soil protection and integrity of water resources

The new 2010-priority of the CAP on "sustainable management of natural resources" implies a focus on soil and water resources. This objective relates to SDG 6 (Clean water and sanitation). Both resources are crucial for agricultural production and human wellbeing. Both resources are connected: soil quality, erosion, nutrient load, or pesticides affect water availability and quality; vice-versa water availability and quality affect soil and agricultural productivity. Our assessment of the CAP's impacts on soil protection concerns primarily water-induced erosion, while our assessment regarding water resources focuses on water quality (pollution) and water uptake for irrigation. Our literature search also included risks such as floods and landslides. CAP instruments most likely to have direct effects on soil protection and water resources include Cross Compliance with the Nitrates Directive and Good Agricultural and Environmental Conditions (GAEC), and some AECM. CAP's influence on crop choice is also likely to have indirect effects on soil protection and water resources.

Keywords used: Soil, erosion, water, pollution, nitrates, WFD, irrigation, flood, risk prevention, landslide (in combination with "Common Agricultural Policy" or "CAP").

Data analysed: Key sources evaluated for general trends and CAP's effects include a JRC report on the state of soils in Europe (Jones et al. 2012) and, on water, an assessment of the European Court of Auditors (2014) on the integration of the WFD with the CAP.

3.3.7 Biodiversity and ecosystem services

Agricultural areas in Europe have been claimed for their potential contribution for biodiversity conservation and the provision of ecosystem services (ESS; Biodiversa, 2017). Such claims relates to the diversity of the observed agricultural landscapes and farming systems, some of which are known to support not only natural and semi-natural habitats, but also species fully or partially dependent on the maintenance of specific management practices. Biodiversity and ecosystem services are tightly linked with each other and biodiversity may be a key driver of ESS (Tscharntke et al. 2005, Duncan et al. 2015). ESS are the goods and services that humans benefit from a healthy functioning of ecosystem. These can include various dimensions including social, economic and environmental needs as well as subjective happiness (Summers et al. 2012). In this report, we only concentrated on services provided by natural and semi-natural ecosystems. Issues relating to biomass production by and within agricultural areas (provisioning services) are covered in the respective section on productivity (see **section 4.3.1**). ESS related to climate regulation, soil and water are covered in the respective sections as well (see **sections 4.4.1 and 4.4.2**). Here, we therefore focused on studies that either looked systematically across ESS or addressed key ESS that are not covered by other sections, such as pollination, pest-control, or cultural services. Considering the recognized impacts of agricultural practices on farmland biodiversity and ESS, we assessed here to which extent the CAP affects changes in, or incentivizes, the adoption of measures and interventions that benefit biodiversity and ESS. We also examined whether the CAP effectively and efficiently acts to reverse the ongoing trends of biodiversity decline and, thereby, biodiversity-related ESS.

Our review focused primarily on AECM, greening, and CC as key instruments for maintaining biodiversity and ESS. Apart from AECM, there is too little evidence for other measures within Pillar II to be included it in the analyses. We also considered HNVf, as these are among the biodiversity indicators within the Common Monitoring and Evaluation Framework implemented to monitor the impacts of the CAP. HNVf are characterized by long-established, specific low-intensity farming systems (low levels of agrochemical inputs, mechanization, and livestock stocking levels and rotational uses of the land). They include livestock-based systems, arable-based systems, permanent crop oriented systems, and mixed farming systems, and their maintenance support the presence of a high proportion of semi-natural vegetation and small-scale elements such as field margins, hedgerows and trees intermingled with farmed areas (Beaufoy and Cooper 2008; Pienkowski 2011; Lomba et al. 2014). Some HNVf are characterized by complex, labour intensive practices, livestock breeds and crop types adapted to the local biophysical conditions, e.g. soils and climate (Keenleyside et al. 2014). While not specifically tailored to HNVf, AECM are among the policy tools that have been mobilized within Rural Development Program (RDP) to assure the maintenance of farming practices known to support high levels of biodiversity and to the wide provision of ESS in agricultural landscapes. Finally, we examined whether any publications relating to the

status and trend of farmland biodiversity point to direct effects of the CAP by instruments that are designated to other objectives; examples include Direct Payments and ANCs (formerly LFAs).

Keywords used: biodiversity, ecosystem services, cross compliance, ecological focus areas, crop diversification, high nature value farmlands, HNVF, HNV, permanent grassland, pollination, pest-control, forest, afforestation, forestry, aesthetic, tourism, attractiveness (in combination with "Common Agricultural Policy" or "CAP").

Data analysed: Key publications addressing the CAP's performance with respect to biodiversity and ESS included Batary et al. (2015) and Sutherland et al. (2015) for AECM; Pe'er et al. (2014), Hart (2015), EC (2016) for greening, the Fitness Check of the Birds and Habitats Directives (Milieu et al. 2016) for CC, LFA as well as coherence between the CAP and the Nature Directives, and Oppermann et al. (2012) and Keenleyside (2014) as key sources of information on HNVf both in the EU and in other countries in Europe. Additional material was provided directly by RSPB (158 publications on AECM performance). A call for evidence published by the EU project EKLIPSE delivered additional publications with respect to greening. Key publications with respect to farmland ESS included MAES reports 2013, 2014, 2016. Additional data to assess the overall trends of biodiversity were the Farmland Bird Index (source: EBCC, RSPB, BirdLife international, Statistics Netherlands), and the Pan-European Grassland Butterfly Indicator (source: Butterfly Conservation Europe / Statistics Netherlands, both covering the years 1990-2015.

3.3.8 Organic farming in the context of sustainable farming

The CAP's new objectives as delineated by 2010-priority 2 seeks to foster sustainable farming systems and green growth. The UN (2016) defines sustainable growth as growth or development that minimized the use or depletion of natural resources and the use of toxic materials. Following the OECD, the objective of green growth is to seek an economic growth pathway which would allow natural assets to continue providing resources and services. Strategic elements of green growth as identified in the agricultural context are: a) increased productivity, b) internalization of the costs of negative externalities, c) increase of positive externalities, and d) the provision of public goods by agriculture (OECD 2012). Therefore, we examined whether, and how, the CAP supports sustainable agricultural systems and practices that fulfil the concept of green growth.

To identify which systems should be included in this part of our assessment, we considered how operational a farming system is. According to Pretty (2008) a functional system of sustainable farming to support green growth requires: a) a legal definition of a sustainable farming system; b) a functioning control system; and c) a well-defined policy framework and measures. From an economic perspective, Fritsch (2014) proposes that d) a market-oriented approach would be superior to any approaches based on subsidy as it can reduce the dependency on policy support. Möckel (2015) lists four main approaches to sustainable or environmentally friendly farming which include some of those features: organic farming, conservation tillage, integrated pest management and precision farming.

Organic farming is a holistic approach based on the objective of closed nutrient cycles, the development of fertile soils, wide crop rotations, a limited animal density, animal friendly stable system and the absence of synthetic pesticides and chemical fertilizer (Möckel 2015, Vogt 2007). This farming system has been developed by different organic farming associations in Europe (Lakner & von Meyer-Höfer 2014). It has a legal definition and a control system (Gambelli et al. 2012). The fundament of the support for organic farming is the EU-regulation 2092/1991 for organic plant production and EU-regulation

1804/1999 for animal production (EU Council 1991, 1999). Both were unified by EU-regulation 834/2007 (EU Council 2007). The main objective and rationale of organic farming policies is the support of environmentally-friendly farming (Stolze & Lampkin 2009). The EU has established a functioning legal framework for organic farming since 1991 (Sanders et al. 2011, Sanders et al. 2013), and the standards have been defined by EU-Regulation 2092/91 and 1804/99. In 2007 the legal framework was unified under the EU-regulation Council Regulation (EC) No 834/2007. Since 2013, the EU is discussing about further reforming the organic framework. There is also a significant market for organic products. Implementation strongly depends on MSs (see for details Sanders et al. 2013: pp. 289/290). The positive environmental impacts have been reported in multiple studies (Maeder et al. 2002, Hole et al. 2005, Schneider et al. 2014, Reganold & Wachter 2016), and there are different scientific bodies who described organic farming as a preferential approach to sustainable farming on the national level (e.g. German Council for Sustainable Development 2013) and on the international level (IAASTD 2009).

Conservation tillage (or zero tillage farming) describes farming systems which minimize ploughing in order to improve soil fertility and reduce potential erosion. However, this system often then applies plant protection measures (herbicides), negatively affecting plant and animal diversity. Following Möckel (2015), the system can provide some environmental benefits and it can be combined with both conventional and organic farming systems, but it is not sufficiently tested. There is no legal definition of this farming system and no market for products based on these techniques.

Integrated pest management (IPM) describe farming systems which aims to reduce the level of pesticides by monitoring pests, and using mechanical or biological control methods instead of chemicals (EISA 2012) and is regulated by Directive 2009/128/EC and Regulation 1107/2009. The system defines thresholds that must be reached before applying pesticides. The environmental and economic impacts of this system need to still be assessed (Möckel 2015). In some EU-regions, integrated farming is listed as agri-environmental programs (e.g. in Italy). But the attempt to upscale this system in the EU was not yet successful. It is not a market-oriented approach and it is not systematically connected with the CAP at present. In contrast, in Switzerland, one third of the farmers adhere to a label organization ("IP-Suisse") that prescribes higher environmental standards with respect to biodiversity conservation, and thus achieves a higher market price. However, this is the only significant market for IPM products we are aware of.

Precision farming describes farming systems which use sensors and satellite techniques to target agrochemicals (pesticide, fertilizers) more efficiently, e.g. depending on soil properties. This farming system is strongly dependent on modern techniques and is therefore capital-intensive. While it can bring a number of environmental benefits and can be combined with any other farming systems (Möckel 2015), precision farming per se cannot be defined as a farming system or relating necessarily to environmental protection contexts. Also because there are no specific regulations in the environmental context, it cannot be linked to a green-growth strategy.

Among the abovementioned farming systems, only organic farming includes a legally defined standard and control system, which is crucial to create a reliable standard for green growth. Additionally, there are no significant markets for farming systems other than organic farming. We therefore chose to focus our assessment on organic farming as the broadest and most established system. We first assessed the status and development of organic farming systems over time, and investigated the contribution of CAP to support them. We assessed the proportional budgets allocated to organic farming, but also

examined the broader balance, namely, whether the CAP more generally supports sustainable farming systems, as well as systems that can be considered as unsustainable.

Keywords used: organic farm*, biological control, Integrated pest management, precision agriculture, diversified farming systems, sustainable, agro-ecolog* (in combination with "Common Agricultural Policy" or "CAP").

Data analysed: Key publications for organic farming are Sanders et al. (2013), Crowder and Reganold (2014), Reganold and Wachter (2016). We also evaluated data on organic farming provided by Eurostat and the German Ministry for Food and Agriculture.

3.3.9 Animal welfare

Growing public concern for ethical impacts of agriculture has been noticed, especially about farm animal welfare due to widespread change as well as the evolution of societal values concerning the proper value of animals as sentient beings. In addition, there is growing concern about industrial animal production due to potential risks for human health (food safety incidences, use of antibiotics, diseases etc.). Modern industrial animal production symbolizes a way of agricultural production that is hard to understand for consumers who are today largely estranged from the sector and feel a deep gap between their romantic / idyllic farm image (mixed farms with free ranging animals of all kind) and current realities. Public debate about farm animal welfare represents a highly challenging discourse revolving around numerous trade-offs related to more sustainable production.

Although no CAP objective directly tackles such issues, the Protocol on Animal Welfare has been adopted by the EU in Amsterdam Treaty of 1997. A further set of rules dealing with all animal species' protection, has also been defined by Council Directive 98/58/EC, included under CC. It focuses on species kept for food production, wool, skin, fur, or other farming purposes. These rules are based on the European Convention for the Protection of Animals kept for Farming Purposes, which acknowledges the so-called 'five freedoms': freedom from hunger and thirst, freedom from discomfort, freedom from pain, injury and disease, freedom to express normal behaviour and freedom from fear and distress. In the Lisbon Treaty of 2009 which amended the TFEU, Article 13 of Title II explicitly states that "the Union and the Member States shall, since animals are sentient beings, pay full regard to the welfare requirements of animals, while respecting the legislative or administrative provisions and customs of the Member States".

Animal welfare issues are embedded into the principles and regulations related to organic farming, and farmers in the EU are obliged to respect these standards. The main instrument to do so is via the Statutory Management Requirements within CC, linking Direct Payments with the regulations for animal health and welfare (among others).

Keywords used: animal welfare, in combination with other words such as payment, impacts (in combination with "Common Agricultural Policy" or "CAP").

Data analysed: To our best knowledge, there is no systematic data collection on animal welfare throughout the EU.

3.3.10 Health, sustainable consumption and production

Several topics in our assessment emerged primarily from our third question about the ability of the CAP to contribute to SDGs. One must consider a) that SDGs reflect global rather than EU targets (and hence not all of them are relevant to the EU) and that SDGs themselves have been formulated very recently. One can hence not anticipate studies to have reflected specifically on SDGs. Accordingly, we focused on both explicit and implicit reference to SDGs according to the themes they address.

This is the case for the topic “Health, sustainable consumption and production”. This topic represents cross-cutting issues and could not easily be addressed within a single evaluation criteria. It was therefore evaluated within a separate section on cross-cutting issues (**section 4.10.1**).

The first topic relates to SDGs 3 (health and wellbeing) and 12 (responsible consumption and production). We linked these two topics because, in the case of agriculture and food, the two are tightly linked. There are various ways in which agriculture affects public health. Direct and intuitive impacts relate to the use of agrochemicals, and consequent pollution. This topic is addressed in our evaluation of soil and water, as well as the topic of organic farming which explicitly sets regulations with respect to agrochemicals. The CAP influences consumer's health also indirectly by its impact on food markets, which can have effects on the diets and consumption behaviour of EU citizens. Relevant CAP instruments include coupled and decoupled support that can constitute indirect subsidies to certain types of nutritional products. Here we note specific public concern regarding the health effects of excessive consumption of animal products. Also demand-side measures are relevant, such as the school milk schemes. Farmland also offers recreational landscapes which have been demonstrated for their contribution to mental health and wellbeing (Marselle et al. 2013, Lee et al. 2015). Natural England’s national survey of people and the natural environment indicates 7% of visits to natural environments in England are to farmland, with 209 million visits to farmland in one year (Natural England 2010, p 22). We note that therapeutic horticulture and care farming exist as well. The CAP’s impact on landscapes and their recreational value, however, is covered indirectly in our section on land use change, and more directly in our section on biodiversity and ESS.

We analysed the effect of CAP support to different types of producers or certain types of food (specifically animal products) and demand-side CAP measures. We also analysed indirect CAP subsidies with recommendations in light of studies on nutrition-induced diseases. Finally, we analysed CAP effects on the recreational functions of farmland landscapes.

Keywords used: Health, healthy diet, obesity, meat, dairy, animal products, consumption (in different combinations and in combination with "Common Agricultural Policy" or “CAP”).

Data used: Our literature research included a limited number of peer-reviewed articles and reports, where these could demonstrate a relation between the CAP and these two relevant SDGs. We also conducted evaluations of relevant statistics such as FADN.

3.3.11 Reducing inequalities

The new CAP objective (2010-priority 3) (EC 2010) "Balanced Territorial Development" includes a component on reducing inequalities. It is also a general objective of other EU policies, such as cohesion policies. Different levels of inequalities are relevant for agriculture and the CAP: Inequalities between MSs and regions of the EU, between urban and rural areas (see also SDG 11), and between farms and farmers

depending on area, location, size and socioeconomic background, age and gender (SDG 5). Here we focus on economic inequalities between MSs and farms. Differences between urban and rural areas are covered in the section on "Balanced Territorial Development". When analysing differences between MSs level, we focus primarily on the situation in new MSs, where different living conditions existed and still exist as a result of the époque of socialism. We evaluate the CAP's direct and indirect effect on these differences by analysing literature on intended and unintended effects of direct payments, and also by examining literature that assesses the suitability of direct payments and RDP measures to the conditions in the new MSs. For inequalities between farms, we concentrated on distributional effects of direct payments between farm size classes. This topic represents cross-cutting issues and could not easily be addressed within a single evaluation criteria. It was therefore evaluated within a separate section on cross-cutting issues (**section 4.10.2**).

Keywords used: equity, inequality, distribution, NMS (in different combinations and in combination with "Common Agricultural Policy" or “CAP”). We mostly evaluated peer-reviewed articles, and also relevant reports, the latter particularly on EU-wide effects of direct payments.

Data analysed: We complemented the analysis by own evaluations of Gini-coefficients reflecting inequalities in the distribution of direct payments between farms, differentiated by MS and assessed over time, in order to ask whether levels of inequality are increasing or decreasing over time and where.

3.3.12 Global effects of EU’s agriculture and the CAP

Article 208 of the TFEU explicitly requires that the “Union and the Member States shall comply with the commitments and take account of the objectives they have approved in the context of the United Nations and other competent international organisations”. Examining the global effects of the CAP is particularly essential because the EU is a key player in the global trade of agricultural products, both as an importer and exporter. International trade discourse and WTO negotiations have put pressure on the CAP to reduce its export subsidies and market distorting effects (Daugbjerg and Swinbank, 2007). Trade in itself, however, is treated under the EU’s external coherence (subsection on PCD). Instead, and in consideration of the SDGs being global in nature, we examine more generally the global impacts of European agriculture and consumption, and the contribution of the CAP to such impacts. This topic represents cross-cutting issues and could not easily be addressed within a single evaluation criteria. It was therefore evaluated within a separate section on cross-cutting issues (**section 4.10.3**).

We analysed the impacts of EU’s agriculture and the CAP on global markets, global food standards or animal welfare. We also analysed the ecological footprint of European production and consumption patterns outside the EU, in particular the impact of European agriculture becoming more environmentally friendly and feedstock importations increasing. CAP instruments have indirect effects, e.g. by creating indirect subsidies or influencing the demand for certain types of products, or by triggering a more extensive production that can lead to increased imports and thereby have socio-economic and environmental impacts outside the EU.

Keywords used: footprint, virtual land, Africa, Brazil, developing countries, deforestation (in different combinations and in combination with "Common Agricultural Policy" or “CAP”).

4 Results

4.1 Overview of the knowledge base

As of 18 November 2017, we **identified 858 publications** as potentially-relevant for evaluating the CAP based on their title and abstract. This high number of publications demonstrates the existence of a wealth of knowledge on the effects of the CAP. For the production of this report, we **used 494 publications** (scientific papers, report, books etc.), of which 350 were prioritised and fully assessed based on their full-text for incorporation in our in-depth database. Of these, 44 publications did not offer a direct assessment the CAP's performance along the evaluation criteria. As a result, we **incorporated 306 publications into the in-depth component of our database** ("fully assessed"). The statistics presented hereafter are based on these 306 fully-assessed publications.

Half of the fully-assessed publications (52%) were published from the year 2014 onwards. A large number of publications covered the EU level (37%, n = 113). Country-level studies covered 26 EU MS, with strong difference in coverage level between MSs; the largest number of publications concerned Germany, followed by Italy, the UK, Spain, the Netherlands and France (**Fig. 4.1.1**). In addition, 37 studies addressed situations outside the EU: Switzerland (n = 9), European countries outside the EU (n = 5) and other countries and continents (n = 11). Twelve papers addressed the global level.

Most publications included in our database originated from peer-reviewed scientific papers (n = 253), and the rest were mostly high-profile reports from EU institutions and organizations as well as research centres located in MSs (n = 57). In addition to these, we used 71 reports, books, EU regulations, technical handbooks, conference presentations etc. in our assessment. The predominant language was English (n = 313), but we also included reports in other languages that were clearly relevant to our research (10 in German, 1 in Estonian, 1 in Slovenian, 1 in Spanish and 1 in Swedish).

The largest number of "fully-assessed" publications addressed the evaluation criteria Effectiveness (n = 191), followed by Efficiency (n = 92). The lowest number of publications addressed Internal Coherence (n = 29; **Fig. 4.1.2**). Despite a substantial effort to obtain a balanced representation of socio-economic and environmental literature, the largest number of publications addressed environmental SDGs, namely SDG 15 (Life on Land), SDG 13 (Climate Action) and SDG 6 (Clean Water and Sanitation; **Fig. 4.1.3**). This unbalance towards environmental issues indicates the existence of a larger knowledge base on the environmental effects of the CAP. Other SDGs associated with substantial literature (n>20) were SDG 8 (Decent Work and Economic Growth) and SDG 12 (Responsible Consumption and Production). We clustered together SDG 1 (No Poverty) and SDG 2 (Zero Hunger) due to the limited number of publications identified.

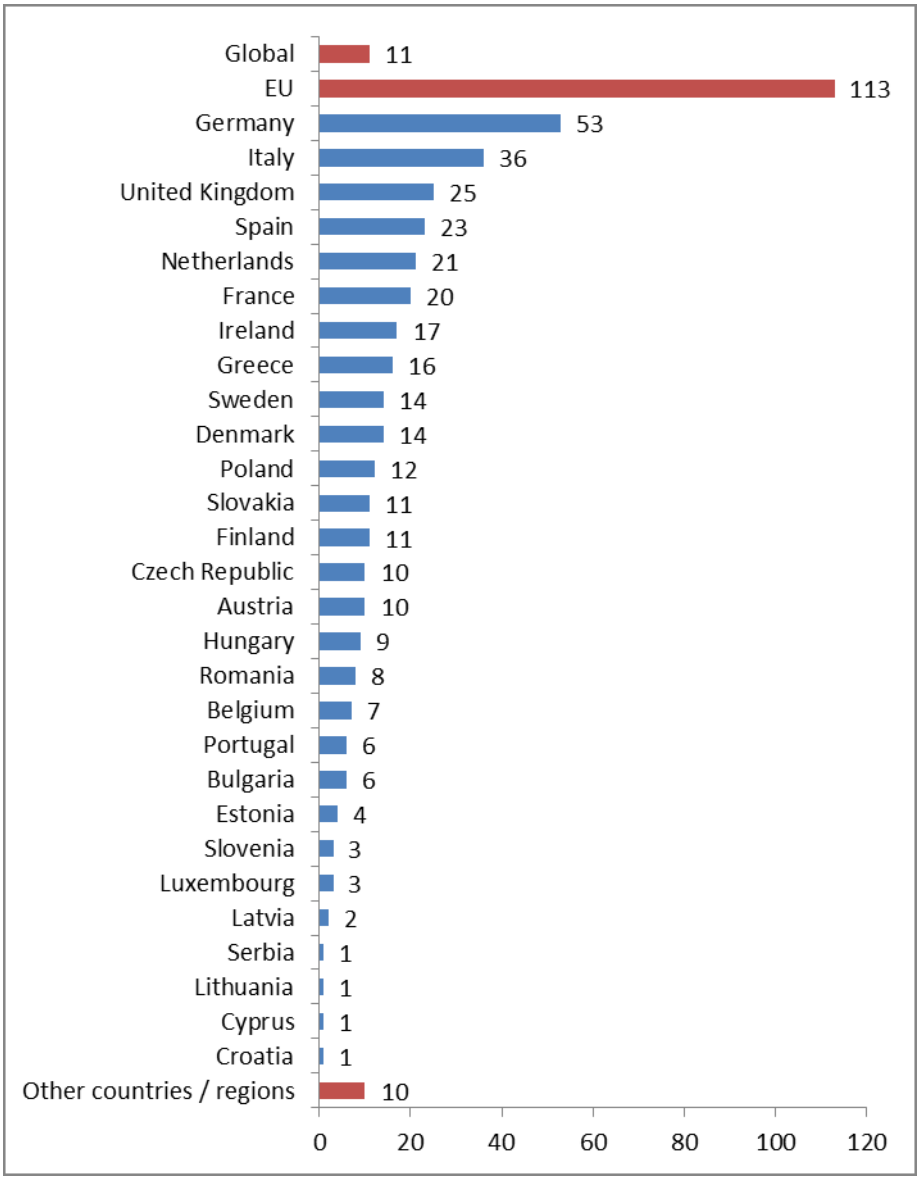


Figure 4.1.1: *Frequency of occurrence of MSs within our in-depth database, and number of publications covering the EU, other regions or the global level. Note: a large number of publications addressed several countries. Source: our in-depth database, containing a sample of 306 publications.*

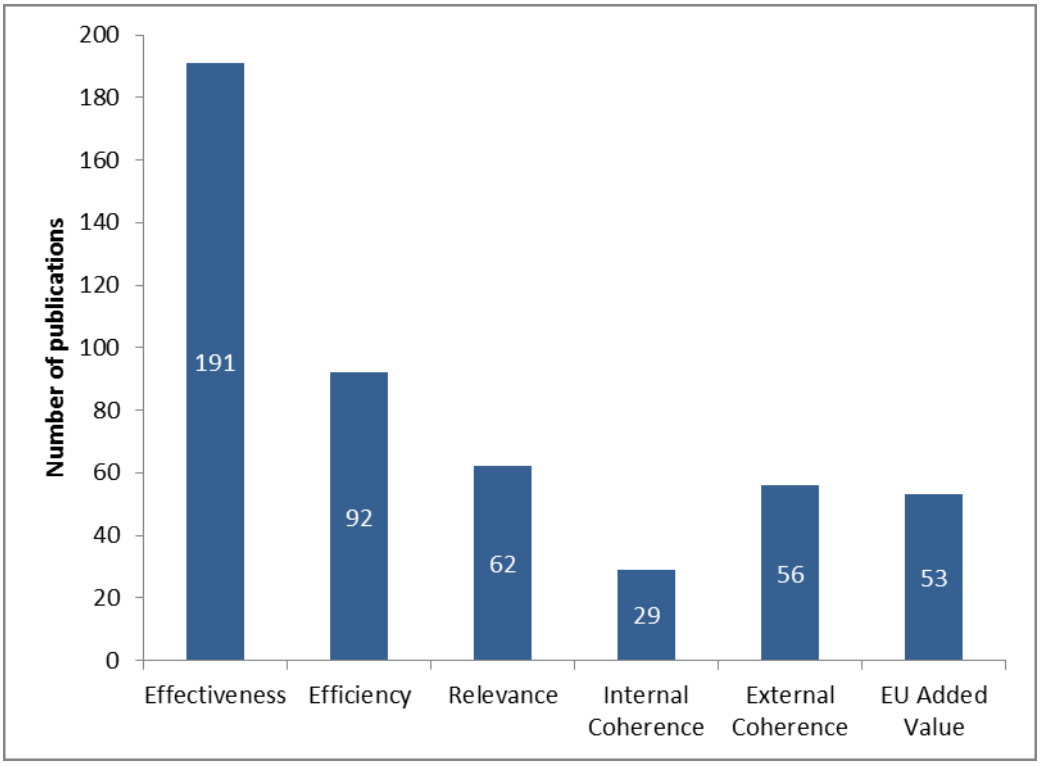


Figure 4.1.2: *Number of publications within our in-depth database addressing each Fitness Check criterion. Note: a given paper could address more than one criterion. Source: our in-depth database, containing a sample of 306 publications.*

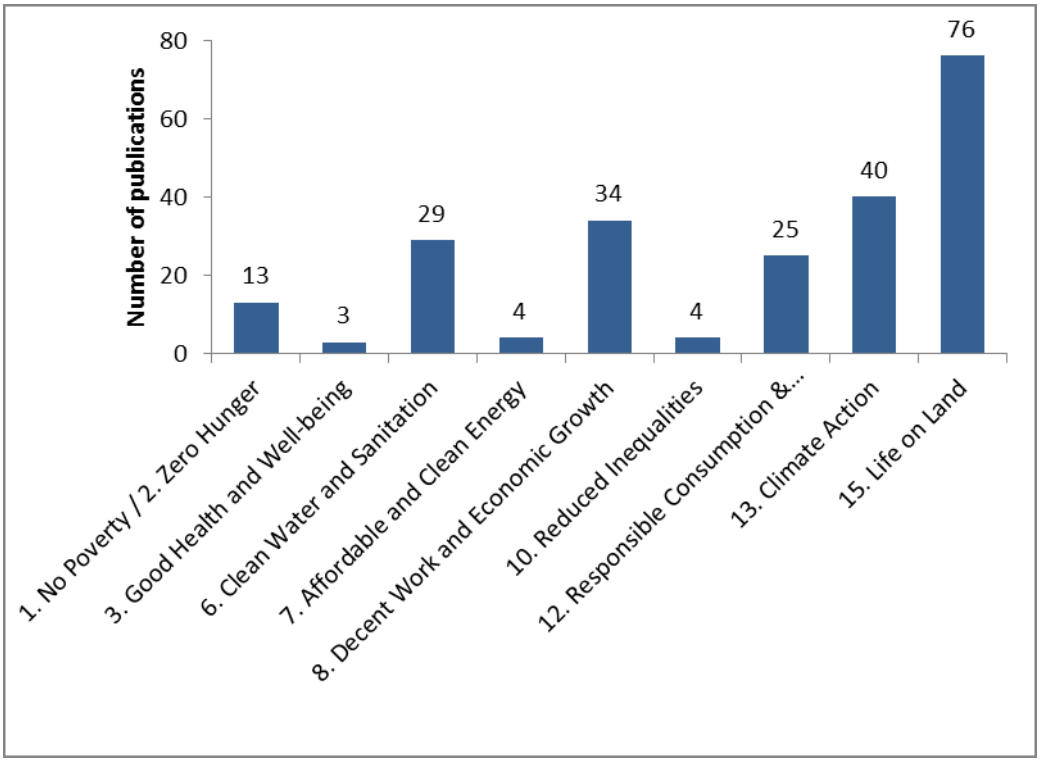


Figure 4.1.3: *Number of publications within our in-depth database addressing each addressing each Sustainable Development Goal (SDG). Note: a given paper could address more than one SDG. Source: our in-depth database, containing a sample of 306 publications.*

4.2 Land use, farm structure and management

Question: Does the CAP affect land-use changes, changes in farm structure or farm management?

Relevant CAP objectives: All

Relevant SDGs: All

Number of publications scanned: >150 publications

4.2.1 Land use

4.2.1.1 Overall trend on land use

European farmland is undergoing two spatially-distinct land use change trends (Reginster et al. 2010, Kuemmerle et al. 2016, Van der Sluis 2016). One is a constant expansion of cropland area with stable or increasing land management intensity in Western EU, whereas the other is a decline in cropland area and

geographically variable trends of intensity in the Eastern EU, attributed to the breakdown of socialism in 1989 which triggered widespread agricultural abandonment. Agricultural intensification in the 19th and 20th century began later and progressed slower in Eastern than in Western Europe (Jepsen et al. 2015). Another widespread source of land use change across the EU is the transformation of agricultural areas into urban and peri-urban areas.

Finally, a major land use change in the EU is the abandonment of cropland in areas less suited for agriculture due to socio-economic constraints and geographical limitations (e.g. water shortages, rugged terrain) as well as demographic reasons (depopulation, aging; MacDonald et al. 2000). Agricultural abandonment reflects a post-war trend in Western Europe of rural depopulation to which isolated and poorer areas were most vulnerable (MacDonald et al. 2000).

Around 520,000 ha of agricultural land were transformed into non-agricultural land in 38 countries between 2000 and 2006 (EUROSTAT 2012).

4.2.1.2 Results of our literature review on CAP effects on land use

Key findings

It is challenging to quantify up to which point the CAP has enhanced existing trends in land-use changes. The CAP was found to have only minor impacts on land use changes, mostly reinforcing existing trends. The CAP has been criticised for encouraging farmers towards intensification by subsidizing production and focusing on more fertile and readily-accessible land, leading to abandonment of traditional farming in marginal areas and a decline in human working labour. Decoupling of direct payments and the adoption of single payment schemes is expected to have reduced intensification trends, but evidence is lacking on the extent of these effects. Greening measures are estimated to have a marginal impact on land use changes. Although Western farmers have greatly benefitted from the CAP since the 1990's, whereas Eastern Europe's farmers initially had no access to these subsidies, the CAP can only partially explain differences in land use changes observed between Western and Eastern Europe due to a large historical and socio-economical context as well that mainly affected such changes. Some evidence however suggests that the CAP contributed to the increase of arable land.

Land use changes in Europe are driven by socio-economic factors such as technical changes, changes in world market prices for agricultural commodities, central policies as well as a variety of regional and demographic factors (e.g. farmers' age). The complexity of these mechanisms set hurdles to the identification of a clear cause-effect relationship between CAP instruments and land use changes. The influence of the CAP on land use and landscapes in the EU is multifaceted (Lefebvre et al. 2012). Various studies have tried to link CAP to specific land use changes, but mostly at regional scale (e.g. Corbelle-Rico et al. 2012, Nunes et al. 2010, Martinez-Casasnovas et al. 2010). Some studies address European-wide effects, yet they must be interpreted cautiously since they are based on modelling and scenarios involving numerous assumptions (e.g. Eickhout et al. 2007).

There are some evidence that **cross-compliance** (and within it GAEC) may have had a local impact on land use changes, for example in Ireland, by maintaining the amount of permanent pastures and therefore limiting the amount of land potentially available to grow bioenergy crop (Smyth et al. 2010). **The**

withdrawal of compulsory set-aside in 2009 seems to have influenced land use changes in the EU15, whereas **direct payments** did not seem to have any effect after 2005, except in most EU15 Southern regions (Agrosynergie 2013). In southern regions, the relative share of set-aside, fallow land, permanent grassland and meadows increased, while the share of arable crops decreased. The extensification index[10] seems to have decreased in the EU15, except in regions implementing SAPS model, where the set-aside requirement has never been applied and the extensification index increased (Agrosynergie 2013). Future scenarios of land-use change however suggest that the CAP may only have **minor effects on the amount of land abandonment** (Reginster et al. 2010).

Differences in land-use changes observed between Western and Eastern European countries could be explained by the fact that Western farmers benefitted from the CAP since the 1990's, while Eastern Europe's farmers had no access to these subsidies during most of our study period. The influence of the CAP in Central and Eastern Europe remains difficult to assess because these regions are still undergoing a post-socialism shift (Kuemmerle et al. 2016). Nevertheless, the eastward expansion of the EU in 2004 and 2007 was associated with cropland expansion in Eastern Europe, for instance in Bulgaria, where a substantial conversion from natural grasslands to arable land was observed (Dobrev et al. 2014).

The crop diversification measure recently included in the CAP is likely to have a significant influence on land use changes. There is however still little evidence on its effects since it started being implemented in 2015. Projections based on early drafts of the greening proposals in 2011 (rather than their final design in 2013) predicted a marginal impact of greening on overall land use in the EU (Gocht et al. 2016). Overall land use effects due to crop diversification were expected to be relatively small or even negligible since only 5% of farms are affected by this measure (Gocht et al. 2017), due to broad exemptions and low requirements compared to actual trends (Pe'er et al. 2014). At the EU level, less than 1% of agricultural area was expected to be reallocated due to the crop diversification measure (Louchini et al. 2017). A potentially weak positive effect on crop diversity was expected for areas where maize is the dominant crop in Belgium (Mahy et al. 2015). A modest positive impact of greening on crop diversity was predicted in monocultural and duo-cultural croplands in Baltic countries, which are generally limited by the number of available crops due to climatic conditions (Was et al. 2014). A slight increase in fallow land and nitrogen-fixing crops was actually observed in Germany, following (and likely due to) greening (Pe'er et al. 2017).

4.2.2 Farm structure

4.2.2.1 Overall trend on farm structure

We analysed changes in farm size, farm type, economic farm size, labour type farmer's age.

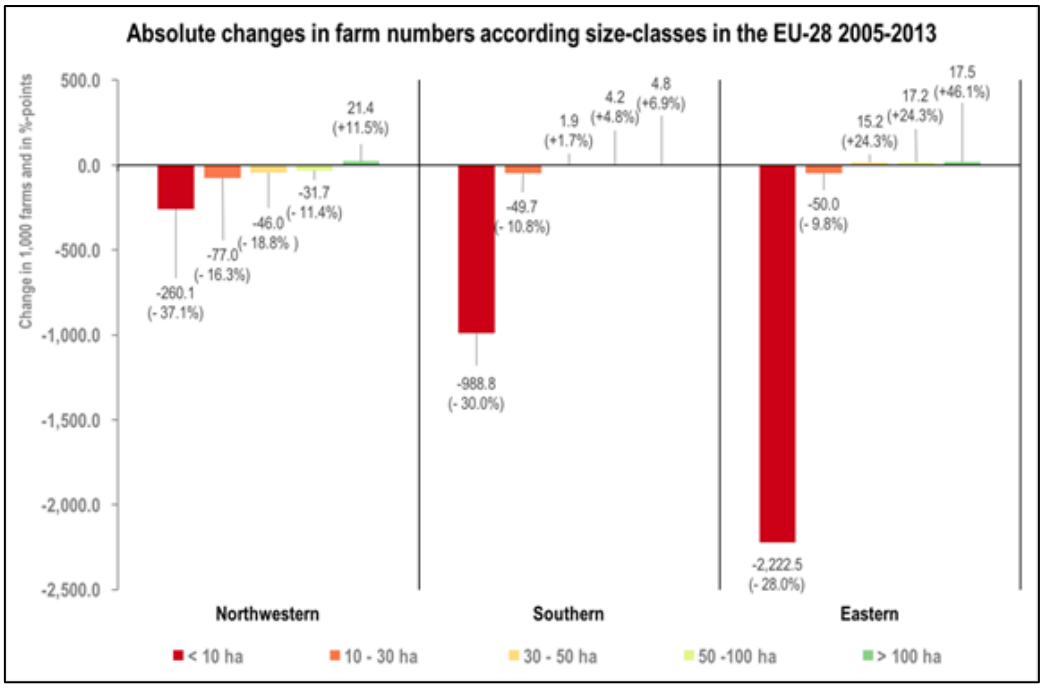
Farm sizes increased and the number of farms decreased consistently over the period 2005-2013. Within the EU28, very small farms (<5 ha) represent 66% of all farms and occupy only 6.2% of the total agricultural land, while large farms (>50ha) represent 7% of all farms and cover 68% of the total

[10] The extensification index measures the percentage of UAA set aside for non-farming activities (permanent grassland and meadow) and/or unfarmed due to regulations (set-aside areas under incentive schemes) or so decided by farmers (fallow land) over total UAA (Agrosynergie 2013)

agricultural land. The Utilised Agricultural Area (UAA) was relatively stable between 2005 and 2013, while the total number of farms in the EU28 (excluding Croatia) fell by 26.2 %, an equivalent to an average decline of 3.7 % per annum (Eurostat 2017). The largest declines in farm numbers were recorded in Slovakia (8.2 % per annum), Bulgaria (6.5 %), Poland (5.3 %), Italy (5.2 %), the Czech Republic (5.8 %), Latvia (5.5 %) and the United Kingdom (5.3 %). There are significant differences in farm sizes among regions of Europe, with small farms (<10 ha) representing over 80% of farms in Eastern and Southern Europe (**Fig. 4.2.1**). The absolute decline of small agricultural holdings was very high in new MSs, with 2.2 million farms < 10 ha being lost over the period 2005-2013 (**Fig. 4.2.2a**), but interestingly the percentage of declines was higher in North-Western Europe (**Fig. 4.2.2b**). In many Central and Eastern European countries, large farms were collectivised during the communism era, and remained as such after 1990, while medium-sized family farms are notably absent in these countries also now in the era of the CAP (Blacksell, 2010). East-west divides in terms of farm sizes therefore remain clearly prevalent (Batáry et al. 2017).

Figure 4.2.1: *Farm sizes in the agricultural sector across three regions in the EU28, for the period 2005-2013.*
Note: we divide MSs according to three regions: North-western EU: Belgium, Denmark, Germany, Ireland, France, Luxembourg, The Netherlands, Austria, Finland, Sweden, United Kingdom; Southern EU: Greece, Spain, Italy, Cyprus, (Malta), Portugal; Eastern EU: Bulgaria, Czech Republic, Estonia, (Croatia), Latvia, Lithuania, Hungary, Poland, Romania, Slovenia, Slovakia. Source: Eurostat (2017).

(a)



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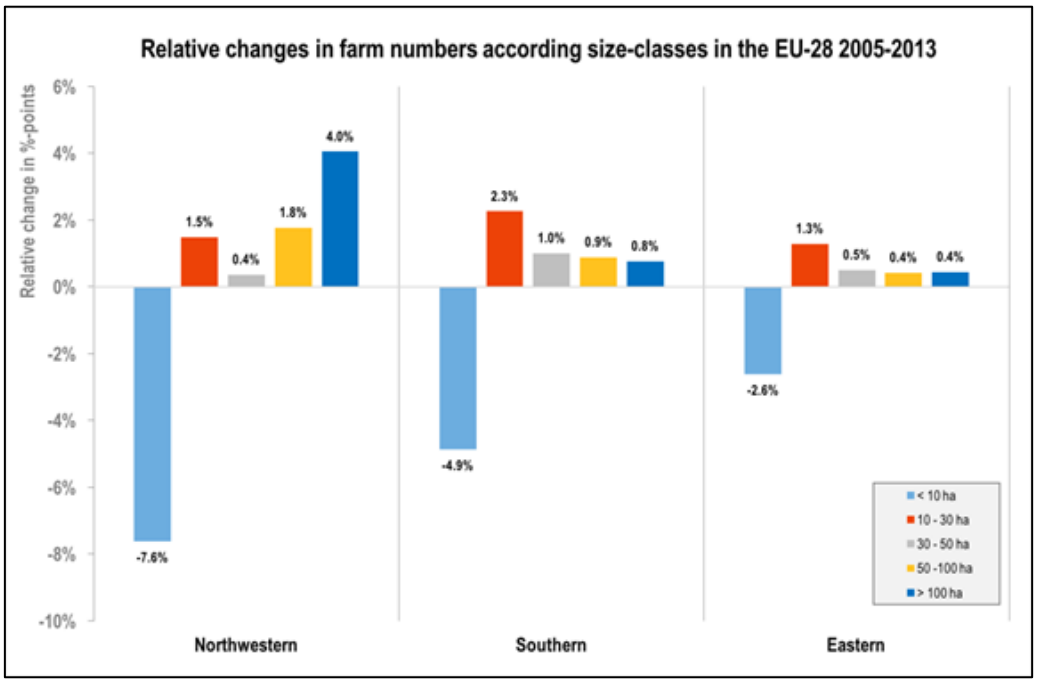


Figure 4.2.2: *(a) Absolute change in number of farms per farm size classes and (b) relative change in farm size classes across EU MS between years 2005 and 2013.* Note: the division into three EU regions is similar to Fig. 4.2.1.
Source: own calculations, data from Eurostat (2017).

Farm types are mainly described by their main land use or crop type (e.g. arable crops, organic, deep tillage, heavy irrigation, livestock, etc.). Farm types and production systems differ greatly between MSs and geographical regions (**Fig. 4.2.3**). Arable and dairy & cattle farms are dominant in Northwestern Europe, vineyards, olive farms, fruits, permanent crops are dominant in Southern Europe, arable and mixed farms as well as pig and poultry farms are dominant in Eastern Europe. The share of arable farms has increased and the share of mixed farms has declined in all regions between 2003 and 2013, with the strongest changes in Eastern Europe (**Fig. 4.2.4**). Analysis of the diversity of farm types at Member State level in 2010 (the year of the last agricultural census; **Fig. 4.2.5**) shows that Eastern countries (in particular Croatia, Romania and Bulgaria) hold the highest diversity.

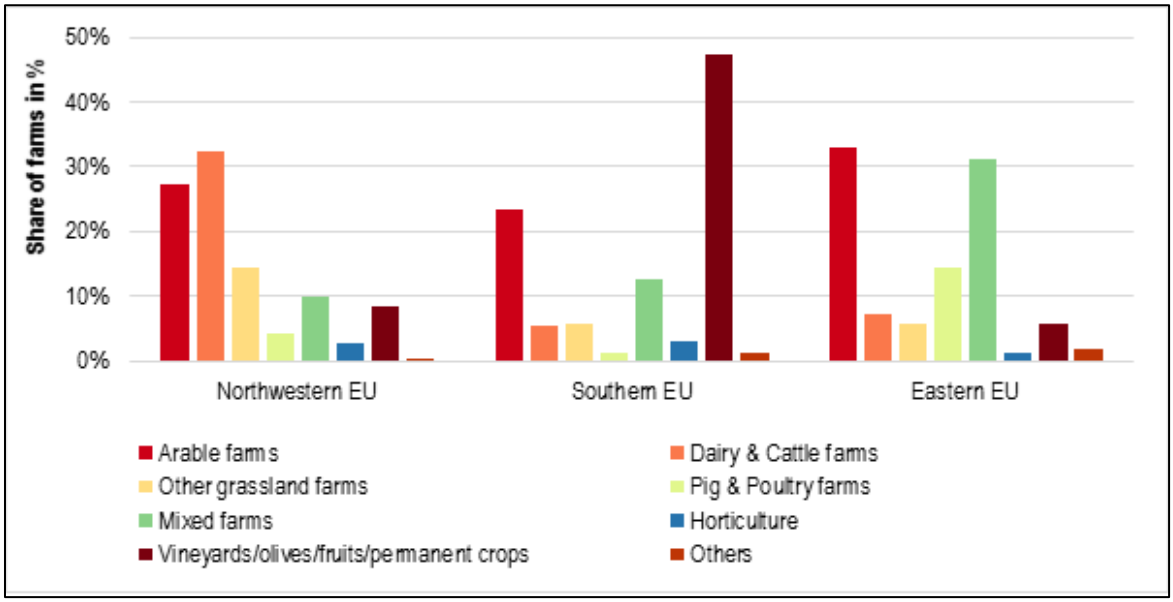


Figure 4.2.3: *Share of farm types in terms of extension in EU28.* Note: the division into three EU regions is similar to Fig. 4.2.1. *Source: Eurostat (2017).*

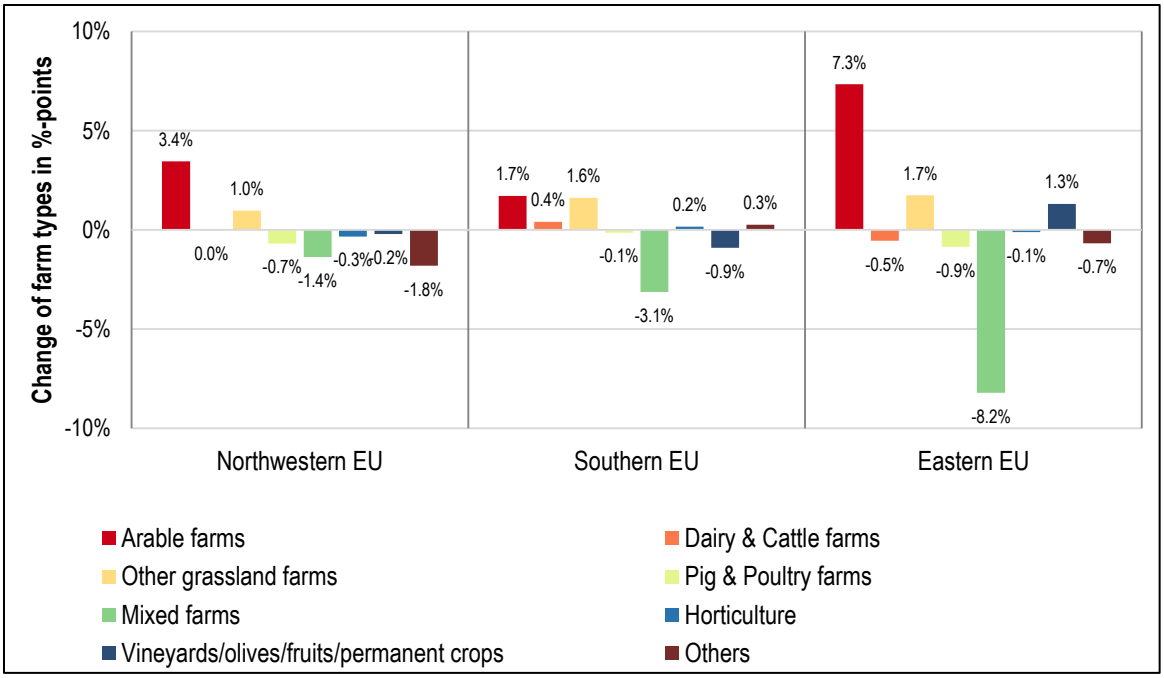


Figure 4.2.4: *Change of the share of farm types within the three European regions between 2005 and 2013 (in % of all farms in the EU28).* Note: the division into three EU regions is similar to Fig. 4.2.1. *Source: Eurostat (2017).*

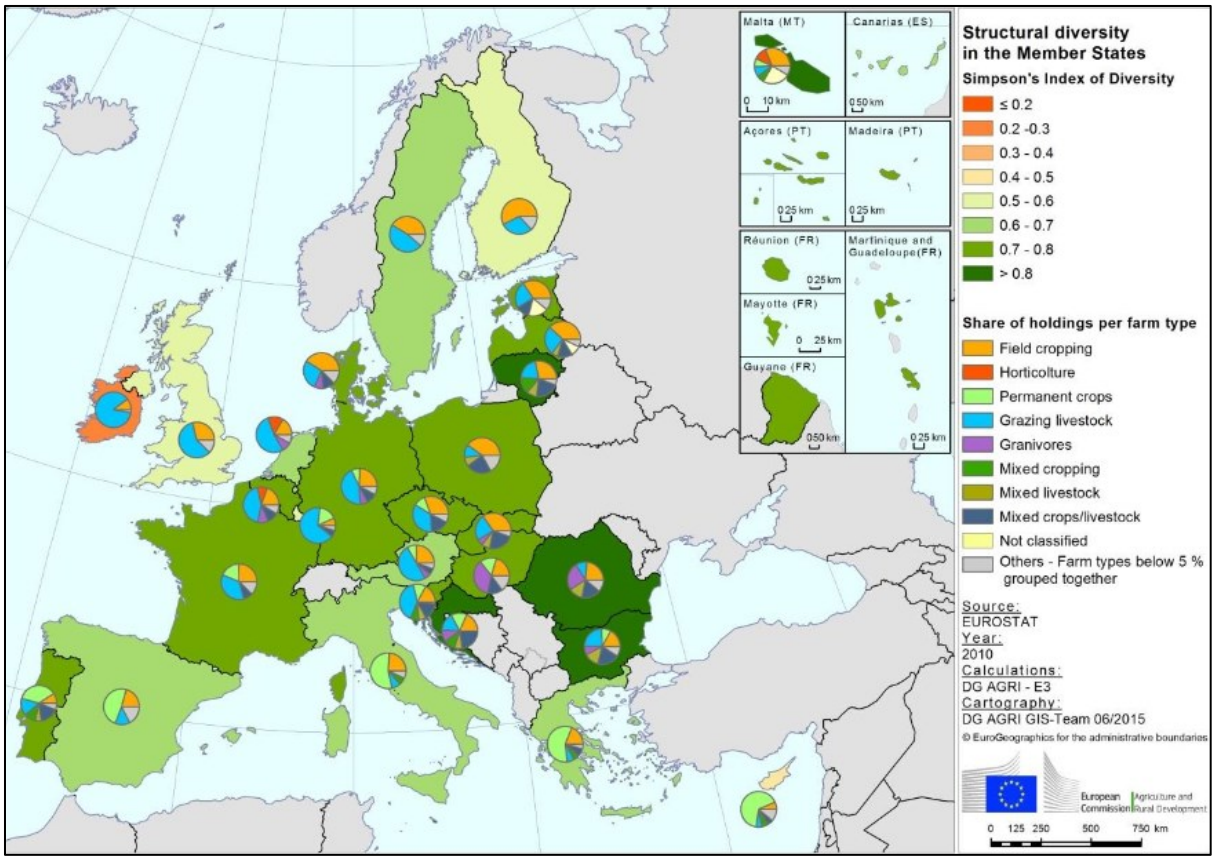


Figure 4.2.5: *Structural diversity of share of holdings per farm type in the EU28 as produced by Simpson's Index with 2010 data. Source: DG Agriculture and Rural Development, Unit Farm Economics.*

Economic farm size also varies significantly among European regions (**Fig. 4.2.6**). In economic terms, most EU farms are small, with 69% having less than 8,000 EUR standard output per year and only 10.6% have more than 5,000 EUR (**Fig. 4.2.7**). Economic farm sizes are larger in Central and Northern Europe, compared to the South and East. For example, the average economic size of farms in the Netherlands was approximately 92 times larger than the ones in Romania. The average standard output per farm between 2005 and 2013 increased by 57% in the EU27. This growth rate was even higher per year in EU12 (+7.2%) than in the EU15 (+5.1%).

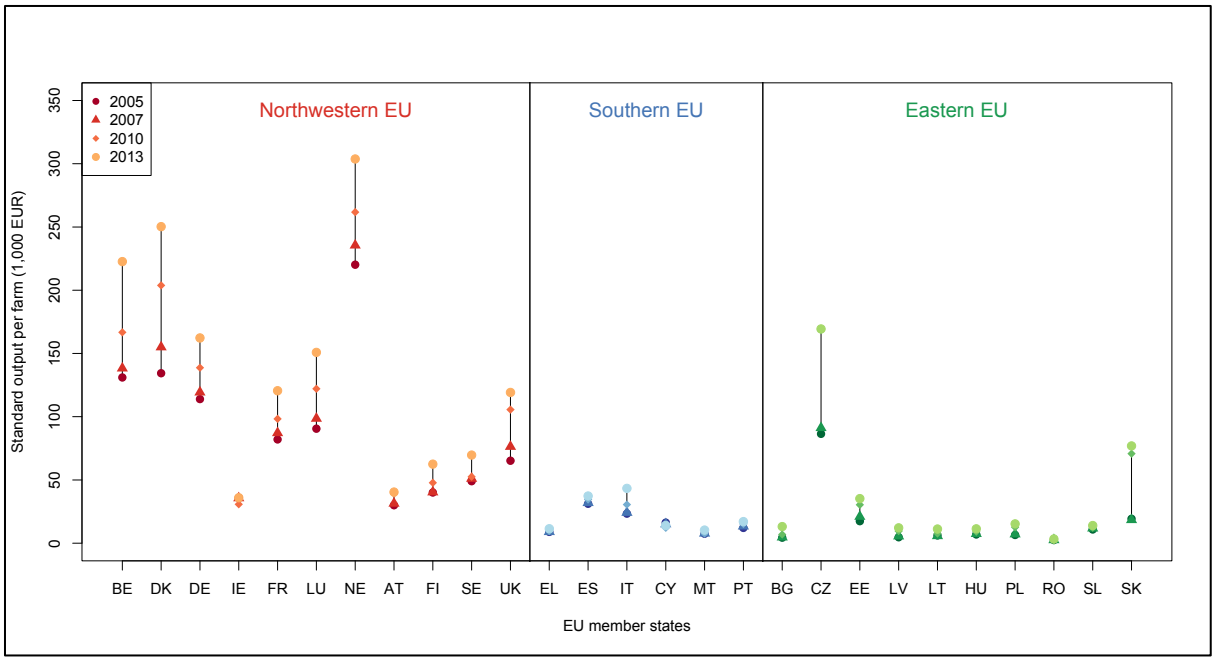


Figure 4.2.6: *Average economic size of farm holdings in 2005-2013 in EU28[2] in thousands of EUR. Source: Eurostat (2017).*

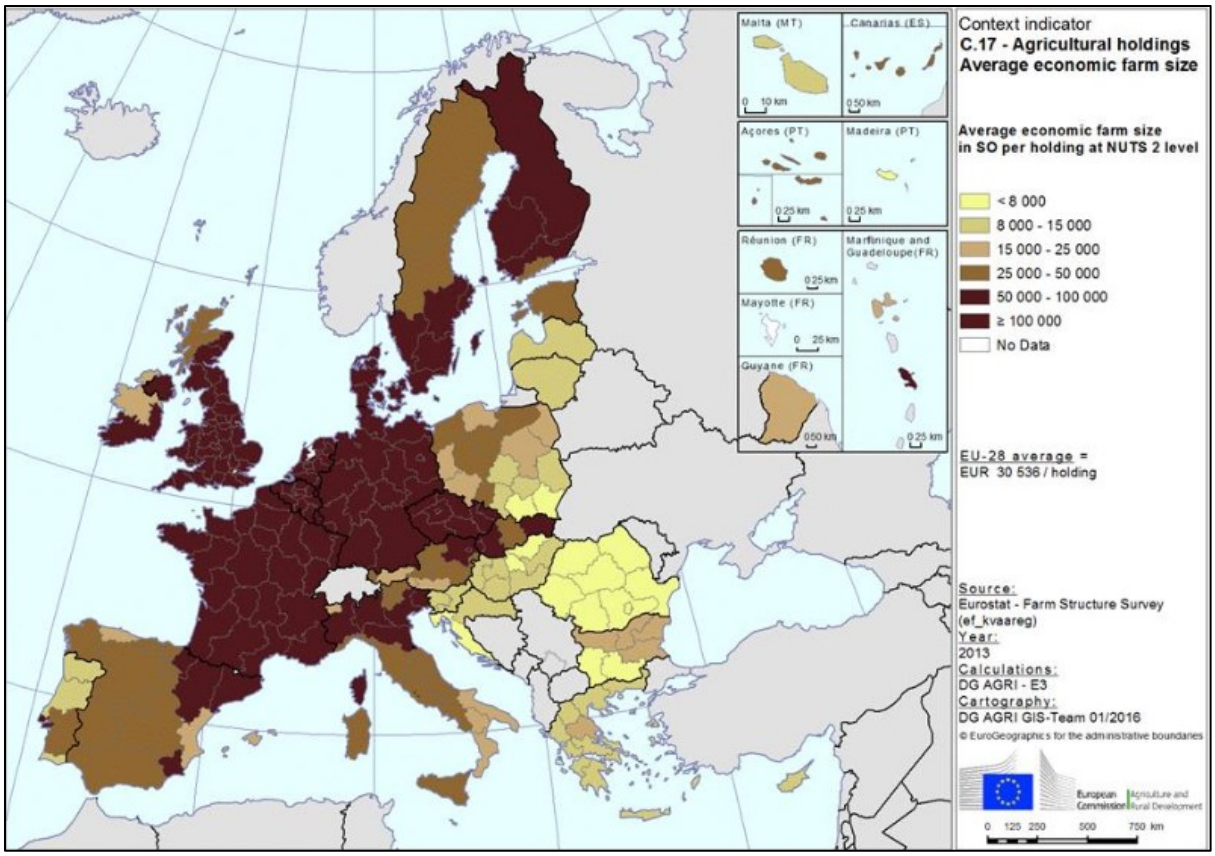


Figure 4.2.7: *Average economic farm size of agricultural holdings in standard output per holding in the EU28 with data from 2013. Source: DG Agriculture and Rural Development, Unit Farm Economics.*

In the EU, f**arming is predominantly a family activity**: 76.5 % of the labour input in agriculture is coming from family farms (Eurostat, 2013). In Ireland, Croatia, Slovenia and Poland, family labour accounted for over 90 % of the volume of work carried out in agriculture (**Fig. 4.2.8**). In contrast, in few MSs non-family labour accounted for a majority of the labour force, e.g. Estonia (59.1 %), Slovakia (72.4 %) and the Czech Republic (74.2 %).

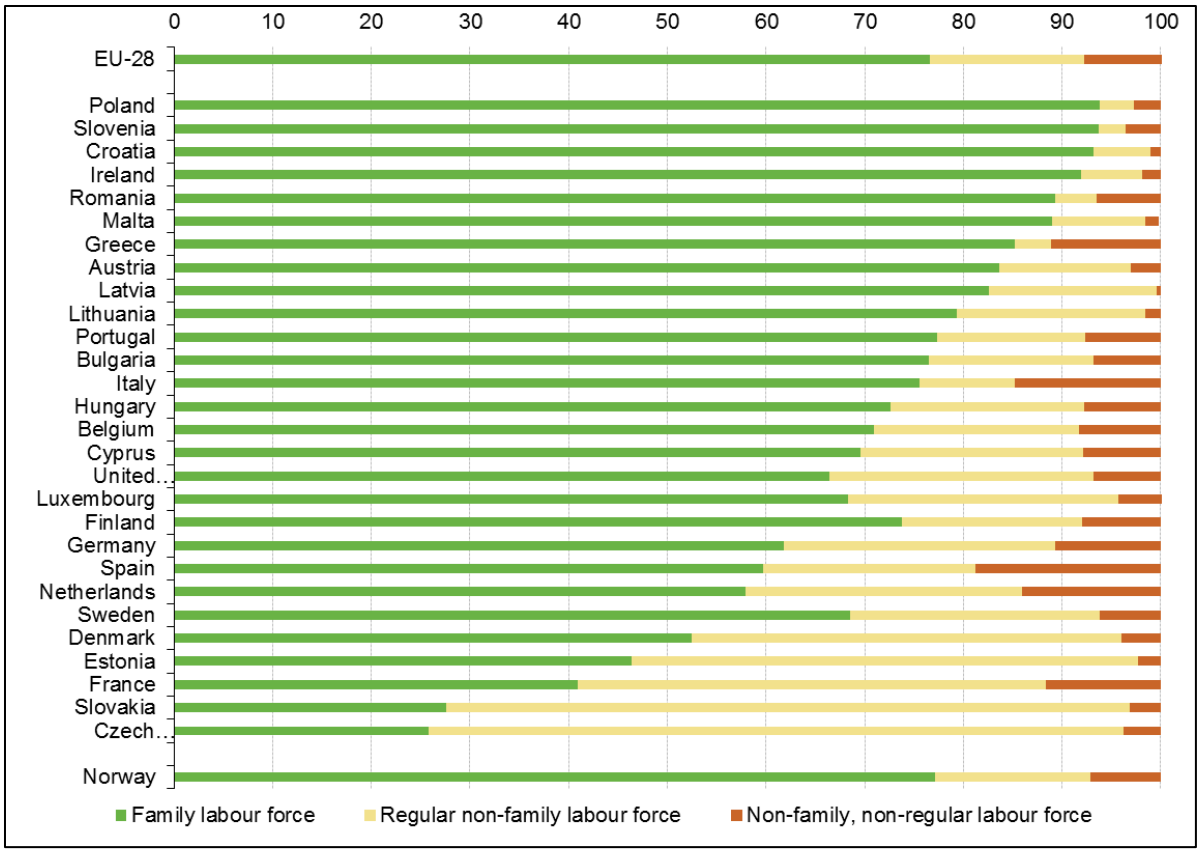


Figure 4.2.8: *Farm labour force in EU based on data from 2013, in respect to labour-force type and different MSs. Source: Eurostat (2017).*

The majority of farmers in the EU is older than 55 years (56 %) while only 6 % are younger than 35 years (Eurostat, 2013). Portugal appears to have the highest proportion of elderly farm managers (>55 years old) while whereas Austria has the lowest proportion. Elderly farm managers tend to work on very small or small farms (measured in economic terms) which are characterised by low levels of income and subsistence households, and they are less likely to have received professional training. By contrast, young farmers tend to manage larger farms (in economic terms), are more likely to have higher levels of education and to have received professional training.

The EU28 farm labour showed a decline of 2.3 million annual work units (full time workers) during the period 2007–2013, equivalent to a reduction of 19.8 % (Eurostat, 2013). The largest decline has been recorded in some Eastern EU countries (50-60 % reduction) while labour decrease in Slovenia and some Western EU countries was less substantial (**Figs. 4.2.9 & 4.2.10**). More than one out of four agricultural jobs has disappeared since 2005 (-25.4 %), with stronger losses during 2005-2010 (-4.1 % per year) than during 2011-2016 (-1.4 %). The greatest reduction was observed in family labour (-33 % for 2005-2016) while hired labour hardly changed. Romania reported by far the biggest losses in agricultural jobs (**Fig. 4.2.11**).

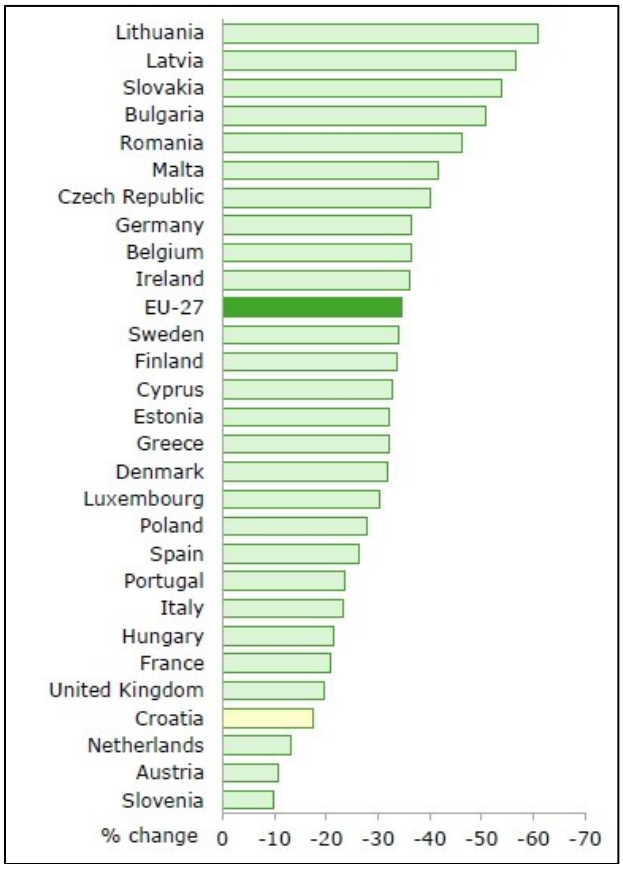


Figure 4.2.9: *Percentage change in number of persons employed in agriculture in EU MS during the period 2000-2012. Source: Eurostat (2017).*

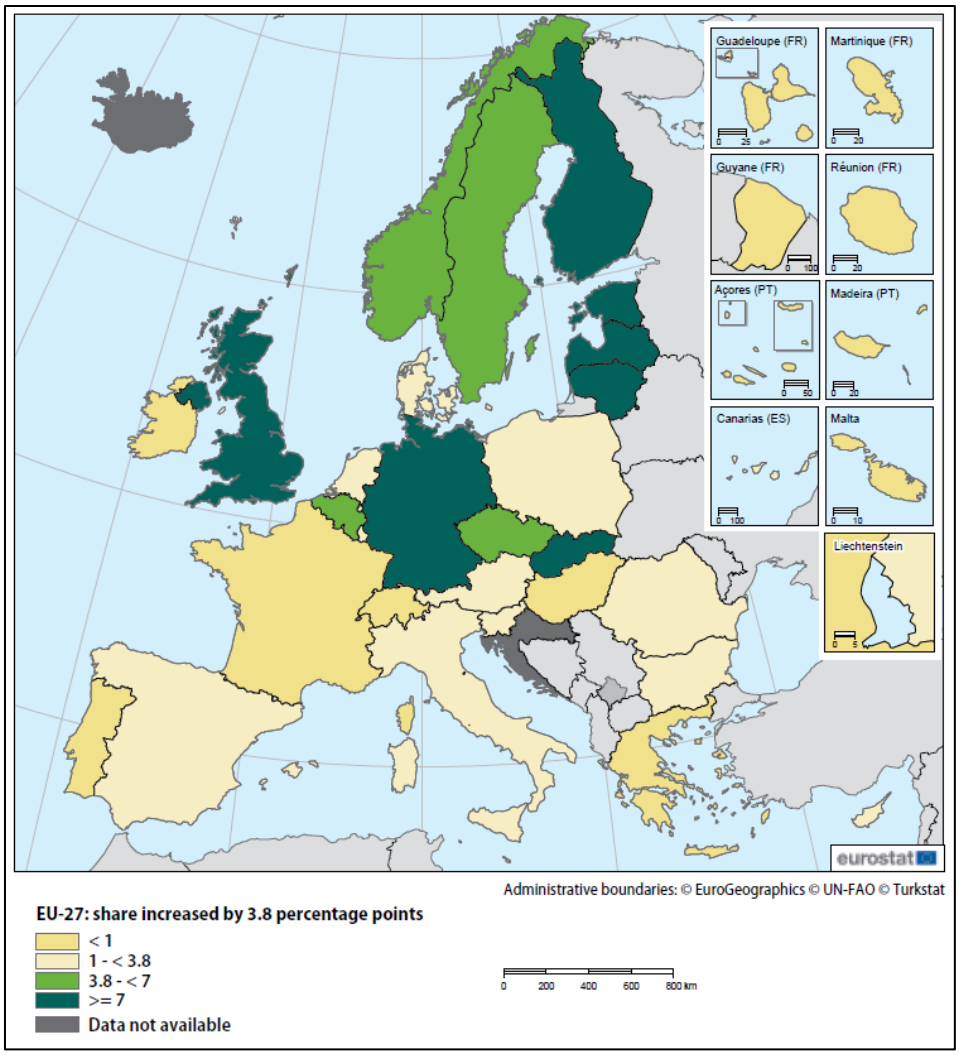


Figure 4.2.10: *Change in the share of directly employed labour force in agriculture during the period 2005-2013, in farms with 50 or more hectares. Source: Eurostat (2017).*

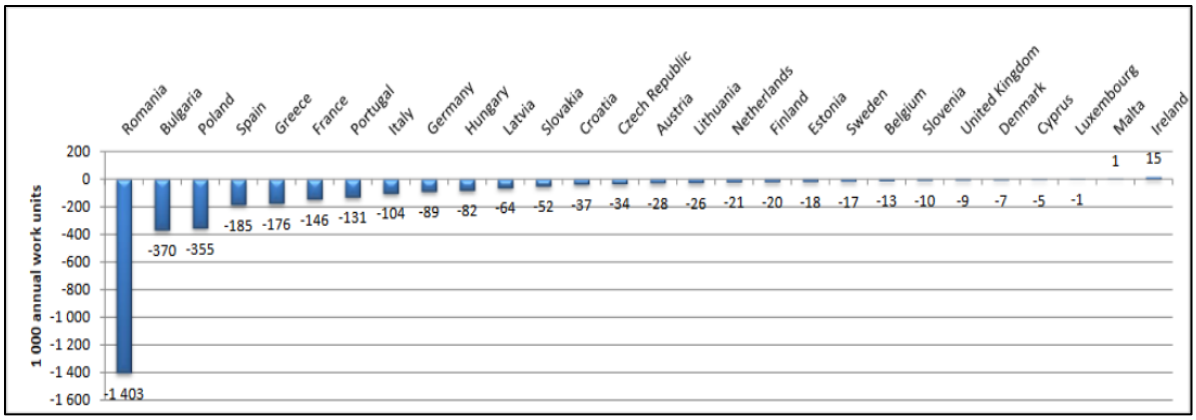


Figure 4.2.11: *Loss of agricultural jobs by each Member State (in 1000 annual work units) during the period 2005-2016. Source: Eurostat (2017).*

4.2.3.2 Results of our literature review on CAP effects on farm structure

Key findings

Although the globalization of commodity markets and CAP reforms clearly contributed to agricultural intensification and the increase in field size, it is difficult to isolate the net effects of the CAP on farm structure. Some evidence suggests that the CAP may have slowed down the speed of changes in farm structure i.e. the increase in farm size. However, the increase in farm size is still ongoing, even in countries where small farms are dominant, and several publications highlight the fact that the CAP still provides insufficient support to small farms. Some evidence suggests that the CAP contributed to the decline of mixed farms. Payments coupled to production had a known impact on farm structure, and decoupling has partially reduced this pressure. However, decoupled payments (i.e. linked to area) implicitly still incentivise farmers to grow more crops and/or more subsidized crops, therefore increasing farm size and reducing crop diversity. This trend is particularly striking in Eastern EU countries, where the proportion of arable farms increased at the expense of mixed farms. CAP effects on agricultural human labour, which has experienced a decrease of 2.3 million annual work units for the period 2007-2013, cannot be quantified.

Although there are many publications on farm structural changes, few of these publications truly study the net effects of the CAP on farm structure, i.e. how the CAP specifically affects structural changes, or how these changes would differ without the CAP. As a result, it is difficult to assess to what extent the CAP contributed to the speed of structural change beyond changes caused by technological progress.

The CAP seems to have accelerated the disappearance of some small farms and/or the growth in size of other small farms, leading to a greater homogeneity in farm distribution among size classes in all single farm payments models, and therefore for the EU27 as a whole (Agrosynergy 2013). One can hypothesize that the increase of payment with farm area (**Figure 4.2.12**) may have incentivised farm size expansion,

and that larger farm-holders may hold higher capital and therefore be more capable of expanding their farms. In that sense, the unequal distribution of direct payments may amplify changes in farm structure. Several publications also indicate an **inadequate support of the CAP with regard to small farms, and mixed small-scale farming**, especially in Eastern EU countries. Several case studies highlight that incentives are insufficient for farmers to maintain mixed small-scale farming (Bezak and Mitchley 2014, Ohlund et al. 2015). Farmers in Slovakia perceived subsidies, not adapted to local conditions, and complicated administration as major challenges, in particular for small farms, and therefore major drivers of recent changes in farm size (Bezák and Mitchley 2014). Surveys conducted in Romania also showed that complex administrative structures are particularly overburdening for a large number of smallholders, who hardly have any means to voice their concerns (Wegener et al. 2011).

Evidence suggests that the effects of the CAP on farm size may vary according to national contexts. For example, some evidence suggests that there was no impact of direct payment on an increased farm size change in France, probably because selling and renting land is restricted on a local level (Piet 2011). In Italy, where farm income concentration is high, CAP payments can also have equalizing effects, i.e. reducing losses of small farms (Ciliberti & Frascarelli 2015). Similarly, **the 2003 CAP reform also contributed to the decrease in small economic farms** (Agrosynergie 2013). In other examples, regional, societal and historical policy models play the strongest role in shaping farm size (Loughery & Donellan 2017).

Some evidence suggests that the CAP may have slowed down the speed of increase in farm size. A combination of surveys and scenarios modelling suggested that the choice to expand farm size appears to be strongly driven by profit maximisation: 26% of farmers would expand their farm size under CAP payments, whereas almost half of farmers would do so under a complete removal of the CAP (Bartolini & Viaggi 2013).

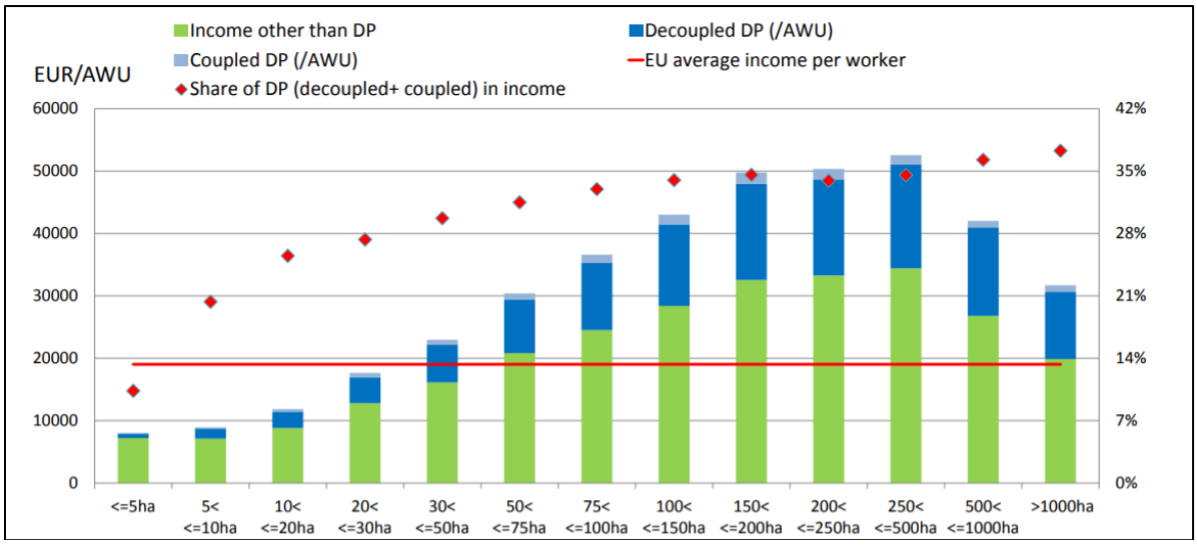


Figure 4.2.12: *Farm income and contribution of DP to it, including share of DP in farm income, divided into farm size classes. Source: DG Agriculture and Rural Development, Presentation: "Did you know that?... Part I". The CAP: have your say. Brussels, 7 July 2017. Data based on FADN.*

The 2003 CAP reform increased farm specialisation, by accelerating the reduction in the number of mixed farms while slowing down the reduction in the number of specialized farms between 2004 and 2009 (Agrosynergie 2013). The decoupling of direct payments increased farmers' decision freedom, therefore favouring a shift towards "easier, less "demanding" crops in terms of production factors, technical characteristics and business effort" (Agrosynergie 2013). Decoupled payments (i.e. linked to area) implicitly incentivise farmers to increase the area and grow more (subsidized) crops, therefore increasing arable crop area and reducing crop diversity. Evidence of this trend is notable especially in Eastern EU countries, where arable farms increased at the expense of mixed farms. This is linked to the permanent increase of the area managed per farm, even in countries with persistence of small farms (Alexandri et al. 2015, Szumelda 2013, Bojnec and Latruffe 2013).

Crop diversification is expected to slow down farm specialization only marginally since only 5% of farms are affected by this measure (Gocht et al. 2017), due to broad exemptions and low requirements compared to actual trends (Pe'er et al. 2014). Middle-sized farms are expected to be most affected. A potentially weak positive effect on crop diversity is expected for dairying specialized farms, which are structured to produce large amounts of maize silage for livestock feed (Cortignani et al. 2015). Simulations based on the rules of crop diversification suggested that 10.7% of German farms would adjust their production scheme, but that 56% of these farms were actually farms producing biogas which would need to reduce their production of maize (Lakner & Holst 2015). These results need to be interpreted while keeping in mind that the CAP is not the only driver of farm types in general, and crop diversity in particular. Indeed, the national policy framework for biogas (the renewable energy act) has been supporting the production of maize for biogas production. This policy was associated with a 82.8% increase in the area covered by maize in Lower Saxony between 2005 and 2010 (Steinmann & Dobers 2013). These results therefore suggest that **crop diversification may actually compensate the negative effects of the national policy framework for biogas production**.

The 2003 CAP reform, in particular decoupled payments, may have contributed to accelerate the decrease in agricultural human labour in the EU (Agrosynergie 2013). The decrease in agricultural human labour, has been more important in Eastern EU countries. However, the fact that decline rates have been more variable and often more rapid in other non-EU Eastern European countries makes the pattern observed in Eastern EU countries difficult to interpret. Several publications suggested that the CAP incentivises the abandonment of traditional agriculture in marginal and low-intensity areas, therefore providing more opportunities for large scale farming which requires less labour (Ciutacu et al. 2015, Bartolini & Viaggi 2013). Moreover, the CAP eased the access of commercial farmers to credit and vertical integration, which were key elements to transform agriculture into agribusiness. Although subsidies may have contributed to the replacement of human labour by capital-intensive technologies by facilitating the purchase or rental of machinery, it remains difficult to assess how much of these changes can be directly attributed to CAP.

4.2.3 Farm management

4.2.3.1 Overall trend on farm management

We primarily analysed changes in agro-chemical and water use, livestock intensity and irrigation.

Total fertilizer use decreased by 56 % in the EU between 1987 and 2007, including a significant decrease in N application per hectare (Good and Beatty 2011). This also appears in FAO global charts (Roser & Ritchie 2017), where the EU is associated with a very important decrease after 1990s in both Nitrogen and Phosphate fertilizer consumption, whereas Asia is associated with continuously increasing fertilizer inputs (**Fig. 4.2.13** and **4.2.14**). Trends in fertilized use however vary between countries and regions. Fertilizer use in cropland seems to have particularly decreased in South-Eastern Europe, whereas it increased in Eastern Germany, Poland, Czech Republic, Central Spain and Northern Italy (Kuemmerle et al. 2016). Pe'er et al. (2014) have also identified decreases in fertilizer use in Southern and Western Europe but increases in new MSs (**Fig. 4.2.15**). **Herbicide use** has been registering an overall stable or slightly increasing trend. **Pesticide use** increased by 17 % in France between 2008 and 2013 (Urruty et al. 2016).

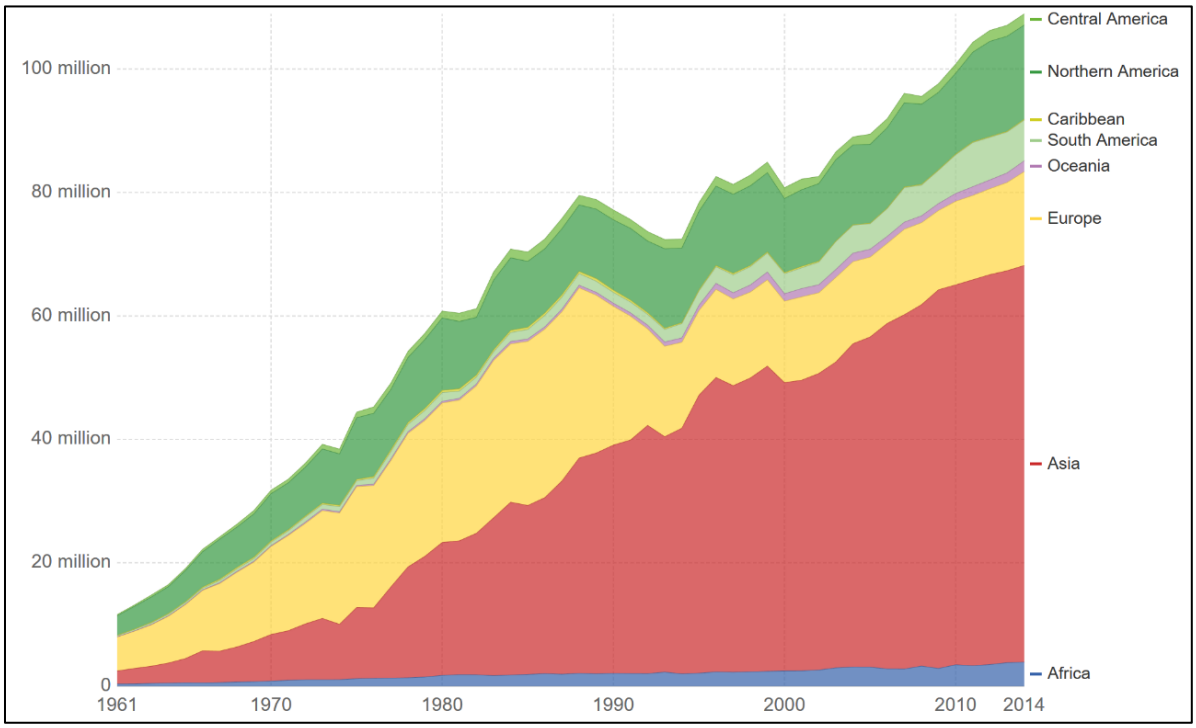


Figure 4.2.13: Global nitrogen fertilizer consumption in tonnes, measured in tonnes of total nutrient per year. *Source: UN Food and Agricultural Organization / FAO (https://ourworldindata.org/fertilizer-and-pesticides/).*

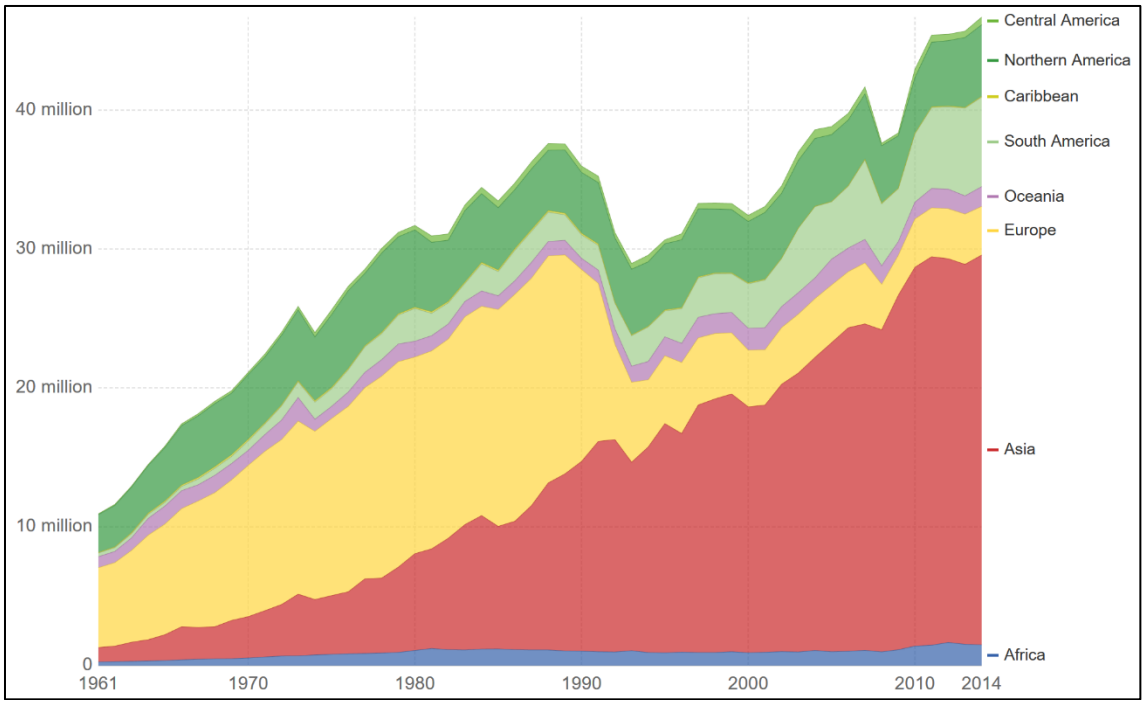


Figure 4.2.14: Global phosphate fertilizer consumption in tonnes, measured in tonnes of total nutrient per year. *Source: UN Food and Agricultural Organization / FAO (https://ourworldindata.org/fertilizer-and-pesticides/).*

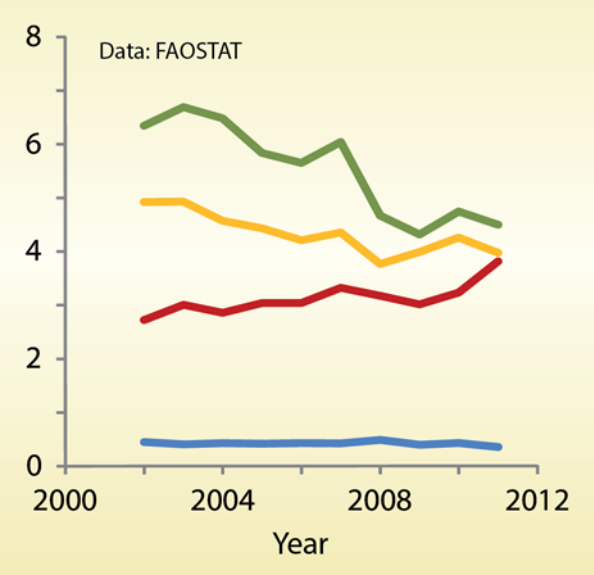


Figure 4.2.15: *Fertilizer use in 10^{12} tons, calculated based on FAO data for fertilizer applied in West, North and South MSs s as well as new MSs. EU is divided into western (yellow), northern (blue), southern (green) and Central and Eastern Europe (new MSs; red). Source: Pe'er et al. (2014).*

Livestock intensity has generally declined across most of Europe, along with grazing land intensity, especially in Eastern Europe (Kuemmerle et al. 2016). The decrease in the number of farms with livestock units (LSU) has been stronger than the decrease in the total number of farms (Agrosynergie 2013). Around 10 % of the EU total Livestock Unit (LSU) is concentrated in larger farms (**Fig 4.2.16**), which are usually less intensive, i.e. lower SLU, than smaller farms, with the exception of Estonia, Slovakia and Finland.

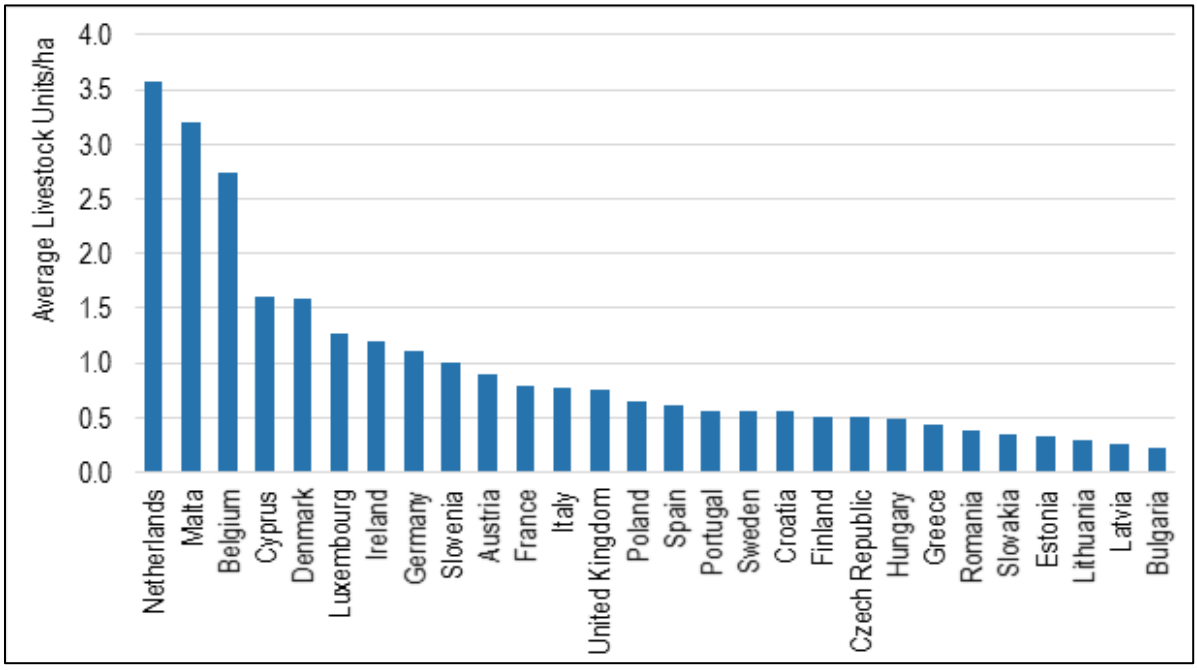


Figure 4.2.16: *Share of LSU of larger farms in % of the total LSU, based on data from January 2011. Source: Eurostat (2011).*

Irrigation has been stable at the EU level in the 2005-2013 period, although with important regional variations. The share of irrigated areas in UAA averaged 6% in the EU28 (Eurostat data for 2013). The highest shares occur in Southern European countries (countries with over 10% include Malta, Greece, Italy, Cyprus, Portugal and Spain; **Fig. 4.2.17). Increases have being highest (up to 10%) in Hungary, Italy and Malta, whereas the decline has been** particularly significant in Greece.

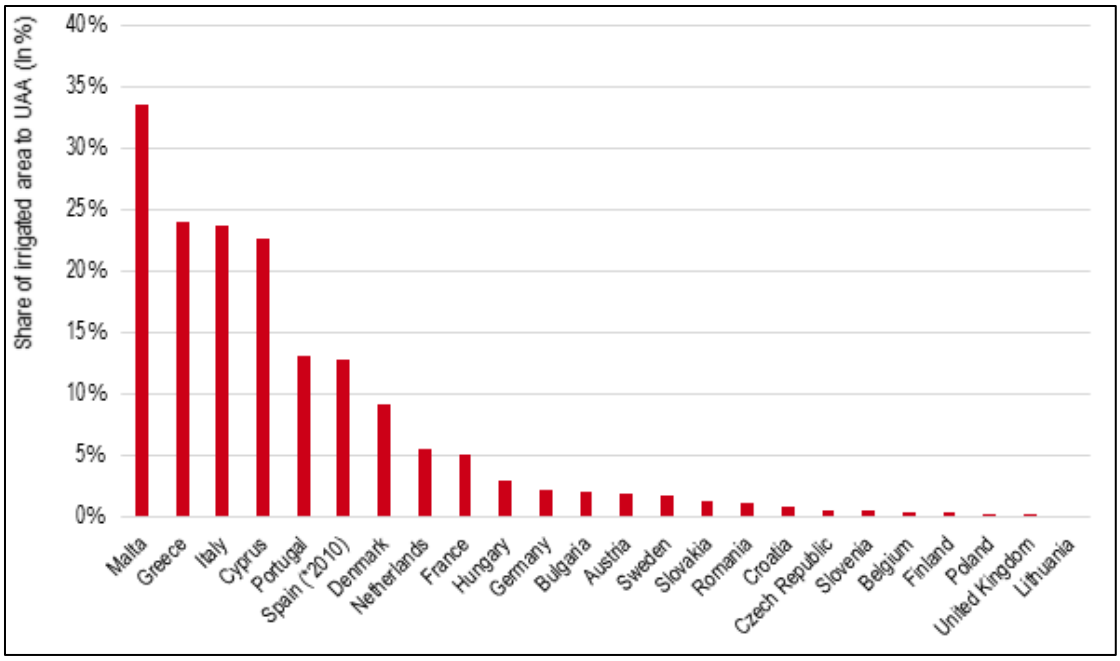


Figure 4.2.17 *Share of irrigated area to arable land (%) in EU MS in 2013. Source: Eurostat (2011).*

4.2.3.2 Results of our literature review on CAP effects on farm management

Key findings

Isolating CAP effects on farm management from other drivers (social, economic and technological progress) remains challenging. The literature, often based on modelling and simulation, provides contrasting evidence on the CAP's effect on farm management, indicating mixed effects, i.e. either neutral, positive or negative effects. On one hand, the CAP provides financial means for intensification, including an increase in agrochemical use, especially in new MSs, and more irrigation. On the other hand, the CAP also limits agrochemical and water use by regulations and financial incentives like AECM. Several studies however highlight that isolating CAP effects from other drivers (social, economic and technological progress) behind the observed change in structures and farm management trends remains difficult. Evidence suggests that the CAP significantly contributed to the intensification of livestock farming.

Several studies suggest that there may be no effect of the CAP on agro-chemical inputs and water use, suggesting that the CAP may only be supporting existing trends. A study based on modelling suggested that farmers of nine EU countries would carry on current trends of decreasing agro-chemical inputs and constant water use under a CAP abolition scenario, with stronger decreases in

farms receiving more than 5000 Euro per year via SFP/SAPS (Giannoccaro & Berbel 2013). Surveys conducted among 1328 farmers across 11 MSs similarly indicated that farmers' behaviour and management would not be affected strongly if CAP was to be abolished (Giannoccaro et al. 2011, 2013, 2014). Interviews within a continuous long-term CAP implementation scenario suggested that farmers appear to decrease fertilizer and pesticides' application further, and keep constant the irrigation schemes (Viaggi et al. 2013).

Some studies indicated a negative effect of the CAP on agro-chemical use. Simulation analyses suggested that reducing direct subsidies at various levels would have a positive effect on methane and N2O emissions reduction and nutrient surplus reduction (N and P), indicating a negative effect of the CAP on emissions and nutrient use (Sieber et al. 2013). Similarly, by analysing the link between payment levels in different EU member states and corresponding values of agri-environmental indicators, Lotman et al. (2017) found that higher payments are correlated with higher nutrient surpluses, bigger use of mineral nitrogen, higher livestock densities, bigger ammonia- and greenhouse-gas emissions, and use of more pesticides. In Scotland, Mouratiadou (2010) attributed the increase in average N use levels to land use changes triggered by the 2003 CAP reform and increased crop prices.

Some studies indicated a positive effect of the CAP on agro-chemical use. Simulation analyses suggested that reducing direct subsidies would result in the increase of pesticide applications, indicating a positive effect of the CAP on pesticide use reduction (Sieber et al. 2013). Modelling work suggested that the CAP abolition would trigger an increase in agro-chemical inputs use in new MSs (Giannoccaro & Berbel 2013). Finally, AECM seem to be associated with lower fertilizer levels (Wall & Dillon 2017).

Finally, other studies highlights that isolating CAP effects on agro-chemical use from other drivers remains extremely challenging. A large proportion of the decrease in total fertilizer use between 1987 and 2007 in the EU (56 %) may be primarily due to EU producers now being required to provide detailed N farm balances (Nitrate regulation) to receive subsidy payments, but also due to the successful implementation of nutrient reduction programs by developing best nutrient management practices (Good and Beatty 2011). Processes influencing changes in pesticide use between 1989 and 2013 in France vary depending on the period considered. They result from the influence of public regulations, notably the compulsory set-aside policy in force during the 1990s, as well as changes in market conditions, particularly high prices for cereal grains at the end of the 2000s (Urruty et al. 2016). The 17 % increase in pesticide use observed in French between 2008 and 2013 correspond to substitutions between crops with similar per-hectare pesticide use intensities, and/or to substitutions with counterbalancing impacts on these intensities. The decrease in agro-chemical use observed in an Italian rural region seems to be associated with the decoupling of CAP payments (2005-2007), which resulted in smaller farms and farms located in mountainous areas associated with lower levels of agrochemical use (Bonfiglio 2011).

There is some evidence that CAP contributed towards a higher share of irrigated land, as many supported crops are water demanding (Lefebvre and Gomez, 2012). For example, in the Mediterranean region, CAP has contributed to the increase of olive production using a greater amount of mechanization and irrigation (OECD, 2010; Lefebvre and Gomez, 2012). On the other

hand, the environmental component of CAP tries to reduce water consumption (e.g. GAEC standards, RDP, AECM).

Evidence suggests that the CAP contributed to the intensification of livestock farming at the local level (e.g. Lefebvre et al. 2012). The number of livestock units has generally increased in FADN constant sample livestock farms with UAA, both specialised and mixed farms, in EU15 (Agrosynergie 2013). This trend can be related to the decoupling of payments: although the direct influence of the CAP on production choice via coupled payments disappeared with decoupling, farmers choose the most profitable system (often cattle) resulting in a higher animal density. In Denmark, CAP payments for grassland were insufficient to compensate for the loss in direct payments for cattle farming, resulting in an increase in large-scale pig farming, with an impact on environmental emissions and nitrogen losses (Happe et al. 2011). The reforms of CAP in Ireland (with decoupling of direct payments, extensification programs and the nitrate directive) have had a major influence on land use and livestock densities leading to a decline in livestock units from 1998 to 2006 (Humphreys 2008). Finally, re-coupled direct payments for cattle production[11] indirectly incentivised increased grazing intensity in Portugal (Guerra et al. 2016).

4.3 Effectiveness: Socio-economy

In the following sections, we present the results of our assessment from the most general to the most specific and local outcomes. We structure these sections around topics that were derived from the CAP-objectives of 1957/2009 and the new objectives of 2010. Each section starts with overall trends (whether or not these are determined by the CAP), continues with a brief summary of key findings of our literature review on CAP effects, and then develops more detailed results of our literature review on CAP effects. Detailed results first present reviews and key publications at a broader scale and higher overall relevance to the CAP assessment, followed by the outcomes from more specific case studies and/or CAP instruments.

4.3.1 Growth of agricultural productivity

Question: Have CAP measures affected changes in, or incentivised, Growth of agricultural productivity and competitiveness?

Relevant CAP objectives: Article 39a and b, and 2010-priority 1 (viable food production)

Relevant SDGs: 2 ("…achieve food security") and 8 (Decent Work and Economic Growth)

Number of publications scanned: 20

[11] As part of the re-coupled direct payments after the CAP-reform 2013.

4.3.1.1 Overall trends on agricultural productivity

Economists attempt to measure productivity using the concept of total factor productivity (TFP). Productivity growth in Europe has been moderate over many decades in comparison to e.g. North America or Oceania. The statistics show that there has been an increase during the last phase between 2004 and 2013. The growth of TRP[12] in the EU during the period 2004-2013 was 0.02%, namely insignificant, and substantially smaller than in other regions of the world (**Fig. 4.3.1**, see also: OECD 2017).

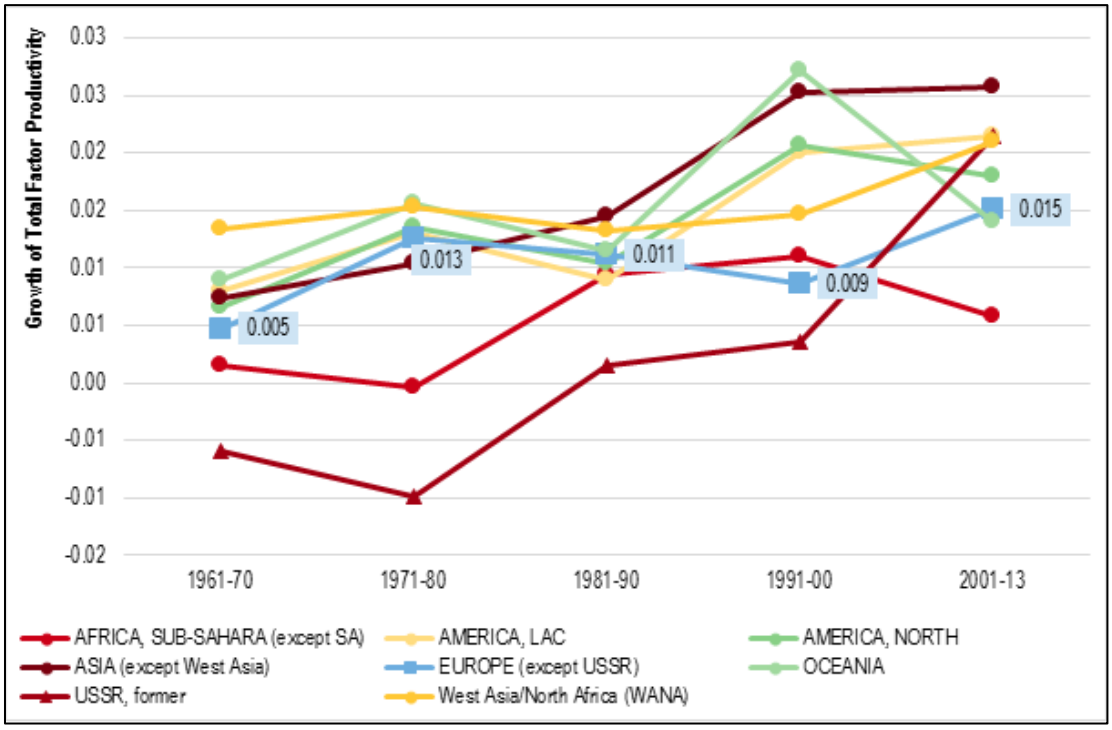


Figure 4.3.1: *Growth of Agricultural Total Factor Productivity (TFP) for different geographic regions 1961-2013, the growth of TFP expressed as index-number with 1960 = 100%. Source: USDA (2016).*

[12] The 'Total Factor Productivity (TFP)' analyses the change of outputs relative to the change in input-factors.

4.3.1.2 Results of our literature review on CAP effectiveness on agricultural productivity

> ***Key findings***
>
> Through the MacSharry-reform (1992), the Agenda 2000-reform (1999) and the Fischler-reform (2003), the EU has constantly reduced the level of market- and production-distortion through the CAP. The OECD's *'Producer Support Estimate (PSE)'*[1] has decreased from 39% of farm income in 1986-88 to 20% of the farm income in 2014-16. Also the share of the '*Potentially most distorting support as % of PSE*'[1] from the OECD has been reduced in the same time period from 92% (1986/88) to 27% (2014/16) (OECD 2017: pp. 104). These trends indicate a successful historical reduction of the production-distortion effects of the CAP through the reform path since 1992.
>
> The CAP still has an influence on productivity and efficiency of farms, but with diverging effects. Out of 20 studies, ten evaluated the effect on productivity as negative, six as positive and four studies found mixed effects. The empirical literature shows that the DP still influence productivity-growth, despite the fact that they are now mostly decoupled from production. After the decoupling of direct payments following the Fischler-reform in 2005, farm productivity has overall increased. This increase can be partly explained by an improved allocation of resources used on farms, and a reduced distortive effect of subsidies in comparison to the policy prior to 2005. Direct payments still influence input choice, capital formation and credit access.
>
> The allocation and production decisions are still influenced by direct payments. Land markets are distorted by direct payments as well, and farmers' decisions are clearly influenced by these payments. Therefore, there is still an influence of the CAP on productivity and efficiency, but the long term trend during the reform-phases of the CAP seems rather positive. Despite the increasing effect on productivity, direct payments still have a negative effect on farm efficiency, which might outweigh the positive effect.

We analysed changes in farm productivity and technical efficiency, since both are dimensions of the stated objective of improved productivity growth in Article 39 (1)b. We analysed 20 studies on productivity and technical efficiency, of which 10 indicate a negative impact of the CAP, 6 a positive and 4 a mixed or neutral result.

The literature on the impact of decoupled DP on productivity shows mixed outcomes, although trends are positive in most cases. Rizov et al. (2013) showed that coupled DP had a negative effect on farm productivity in 13 of 15 EU-MS. According to the same study, their effect became more nuanced after decoupling in 2005–06: the influence became positive in 9/15 EU MS but remained negative in 5 of 15 EU MS, although with a less negative coefficient i.e. a slight improvement as well. Overall, the decoupling incentivized a higher productivity level in all modelled MSs (Rizov et al. 2013). In the same line, Kazukauskas et al. (2010) found that decoupling increased productivity of Irish dairy farms by 7.2%. Kazukauskas et al. (2014) found a positive impact of decoupling on productivity in two of eight farm groups. These contrasting outcomes indicate a mixed effect of subsidies on

productivity, depending on the farm type and country. However, in most cases, decoupling had a positive impact on productivity.

There is strong evidence that DP reduce technical efficiency. A meta-study of 195 field studies found an overall negative effect of direct payments on Technical Efficiency (TE; Minviel and Latruffe 2017). Their estimated coefficient of direct payment was -0.58, with studies before the decoupling in 2003 being more likely to show a negative impact of subsidies. Similar results were found by single studies (e.g. Latruffe et al. 2017; Latruffe and Desjeux 2016; Zhu et al. 2012). Examining the impact of direct payments on TE in 9 Western EU member states (old MS), Latruffe et al. (2017) found a negative impact in two states, a positive impact in three states and no significant impact in four. Negative effects of subsidies on TE were found for farms in France (Minviel and Witte 2017), Hungary (Bakucs et al. 2010), organic farms in Greece (Nastis et al. 2012) and Germany (Lakner 2009; Lakner et al. 2012), and farms of different size classes in Slovenia (Bojnec and Fertö 2013).

The decoupling of DP following the Fischler-reform in 2003 increased farm productivity but reduced farms' technical efficiency. The present assessment does not aim at evaluating which of the two effects (productivity growth vs. efficiency reduction) is stronger. The literature points at different mechanisms through which subsidies might influence productivity and efficiency. First, subsidies influence the choice of input. For instance, coupled DP have been shown to lead farmers to substitute labour with inputs in Norway (Henningsen et al. 2011). Kazukauskas et al. (2014) also find that subsidies influence the degree of specialization, but in different directions depending on country and farm type. Second, subsidies influence the demand on land market. Bartolini and Viaggi (2013) found an increased demand for land by farms receiving a higher level of direct payments. Their model shows that direct payments in Eastern Europe and Germany/France/Holland lead to a higher willingness to rent or buy more land. The capitalization of DP into land rents has been shown also by other authors (Breustedt and Habermann 2011; Ciaian and Kancs 2012). Finally, subsidies influence capital formation. Direct payments can enhance capital formation and help overcome short-term credit constraint. However, Ciaian and Swinnen (2009) show that the gains of productivity and income might be outweighed by increased land prices. Some studies highlight the need to take into account environmental dimensions when assessing productivity and efficiency. Indeed, Aldanondo-Ochoa et al. (2014) and Sipiläinen and Huhtala (2013) showed that productivity or efficiency tend to change if environmental variables are included into the model. In both studies, the inclusion of environmental variables into the model indicate that environmental-friendly farming systems (organic farming) performs substantially better. It is important to highlight the situation in new MSs, where mixed results of AECM are associated with complex socio-economic trends relating to agriculture in general and the accession to the EU in particular. Bezak and Halada (2010) report an overall decline in agricultural area (cover and employment). While implementation of the CAP (including AECM) benefited some abandoned areas, some others remained out of reach or effect due to various factors like remoteness, weak social capital, or competition with large farms (Bezak and Halada 2010).

Decoupling successfully reduced the distorting effects of the CAP on production, as indicated by the substantial decline of the OECD's "Producer support estimate" (PSE). However, the EU Commission has partly reversed this long-term trend by introducing recoupling in the 2013 CAP-reform. The

provision of more flexibility to MSs with respect to decoupled versus re-coupled support, has resulted in a slight increase in the subsidies linked to production in 2016 (OECD 2017: 103; see also section 4.6, 'internal coherence').

There are still some **limitations in the literature**. For instance, the link between decoupled direct payments and production decisions, which reduces the efficiency of markets, is based on the assumption that the decoupled direct payments are used in farm businesses and not as additional family income. Empirical results might change if DP were partly used for private consumption, but there is little evidence on the extent of this. And there are too little studies, including the environmental dimension of productivity.

4.3.2 Fair standard of living for farmers

Question: Have CAP measures affected changes in, or incentivised fair standard of living, individual earnings or viable farm income?

Relevant CAP objectives: Article 39a

Relevant SDG: 1 (no poverty) and 8 (Decent work and economic growth). For well-being in the broader sense, see section 4.10.1 (SDG 3).

Number of publications scanned: 54

4.3.2.1 Overall trends on fair standard of living for farmers

A common assumption is that issues relating to farmers' standard of living are best addressed by targeting farmers' income, since, if not supported by the CAP, the income would be lower than the average income in the EU. This assumption is seemingly supported by the fact that, even with the support of DP, the average agricultural income in 2008 was 58% of the average wage in the EU (European Commission 2011, p. 31). However, these figures ignore non-farm income of farm households, which, when considered, indicates farmers not to be a particularly low-income sector (Hill & Bradley 2015). This section therefore focuses primarily on income support.

This section also analyses the share of agricultural labour. The main driver of structural changes in agriculture labour is a) value added and b) technological progress inside and outside agriculture. In a longer-term perspective, the growth of value added outside agriculture was higher, resulting in higher wages in the industry and the service sector. Higher wages in the industry and the service sector attracted farmers to quit farming and leaving the agricultural sector (pull-factors). On the other hand, technological progress within the agricultural sector leads to increasing farm sizes and is therefore releasing labour forces (push-factor; see Balmann 1996 or Brandes 2000 for a theoretical overview). In 2010, around 10 Mio. persons were employed in the agricultural sector in the EU, i.e. 5% of total employment in the EU. Adding other labour sources, i.e. including employed workers, part time farmers and seasonal workers, this number raised to around 22 Mio. persons (Eurostat 2017, EU Commission 2013c). A global and long-term trend which relates to industrialization in general, is a decline in agricultural labour (and hence employment. Many full-time jobs disappeared: 4.8 million full-time jobs were lost in the period between

2000 and 2012, 93% were non-paid jobs and 70% were lost in new MSs (EU Commission 2013). The initial level has been lowest in United Kingdom, where following the early industrialization and trade orientation, the labour forces in agriculture were already at a low of 3.3% in 1969 (**Fig. 4.3.2**). In other western and northern European countries, the level was similar in 1969. In southern European countries like Greece, Italy or Spain, the share of labour forces in agriculture was higher at the end of the 60's (**Fig. 4.3.3**). After the accession to the EU, it further declined. The same is true for eastern European countries, with the exception of Romania, where it increased in 1990 and started to decline again at the beginning of the 2000s. This development is explained by the further industrialization of respective countries and is largely independent of the EU-membership, since the same pattern is observed in Switzerland, Norway and the Ukraine.

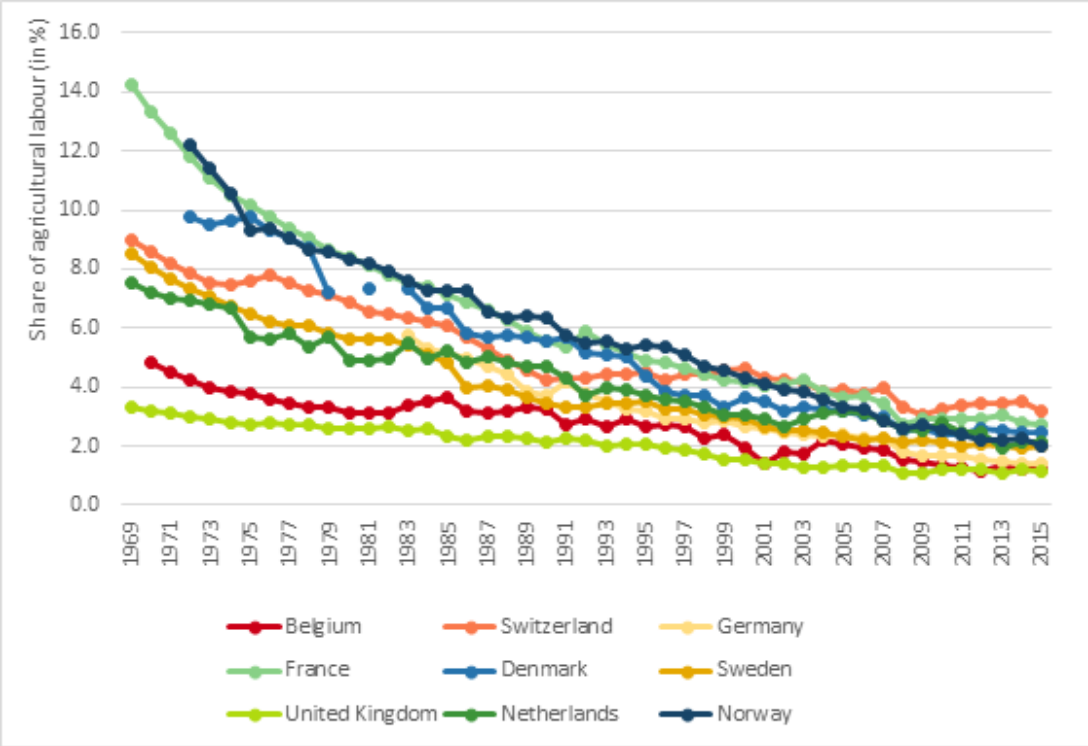


Figure 4.3.2: *Employment in agriculture since 1968 in Western Europe as share of total employment. Source: data from the World Bank, 2017; Figures are in per cent; Norway and Switzerland are used as reference points for non-EU countries, i.e. without CAP.*

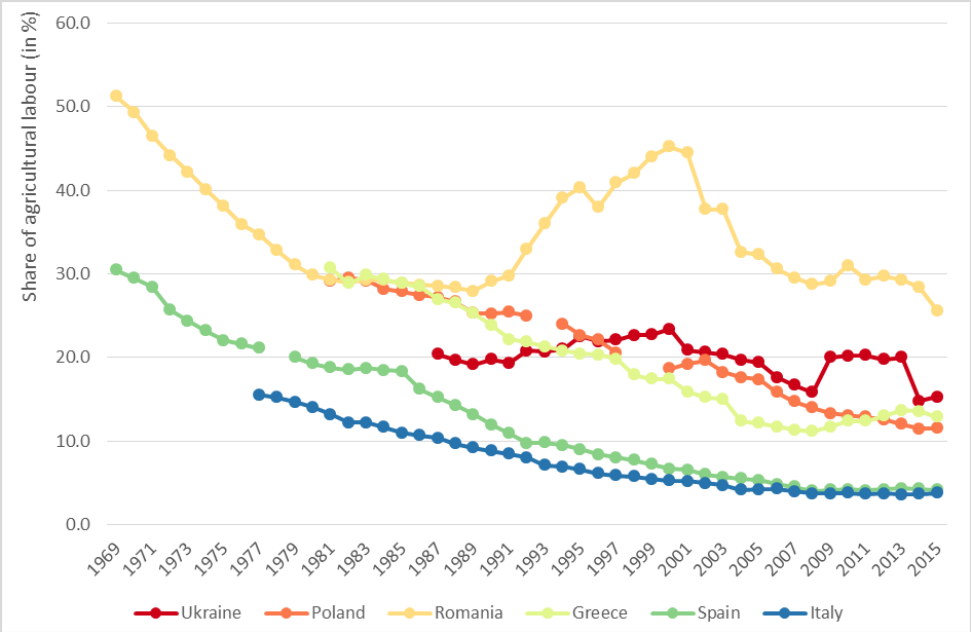


Figure 4.3.3: *Share of employment in agriculture since 1968 in Southern and Eastern Europe. Source: data from the World Bank, 2017, figures are in per cent. Norway and Switzerland are used as reference points for non-EU countries, i.e. without CAP.*

4.3.2.2 Results of our literature review on CAP effectiveness on fair standard of living for farmers

Key findings

The EU direct payments are still regarded primarily as an income support instrument for farmers. This is, to a smaller extent, also the case with payments from Pillar II, e.g. with some AECM or with payments for natural constraints. However, the literature review focuses mainly on the effects of Pillar I payments on farm income. The evidence based on 54 publications indicates that without the CAP, indeed farm income would be lower and variability over time would be higher. There are indications that DP have kept farmers from pursuing more profitable activities within and outside of agriculture. However, this effect has likely decreased as a result of decoupling.

The literature also indicates that performance assessment of the CAP is insufficient in terms of the clarity of objectives and indicators with respect to the CAP effects on farm income and well-being.

4.3.2.2.1 Incomes in agriculture

To inspect the link between Direct Payments (DP) and farm profit, we first examined the share of DP in farm profit („net value added"; **Fig. 4.3.4**). DP contribute on average a share of 25.7% of farm profit,

based on 2007-2013 data, and between 20 and 30% in most countries. One may expect higher contributions of DP where farm income is lower, and such a general trend can indeed be seen. However, the outcomes are quite heterogeneous: in some countries (e.g. Slovakia, Ireland, Slovenia and Sweden) this share is above 40%, while it is very low in countries like the Netherlands, Cyprus and Italy. While these results are based on averages per country, the strong visible variation indicates limited effectiveness in allocating income support so as to compensate for lower profits (and hence risks).

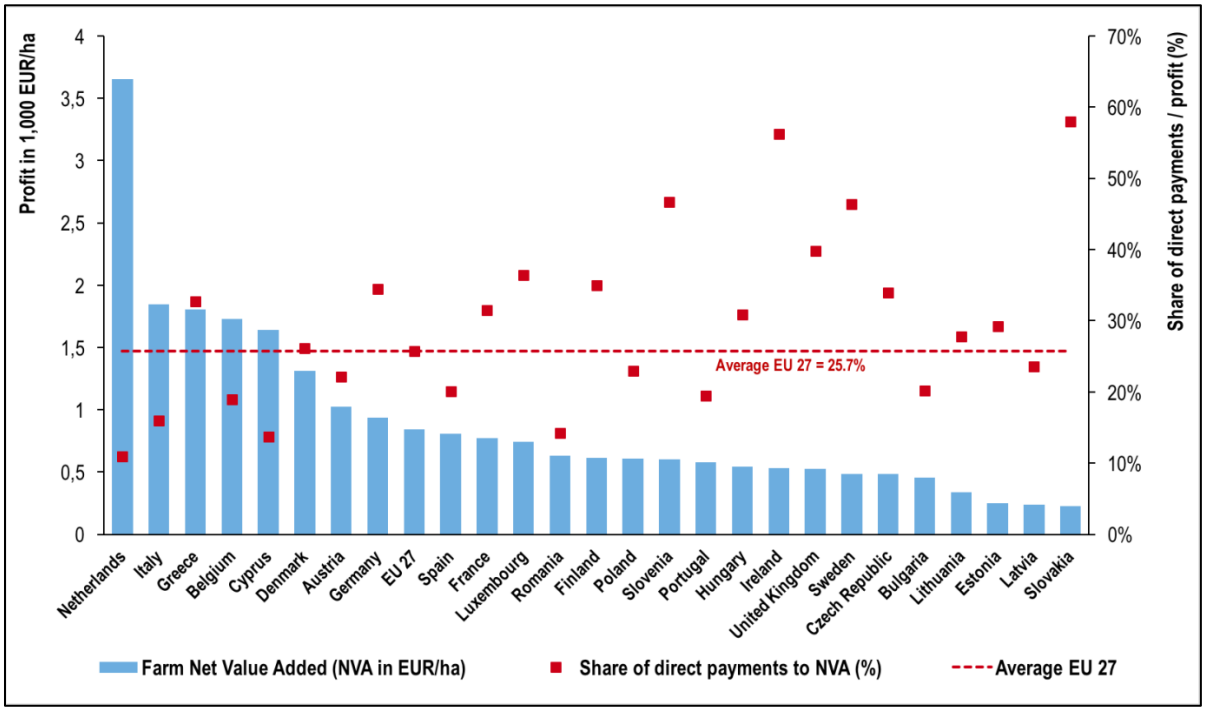


Figure 4.3.4: *Farm profits (Euro) and share of direct payments in share profit (%) for the years 2007-2013. Source: own calculations, data from Farm Accounting Data Network (FADN).*

The literature on income is heterogeneous in methods and indicators, but generally indicates that DP had a positive effect on farm income (OECD, 2011; Agrosynergie 2011; Severini et al., 2016; Soliwoda, 2016; Poczta et al., 2012; Deppermann et al., 2014; European Commission, 2011). According to a simulation done by Agrosynergie (2011, p.249), the weighted average farm income (2004-07) would have decreased by 27% if direct payments had been removed. A somewhat similar number is reached by Deppermann et al. (2014) when simulating the income effects of the CAP measures for farms in western Germany for the year 2020 based on the period 2006-2008. The simulations predict that an abolishment of direct payments would cause a 19.7% reduction in farm income. The impacts of EU accession were analysed e.g. in Poland (Poczta et al. 2012), indicating real farm income to have doubled from 2004 to 2009, mainly due to subsidies paid under the CAP. Another main component of agricultural revenue represents market returns which comprise a total of 86% of FADN Total Output for the EU-27 and are actually driven by quantity of output and price. Apart from relative stable yields, crop prices have

fluctuated considerably during 2005 - 2012 period, and there is no doubt that DP have played a major role in income evolution. The importance of these income components differ by farm type (Hill & Bradley 2015). However, Matthews (2017) argues that the dependency of farmers on DPs is overestimated, since much of the support leaks to non-target beneficiaries (e.g. landowners). Matthews (2017) also highlights that farm support and income calculations currently poorly reflect the overall income of farm families and farm households including non-farm incomes (and hence, important aspects of income diversification), as well as actual on-farm workers, with little or no evidence as to how much such workers benefit from the CAP payments. In addition, Matthews (2017) and other authors highlight that the distribution of DPs poorly favours low-income farmers (see also section 3.3, "efficiency"), thus impeding the contribution both to Objective 39a and to SDG1.

Evidence suggest that the CAP reduced income volatility but also decreased farmers' aversion to financial risks. The agricultural sector is especially prone to income risk, due to the multitude of environmental factors that are beyond farmers' control. Spicka et al. (2009) found that CAP subsidies paid to Czech farms reduce income volatility directly and indirectly, since subsidies can be used to invest in risk mitigating technologies. In a study from Italy between 2003-2012, Severini et al. (2016) detected an income stabilizing effect mainly because DP are less volatile than market income. Agrosynergie (2011) also concluded that CAP subsidies have income stabilizing effects and that the income volatility, especially of small farms, would increase without DP. Sinabell et al. (2013) and Severini & Tantari (2013) find for the case of three regions in Italy that the direct payments (though highly concentrated) can reduce inequality of incomes. The choice between the different distribution modes (SFP, SAP or hybrid) does not seem to have an influence. Soliwoda (2016) concluded that, despite some income-stabilizing effect, DP may at the same time destabilize farm finances by decreasing farmers' aversion of financial risks. Nevertheless, payments to farmers also allows farmers to take the risk of investing in new, potentially more profitable activities. This is particularly relevant since the 2005-reform, where DP have been decoupled from production - thus changing the incentive structure for production choices by farmers. Indeed, Viaggi et al. (2010), studying the investment behaviour of a small sample of households in 8 EU countries, found that the share of household who increased their investments after decoupling was higher in the group of households that did not experience a positive income effect as a result of decoupling. The authors concluded that lower-income farmers invested more in adaptation, whereas higher income increased consumption and potentially decreased farming activity. Kazukauskas et al. (2014), looking at Dutch, Danish and Irish farm-level data from 2001-2007, found indications that farmers have specialized in more productive activities after the reform, but they did not find that decoupling caused farmers to switch to producing new products. In Slovenia, Bojnec and Latruffe (2013) found that the system of agricultural subsidies after accession to the EU has kept small farms profitable, despite being less technically efficient compared to large farms. They also observed a decline in mid-size farms, which were also economically inefficient, but did not become profitable as a result of DP.

In a sample of 15 EU countries in the time before decoupling, Rizov et al. (2013) found a negative correlation between subsidies and farm efficiency. However, after decoupling, the correlation was not as stringent and even positive in some cases. They show that agricultural subsidies lead to an efficiency loss, but also to an easier access to investment capital, since decoupled payments might be more acceptable as collateral.

4.3.2.2.2 Labour in Agriculture

Empirical evidence shows that the CAP has some (limited) positive effects on agriculture labour. Arovuori and Yrjölä (2015) analysed the effect of the CAP from 1980 to 2010 on the value added per worker. They observed that the agricultural subsidies under the CAP have kept labour in the agricultural sector. This overall has reduced structural change. Based on their results, the increase of the value added per worker is slowed due to the subsidies. Olper et al. (2014) showed a moderate but robust effect of CAP payments on keeping labour resources in the sector. Matthews (2017) argues as well that DP keep more labour resources in agriculture than would be the case without DP. This finding has been confirmed by Breustedt and Habermann (2011) and Ciaian and Kancs (2012). Sahrbacher and Balmann (2014) show that the redistributive payment in Germany will keep small farms in the business in the short run but is not sufficient to help the long-term 'survival' of small farms. They also showed that redistributive payments increase the capitalization of DP into land rents (Sahrbacher & Balmann 2014). Policies like the production quotas for milk or sugar beet tend to slow down technical progress and thereby structural change. The comparison of yields of wheat (no quota) and sugar beet (with quota; **Fig. 4.3.5**) illustrates this point. This effect has been reduced with the decoupling of payments and by the reforms of milk[13] and sugar-markets[14] 2015/17 where in both cases quotas were abolished.

[13] On March 15, 2015, the milk-quota was abolished after a long phase of phasing out since 2010 (EU-Commission 2016; https://ec.europa.eu/agriculture/milk-quota-end/history_en)

[14] On September 30, 2017, the sugar quota was abolished. This was also accompanied by a long-run phasing out and a decrease of the intervention prices for sugar from 632 EUR/t in 2008 to 404 EUR/t in 2009 (EU Commission 2017a; https://ec.europa.eu/agriculture/sugar_en)

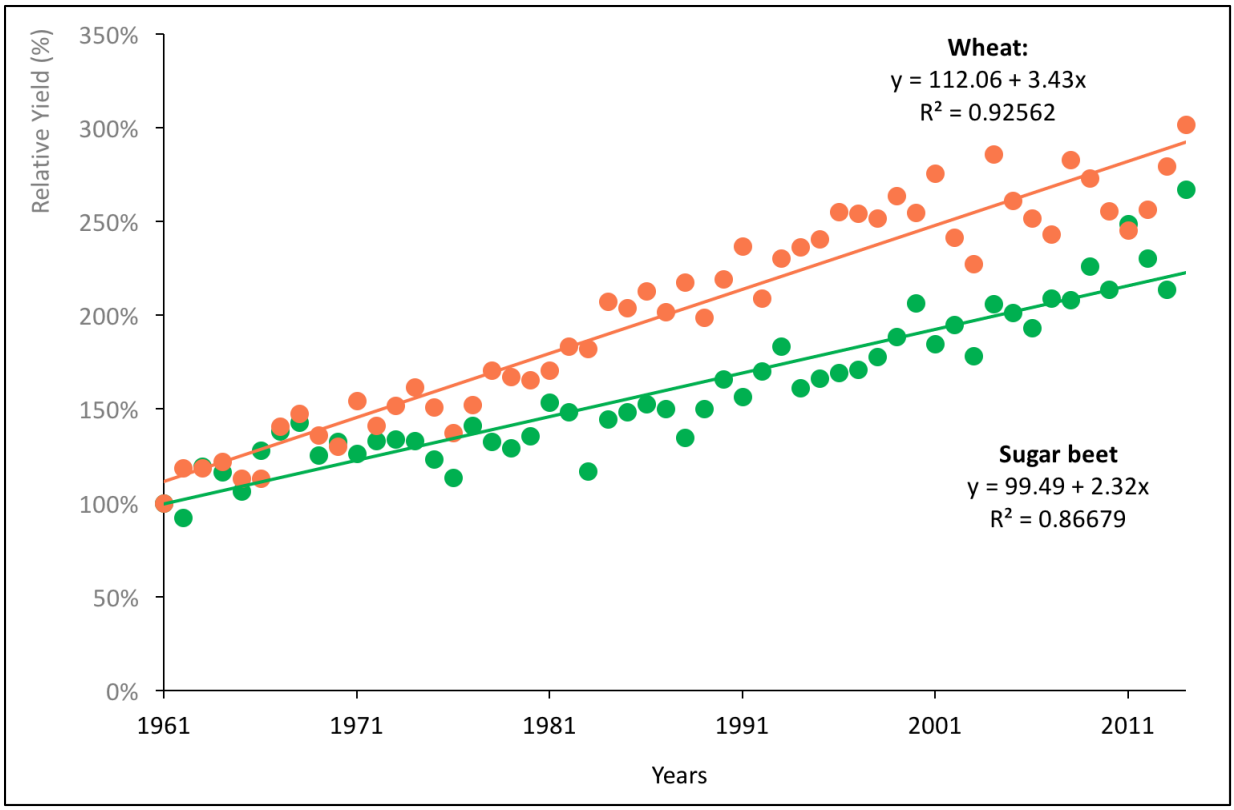


Figure 4.3.5: *Relative Increase of Yield of Wheat and Sugar beet in Germany 1961-2014 (1961 = 100%). Source: own calculation based on data of the FAO 2017.*

4.3.3 Market stability

Question: Have CAP measures affected changes in, or incentivised stable markets?

Relevant CAP objectives: Article 39c and Article 39e

Relevant SDG: indirectly, SDG 2 ("achieve food security and improved nutrition and promote sustainable agriculture")

Number of publications scanned:

4.3.3.1 Overall trends on market stability

CAP reforms starting from 1992 onward have actively sought to reduce the EU's intervention in prices, by decoupling support from production; opening the market access to the European markets; and abolishing export subsidies. One can see that the support has become fixed (= stable) per area, while wheat prices in Germany became more variable as they now follow the world markets (**Fig. 4.3.6**). This example illustrates that most sectors are now integrated into international markets: supply and demand meet on

the international markets, prices are allowed to send signals of demand and supply and are not politically fixed. This can be considered as bringing more market stability at the global level, but, compared to politically fixed prices from earlier periods, it enhances price variability in the European markets and can expose farmers to market risks. CAP reforms have effectively achieved the goal of aligning EU farming with global markets, but at the cost of increasing price volatility from the perspective of many farmers.

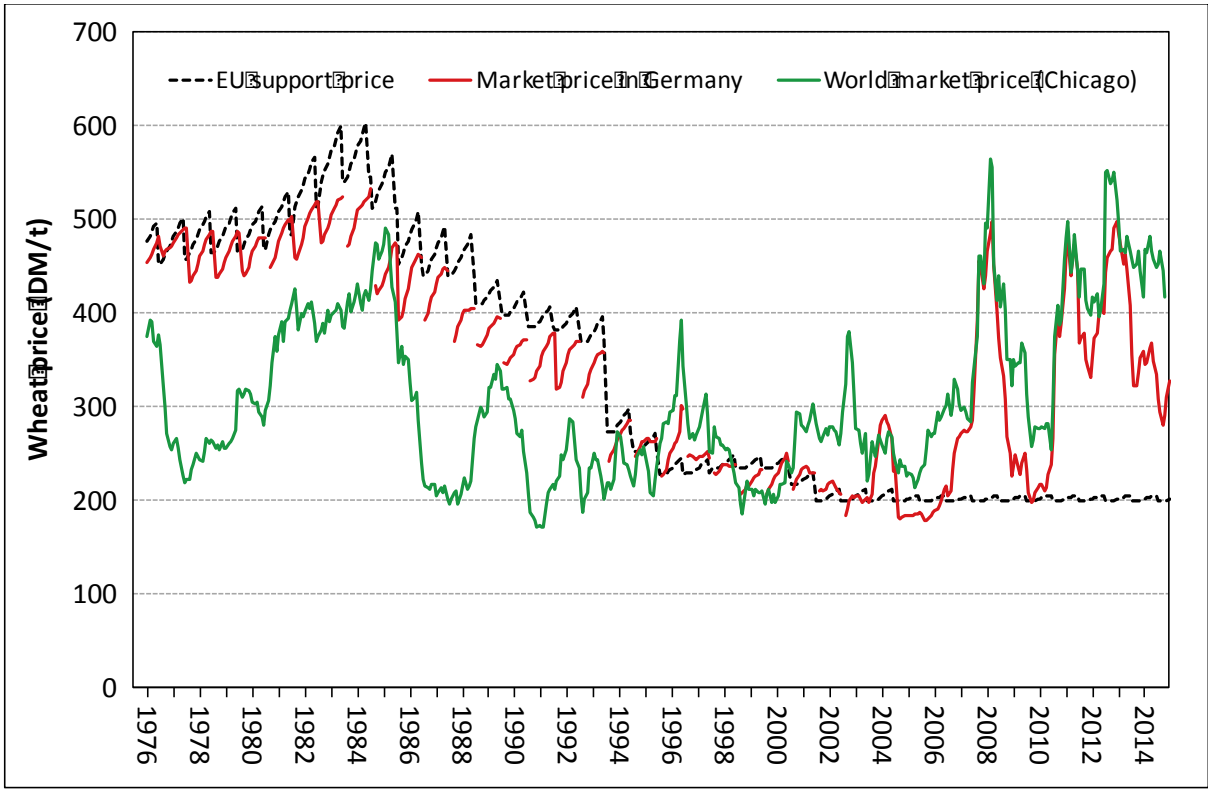


Figure 4.3.6: *EU support levels (DM/t), wheat prices in German and global wheat prices (DM/ton) over time. Source: Data from von Cramon-Taubadel & Ihle (unpublished). Note: Data for the world market price are taken from Chicago Board of Trade (CBoT;); German price data are provided by Zentrale Markt und Preisberichtsstelle (ZMP) until 2009 and by Agrarmarkt Information GmbH (AMI) from 2009 onwards.*

4.3.3.2 Results of our literature review on CAP effectiveness on market stability

Key findings

Prior to successive CAP reforms, agricultural markets in the EU were mostly insulated from international markets. This ensured more or less stable domestic prices at politically fixed levels. Greater market orientation was achieved through recent reforms, reaching a better balance between supply and demand. However, it increased the transmission of price volatility from world markets to domestic markets, giving rise to concerns that farmers in the EU are now facing higher price volatility. While farmers can react more effectively to price signals from international markets, excessive price volatility can be a threat.

The European Commission does not offer a clear definition of 'market stability'. The reduction of previous market distortion and the integration of the EU market into world markets represent one dimension of market stability. Moreover, many authors refer to the stability or volatility of prices (Tangermann 2011b; EC 2011; Matthews 2010; Thompson et al. 2000; Jongeneel et al. 2011). We therefore considered that market integration and price volatility represent relevant indicators for market stability.

The 2003 CAP reform increase the integration of the EU market into world markets. Prior to successive CAP reforms and their implementation, agricultural markets in the EU were mostly insulated from international markets. Production decisions were strongly influenced by price support regimes, and less market-oriented. Relatively stable domestic prices were achieved because movements in international markets were transmitted either moderately or not at all to EU markets. Low responsiveness to world market signals, however, could lead to an imbalance of supply and demand (Jongeneel et al. 2011; EC 2011; Matthews 2010; Thompson et al. 2000). Successive reforms of the CAP[15] have moved towards a more market-oriented production, and reduced distortions to production-decisions. Feng & Patton (2013) found evidence that the degree of cointegration for EU butter prices and world market prices (i.e. changes in the world market price transmit into domestic price) has increased, and also the changes of EU and world market beef prices are more closely aligned. Contrarily, for wheat and barley they found no evidence of increasing co-integration. Castillo-Valero & García-Cortijo (2012) found that the reforms positively affected the integration of world and domestic maize markets. Mela (2012) assess the integration of several agricultural markets (soft and hard wheat, corn, feed barley and butter). The results indicate "*…that the reform had a positive effect on market integration*" (Mela 2012, p 13).

The 2003 CAP reform increased farmers' exposure to the volatility of world market prices. Together with a more liberal global trading of agricultural commodities, price signals as well as price volatility now transmit from world markets to domestic markets (Matthews 2011; von Ledebur & Schmitz 2012; O'Connor & Keane 2011; Bergmann et al. 2016). We found eight papers addressing the impact of CAP reforms on price volatility. Among agricultural economists there seems to be widespread consensus that an increased market orientation has the effect of exposing EU producers to more volatile world market prices compared to the politically fixed EU prices of the past. These include Moss et al (2011), von Ledebur & Schmitz (2012), Mela (2012), European Commission (2011), Feng & Patton (2013), Matthews (2010) and Femenia (2012). However, only few studies explicitly examined the effect of the successive CAP reforms on price volatility or the effect on price transmission and the degree of market integration,

[15] Parts of this process towards more market orientation and trade liberalisation were also achieved through WTO commitments.

respectively. Bergmann et al. (2016) found no significant effects for butter before 2006, but significant price and volatility transmission effects after 2006. Jongeneel et al. (2011) found similar evidence on the dairy market. O'Connor & Keane (2011), focusing on the effects of recent reforms on price volatility of butter and skim milk powder, also show that prices and price volatility within the EU align more closely with the world market, where high price volatility on world markets affected EU prices. A report of LMC International (2012) shows an increase in price volatility for cereals, which the authors relate to an improved market orientation compared to past reforms. These studies and others (e.g. Matthews (2010)) indicate that recent reforms increased the probability of high volatility transmission from world market prices to EU prices. Matthews (2010, p.8) concludes that there is "*a clear trend toward increased price volatility with successive CAP reforms*". One of the intended objectives of the reforms was to increase the market orientation of the agricultural sector. As a consequence, price variation is inevitable and to a certain extent even desirable as it means that price movements reflect changes in fundamental supply and demand characteristics. They act as signals to reallocate resources efficiently, and enable domestic production to react more flexibly to international price signals. In the long run this is expected to increase market stability at the global level. This is perceived as an improvement from pre-1992 CAP measures, which had a destabilising impact on world markets (Pinstrup-Andersen 2013; O'Connor & Keane 2011; Matthews 2010; Rudloff 2009).

The results of many studies should be considered with caution, since the years 2007-2009 were characterised by severe disruptions in world commodity markets which affected levels and volatility of prices. Brümmer et al (2016) give an overview of factors that increased or triggered volatility in international markets. These include low stock levels, demand for biofuels and macroeconomic factors. Altogether these events may have overshadowed price impacts of CAP policy changes.

4.3.4 Balanced territorial development

Question: Have CAP measures affected changes in, or incentivised balanced territorial development?

Relevant CAP objectives: 2010 Objective 3

Relevant SDGs: 10 (reduced inequalities), as well as 1 (No poverty), 8 (Decent work and economic growth)

Number of publications scanned: 19

4.3.4.1 Overall trends on balanced territorial development

Among 22 million workers employed currently employed in the agricultural sector (Eurostat 2017), there are significant differences in work units and substantial disparities between regions, north and south, and particularly between older and newer MSs. A wide range of employees is underemployed; and in new MSs, there are still considerably more people engaged in agriculture and they are more often working on semi-subsistence farms (Matthews 2017).

Agricultural employment has strongly declined between 2000 and 2015 (**Fig. 4.3.7**). The decline was more distinct in New MSs from 2000-2005, i.e. prior to accession to the EU. The main explaining factors are technical change in agriculture and a higher wages outside agriculture. Nonetheless, in new MSs, a

considerably large proportion of the population is still engaged in agriculture – many of which with low economic viability (Matthews 2017).

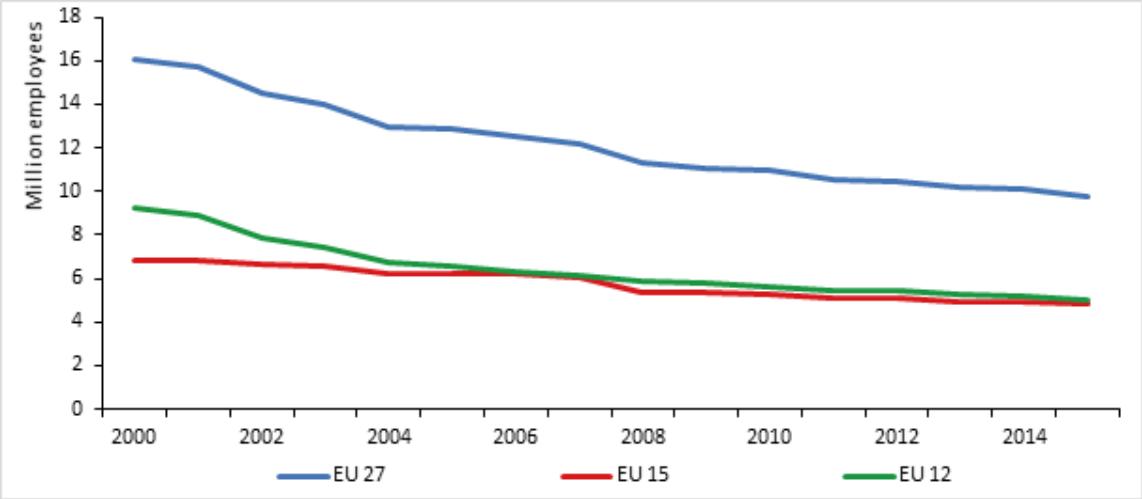


Figure 4.3.7: *Development of the agricultural employment in the EU (2000-2015). Source: Own calculations based on Eurostat (NACE_R1 data, table: lfsa_egana, employees from 15 years upwards).*

4.3.4.2 Results of our literature review on CAP effectiveness on balanced territorial development

> ***Key findings***
>
> Based on 19 publications, we find individual CAP measures to show divergent impacts on balanced territorial development, with both positive and negative impacts. Overall it seems the CAP has positive but weak effects toward the goal of achieving balanced territorial development in terms of employment and labour. The reviewed studies dealt mostly with overall CAP effects (9 publications), 3 papers addressed decoupling and 7 papers focused on Pillar II effects. Pillar II payments were found to be more effective than Pillar I (decoupled) payments, with Rural Development measures indicating potentials for creating agricultural jobs whereas Pillar I decoupled payments had some positive but also noticeable negative effects**.** Young farmer schemes are too new to be evaluated, whereas LFA and ANC payments may help by alleviating environmental burdens and by preventing land abandonment, respectively.

Some evidence suggests positive effects of the CAP on balanced territorial development. Bonfiglio et al. (2016) found the CAP payments to possibly enable 4.6 million labour work units. Though this amount primarily relates to the capacity of work which is necessary for facing potentially increased outputs, it could lead to the creation of new jobs. In addition for Pillar I, Nordin (2014) reveals that funds make a

considerable contribution to preserving agricultural jobs, with specific payments like the grassland support measure in Sweden inducing the deceleration of structural change in rural areas. Moreover, grassland support reduces small-scale farm surrender and therefore contributes to structural diversity in areas with larger share of grasslands (Nordin 2014). Regarding Pillar II, Granvik et al. (2012) ascertain that rural development measures lead to increased farm diversification potentials associated to new activities and innovations together with enhanced employment rates. Schuh et al. (2016) confirm CAPs positive influences on rural development in terms of supporting small scale farms and strengthening diversification potentials like tourism. Beyond that, Uthes et al. (2017) show that rural development expenditures are in line with regional requirements; and that the payments contribute to an increase of labour force and productivity in agriculture. Olper et al. (2014) show that CAP payments contribute to preventing migration of farmers, estimating that each increase of funds by 1% induces a decline in migration by roughly 0.172 %. Although the subsidies lead to the preservation of agricultural labour units, the effect is bound on the specific measure, where DPs seem to have a greater effect than Pillar II funds in terms of decreasing agricultural migration, due to the more central role of Pillar I subsidies for farm income support (Olper et al. 2014, Hubbard & Gorton 2011).

Some evidence suggests negative effects of the CAP on balanced territorial development. Both decoupled payments (Pillar I) and the rural development measures (Pillar II) were said to negatively affect agricultural employment (Petrick et al. 2011). Schuh et al. (2016) suggest that the CAP lowers the potential of new rural employment opportunities because decoupling did not induce a reallocation of workforce into agricultural tasks. Hennessy & Rehman (2008) ascertain that decoupling negatively effects on-farm labour marginal returns. As a consequence, farmers enhance the amount of off-farm labour hours. Petrick et al. (2012) explain these insights through the fact that farm workers are no longer bounded on sustaining specific levels of agricultural production for preserving decoupled direct payments. As a result, decoupling increases shortages of labour in agriculture (Dupraz & Latruffe 2015). Considering rural development measures, Pelucha et al. (2013) found that creating new jobs and thwarting unemployment is of marginal relevance, since the unemployment and migration rate in municipalities receiving rural development funding is on a level with the rate of municipalities which do not receive these payments.

Sahrbacher et al. (2009) analysed the impact of CAP payments on the structural development of farms in the Czech Republic following the accession to the EU. Their results suggest an influence of the EU accession on a decelerated structural change in terms of a higher amount of agricultural farms through CAP subsidies. Yet the explanation was that numerous farmers registered their farms only after the Czech Republic's accession to the EU in order to be eligible for receiving CAP payments. However, farm registration is not the only precondition for subsidy-allowance, since many other eligibility criteria must be met. Bezak & Mitchley (2014) note that the administrative and financial requirements as well as the minimum area for eligibility, hinder the CAP implementation among many farmers in the New MSs, and particularly smallholders. That refers spatially to remote and mountain areas, and socially it concerns small farmers with low socio-economic capital, where CAP conditions are general and difficult to be met.

Mikulcak et al. (2013) notes that although EU rural development policy is strongly focused on economic development, it still lacks adjustment of CAP subsidies to local circumstances and challenges, since in recently accessed countries under-employment and rural population decline put traditional farming at risk. Accordingly, the recent CAP measures are directed to sustain large scale holdings rather than maintaining structural diversity in terms of small farms (Bezak & Mitchley 2014) or facilitating creative

and innovative neo-endogenous activities (Dax et al. 2016). In a more general context, Hubbard & Gorton (2011) suggest that the CAP fails to support a broader rural development. External factors, however, remain more relevant in terms of promoting employment and labour as well as leading to the viability of rural areas. These include mainly rural services and manufacturing (Hubbard & Gorton 2011) and also country specific factors (Viaggi et al. 2011).

Focused instruments like investment aids appear to be more promising in terms of agricultural employment support (Petrick et al. 2012). In this regard, Bournaris et al. (2014) found that the rural development measure "setting up young farmers" increase the work amounts, it aims at transferring land to young and skilled farmers and counterbalancing the set-up costs. Withal, this measure seems to bring positive impacts to the reduction of agricultural migration of young people.

Several methodological problems to assess CAP effects on balanced territorial development relate to insufficient data, sampling limitations as well as short implementation periods regarding specific measures. For instance there are limited assessments of the distribution of CAP spending over space (Shucksmith 2005). Since available data on farm labour is fragmentary, Dupraz & Latruffe (2015) argue in favour of developing appropriate databases. Moreover Uthes et al. (2017) recommend the development of suitable indicators for measuring time series effects and facilitate monitoring. As several studies are based on modelling and are possibly related to unintended long-term external impacts (e.g price changes), results should be taken with caution (Olper et al. 2014; Bonfiglio et al. 2016). Beyond, Nordin (2014) emphasizes the need for analysing the impacts of decoupling on off-farm employment, as there are some shortcomings in the literature. Additionally, according to Esposti (2007) there also shortcomings in regional growth policies concerning counter treatment effects, as well as how effective and targeted Rural Development Programmes are (Camaioni et al. 2014). Because certain studies focus mainly on one specific GAP measure (Bournaris et al. 2014; Nordin et al. 2014) or one country (Petrick & Zier 2011; Pelucha et al. 2013) comparisons to other measures and between different member states are suggested in order to sustain effective programmes (Bournaris et al. 2014).

4.4 Effectiveness: Environment

4.4.1 Climate Action and Energy

Question: To which extent do CAP instruments/measures affect changes in, or incentivise the mitigation of climate change and the production of affordable and clean energy?

Relevant CAP objective: "*Sustainable management of natural resources and climate action" (2010-priority 2)*

Relevant SDG: 13: Climate Action, 7: Affordable and Clean Energy

Number of publications scanned: 37 publications for climate, 5 for energy

4.4.1.1 Overall trends on climate action and energy

Agricultural greenhouse gas (GHG) emissions in the EU have slowly declined between 2001 and 2012. They however started increasing again after that to come back in 2015 to the level of emissions observed in 2006. At the same time, overall EU GHG emissions saw a reduction of approximately 18% since 2006 (Fig. 4.4.1). Within the EU, GHG sources included under the IPCC reporting category "agriculture" contribute approx. 10% to overall GHG emissions (2015: 437 out of 4,452 MT[16] CO2e[17]).

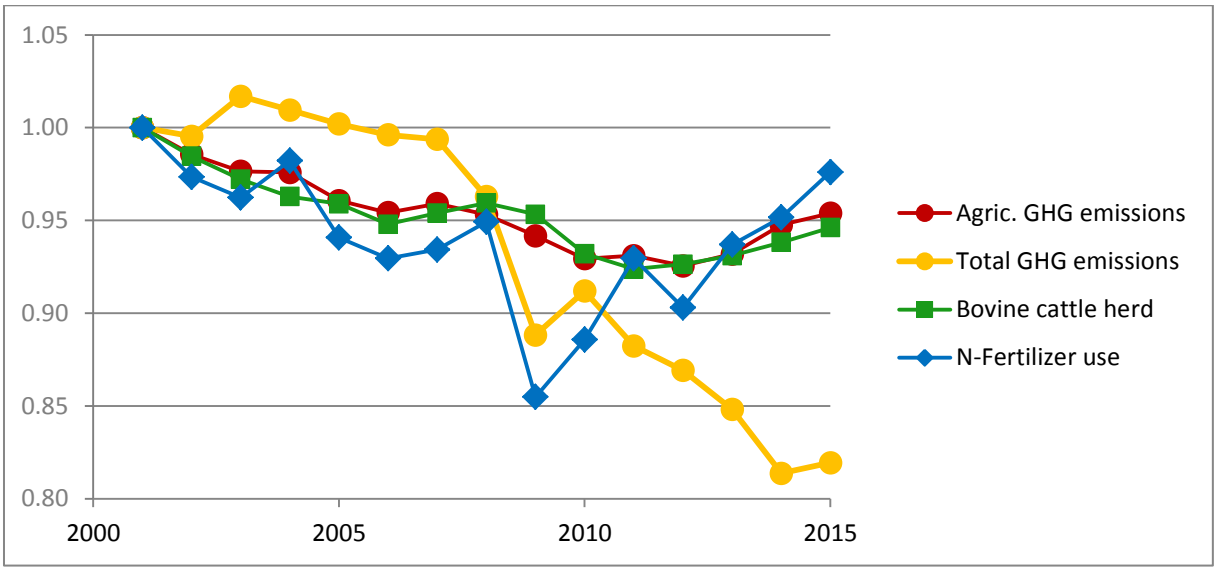


Figure 4.4.1: *Development of EU agricultural against total GHG emissions and trends in herd size and fertilizer use. The value 100% for 2001 corresponds to 458 Mio.t CO_2e for agricultural emissions, 4,887 Mio.t CO_2e for total emissions, 94 Mio.t CO_2e for bovine cattle, 12 Mio.t CO_2e for inorganic N-fertilizer. Source: Own elaboration based on Eurostat 2017.*

GHG sources included under the IPCC reporting category "agriculture" do, however, only represent about half of all agriculture-related emissions. Main sources under "agriculture" are: 1) soil emissions of Nitrous oxide (N_2O), originating from mineral and organic nitrogen fertilisers (3.7% of overall EU GHG emissions); 2) Methane (CH_4) emissions from livestock digestion processes (4.2% of EU overall GHG emissions); and 3) Methane and N_2O emissions from manure management (1.5% of EU overall GHG emissions; Fig. 4.4.2).

16 http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Total_greenhouse_gas_emissions_by_countries_(including_international_aviation_and_indirect_CO2,_excluding_LULUCF),_1990_-_2015_(million_tonnes_of_CO2_equivalents)_updated.png

17 *CO_2e* means *CO_2 equivalent*. Emissions of other Greenhouse Gases than CO_2 are generally converted to CO_2e according to their global warming potential, in order to make them comparable.

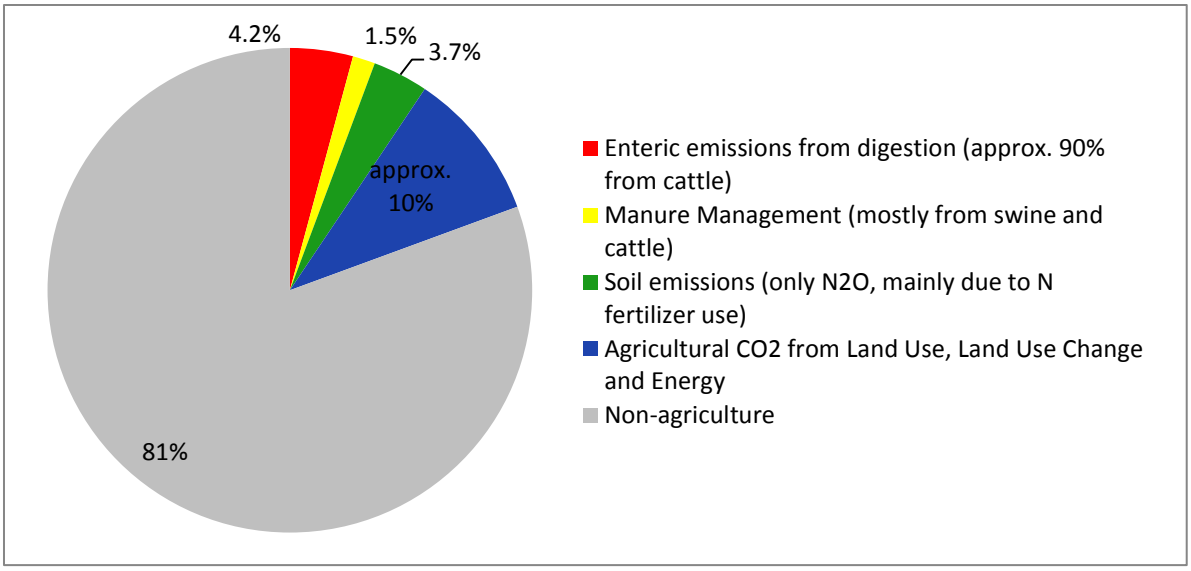


Figure 4.4.2: *Sources of EU agricultural GHG emissions 2015. Source: Own elaboration based on EEA (2017).*

There are however very important amounts of GHG emissions that are caused by agriculture but not included under the UNFCCC reporting category "agriculture". In a Life Cycle Assessment for livestock production, Weiss & Leip (2012) assessed total GHG emissions only of EU livestock production and found total emissions of 623–852 Mt CO_2e, thus 150-200% of the value reported under "agriculture" (which includes crop cultivation too). It can thus be estimated that the consideration of all relevant sources would at least double agricultural GHG emissions compared to the values currently reported under "agriculture". There are four important additional sources of agricultural GHG emissions:

- Upstream emissions reported under "Industrial processes", mainly due to industrial fertilizer and feedstock production.
- Energy consumption for agricultural production (reported under "Energy"): It causes some 5% of overall agricultural emissions in Germany (Osterburg 2009). Together with industrial processes, it contributes 17-24% to the EU's overall agricultural GHG emissions from livestock production Weiss & Leip (2012). From 2004 to 2014, energy consumption by agriculture dropped approx. 10%[18].
- Land Use and Land Use Change: The cultivation of organic soils was found responsible for approx. 80 MT CO_2 in 2011 and 2015 (EEA 2017, Van Doorslaer et al. 2015). Land use change outside the EU, due to the conversion of tropical forests to farmland for the production of imported feedstock, is however difficult to accurately assess. It is estimated to be responsible for 9-33% of emissions related to livestock production (Weiss & Leip 2012).
- Downstream emissions e.g. from food processing or waste disposal, which are not considered here.

[18] http://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-environmental_indicator_-_energy_use

Livestock production is responsible for over 2/3 of agricultural GHG emissions in the EU if all different sources are included (Weiss & Leip 2012). Most of these are attributable to the beef and dairy sector (Bellarby 2013). In Germany, beef and particularly dairy production are responsible for over 50% of agricultural emissions, and are also the most GHG-intensive agricultural products on a per-kg basis (Osterburg 2009).

Energy is also included in this section due to the interconnections with climate change and the rather marginal relation to the CAP which would not justify an alone-standing section on this topic. In 2011, energy crops covered an estimated 6.1 million ha of agricultural land in the EU, equivalent to 3.4 % of the total UAA and contributed approximately 2% to primary energy production[19].

4.4.1.2 Results of our literature review on CAP effectiveness on climate action and energy

Key findings

Agricultural GHG emissions in the EU represent approx. 20% of the EU's total GHG emissions; the category "agriculture" for EU reporting to the UNFCCC only includes half of these. Livestock production is responsible for more than 2/3 of agricultural emissions.

There is no visible effect of climate action under the CAP on the EU's agricultural GHG emissions; a slight overall reduction since 2001 and also a recent increase since 2012 can mainly be explained by changes of the bovine herd size and fertilizer use, influenced by decoupling, the milk quota regime the nitrates directive (CC-scheme). Much smaller and mixed effects on GHG emissions can be expected from AECM and greening. Clear and targeted measures that would effectively tackle climate change based on known reduction potentials are widely missing under the CAP. Particularly emissions from livestock production are not addressed adequately; this also includes emissions from deforestation outside the EU for the production of imported feedstock.

Energy crops are not receiving specific support from the CAP anymore, evidence shows no significant CAP effect on them.

The overall trend of agricultural GHG emissions does not show any visible effect of targeted actions under the CAP. This can be explained by two main reasons (EEA 2017, Fig. 4.4.1): the most important one is a change in bovine cattle numbers (from approx. 94 in 2001 to 89 million in 2015), due to decoupling and the milk quota regime; while the second reason is the development of N fertilizer used, with earlier reductions because of the Nitrates directive as "Statutory management requirements" under CC (Council Directive 91/676/EEC). These CAP measures are not primarily targeting climate change; moreover, there seem to be no adequate measures under the CAP to mitigate the recent increase in agricultural emissions. The agricultural sector clearly lags behind other sectors; it does not seem to achieve to decouple GHG emissions from agricultural production.

[19] http://ec.europa.eu/eurostat/statistics-explained/index.php/Archive:Agri-environmental_indicator_-_renewable_energy_production

Further on in this subsection, we first analyse the most important sources of GHG emissions and the CAP's possible effects or non-effects on them. Then additional results from the literature review are presented for specific CAP instruments. After this, we briefly summarize literature findings on emission reduction potentials, in order to assess if more targeted action would be possible under the CAP. We further include a short note on adaptation to climate change. Finally, energy is addressed briefly.

GHG emissions from livestock farming

As shown above, agricultural GHG emissions developed in parallel to livestock numbers in the last 15 years. EEA (2017) indicates the milk quota regime being the most important CAP-related driver for past herd reductions, while also decoupling in general had this effect. This is backed by Thorpe (2009) who states that agricultural GHG savings have been more a consequence of reducing subsidies than a determined attempt to reduce emissions. As a consequence of post-2013 CAP reforms, however, Kirchner et al. (2016) modelled increasing cattle herds in Austria, incentivised by the recent abolishment of the milk quota regime - and recently, herd sizes are indeed increasing in the EU (Fig. 4.4.1), already before the abolishment of the milk quota regime in 2015.

The mainly indirect effects of the CAP on livestock emissions and the related lack of specific measures are also mentioned by Erjavec et al. (2016), stating that GHG emissions of the livestock sector are not targeted directly by the CAP, and Solazzo et al. (2016), arguing that the dairy sector, while being most important for agricultural GHG emissions in Italy, is only marginally affected by the CAP and particularly greening.

The largest share of livestock-related emissions are so-called "enteric emissions", methane emissions occurring from digestive processes of cattle. They might be reduced directly by feeding special additives; such measures are however questioned and not part of European policies (Thorpe 2009). Also manure management causes methane emissions by anaerobic storage. For large pork and poultry farms, adequate manure storage is already mandatory by the Industrial Emission Directive (IED 3233, EEA 2017), which is not a part of the CAP. Statistics seem to indicate that targeted measures are missing: The decrease by 24.3% of GHG emissions from manure management between 1990 and 2011 (Van Doorslaer et al. 2015) is equivalent to the decrease of the herd size, indicating that no significant improvement was reached in manure management.

Livestock-related emissions due to land use change outside the EU are analysed in further below in this section under "land use and land use change".

N_2O emissions from nitrogen fertilizer use

N_2O emissions from soils are mostly a side-effect of nitrogen fertilizer use that is difficult to avoid even when organic fertilizer is applied (IPCC 2006). They can thus best be reduced by reducing N fertilizer. This was achieved by the nitrates directive which is mainly targeting water pollution but included under cross compliance (EEA 2017). Excessive use of fertilizer since the 1990s has also been reduced in the context of reducing EU overproduction (Good & Beatty 2011) and due to the economic decline in Eastern Europe after the collapse of the Soviet Union (EIA 2017). There is however a recent increase in N fertilizer use since 2012 (Fig. 4.4.1, also contributing to the recent increase of GHG emissions.

AECM can locally be effective in nitrogen reduction as shown by Casey & Holden (2006) who found a 49% reduction in nitrogen fertilizer use with only small productivity decreases for suckler-beef farms in Ireland

when switching from intensive management to a Rural Environmental Protection Scheme (REPS, implementation of AECM on the national level in Ireland). For the post-2013 CAP, based on a modelling analysis, Kirchner et al. (2016) estimated a slight increase in the use of N-fertilizer, since farmers are motivated to intensify production again due to reduced agri-environmental payments that are not fully compensated by greening.

Climate impacts due to land use and land-use change

Emissions due to land use are mainly caused by the cultivation of organic soils such as peat lands that keep emitting CO_2 after being drained and converted to agricultural land (Natural Capital Germany – TEEB DE 2015). While the CAP does not provide direct payments for climate relevant reversal of drainage of organic soils after 2004, Pillar II payments for rewetting drained organic soils are available under certain circumstances (Regina et al. 2016). According to Peters & von Unger (2017), the consideration of organic soils e.g. in GAEC criteria is insufficient, leaving potential for improved agricultural peat soil conservation and thus avoidance of CO_2 emissions.

Land-use change is particularly important outside Europe and its main source is feedstock production for the EU livestock farming. The main cause for this GHG source is deforestation for soy cultivation as imported feedstock from Latin America (Khatun 2012), also causing a range of other adverse environmental impacts (Boerema et al. 2016). Weiss & Leip (2012) note a difficulty to estimate the exact impact but estimates that feedstock production outside Europe contributes between 9 and 33% of the EU's livestock emissions. While the CAP cannot directly be held responsible for this situation, there is also no measure under the CAP to tackle this source of GHG.

EU policies on biofuels are another important cause of land-use change outside the EU, mainly because of palm oil cultivation in Southeast Asia (Miyake et al. 2012). The main driving policy however is the RED (Renewable Energy Directive) with only partial relations to the CAP by e.g. providing payments for energy crops under certain circumstances.

Some authors warn that EU measures that promote less intensive production or set-asides may lead to adverse climate effects elsewhere. Warner et al. (2017) conclude that in the UK, most options under AECM achieve an absolute reduction in GHG emissions compared to an existing arable crop baseline, but at the expense of removing land from production, risking production displacement. Pelikan et al. (2015) model increased land use outside the EU due to set-asides for EFAs, assuming 7% of arable farm land devoted to EFAs. They suggest that for each additional hectare set aside, "*land-based GHG emissions and emissions from fertiliser use in the rest of the world will rise by about 21 tonnes CO_2 equivalent*". These results, however, assume that 7% of arable land would be removed from production, whereas implementation data show that most EFA area is devoted to productive options, and generates only marginal land-use changes (Pe'er et al. 2017).

Additional results on the effects of specific CAP instruments

As shown above, targeted measures tackling the most important sources of agricultural GHG emissions are scarce under the CAP, therefore, also in the future, its main impacts on GHG emissions can be expected by co-effects of other measures (such as the abolition of the milk quota regime). Nevertheless, climate action is an explicit CAP objective (2010-priority 2), and also under Pillar II, RDP priority No. 5 promotes "resource efficiency and supporting the shift towards a low-carbon and climate-resilient

economy in the agriculture, food and forestry sectors". Several measures exist with a stated purpose of climate change mitigation.

For greening, quantitative evaluations of GHG-reducing effects are difficult to find. Solazzo et al. (2016), using a modelling approach, found small GHG reduction of greening (1-2%) for Northern Italy, mainly due to a potential reduction in maize and other cereal crops in some areas, and the increased spread of nitrogen-fixing crops, mainly alfalfa and soya. Domingo et al. (2014) found that, if applied in an ideal manner (e.g. by supporting protein crops under EFAs), greening could tackle 23% of the agricultural GHG reduction potential in France, by increasing the surface area of grain legumes, buffer strips hedges and cover crops, among others. Reduction of GHG via the crop diversification greening measure are expected to be very limited, since this will only affect approximately 2% of arable land in the EU according to Westhoek et al. (2012). Van Zeijts et al. (2011) claim that measures implemented by CAP greening lead to just a small (3%) reduction in GHG emissions from agricultural activities. Gocht et al. (2016) simulated the impact of a 5% increase in grasslands at the EU level on GHG emissions. The expected net effect was a reduction of 4.9 Mt CO_2e /year. The authors, however, identified a major risk in using the conversion to permanent grassland as an emission mitigation measure: carbon is stored in soil only as long as these grasslands are maintained, quickly returning to the atmosphere once land is re-converted to arable land. In addition, the authors proposed that, compared to other GHG mitigation measures such as peatland restoration or afforestation, the cost-benefit of this policy implementation would be relatively low. Gocht et al. (2017) estimate that greening measures will reduce the aggregate GHG emissions for the whole EU-28 by 0.20% until 2025. However, the grassland measure has the opposite effect in this study, with a 0.25% increase because of the expected increase in animal numbers.

Hardly any literature could be found on effects of AECM on GHG emissions. When studying the effects of AES in cattle farms in Ireland, Casey & Holden (2006) found that environmentally friendly production as promoted under the CAP is slightly less GHG-intensive per production unit than intensive production - but without considering potential shifts of production. Also, Sanchez et al. (2016) found slight overall GHG reducing impacts of different (mainly unspecified) CAP measures in Aragon, Spain, but also a lack of targeted support for the most effective and efficient measures, due to a lack of regional specificity of the CAP.

There is still further potential for the CAP to improve climate action. Several studies identified an important potential to improve management of N-fertilizer, allowing for savings of fertilizer, GHG emissions and even costs due to more precise applications (Domingo et al. 2014, Moran et al. 2009, Van Doorslaer et al. 2015). For instance, Domingo et al. (2014) found that the introduction of farm-specific N-balances, implemented e.g. under cross compliance or under Pillar II, has a potential of annually reducing 21.5 MT CO_2e by minimizing unnecessary fertilizer-use; such a measure could be cost-neutral, it would however be demanding in monitoring. Anaerobic digestion of manure, avoiding emissions by flaring methane or using it for energy production is identified in all studies as a high-potential measure, near to cost-neutral. Hurdles are mostly due to missing information and access to technology. As a cross-cutting measure, Domingo et al. (2014) suggest to introduce AECM based on farm-level analyses of mitigation potentials of different sources, specifically identifying and supporting the most promising and feasible measures. When modelling hypothetical scenarios with fixed agricultural emission reduction targets in the EU, van Doorslaer et al. (2015) found that GHG reductions are mainly achieved by further reduced herd sizes; interestingly, they found farmer's income to remain stable due to higher prices, which again lead to partly reduced animal product consumption, but also to the risk of shifting production and thus

emissions to other parts of the world. There is thus also a potential of further reducing herd sizes and thus emissions by a lower meat consumption. Bellarby et al. (2013) identified a reduction potential for livestock-related emissions of 12-61%, to be realized by reduced production/consumption, avoidance of food waste and also increased beef production on grasslands instead of intensive grain-feeding. Meat consumption may currently be influenced by an over-proportional CAP-support for livestock production. For comparison, DP account for 7% of the income of horticultural farmers, versus 70% of the income on 'other grazing livestock' (Matthews 2017). The rewetting of drained peatland was not assessed in the above-mentioned studies, but probably bears an important potential of GHG reductions (Natural Capital Germany – TEEB DE 2015). It seems thus clear that targeted climate action, based on quantitative GHG mitigation potentials, could be very effective, but is currently widely missing under the CAP. This is in line with missing ambitions to reduce agricultural GHG emissions at the political level. In 2015, the Paris Agreement on Climate Change established ambitious targets for GHG reduction. Compared to 1990, the EU currently aims at reducing 40% by 2030[20] and 80% by 2050[21]. Nevertheless, in a follow-up study on the Paris conference, Hart et al. (2017) find that "despite being a significant contributor to GHG emissions in the EU, there remains no clear decarbonisation agenda or GHG emission reduction targets for the agricultural sector at EU level".

Although there is a fair amount of literature available on agriculture adaptation to climate change, there are very few studies evaluating CAP effects on climate change adaptation. Climate change is likely to increase environmental risks for farmers and natural and semi-natural areas are known to act as buffers against such risks. Yet, our analysis of the literature indicates a surprising paucity of studies addressing CAP effects on risk-reduction e.g. fire hazard, flood regulation. Müller et al. (2017) pointed out that climate insurances may have undesirable effects such as disincentivizing adaptive management.

There are also few studies evaluating CAP effects on energy crops. The premium on energy crops and support through the CAP set-aside scheme was abolished in 2009[22]. Today, the CAP only supports energy crops indirectly. For instance, Emmerling & Pude (2017) highlighted that short rotation coppice plantations are eligible as EFAs and can represent energy crops. The main policy influencing energy crops is currently the Renewable Energy Directive (RED; Miyake et al. 2012). As a result, the CAP is likely to have little influence on energy crops. Indeed, Gionnacaro et al. (2014b) did not find any significant effects of different CAP scenarios on energy crops in Andalusia. Finally, evidence suggests that the contribution of energy crops to climate change mitigation might be complex. For instance, Britz et al. (2013) found in Germany that biogas production from maize is probably even more GHG intensive than fossil fuels, due to the GHG emissions related to agricultural production.

[20] https://ec.europa.eu/clima/policies/strategies/2030_en
[21] https://ec.europa.eu/clima/policies/strategies/2050_en
[22] https://ec.europa.eu/agriculture/bioenergy/cap_de

4.4.2 Soil protection and Integrity of Water Resources

Question: To which extent do CAP instruments/measures affect changes in, or incentivised, the adoption of measures/interventions that are beneficial for soil and water quality and protection?

Relevant CAP objective: "*Sustainable management of natural resources, with a focus on … soil and water" (2010-priority 2)*

Relevant SDG: 6 (Clean water and sanitation)

Number of publications scanned: 23 publications

4.4.2.1 Overall trends on soil protection and integrity of water resources

Impacts on soils and water are closely connected with e.g. water runoff from fields causing both soil loss and water pollution (Panagos et al. 2015). We therefore treat both topics together in, three subtopics: soil erosion, water pollution and water scarcity related to water uptake for irrigation.

According to Jones et al. (2012), 1.3 million km2 of land are affected by erosion in the EU 27, corresponding to approx. 29% of the territory, mostly located in the southern MSs; in average, 2.2 tons of soil are lost per ha and year, while soil formation is only 1.4t; Italy, as a Mediterranean state, even presents a soil loss rate of 8.5 t/(ha*a) (Panagos 2015a, Fig. 4.4.3).

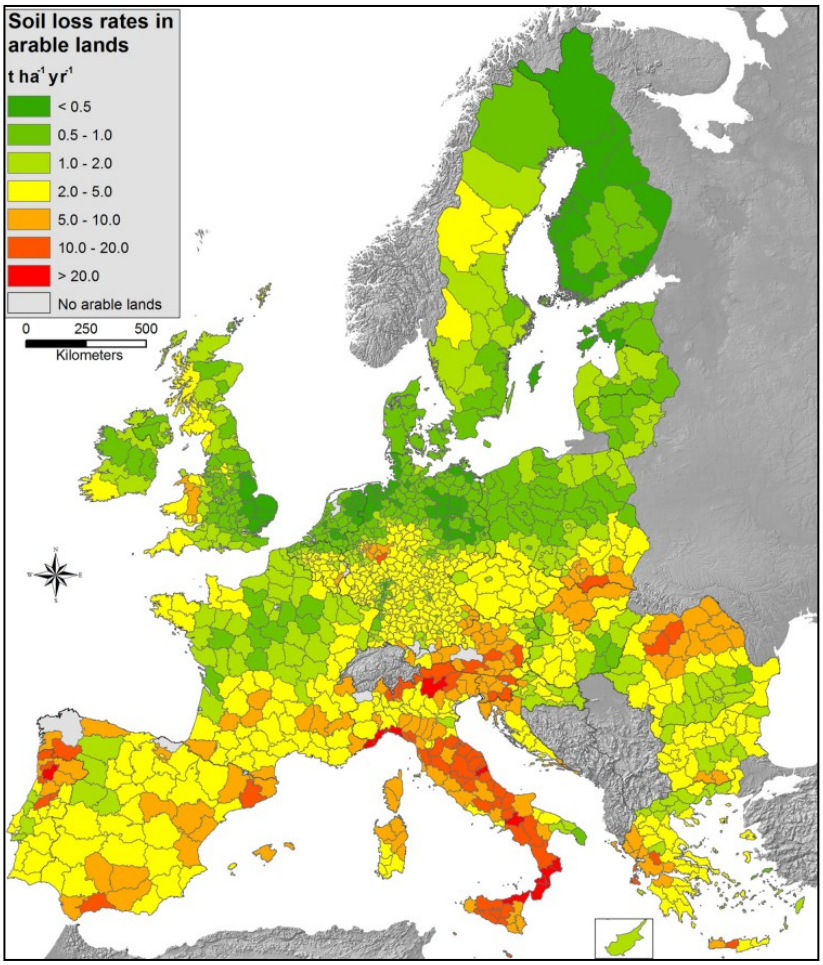


Figure 4.4.3: *Map of soil loss rates in EU. Source: Panagos et al. (2015a).*

River pollution due to nitrates has improved during the last years in Western Europe where in 2010, still the highest levels are found; for the rest of the EU, it is stagnating (Fig. 4.4.4). There is however no data are available from Eurostat after 2010. Pollution of groundwater by pesticides is an issue in the EU, but monitoring data are scarce. For 7% of monitoring stations, most of them located in Northern Italy and Northern France, legal thresholds of some pesticides were surpassed in 2010/11[23].

[23] http://ec.europa.eu/eurostat/statistics-explained/index.php/Archive:Agri-environmental_indicator_-_pesticide_pollution_of_water

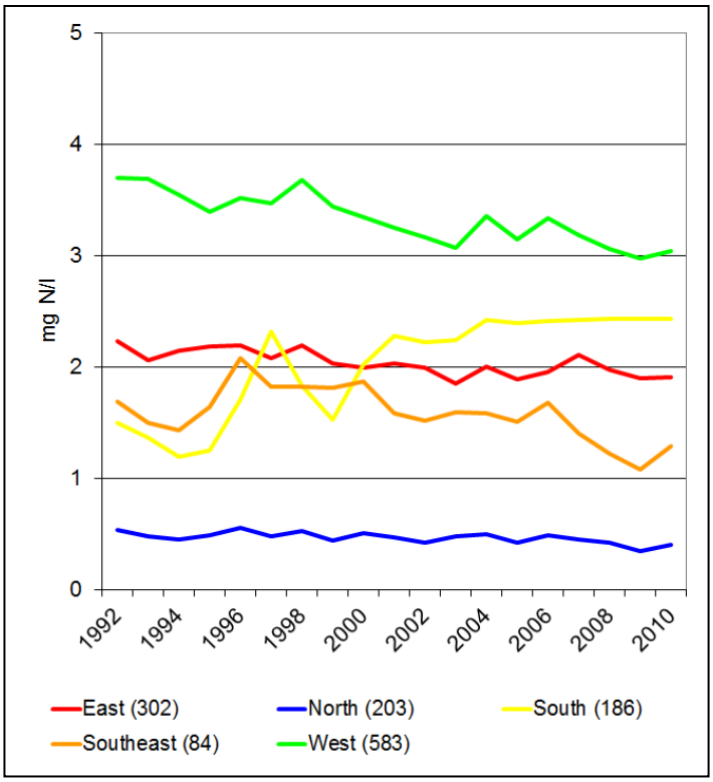


Figure 4.4.4: *Nitrate concentrations in rivers between 1992 and 2010 in different geographical regions of Europe. Source: EEA (https://www.eea.europa.eu/data-and-maps/figures/nitrate-concentrations-in-rivers-between-2).*

Agriculture in the EU accounts for around 44 % of total water use[24], of which more than two-thirds occurs in the Southern EU, mainly for irrigation. The high pressure on water resources is already causing water scarcity which is expected to increase (EC 2012, Milano et al. 2013). The unsustainable use of irrigation water has only seen marginal improvement since 1990 (European Court of Auditors 2014). Levels of water uptake are stagnating (Fig. 4.4.5), indicating that the necessary improvements in use efficiency are not being achieved.

[24] https://ec.europa.eu/agriculture/envir/water_en

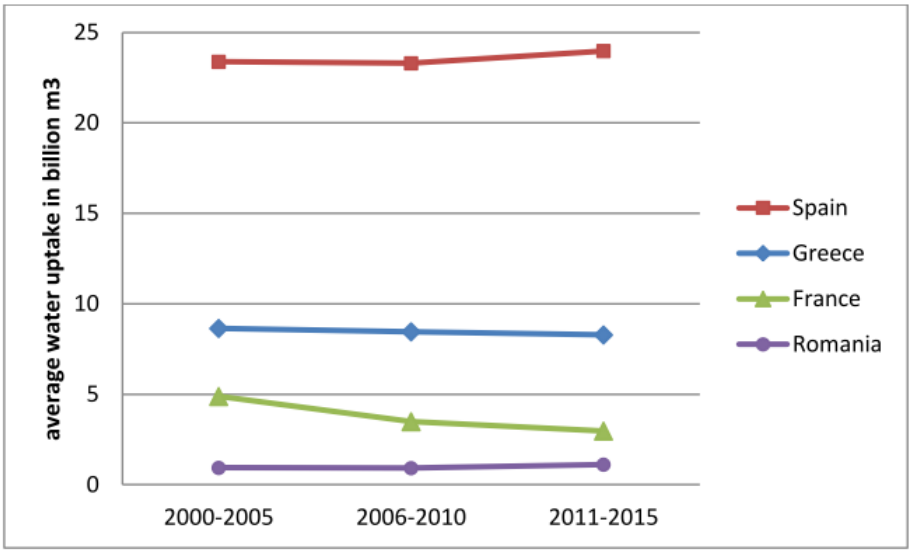


Figure 4.4.5: *Trend of water abstraction for agriculture in selected countries. Source: Own elaboration based on Eurostat (http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do).*

4.4.2.2 Results of our literature review on CAP effectiveness on soil protection and integrity of water resources

Key findings

Soil loss by water erosion affects large parts of southern Europe. Though the overall trend seems to be negative, positive effects of the CAP have been found in modelling studies, among others due to GAEC requirements under CC. For water pollution by nitrates and pesticides, affecting mostly the regions of intensive agriculture in the Western EU, the integration with other policies such as the nitrates directive included in CC is decisive. Improvements have been achieved, but still the CAP is found to show potential for further action, e.g. by promoting more precise N fertilizer use or by including phosphate control and sustainable pesticide use in CC. Water scarcity due to excessive water uptake for irrigation is a mostly a problem of southern EU; it is however not effectively tackled by the CAP, and integration with other relevant regulations (e.g. WFD) is insufficient.

Evidence suggests a potential positive effects of the CAP on the mitigation of soil erosion. However evidence consists in modelling rather than empirical studies. Agriculture contributes to soil erosion by removing the original vegetation cover, mostly forest in the EU, and exposing soils to eroding forces of water and wind (Jones et al. 2012). The most important factors influencing soil erosion are combined in the Revised Universal Soil Loss Equation (RUSLE, Panagos 2015a), and can be summarized by rainfall patterns, soil properties, soil coverage, slope and support practices. There is no specific EU legislation in force[25] on soil protection, and hence the importance of the CAP in this regard is high (Henriksen et al.

[25] A Soil Framework Directive is under discussion since 2006 (Henricksen et al. 2016)

2011, Jones et al. 2014). Modelling studies (Borrelli et al. 2016, Panagos et al. 2015a) showed that the CAP criteria of GAEC (under CC), such as reduced tillage or soil coverage, decreased the loss of soils by approximately 10% in the EU, while the potential for further mitigation of erosion by more stringent definition and application of suitable measures would be even much higher (up to 50% according to Borelli et al. 2015). Panagos et al. (2015a, 2015b, 2015c) showed the high positive potential of measures such as cover crops if applied more frequently. For case studies in the UK, Posthumus et al. (2011) found that "GAEC requirements that appeared very relevant to the major soil degradation issues and compliance to these requirements were reported to have positive impacts." There are different AECM with positive impacts on soil, supporting measures such as the creation of buffer strips, the maintenance of terraces or the promotion of hedge planting. Under greening (and also under AECM), the promotion of the conversion of arable land into extensively managed grassland can be expected to mitigate erosion (Panagos et al. 2015b). Crop diversification is expected to have slightly negative impacts on soil erosion prevention with a potential soil erosion increase in EU-28 with 1.2% (Gocht et al. 2017), but notably, this is under the assumption that the measure will indeed induce an increase in crop diversity. Lopez-Vicente (2014) find positive potential effects of EFAs on soil protection in Spain, particularly if leading to the revegetation of bare soils. The CAP also has indirect effects on soil erosion by triggering certain choices of production systems, both favouring and mitigating erosion. Garcia-Ruiz (2010), for example, shows that in Spain, the CAP incentivized olive and almond orchards in terrain sensitive to erosion. Guerra et al. (2016), for Portugal, report more intensive grazing in consequence of the CAP, increasing erosion risk.

The CAP has a positive effect on water pollution reduction, mainly through CC, but important potential for further improvement remains. Reduced pollution by nitrates in Western Europe is mainly is due to CC with the Nitrates directive (e.g. Van Grinsven et al. 2016 for the Netherlands), and, in earlier times, also due to the reduction of over-production following decoupling (Bonfiglio et al. 2011, Gallego-Ayala et al. 2009). Still, results are not sufficient to reach a "good status" of water bodies according to the WFD. There is also an apparent gap in knowledge about the effects of the recent increase in N-fertilizer use (**Fig. 4.4.1**). Additional and more specific measures of the CAP for water protection were demanded by the European Court of Auditors (2014), such as the inclusion of the sustainable use of pesticides in CC or targeted managed of phosphorus (see also Van Grinsven et al. 2016). Also the harmonization of the currently huge varieties in buffer strip requirements in different MS was proposed to have a potential to improve water quality by reducing runoff from fields (European Court of Auditors 2014). The European Court of Auditors (2014) also states that the "polluter pays" principle has not been put in practice in the case of water pollution, since the inclusion of the relevant directives in CC implies that the penalty consists in reduced payments instead of a quantified liability for possible damages. Several of the EFA options under greening have a known role in erosion control as well as maintaining or restoring soil quality. For instance, with regard to soil formation and condition, catch crops have a shown positive impact on the chemical condition of freshwater (Angileri et al. 20177). They have shown the potential, especially if sown as a species mixture rather than as single species, to reduce the risk of nitrogen leaching. Hence, from a water and also soil perspective, greening has some potential for a positive contribution if really leading to a change of land-use or management. Finally, the integration of the CAP with the WFD and other relevant EU policies is decisive for an effective protection of water resources (European Court of Auditors 2014; see 'External coherence').

The CAP does not adequately address water scarcity. The European Court of Auditors (2014) highlighted that the enforcement of regulations at MS and local level are insufficient, in particular for irrigation. For instance, "*According to the checklists used by cross-compliance inspectors in Greece and Spain, the actual volume of water abstracted is currently not checked against permits. In Slovakia, the Court found that the volume abstracted is not even measured.*" Indeed, water uptake has not decreased in Southern Europe since 2000 (Fig. 4.4.5). Giannakis et al. (2016) found that insufficient enforcement hampers instruments for more efficient use of irrigation water such as water pricing policies. AECM and RDP measures relevant to this topic include the promotion of drip irrigation or the restoration of wetlands (European Court of Auditors 2014). Indirect effects of the CAP have been reported as well: Chico et al. (2013), on cotton in Portugal, found that due to CAP reforms, extensification of the crop production has led to higher water footprint per unit, but a lower overall pressure on the basin's water resources. Such indirect effects of reduced overproduction after decoupling are also reported by Bonfiglio et al. (2011) and Gallego-Ayala et al. (2009), but it is also mentioned that the CAP is still triggering increased production and hence higher resource use in comparison to a No-CAP scenario for the use of fertilizers, pesticides, and water (Giannoccaro et al. 2011, 2013, 2014). In a fitness check of EU Freshwater Policy, the EC (2012) found that "*water-related actions taken under the pillar II of the CAP are not always sufficient on their own to counteract those pressures exerted on water quantity and water quality by trends in intensification and specialisation, some of which have been supported by CAP direct payments*".

4.4.3 Biodiversity and ecosystem services

Question: To which extent does the CAP affect changes in, or incentivise, the adoption of measures/interventions that are beneficial for biodiversity and ecosystem services?

Relevant CAP objective: "*Sustainable management of natural resources and climate action" (2010-priority 2)*

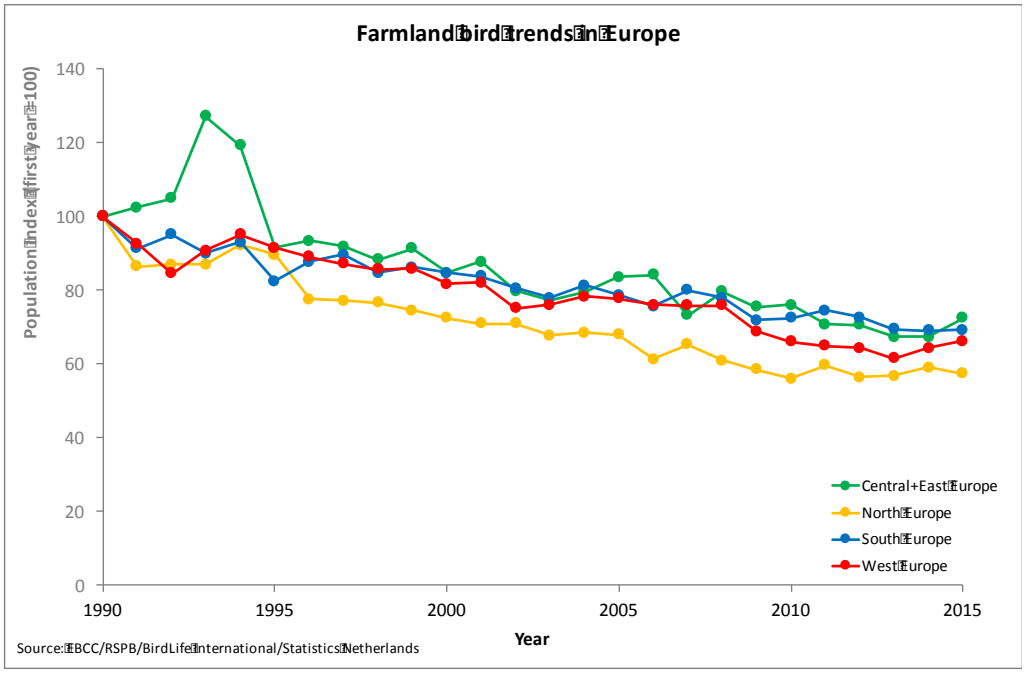
Relevant SDG: 15: Life on land

Number of publications scanned: 123 publications, covering the EU and 25 MSs therein, as well as areas outside the EU such as Switzerland.

4.4.3.1 Overall trends on biodiversity and ecosystem services

Agricultural expansion and intensification, as well as land abandonment, exert major pressures on biodiversity and thereby ecosystem services (ESS). These processes were recently ranked second among the greatest threats to global biodiversity (Maxwell et al. 2016) and rank first amongst the greatest threats to birds in agricultural ecosystems (EEA 2015). Biodiversity declines in farmland areas in the EU are well-documented, especially for some indicator taxa such as birds and butterflies (BirdLife International, 2015; EEA 2015; Van Swaay et al. 2015).

(a)



(b)

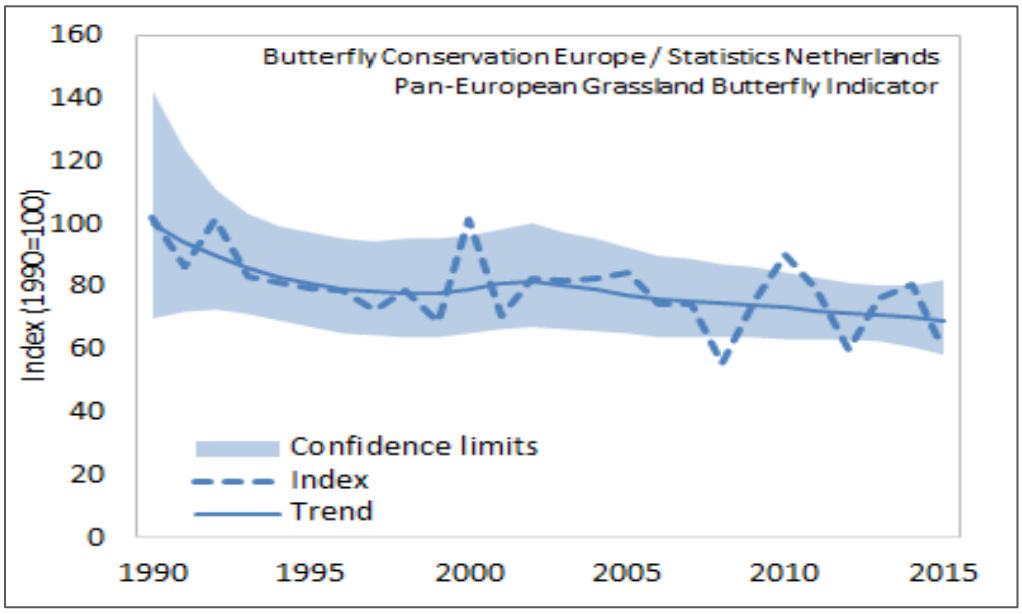


Figure 4.4.3: *a) Farmland Bird Index values across time in western (yellow), northern (blue), southern (green) and central + eastern (red) EU MSs. b) Pan-European Grassland Butterfly Indicator.* ***Sources****: a) EBCC/RSPB/BirdLife International/Statistics Netherlands and b) Butterfly Conservation Europe/Statistics Netherland.*

Overall, declines were found to slow down in some countries in NW Europe and for some taxa specifically, albeit against a much-impoverished status (Pe'er et al. 2014, **Fig. 4.4.3**). Declines of butterflies in European non-EU countries were faster (EEA 2013). These losses can be partly attributed to the degradation and loss of the most relevant habitats. The area of permanent grasslands in the EU declined between 1993 and 2011 by 6.4% in total and by 11.8% in new member states, mostly by conversion to arable and permanent crops, or by land abandonment (Pe'er et al. 2014).

Major ESS that are directly related to biodiversity, e.g. habitat quality, pest control and pollination potential, show negative trends (EC 2016b; Fig; 4.4.4). The IPBES pollination assessment highlights the scarcity of systematic data collections to assess pollination trends, but indicates evidence for significant spatial and abundance changes, some of which explicitly linked to agricultural intensification in the EU (IPBES 2016). In Sweden, for instance, a drastic decrease in bumble bee diversity has occurred during the last century (Bommarco et al. 2011). A parallel trend is an increase in the global agricultural dependence of many food crops on the vital ESS pollination between 1961 and 2012 (IPBES 2016). These two contrasting trends, i.e. decline in wild pollinators versus increase in pollination dependence, combined with the incapacity of honey-bees to keep up with pollination needs in agriculture, entails that pollination deficits are increasing globally, including in the EU, with recorded economic consequences. In order to offset this negative trend, pollinator services and other biodiversity related ESS in agroecosystems need to be enhanced, both to help achieving SDGs and for helping farmers to adapt to climate change.

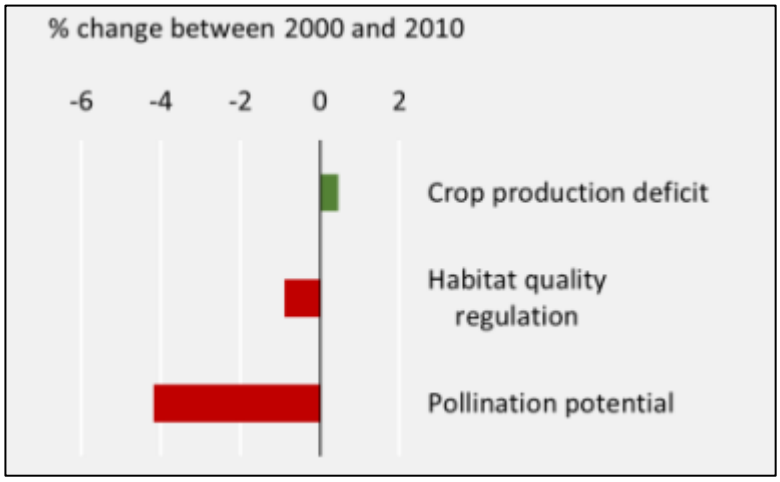


Figure 4.4.4: *Negative trend in biodiversity-related ESSs. Source: EC (2016b).*

Socio-economic pressures are currently major threats to High Nature Value farmland (HNVf; Dorresteijn et al. 2015; Terres et al. 2015). Declines or irreversible losses of species and habitats, which are partially or fully dependent of the continuation of HNV farming systems, are foreseen, jeopardizing key areas in terms of farmland biodiversity conservation in the EU.

4.4.3.2. Results of our literature review on CAP effectiveness on biodiversity and ecosystem services

Key findings

The largest number of publications found in our review addressed the effectiveness of AECM. Despite criticism on the effectiveness of AECM, recent reviews highlight that AECM generally improve the state of biodiversity, mostly at the local (i.e. farm) level. Reviews and case studies indicate effectiveness to be highest when AECM are landscape-targeted, regionalized to the conditions of the sites, and focusing on non-productive areas such as natural habitat and field margins.

But effectiveness *de facto* on an European scale is limited by low uptake of the most relevant measures, limited budget and extent, lack of spatial design, and often, poor design and implementation at the MS or regional level - sometimes leading to mixed or adverse effects. Also, the effectiveness of AECM is countered by other instruments with differing objectives, covering larger areas. Pillar I greening measures (crop diversification, ecological focus areas (EFA), permanent grassland) are expected to have a very limited potential to bring a change in land use and management, and are thus unlikely to reverse current losses of biodiversity and related ESS. Limited effectiveness results from a) broad exemptions (e.g. by high area-threshold), b) low thresholds in terms of requiring little or no changes in practice (especially for crop diversification), c) inclusion of ineffective options for biodiversity (EFA), and d) insufficient management criteria for all three measures. Particularly crop diversification allows further conversion into monocultures rather than maintaining or increasing crop diversity, or promoting crop rotation. Farmers take up mostly productive options (23-25% of EFA at EU level), that are simpler to employ but have little benefit for biodiversity. The support of regulating ESS such as pollination are vital for agricultural ecosystems, but are not enhanced by current greening measures and threatening sustainable food crop production.

HNVf areas are essential for meeting EU 2020 biodiversity targets and supported primarily by AECM. However, HNVf support is not targeted enough, most farmers and areas are not supported. Consequently, the decline and irreversible losses of HNVf areas, alongside affiliated species and habitats, continues unabated. The impacts of CAP instruments that are not designated toward biodiversity protection, both in Pillars I and II, are poorly studied. Overall when scaling up the effects of specific targeted instruments versus the CAP as a whole, effectiveness is low and the potential to reverse trends of biodiversity decline is neither fulfilled nor likely to be fulfilled under current conditions.

4.4.3.2.1 Agri-Environment-Climate measures

A comprehensive review on the impacts of AECM at European level over the last 20 years has shown that the implementation of AECMs has been beneficial to enhance farmland biodiversity locally, often leading to increased number of species (Batáry et al. 2015). Benefits were highest when aimed at areas out of production, such as natural habitat and field margins, rather than those implemented in production areas. A recent unpublished RSPB review based on 158 papers from NW Europe indicates overall positive effects of AECM especially in arable landscapes for plants, arthropods, mammals and birds: as an example, semi-

natural grasslands do not only have a high biological diversity but can also help increase biodiversity on a landscape level with regards to farmland birds and insects, acting as source habitat for individuals, which can spread to habitat of lower quality along field margins or otherwise intensively managed agricultural areas (Öckinger and Smith, 2007; Hiron et al. 2013), grassy field margins can act as an important refuge and serve as food for invertebrates, mammals and birds (Marshall et al. 2006, Vickery et al. 2009; Haddaway et al. 2016).

The role of AECM to support ecosystem services (ESSs) in agriculture is increasingly covered in scientific literature and reports emphasizing the importance of improving the delivery of ESS in agroecosystems (ENRD 2012; Allen et al. 2014; IPBES 2016). Rundlöf and Bommarco (2012) identified three main measures that may specifically promote pollinators in Europe: creation and restoration of semi-natural habitats, establishment and maintaining of flower strips, and reduction of pesticide inputs by conversion to organic farming or introduction of unsprayed field margins. Another, management of hedgerows to enhance flowering, is supported in some countries. These landscape elements are supported under AECM and, less so, EFA (see section below). Biological pest control services can be promoted by tailored flower strips in potato crops and winter wheat (Tschumi et al. 2015; 2016).

However, effects of AES could only be found in simplified but not in complex landscapes (Kleijn et al. 2005; Batáry et al. 2011). Several reviews only indicate effectiveness of AECM when they are targeted to specific landscapes or regions, promote low intensity, low input farming, and regionalized to meet specific management needs that suit local conditions (e.g. Kleijn et al. 2011; Merckx et al. 2009). Due to these known impacts of AECM at small scales or in specific study systems (e.g. particular taxa, areas or indicators), a larger share of reviewed studies raised concerns regarding the incapacity of AECM to reverse the larger-scale, overall trends of farmland biodiversity and ESS decline (European Court of auditors 2011; EEA 2015; Maxwell et al. 2016). Austin et al (2016) used structured interviews with experts to examine the perceived impacts of 11 species-specific conservation schemes in Scotland. They detected the greatest perceived co-benefits associated within pollination, habitat quality and wild species diversity (Austin et al. 2016). A case study on species-rich grasslands in the UK argues that agri-environment schemes encourage the creation of short-term semi-natural grasslands which are proven to have very limited benefits for the provision of ecosystem services (Horrocks et al. 2016).

Modelling and simulation tools to support the design of landscape-targeted (and coordinated) AECM were proposed to reduce administrative burdens and increase collaboration among farmers (Wätzold and Drechsler 2014; Wätzold et al. 2016). Case studies indicate that result-based approaches, where farmers are paid for biodiversity outcomes rather than for specific management prescriptions, may be more challenging and potentially less intuitive, but they can become operational and lead to higher effectiveness, as well as cultural change and social learning (Burton & Schwarz 2013). A series of pilots are currently underway in Ireland, Romania, Spain and the UK, funded by the European Commission (Burton et al. 2013, Birge et al. 2017, Wezel et al. 2018). It needs to be mentioned though, that this approach can entail higher risks to farmers and bears difficulties for monitoring set-up (Burton & Schwarz 2013). Also, the uptake of those measures can be hampered by counteracting policy incentives e.g. biogas subsidies (Russi et al. 2016). A case study conducted in England, Schroeder et al. (2013) show a potential of 69% of farmers who were potentially willing to apply a result-based scheme, if they are kept simple and attached with necessary advice. Based on interviewed farmers in Lower Saxony (Germany), Niens and Marggraf (2010) found that 86% of them would prefer a result-base scheme. They also found that most of the

farmers see advice as a very important measure to improve acceptance of AES (Niens and Marggraf 2010).

A major identified barrier relies on support channelled to prescribed management (mostly) regardless of the ecological results. A significant change in AECM budgeting has been introduced in the 2013-reform, generating much uncertainty as to whether AECM have been improved or degraded in terms of their capacity to promote to biodiversity conservation (Pe'er et al. 2014). Although the proportion of Pillar II funding for environmental measures has increased by 5% (it was 25% in the previous CAP period, 30% in the current CAP), this budget now includes other activities such as e.g. climate change mitigation and organic farming, anticipating both positive and negative impacts on biodiversity and associated ESSs. In reality, AECM funding declined by 8.6% in the 2014-2020 funding period, as a very conservative estimate (see **section 4.5,** 'Efficiency').

4.4.3.3.2 Greening measures within Pillar I

In Pillar I, set aside requirements existed in earlier forms of the CAP and were abolished in 2009, resulting in some recorded losses of bird diversity due to the reduction of fallow land surface (De Frutos et al. 2010). A large proportion of the reviewed publications on greening, published prior to or soon after the 2013-reform, have acknowledged the potential of greening to contribute to achieving the environmental protection aims set by the EU. Yet evaluations of the final design of the greening measures indicated a limited capacity to contribute to halting the loss of biodiversity associated ESSs, attributed to broad exemptions and (too) large flexibility in the choice of measure, low requirements compared to existing land use or management, and lack of specific management criteria to assure environmental quality.

A call for evidence on the effect of greening measures, launched by EU project EKLIPSE, yielded 37 publications on greening. With greening being a new instrument, most publications focused on the potential of greening, and only few have so far addressed the actual implementation and/or its effects, especially with regard to effectiveness on ESS. In the following, we elaborate on the specific aspects of success or failure as well as their impact on biological diversity and ESS as far as possible, for each of the three measures separately.

a) Crop diversification

The primary objective of the measure is crop rotation as a well-established means to promote soil quality, yet there are common claims for potential environmental benefits on farmland biodiversity. It aims to maintain or increase crop diversity (with a focus on soil quality), by requiring farm holdings with arable land of 10-30 ha to cultivate at least two crops, and three crops for farms > 30 ha, with no more than 75% of the farmed area assigned to one crop (EC, 2013c).

Most farmers already meet the requirements and the measure impacts only 2% of EU arable land due to considerable exemptions (Pe'er et al. 2014, also see Fig. 4.4.5): (i) farms below 10 ha are exempted from the measure, accounting for 92% of arable holdings in new MSs and 13% of arable area across the EU; (ii) the requirement sets a threshold that is considerably lower than the average crop diversity prevailing today on EU farms, especially in new MSs, and there are no requirements regarding eligible crop types The measure is unlikely to generate any substantial changes in farming practices or significant

increases in crop diversity in the EU-28, compared with the situation in 2014 (Westhoeck et al. 2012, Was et al. 2014, Hart et al. 2015). For instance, results of the AGRIPOPES project showed that only around 12% of the farms within their pan-European investigation grew less than three crops (Emmerson et al. 2016), some countries have defined winter and summer crops to be considered as two crops (e.g. France); crop rotation, originally proposed as the core element of this measure, has been excluded. MSs could choose to include crop rotation this option, and 5 MSs did so in line with GAEC standards on crop rotation (EC 2016). Josefsson et al. (2017) showed, for a sample of 178 farms spread over Sweden, that over 97% would not need to change their management under the crop diversification measure. Spain and Italy are the countries most affected by the measure, in terms of the number of farms that need to diversify and the total area affected. A JRC study (2015) concluded that only 4% instead of 8% (see above EC 2016) of total arable land will be affected by the measure due to the fact that the Commission assumed all non-compliant farms to move to compliance, whereas the JRC study shows that only less than half would do so. Based on structural information and quantitative models, the Commission considered that this measure successfully targets farms that only cultivate one crop, and that the area reallocation would target mainly wheat, barley and maize. The commission concludes that the crop diversification requirement was already applied (most farmers already comply) on most arable land in Europe, therefore the measure contributes to at least preventing the degradation of soil quality. The findings of Pe'er et al. (2014) indicate the opposite, namely that crop diversification in its current design and implementation cannot yield an increase in crop diversity - but at the same time it may allow decreasing diversity to the required threshold while seemingly supporting the Greening. Data to indicate whether crop diversity has increased or decreased following the implementation of this measure are unfortunately not accessible.

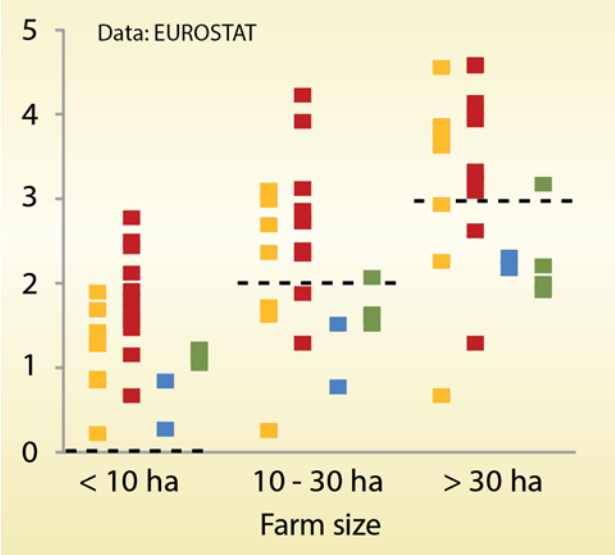


Figure 4.4.5: *Average crop diversity in different MSs compared to minimum requirements set by the CAP (horizontal dashed lines). Colours represents MSs in western (yellow), northern (blue), southern (green) and Central + Eastern EU MSs (new MSs; red). Each square represents the average in one MS. Source: Pe'er et al. 2014.*

T**he effects of crop diversification on biodiversity and ESS are expected to be mixed and very limited** (Westhoek et al. 2012). EU-wide information on crop diversification implementation and hence potential

effectiveness is very scarce. Cultivating three crops on large intensively-managed farms is unlikely to enhance biodiversity (Dicks et al. 2014). In general, the benefits for wildlife arising from crop diversification are questioned by the majority of studies (e.g. Dicks et al. 2014, Pe'er et al. 2014, Hiron et al. 2015, Emmerson et al. 2016). Similarly, Söderberg et al. (2016) claimed that crop diversification requirements have only marginal environmental benefits in Sweden. Here, Hiron et al. (2015) and Josefsson et al (2017) found no or only marginal effect of crop diversity on farmland bird richness. Impacts will mostly depend on the type of crops and their management rather than on crop diversity *sensu lato* (Josefsson et al. 2017). Hart et al. (2015) claimed that the measure could potentially lead to some benefits for biodiversity, particularly if it leads to an increase in crop rotation, and if fallow or legume crops are introduced into the rotation. With regard to ESS there is only little information. If crop diversification would lead to increased crop diversity, resilience can be improved in a variety of ways by having a greater ability to suppress pest outbreaks and dampen pathogen transmission (i.e. pest control) (Lin 2011). Using a biodiversity-friendly farming practices (BFP) indicator, Gocht et al. (2017) estimated that crop diversification has mixed effects, with a small positive impact in some regions due to higher crop diversity and lower fertilization as a consequence of higher amount of fallow land. They further concluded that crop diversification is the CAP greening measure having the lowest environmental effects or even no effects at all. In addition, with the lack of guidance on crop rotation or recommend crops (e.g. legumes), Pe'er et al. (2014) assessed the measure to be generally unlikely to prevent further landscape homogenization (down to the permitted thresholds) and therefore deliver any benefits to biodiversity. Potential benefits for biodiversity can be achieved by a mandatory increase of crop rotation and introduction of fallow or legume crops introduced into the rotation (Hart 2015).

b) Ecological Focus Areas (EFAs)

The introduction of EFAs was foreseen as a means to maintain or restore landscape features of relevance to biodiversity in order to enhance biodiversity. A large number of options were defined by the EU as eligible for EFAs. These include ten main options plus eight types of landscapes features (Article 46 of Reg. 1307/2013) and each MS selected, which of the EFA options defined by the EC are eligible for their national direct payments and the dimension of choice ranges from two options in some MSs up to 18 in others (EC 2015c, Tzilivakis et al. 2016). The European Commission reports that in 2015, 8 million ha of land was declared as EFA, which accounted for 13 % of the arable land falling under the obligation and 10 % after applying the weighting factors (percentages may differ at farm level; EC 2016a). This is significantly above the regulatory requirement of 5 % at farm level (**Fig. 4.4.6**). In 2016, the figures were 15 % and 10 % respectively, with a slight increase of 130 000 ha. The actual area covered by EFAs has been under discussion also due to the various exemptions employed. Pe'er et al. (2014) evaluated that the threshold of 15 ha of arable land as a minimum area for applying the greening requirement already exempts 89% of the EU's farmers and 47% of the EU's farmed area (35,5% of UAA).

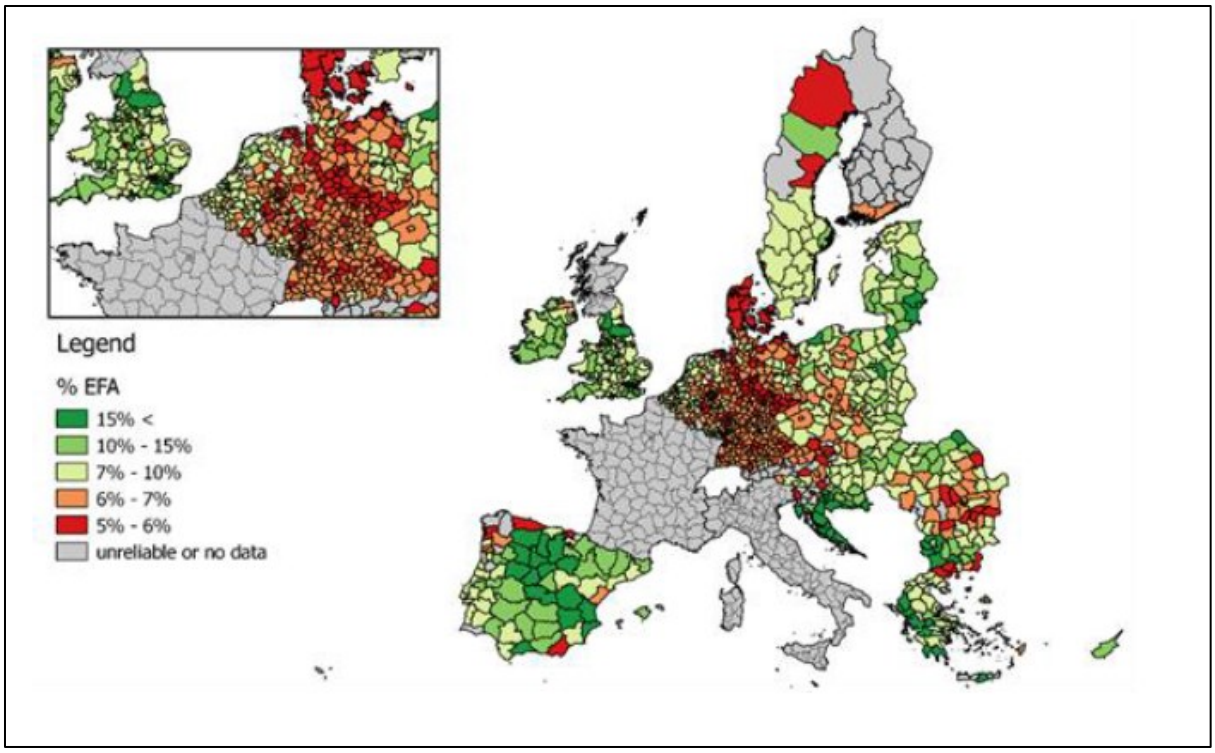


Figure 4.4.6: *EFA implementation data for 2015 shows that in many NUTS3 regions, the actual declared EFA area is much higher than the minimum 5% requested by the legislation. As an average, the EFA declared represents on average 9.4% of the arable land. Source: Angileri (2017, Figure 7).*

Notably, the differences between calculations is that the latter value only considers arable land (i.e., excludes grassland and permanent crops) rather than UAA. In contrast, a EC assessment of the implementation of EFAs indicates in 2016 only 31% of the arable area as exempt from greening (EC 2017), stating that the remaining part of the arable land is not covered by the direct payments system (e.g. farmer did not apply for aid), exempted because of the farm's size (less than 15 ha of arable land), belongs to organic farms or farms under the small farmers scheme, has a high share of grassland or is located in countries that apply the forest exemption.

The assessment of Pe'er et al. (2017) divides greening into environmentally effective EFA-options (fallow land, buffer strips and landscape element) and EFA-options that have lowest effectiveness for biodiversity (catch crops, nitrogen fixing crops and forestry options). Overall, merely 23-25% of EFA at EU level were allocated to measures that have a potential to bring significant benefit to biodiversity (Hart 2015, EC 2016b, Angileri et al. 2017, Pe'er et al. 2017) and the majority of the area, both in actual and weighted values, was taken up by nitrogen fixing crops, catch crops and fallow land whereas landscape features and buffer strips had very low uptake (Fig. 4.4.7). A series of publications refers specifically to the risks entailed by the inclusion of options, such as nitrogen fixing crops, catch crops or short-rotation coppice, that do not have clear and direct benefits on biodiversity (Burrascano et al. 2016; Pe'er et al. 2014, 2017) or are implemented anyway by the farmers and hence require no change of practice (e.g. catch crops).

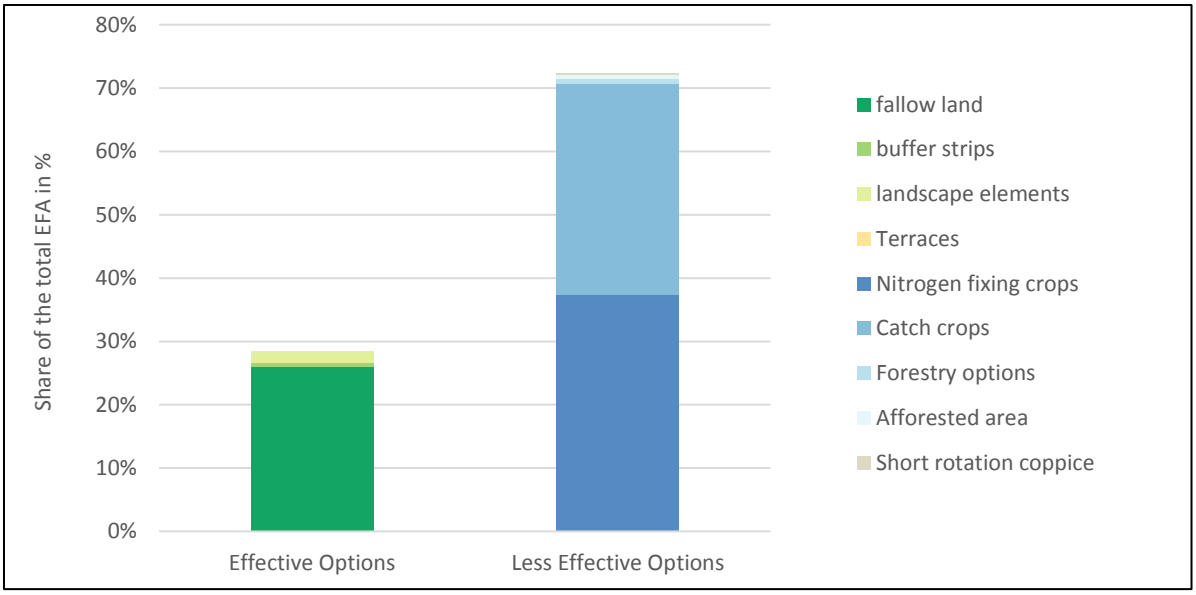


Figure 4.4.7: *Effective and less effective options within the Ecological Focus Area in the EU 2015. Source: own calculations based on data by EU Commission 2016; Division of EFA-options into effective and less effective following Pe'er et al. (2017).*

Studies of the direct consequences of EFA implementation on biodiversity are yet limited, not only because implemented EFAs have been in place for only two years, but also due to the lack of sufficient in-field monitoring, and inaccessibility of implementation data to assess consequences. A simulation-based analyses of the potential effect of EFAs on the European hare in Denmark shows that, despite a potential positive effect (increasing the number of individuals), the 5% requirement for EFAs would be insufficient to achieve a viable hare population (Langhammer et al. 2017). Notably, the authors assumed that EFAs would generally support habitats that are suitable for the hare population, whereas in reality only a few options do. **Fallow land** was particularly dominant in southern Europe. Effects of fallow land are strongly depended on management practices: sown-in wildflowers or set-aside fields left for regeneration can have positive impacts with regard to bird diversity and pollination services (Wratten et al., 2012; Lindström et al. 2017), however, black fallow with bare soil scored lowest on ESS and has potential negative impacts due to higher risk of soil erosion (Angileri et al. 2017). In such a case, land lying fallow would give better results if left unmanaged for a long period. An administrative barrier to such an adaption of implementation lies in the risk that such areas may then fall into the category of „permanent grasslands", which again may limit further agricultural use and therefore is undesirable for farmers (Pe'er et al. 2017). **Nitrogen-fixing crops** could generally be good for flower-visitors, and thus enhancing pollination, but peas and field beans, which make the majority of nitrogen-fixing crops used, have limited value to biodiversity and ESS (Dänhardt et al. 2017). L**andscape features,** and particular flower strips (a relevant element both in AEM and Pillar I greening measures) are expected to have positive impacts on specific biodiversity-related ESS pollination and pest control (Tzilivakis et al. 2016; Angileri et al. 2017). However, total uptake of the EFA measure landscape features comprised only 4.3% of the total EFA area (relatively high uptake in Ireland, Northern Ireland, England and the Federal State of Schleswig-Holstein in Germany) (Angileri et al. 2017, Pe'er et al 2017). In contrast, **catch crops,** with marginal benefits for

biodiversity (but see potential effects with regard to water pollution, section 4.4.2) covered as much as 95% of EFA area.

Limited effects of EFA measures on biodiversity were to a certain extent addressed by assigning differential weighting factors to the different options were less effective options must be met by larger areas. Consequently, the actual cover of EFAs differs significantly from the weighted one (Fig. 4.4.8).

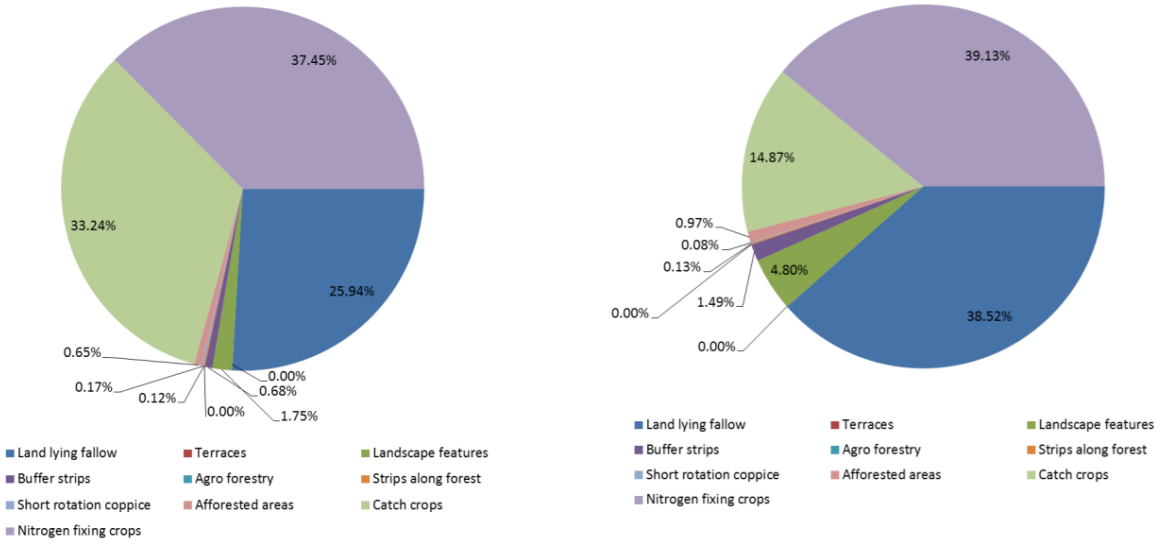


Figure 4.4.8: *Percentage distribution of the most common EFA types a) before and b) after weighting factor Source: EC (2016b).*

The design and implementation of environmentally beneficial EFAs is associated with: 1) administrative burdens that lead to resistance among farmers, and serve as barriers to effective implementation (Zinngrebe et al. 2017); 2) economic reasons guiding the uptake choices by farmers, favouring productive as well as simpler options e.g. to reduce uncertainty or risk of sanctions (examples from Germany and Sweden; Zinngrebe et al. 2017, Dänhardt et al. 2017); 3) allowing the use of agrochemicals (e.g. pesticides incl. neonicotinoids) which have known negative impacts on wild pollinator survival (Rundlöf et al. 2015); 4) a lack of advisory services with sufficient ecological knowledge (Zinngrebe et al. 2017); and 5) promotion of targeting individual farmers and lacking coordinated biodiversity management by the CAP (Leventon et al. 2017; Dänhardt et al. 2017).

A modelling approach in Sweden showed that, with regard to current regulations, even coordinated implementation, which is expected to increase effectiveness of the implementation of EFAs would provide only small environmental effects (Dänhardt et al. 2017). The authors mainly attribute these weak effects to the possibility for farmers to choose EFAs with weak environmental effects or even incentives to place focus areas on low productive land where the environmental benefit is low; currently only a the small number of MSs is supporting collaborative implementation by farmers (only Netherlands and Poland; Hart 2015).

EFA in Switzerland

Author: Felix Herzog

Whilst in the EU EFAs were introduced in 2015, in Switzerland they were introduced already in the late 1990ies. Since then, farmers need to manage at least 7 % of their land as EFA in order to qualify for direct payments (cross-compliance mechanism). Vineyards are also included but for horticultural farms, the percentage is reduced to 3.5 %. Income loss due to late cut of grassland or flower strip planting on arable land is compensated by area payments. Additional bonus payments can be obtained for EFA that meet ecological quality requirements (result oriented payment) and / or that are part of a regional ecological network, in which farmers have teamed up to promote specific target species. In 2015, EFA made up 15.1% of the Utilized Agricultural Area (BLW, 2016), with lower shares in the arable lowland regions (closer to the minimum requirement of 7%) and higher shares in mountain regions (up to 40%). Walter et al. (2010) conclude that in the lowlands, the EFA scheme has contributed to slow down – but not to stop – the loss of farmland biodiversity (see also Aviron et al. 2007) whilst in mountain regions, the EFA help to maintain traditional farming practices, which are related to the still comparatively high biodiversity levels (see also Kampmann et al, 2011).

c) Permanent grasslands

The overall aim of this measure is to maintain permanent grasslands in the EU, recognizing them as providing environmental benefits (including biodiversity) and playing an important role in carbon storage. For example, grasslands on high organic (peat) soils have reduced carbon losses in comparison to arable land that is subject to drainage and nitrogen fertilisation. The measure essentially consists of a ban on ploughing and conversion of designated environmentally sensitive grasslands, mainly within Natura 2000, plus ensuring that the ratio of areas of permanent grassland to total agricultural areas does not decrease by more than 5%, compared to a reference ratio set by member states in 2015 (EC 2013).

A report on the implementation choices by EU member states found that most (23) countries implemented the most flexible route for maintaining the ratio of permanent grassland by applying it at the national level (Hart, 2015). For the EU-28, ten MSs designated 100% of permanent grassland within Natura 2000 areas as environmentally sensitive, with only five countries designating less than 10%. This shows overall large effectiveness in implementation of Environmentally Sensitive Permanent Grasslands (ESPG). In its review of "Greening after one year" (EC, 2016), the European Commission concluded that more than a third of European farmland was classified as permanent grassland subjected to protection, aimed in particular for carbon storage. ESPG covered 16% of total permanent grasslands at EU level, but with significant variability across member states. Within Natura 2000, the amount of permanent grasslands designated as ESPG by member states was 75%, although only 40% was declared as such by greening farmers in the designated areas. Five countries also declared ESPG outside Natura 2000. Therefore, although the uptake of this measure was significant, some member states did not designate all their permanent grassland areas within Natura 2000, whereas, other than area-designating management plants are still missing from various MSs.

The share of permanent grassland on the total agricultural area showed a stable trend between 2006 and 2015 (EC, 2016). According the Greening-regulation in some MS, a maximum 5%-decline of the ratio of permanent grasslands to total agricultural area was allowed for farms, if the regional share wouldn't decline. This is less strict than the former national legislation on the maintenance of grassland (see for the case of Germany; Lakner & Holst 2015). However, this strongly depends on the reporting level and whether the reference is farm-level, regional or nation. There were, however, exceptions (Estonia, Cyprus, UK). In contrast, some countries showed a notable increase (e.g. Lithuania, Sweden; EC, 2016).

The potential impacts of this measure for biodiversity and ecosystem services are assumed as mostly positive, although scientific evidence is still very scarce, given the short period of implementation of this measure. The designation of ESPG in particular, is assumed to bring benefits for biodiversity, carbon, soil and water but the impact will depend on the proportion the Natura 2000 area designated and the extent to which its inclusion under greening leads to greater adherence by farmers (Hart, 2015). Model projections suggest that the full set of greening obligations is likely to slow down the decline in the area of permanent grassland, resulting in in 2.5-4% more permanent grassland in 2025 than what was anticipated in the absence of green direct payments (EC, 2016; Gocht et al. 2017). In Baltic countries, Was et al. (2014) predicted a modest increase in permanent grassland area as result of the CAP greening, with the growth of grasslands area in Poland, Lithuania, Latvia and Estonia being twice as high as the EU average.

Projections of the biodiversity impacts of this measure can only be estimated at this stage. Overmars et al. (2013) showed that arable fields in the EU 27 usually have a lower species richness compared to grasslands (see **Fig. 4.4.9** below), so maintaining or restoring grassland areas should have positive impact on biodiversity. Zeijts et al. (2011) also showed that extensively managed grasslands, in particular, have the highest species richness (compared to arable land, permanent crops and intensively managed grasslands). Their ex ante analysis of the impacts of greening on farmland biodiversity predicted a decrease, but not halting, of biodiversity loss, with greening expected to result in 3% higher species richness on European farmland in 2020, compared to a baseline scenario, although the payment specific for permanent grassland would have little effect. The effectiveness of greening was expected to be higher in more intensive farmland regions. Using a biodiversity-friendly farming practices indicator, Gocht et al. (2017) estimated that greening, including permanent pastures, has a negligible positive impact on these practices in Europe, although they acknowledged that the effects might have been underestimated. Chiron et al. (2013) estimated a slightly (not statistically significant) positive effect of CAP greening measures on the Farmland Bird Index in France in the 2007-2020 period, compared to a baseline (business as usual) scenario, with grassland bird species benefitting more than mixed- or arable-land species (**Fig. 4.4.9**).

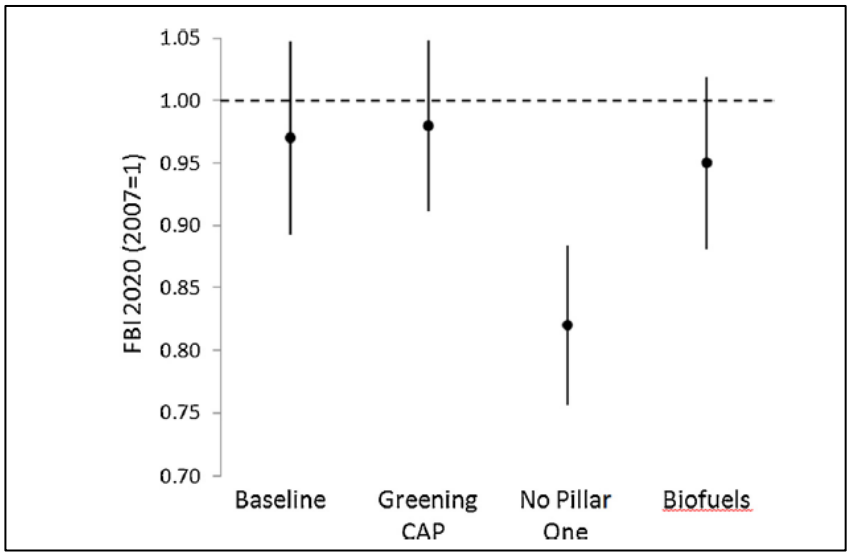


Figure 4.4.9: *Predicted Farmland Bird Index in 2020 under four scenarios for France. The 'Baseline scenario represents the reference case, with 2007 as the reference year (FBI=1). Values below dotted line indicate a decrease in the FBI between 2007 and 2020. Bars are standard errors. Source: Chiron et al. (2013).*

In a study in lower Saxony, Jerrentrup et al (2017) found a decline in farmland bird populations during the 2005-2012 period that was explained by an increase in the area covered by maize, which came at an expense of permanent grassland. Söderberg (2016) claimed that the permanent grasslands measure has limited environmental benefits in Sweden, and these will occur only when the country will exceed the quota for the set reference area. Dicks et al. (2014) and Pe'er et al. (2014) maintained that simply keeping grasslands without specific management measures (such as traditional cutting, maintaining adequate grazing regimes and fertilizer inputs) is unlikely to deliver biodiversity conservation benefits.

4.4.3.3.3 High Nature Value Farmland

Devised in the 90's, the HNVf concept reflects a causal relation between specific low-intensity farming systems and the occurrence of species and habitats, known to be fully or partially dependent on the maintenance of agricultural management (Halada et al, 2011; Oppermann et al. 2012; EIP-AGRI, 2016). The nature value of HNVf builds on the prevalence of high proportions of natural and semi-natural habitats (*sensu* Annex I of Habitats Directive, Keenleyside et al. 2014); the occurrence of mosaics of crop fields intermingled with semi-natural vegetation and small-scale landscape features, or the prevalence of species of conservation interest (e.g. birds, butterflies, plants) (Andersen et al. 2004; Lomba et al. 2014). HNVf are thus among the biodiversity indicators considered within CAPs Common Monitoring and Evaluation Framework for 2014-2020 currently under assessment (Eurostat 2017) and considered essential to achieve Target 3 of the EU Biodiversity strategy to 2020 (EEA, 2015b).

HNVf systems are currently threatened by intensification (Fig. 4.4.10) and abandonment, due to a range of socio-economic and environmental changes (e.g. climate change). Beaufoy et al. (2012) reported contrasting trends of land use, with abandonment of agriculture-related habitats e.g. semi-natural pastures in marginal farmlands of the EU, and the intensification of more productive land, in Ireland

(Kramm et al.2010), Spain (Yoldi et al., 2010) and Sweden (Swedish Board of Agriculture, Söderberg et al. 2017).

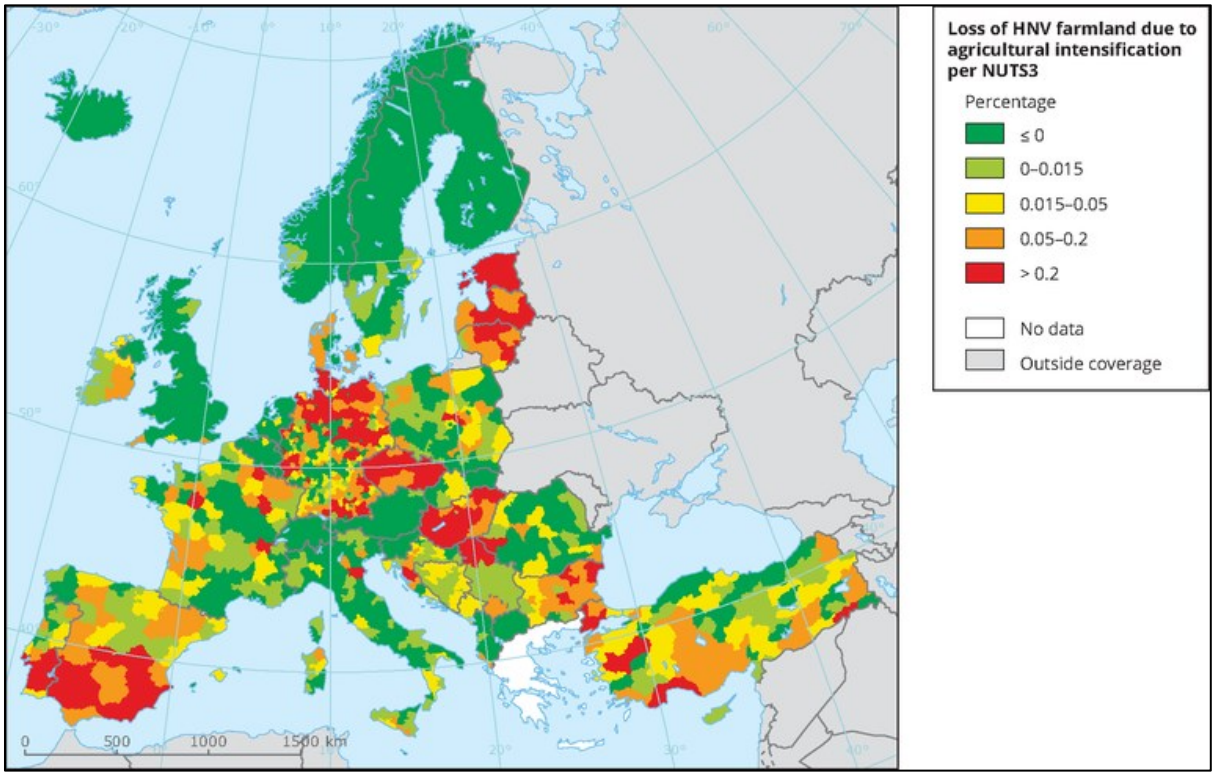


Figure 4.4.10: *Risk of loss of High Nature Value Farmland (HNVf) due the pressure of agricultural intensification per NUTS3 (EEA, draft, last modified 31 July 2017, http://www.eea.europa.eu/legal/copyright).*

HNVf systems sustainability relates to the fact that they deliver agricultural commodities such as feed, food and fire, while contributing to the EU environmental performance, through the support of natural and semi-natural habitats (and species), which persistence is known to depend on specific farming practices (EIP-AGRI, 2016). The multifunctional character of HNVf relates to their contribution to a wide range of ESS (Paracchini & Oppermann, 2012 page 449), e.g. namely genetic resources (provisioning service), pollination, water quality and availability, soil quality regulation and resilience to flooding and fire (regulation), aesthetic value, recreation and ecotourism (cultural services) (Bernués et al. 2016). Yet, the wide range of ESS potentially provided by HNVf, have seldom been scrutinized (Plieninger & Bieling, 2013).

While not specifically tailored to HNVf, several CAP instruments support (or can be used to support) High Nature Value farming systems, including AECM, LFA payments, organic farming payments and Pillar I DPs. In a collection of 35 European case studies, Oppermann et al. 2012a highlighted the key importance of AECM, especially in areas under Natura 2000 payments and payments linked to the Birds and Habitats'

Directives, providing examples from Lithuania, Sweden, and United Kingdom. Remarkably, while Natura 2000 payments are an important source of HNVf support, a large share of HNVf are located outside protected areas (e.g. see Lomba et al. 2015). However, the relation between AEM expenditure in NUTS 1 and 2 administrative units and the share of HNVf in the EU is far from proportional i.e. areas characterized by higher AEM expenditure are not always coincident with areas with higher areas of share of HNVf (Fig. 4.4.11).

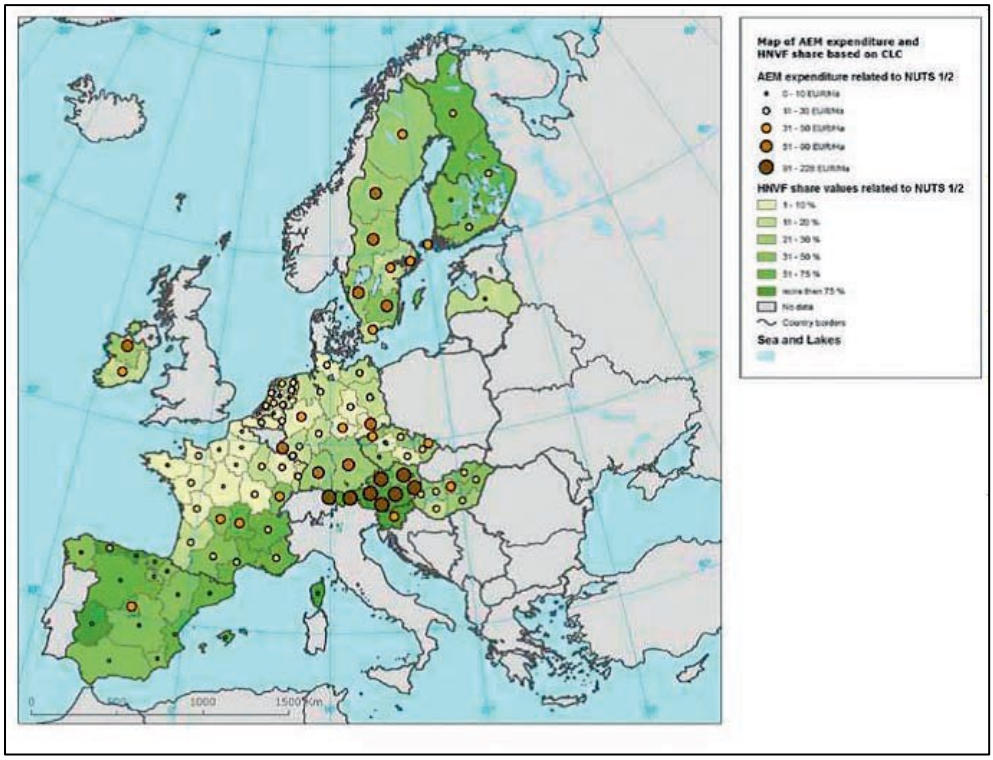


Figure 4.4.11: *Share of High Nature Value Farmland (HNVf) and AEM expenditure in selected countries. Source: Redman 2012, taken from EEA (2009), p. 496.*

As current reporting on CAP direct payments and RDP expenditure at the farm level does not discriminate between HNVf and other farmlands, it is not possible to estimate at the EU and MS level which proportion of CAP's direct payments, AEM, EAFRD and LFA compensations are allocated to HNV farms (Redman 2012, Keenleyside et al 2014). Additionally, Keenleyside et al (2014) recently reported that some important HNVf were partially or completely excluded from CAP support during the period of 2007-2013, as in many MS many HNV farming systems are not eligible to benefit from such a support, this constituting one of the most relevant barriers to HNVf persistence. Reasons for that include small size of HNV farms and agricultural parcels and the presence of many trees and rocks in semi-natural pastures. Most HNVf are small-sized farms, and thus the majority are not eligible to CAP support – especially but not exclusively in new MSs. For example, in Romania 72% of the holdings are not eligible for CAP payments due to holdings less than 1 ha (ref), and in Bulgaria only 62% of the area identified as HNVf is eligible for SAPS. There are though other threats to HNVf persistence: i) the low values of LFA payments,, ii) support for ANCs (Areas facing Natural or Other Specific Constraints) and AECM are not tailored to HNVf, iii) CC rules and

implementation exclude HNVf from support (e.g. in Bulgaria) (Keenleyside et al. 2014). Moreover, as some HNVf are marginal farmlands (often coincident Less Favoured Areas), and thus under several constraints to agriculture (climatic, soil, topography and remoteness), they are more prone to abandonment due to socio-ecological changes (Lomba et al., 2017).

Considering that there's no detailed information on the investment allocated to HNV farming systems support, case-studies point out that, with particular exceptions, the recent political context failed to halt the decline of HNV farming systems (Keenleyside et al 2014). Due to currently high dependencies of HNVf on CAP subsidies, the future of HNVf systems lies in innovating and diversifying farm-related activities e.g. the creation of niche markets for local products (such as the high quality Protected Designation of Origin) and by increasing societal demand by raising awareness on their contribution to the provisioning of public goods and ESS e.g. agri-tourism (O'Rourke et al. 2016).

4.4.3.3.5 Cross compliance

We found 24 papers addressing the impacts of cross-compliance (CC). Most of these reported positive impacts of GAEC on soil properties, and indirectly on biodiversity, both at the EU and the member states level (Panagos et al. 2015, Borrelli et al. 2016, Posthumus et al. 2011). However, an assessment across four Federal States in Germany (Nitsch et al. 2012) found that CC does not effectively act to reduce habitat loss and degradation of habitat quality, with particularly severe degradation of peatland. As part of the Fitness Check of the Birds and Habitats Directives, Milieu et al. (2016) reported that mandatory inclusions of information on CC in farm advisory systems had increased awareness of farmers of their obligations under the directive, yet evaluations on additional beneficial effects of CC due to e.g. GAEC obligations have not been carried out. Implementation of CC can further be hampered by the fact that penalties for CC infringements of up to 5% farmer's annual payment entitlement are considered to be too low to deter against non-compliance (Milieu et al. 2016). In addition, there was no evidence of farmer penalisation for habitat clearing across 12 MSs (Birdlife International, 2009). However, it has also been reported that farmers might adapt their management e.g. by removing vegetation in semi-natural habitats in order to avoid real risks of losing CC payments due to lack of knowledge and this non-compliance with eligibility rules (Poláková 2011).

Our review could not identify sufficient studies on direct impacts of CAP instruments that are not designated to protect biodiversity directly, such as ANC (formerly LFA) or other instruments within both Pillars I and II.

4.4.4 Organic farming in the context of sustainable farming

Question: Have do CAP measures affect changes in organic farming in the context of sustainable farming?

Relevant CAP objectives: 2010-objective 1 ("viable food production") and 2010-objective 2 ("sustainable management of natural resources and climate action")

Relevant SDGs: 6,8,15.

Number of publications scanned: 31

4.4.4.1 Overall trends on organic farming in the context of sustainable farming

We listed four main approaches to sustainable or environmentally friendly farming: organic farming, conservation tillage, integrated pest management and precision farming. Organic farming is the only approach including a legally defined standard and control system as well as significant markets. We therefore primarily focus our assessment on organic farming as the broadest and most established sustainable farming system (see section 3.3.8 for further explanations).

Organic farming has been constantly growing in the EU since 2002, however with varying growth rates between zero and 10 per cent (Fig. 4.4.12). In 2011, 9.6 Mio. hectares or about 5.4% of the agricultural area are farmed according to the registered organic farming system (EC 2013e).

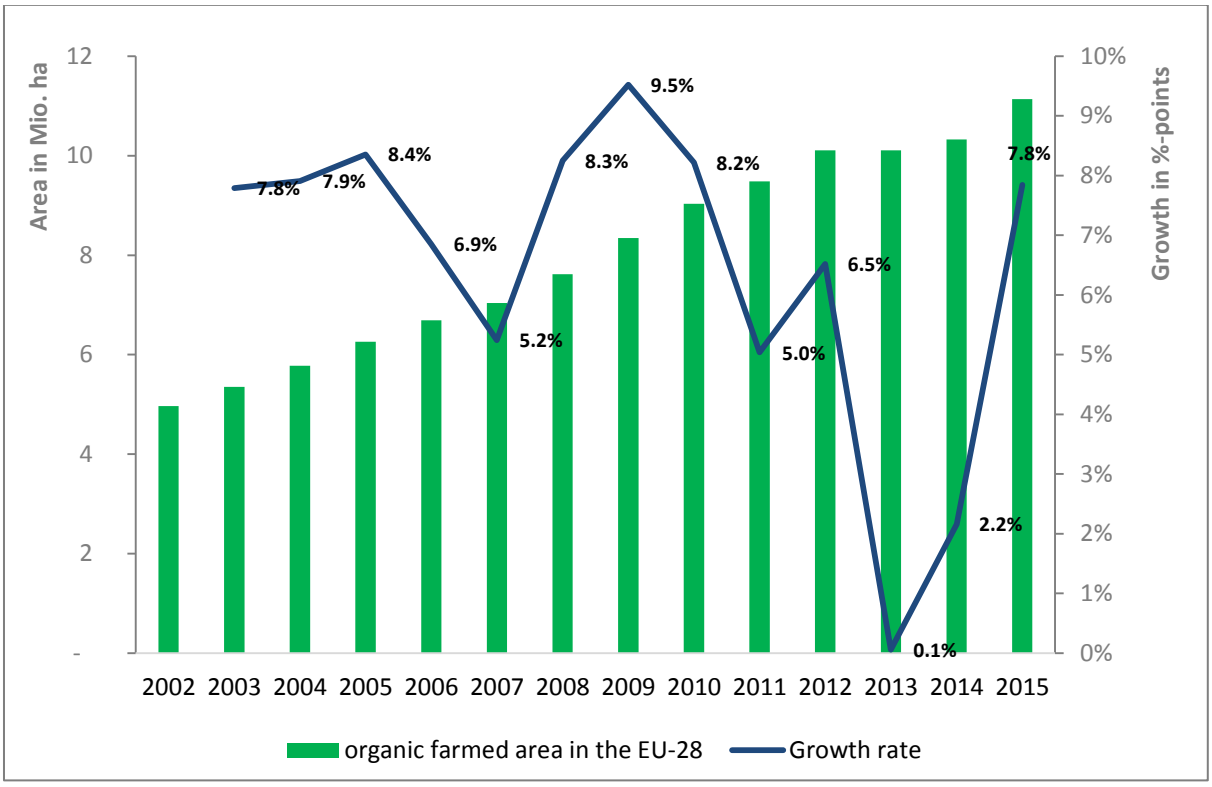


Figure 4.4.12: *Development or organic farmed area in the European Union 2002-2015. Source: EU Commission (2016).*

4.4.4.2 Results of our literature review on CAP effectiveness on organic farming

Key findings

The CAP is likely to have a positive effect on a range of sustainable farming systems, in particular through AECM and CC. On the other hand, the CAP, in particular DP, supports a range of unsustainable farming systems and practices.

Here we explore the case of organic farming as a relatively well-defined farming system which meet the 'Green Growth' agenda. Evidence of the effect of the CAP on conversion to organic farming are mixed and may depend on regions or MSs, but the generally suggests that the CAP contributes to organic farming being a viable farming system with an expanding market. Organic farming has positive or mixed effects on biodiversity. The organic support scheme has mixed effects on productivity and technical efficiency.

The CAP is likely to have a positive effect on a range of sustainable farming systems in multiple ways. For instance, AECM might provide a legal standard and a control system. In some MSs, farms with AECM are excluded from the greening-obligation, which necessitates a legal definition and a control system. Nonetheless, insofar there is no significant market for products from e.g. 'extensive' or 'agri-environmental farming', apart from anecdotal cases of products like 'milk for permanent pastures' in Germany, or "meadow orchards" in various MSs. Similarly, HNVf can be perceived as related to environmentally-sustainable farming systems, albeit, with relatively high levels of poverty and low economic viability, they do not meet the "green growth" agenda. Generally, the poor support by the CAP marks a failure rather than a success in maintaining the social and ecological values associated with HNVf. CAP-related regulations (CC) and incentives within AECM also support a reduction in agrochemical use, at least in some old MSs.

On the other hand, the CAP also supports a range of unsustainable farming systems and practices. Despite greening, DP still dominate the overall balance and supports a range of intensive farming forms, as well as, indirectly, intensification processes (see details in section 4.2.3). Due to the decoupling of DP from production, it is difficult to show that the CAP explicitly incentivises this process, but it does not dis-incentivise it either. Beyond that, the support of the CAP for animal products (dairy and meat products) can broadly be defined as disproportional. First, due to the area-dependency of DP, subsidies for meat and dairy products is higher simply because of the larger area per calorie required compared to vegetable farming (Pushkarev 2015). Yet this difference translates into circumstances where the share of DP in farm income reaches 70% for animal products, compared to 7% of the income of horticultural farmers (Matthews 2017). While these numbers include both extensive and intensive farming systems, the lack of differentiation between them requires attention to the overall balance of the CAP between sustainable and unsustainable farming systems - where, currently, the main emphasis is on the latter.

We here develop the case of organic farming since it is the only sustainable farming approach including a legally defined standard and control system as well as significant markets (see section 3.3.8 for further explanations). Organic farming is supported by the EU in multiple ways (Schwarz et al. 2010), in particular area payments for arable land, grassland and horticultural land, supported by AECM premium within the Rural Development Programmes of Pillar II (Sanders et al. 2013). In 2011, in total ca. 1.41 bn EUR were

paid to organic farms in the MSs (EU Commission 2013e). During the period 2014-2020, MSs and the EU are spending 1.366 bn EUR for the support of organic farming, which is ca. 6.1% of the budget of the RDP in MSs. Organic farming has substantially grown in the EU since 2002 (Fig. 4.4.12). This is the result of the constant conversion aid to organic farming (EU Commission 2016b)

Evidence of the effect of the CAP on conversion to organic farming mostly positive, but it strongly depend on the implementation in the region or MSs (Sanders 2013). Jaime et al. (2016) could show the distinct impact of DP and environmental subsidies (Pillar II) on the probability to convert to organic farming before and after 2003. Their model show that before 2003, DP reduced the probability to convert, whereas environmental payment had no significant impact. After the Fischler-reform, both the decoupled payments and the environmental payment had a significant and positive impact on the conversion to organic farming. This finding suggests that besides the positive impact, a better policy coherence was achieved by decoupling following the Fischler-reform (Jaime et al. 2016). However, some studies actually did not find any impact of the 2003 CAP reform, in particular of direct payments, on farms' adoption of organic farming (Agrosynergy 2013). Requirements and level of payments associated with environmental payments are programmed and determined by each MSs or regions. This can lead to a certain degree of heterogeneity (**Fig. 4.4.13**). Especially throughout the financial period 2007-2013, the general level of organic payment has been reduced in some regions (Lakner 2013). This highlights that organic support is to some extent dependent on political preferences in regions or MSs.

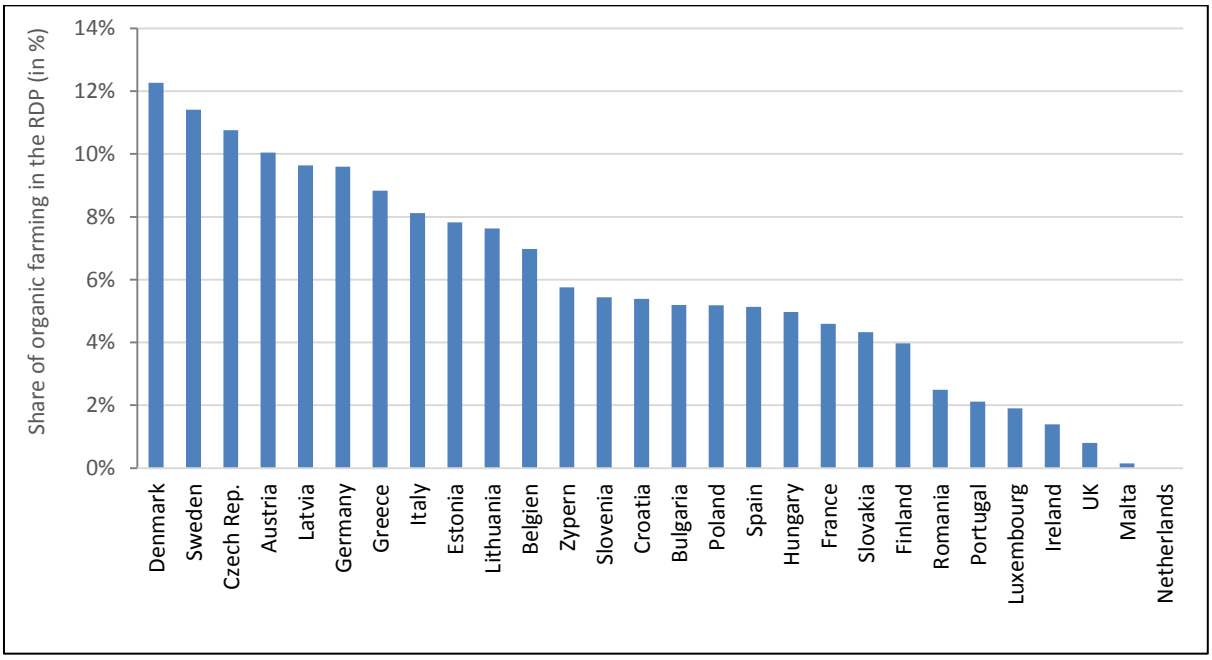


Figure 4.4.13: *Share of Spending for organic farming within the Rural Development Programs (RDP) 2014-2020. Source: EU Commission 2015, factsheets RDP; figures include national co-funding; The Netherlands supports organic farming within their Agri-Environmental and Climate Program.*

Evidence suggests that the CAP contributes to organic farming being a viable farming system, although effects may vary depending on local conditions, farming system and level of financial support. Crowder &

Reganold (2015) evaluated 129 studies comparing financial performances of organic and conventional farming systems. When including the organic payment, organic farms performed financially significantly better in most studies (measured in gross returns, benefit/cost ratios, and net present values). However, when excluding the organic payment, organic farms performed worse than their conventional counterpart. This finding is consistent with long-term observations of German organic farms and comparable conventional farms from 1995-2014 showing that organic farms achieved a higher profit/labor unit in most years (Sanders 2015, Fig. 4.4.14). However, other case studies show mixed evidence on the financial performance of organic farms, which strongly depend on local conditions, farming system and level of financial support (Eltun et al. 2002, Poudel et al. 2002, Lien et al. 2007). Offermann et al. (2009) pointed out that organic farms are more dependent on payments than conventional counterparts. They also found that full decoupling after the Fischler-reform 2005 was beneficial for organic farms especially where performed on a regional basis (Offermann et al. 2009).

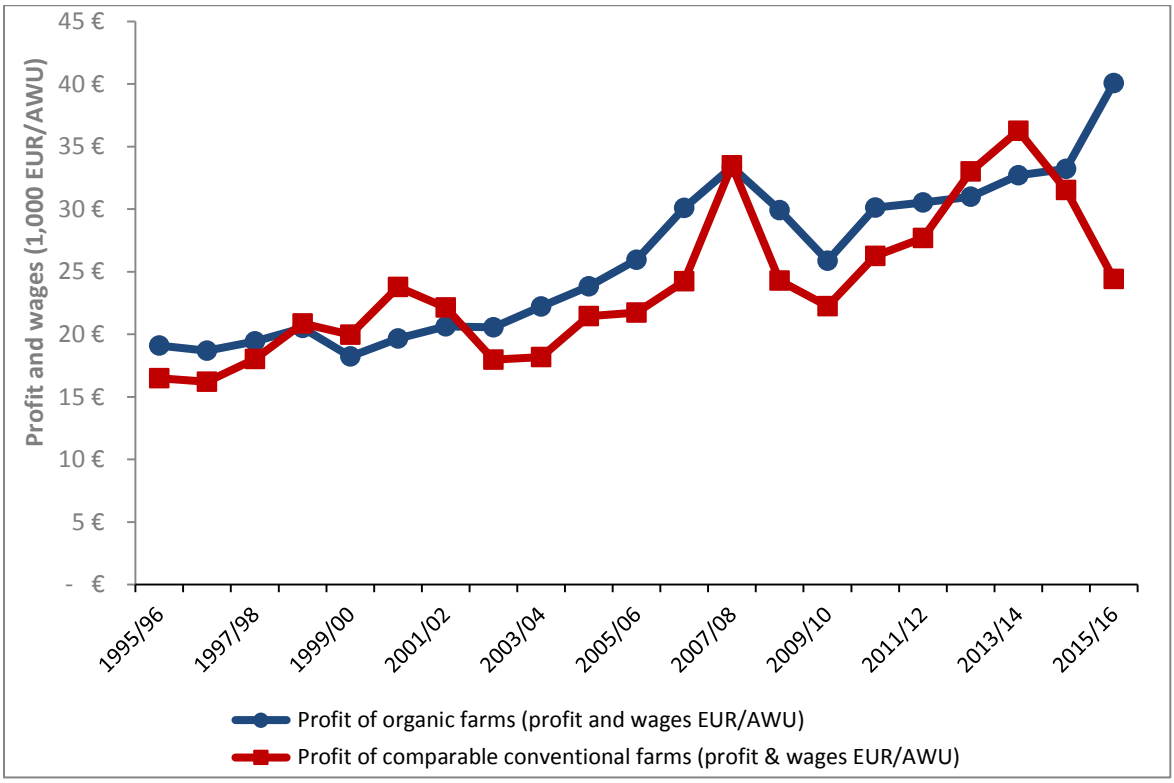


Figure 4.4.14: *Development of profits and wages on organic and comparable conventional farms in Germany 1995-2015. Source: Own presentation, data from the Agricultural Report, Ministry of Agriculture: diff. Issues, and Thünen-Institut, diff. Issues.*

Control substantially contributes to the credibility of organic farmers from the consumer's point of view. Control bodies are executing a strict certification system. Gambelli et al. (2012) could show that up to 50% of the organic farmers can be subject to the category of “slight sanctions”. Those sanction can even be based on bureaucratic requirements like correct bookkeeping etc. However, within the category of ‘severe non-compliance’ there are less than 4% organic farming in most investigated EU MS. Only in

Turkey (as an EU accession candidate part of this project), there are shares of around 20% of severe sanctions (Gambelli et al. 2012: p.12).

The organic support scheme has mixed effects on productivity and technical efficiency. The literature shows that the conversion from conventional to organic farming is not automatically a success, and bears a range of challenges (Sahm et al. 2011). Indeed, environmental advantages of organic farming come at the costs of lower yields, as reported from different meta-studies (de Ponti et al. 2012, Seuffert et al. 2012). Diversification within organic farming system can also contribute to a reduced yield level on organic farms (Ponisio et al. 2012). A meta-study of productivity and technical efficiency of organic farming system confirms a lower productivity of organic farming systems, however with an improved productivity and efficiency if environmental benefits are included in the modelling approach (Lakner & Breustedt 2017). There is mixed evidence of the effectiveness and efficiency of this policy support (see overview in Lakner & Breustedt 2017). A study by Lakner (2009) investigates the impact of organic payments and agri-investment schemes on technical efficiency of organic milk farms. Both policy instruments exhibit a negative influence on technical efficiency. The same result was confirmed by Lakner et al. (2012) for organic payments for organic grassland farms. A similar result was found for organic alfalfa farms in Greece, where the share subsidies had a negative influence on technical efficiency (Nastis et al. 2012). A study of Sauer & Park (2009) has shown that payments tend to increase technical efficiency and technological progress of organic milk farms in Denmark. The same study has shown that payments can reduce the probability of farms leaving the sector (Sauer & Park 2009).

Organic farming has positive or mixed effects on biodiversity. Positive effects of organic farming were shown across taxa such as plants, fungi, arthropods, birds and mammals (Verbruggen et al. 2010, Gabriel and Tscharntke 2007, Holzschuh et al. 2008, Clough et al. 2007, Smith et al 2010, and Wickramasinghe et al. 2003). Effects can be mixed, particularly with regard to landscape complexity as species densities can e.g. be affected positively by organic farming but not species diversity (Winqvist et al. 2012, Birkhofer et al. 2014). Another meta-study distinguishes between industrial and developing countries finding advantages for the organic farming system in developing countries (Badgley et al. 2007).

4.4.5 Animal welfare

Question:

Relevant CAP objectives: none

Relevant SDGs: none

Number of publications scanned: 10

The topic of animal welfare is included in policies on health and food safety but is not directly included in any CAP objectives or SDGs. It is however broadly accepted as a topic of high relevance to the public and indirectly included in CAP through Cross Compliance. We therefore chose to assess CAP effects on animal welfare.

4.4.5.1 Overall trends on animal welfare

Today farm animal welfare is being increasingly perceived as an integral element of overall food quality, having important knock-on effects on animal health and food safety. Consumers demand higher standards of animal protection and it is incumbent upon policy-makers and legislators to respond accordingly (Horgan and Gavinelli 2006).

Findings of the Special Eurobarometer 442 survey (2016) illustrated that farm animal welfare is a very important issue for EU citizens and there is an expectation that it should be further enhanced compared to the current situation. However, there is high degree of uncertainty about public expectations with regard to animal production / farm animal welfare, and particularly the level of awareness, or expectations, regarding trade-offs between animal welfare, consumer prices, environmental aspects, food security, etc.

4.4.5.2 Results of our literature review on CAP effects on animal welfare

> ***Key findings***
>
> Public awareness to animal welfare is increasing in the EU and accordingly included in the CAP, yet the extent is limited and rules are not yet harmonized. The CAP contributes to animal welfare in mostly through CC and AECM. Only few studies examined CAP effects on farm animal welfare. The lack of studies on CAP effects on the topic is somewhat surprising given the known, although not universal, negative relation between increases in the efficiency of animal production and a decline in welfare. Evidence suggests that there is an important gap between the public claim for increased farm animal welfare and current legislation and budgets.

Recognition of animal welfare is increasing in the EU and in the CAP, although rules still needs to be harmonized. The increasingly importance of farm animal welfare for civil society has been enshrined when the Lisbon Treaty (in force since 2009) amended the TFEU by introducing the recognition that animals are sentient beings and obliging Member States and EU Institutions to pay full regard to the welfare of animals when formulating and implementing Community legislation (Article 13 of Title II). In their Rural Development Programs, the EU spends 345.7 Mio EUR p.a. in the EU-27 (incl. national co-funding), which is 1.5% of the RDP 2014-2020 (own calculation based on EC 2014). According to the EC, 17 out of 27 EU MSs use this program option. Still, regulations on animal welfare are mostly implemented on EU and MS level[26]. Ryland (2014) reveals that after the 2003 reform, EU secondary legislative animal welfare requirements reach only minimum standards with many exceptions for the rules that are only specific for some species. In the global context, however, animal welfare standards are relatively high in the EU. An example is the prohibition of housing of layer hens in conventional cages since 2012 (Directive 99/74/EC) which goes beyond standards in most other countries (Grethe 2007). The EU is currently working on harmonization of animal welfare rules (Jacques 2014), e.g. through the animal welfare

[26] See page 40 of: https://ec.europa.eu/agriculture/sites/agriculture/files/consultations/cap-modernising/summary-public-consul.pdf

strategy 2012-2015[27]. Therein, it envisions to include animal welfare standards into trade agreements in order to a) avoid disadvantages due to higher EU standard in comparison to other countries, b) provide better information to consumers, c) assess possible labelling for animal welfare products and d) link animal welfare better to the CAP through cross-compliance, rural development, promotional measures, quality policy, organic farming and others.

The CAP can influence animal welfare in several ways, yet there are few studies examining CAP effects on farm animal welfare. There are several directives on animal welfare included under Cross Compliance (such as the Council Directive 98/58/EC on the protection of animals kept for farming purposes). From the perspective of the CAP, animal welfare issues are embedded into the principles and regulations related to organic farming, and farmers in the EU are obliged to respect these standards. The main instrument to do so is via the Statutory Management Requirements within CC, linking Direct Payments with the regulations for animal health and welfare (among others). Ryland (2015) reveals that after the 2003 reform, three significant factors have had a constraining impact on the effective protection of animal welfare in the EU: 1) EU secondary legislative animal welfare requirements are only minimum standards (with hundreds of exceptions for the rules that are only specific for some species), which have proven inadequate in ensuring good quality animal welfare. 2) EU secondary legislative animal welfare requirements are not all-encompassing, and species-specific standards do not exist, for example, for dairy cows, beef cattle, sheep, goats, turkeys and ducks. 3) The narrow interpretation by the Court of Justice of the European Union (ECJ) equating minimum EU legislative standards of animal welfare with total harmonisation has had the effect of further limiting the advancement of animal welfare in the EU. **The lack of studies on CAP effects on animal welfare is somewhat surprising given the known, although not universal, negative relation between increases in the efficiency of animal production and a decline in welfare**. Indeed, welfare problems are more likely among faster-growing, higher-yielding breeds and individuals than slower-growing and lower-yielding animals (Winter 1998).

Evidence suggests that there is an important gap between the public claim for increased farm animal welfare and current legislation and initiatives. An official study on animal welfare conducted for the German government (Grethe et al. 2016), evaluates the willingness of German consumers to pay more for increased animal welfare standards; they found that 70% of consumers interviewed were ready to pay up to 20% more for a labelled meat. This shows that the current standards on animal welfare lag behind consumer's demands, leaving an unfulfilled potential for further action also under the CAP (Grethe et al. 2016), e.g. by introducing and/or enforcing animal-protection payments and the conditions for these. Isermeyer (2014) as well as several NGOs suggest that better incorporation of animal welfare, particularly within Pillar II, is needed in order to align food production systems with public expectation. The EU's 'Fitness Check of the Food Chain' (EC 2013) notes a range of challenges with achieving the objectives of the animal welfare legislation, one of them being the "lack of incentives for farmers who are proactive in developing good animal welfare practices or anticipating legal deadlines". It is suggested that a suitable instrument to address this challenge should reside in RDP (EC 2013)[28].

[27] Communication from the Commission to the European Parliament, the Council and the European economic and social sommittee on the European Union Strategy for the Protection and Welfare of Animals 2012-2015 (https://ec.europa.eu/food/sites/food/files/animals/docs/aw_eu_strategy_19012012_en.pdf.)

[28] http://ec.europa.eu/smart-regulation/evaluation/docs/st_17996_2013_en.pdf

4.5 Efficiency

While the sections on effectiveness include a sub-section on overall status and trends, this is less relevant when evaluating CAP efficiency. The following sections therefore only present key findings of our literature review on CAP efficiency, followed by more detailed findings. We only address a subset of topics for which efficiency can be evaluated and literature is available.

4.5.1 Income support

Question: Have CAP measures been efficient in changing, or incentivising fair standard of living, individual earnings or viable farm income?

Relevant CAP objectives: article 39 (1) a on increasing standard of living.

Relevant SDGs: 1, 8 and 10

Number of publications scanned: 33 publications

Key findings

Evidence suggests that the efficiency of direct payments (DP) is low due to the lack of proven relationship between DP and farmers' income. The fact that DP are associated with multiple objectives, other than income support, reduces their efficiency. There is currently no detailed justification on how the EU Commission wants to achieve its income objective, and no adequate indicator to assess this relationship.

DP are unequally distributed among farmers and there are substantial doubts that this unequal distribution is appropriate to achieve the income objective of the CAP. The distribution of income support under DP depends greatly on the distribution of land and farm sizes and are strongly related to fundamental structural differences between larger and smaller farms.

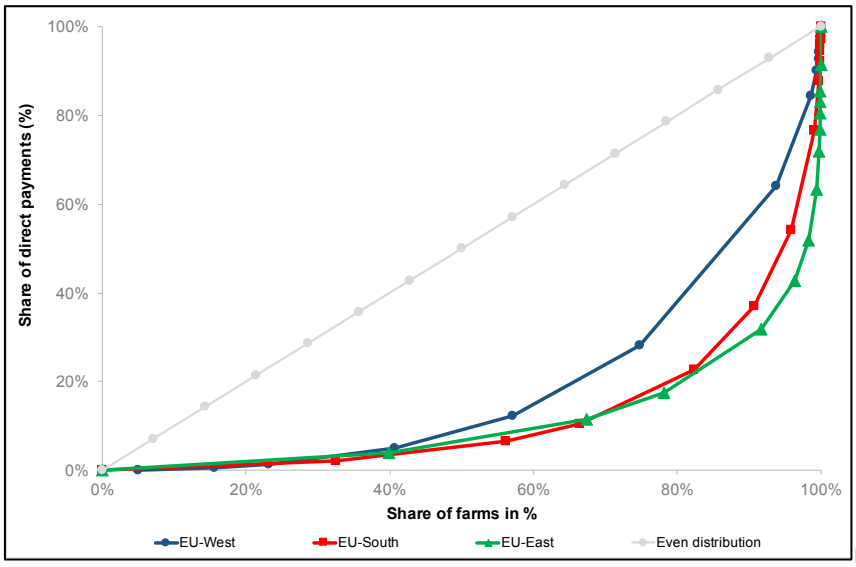
Evidence suggests that the efficiency of DP is low due to the leakage of DP to landowners. Decoupling increased the capitalization of DP into land rents, although results may vary between regions and farm types.

Finally, some evidence suggests that a basic income scheme would reduce income variability between farms more efficiently.

First, the fact that DP are associated with multiple objectives, other than income support, reduces their efficiency. Tinbergen's rule suggests that policy efficiency requires one instrument for one objective (Mann and Lanz 2013). However, DP are meant to support farmers' income, to support young farmers, support farmers in disadvantaged regions, to contribute to minimum environmental standards through CC and greening. Tinbergen's rule is violated, suggesting a reduced efficiency of DP.

Evidence suggests that the efficiency of DP is low due to their unequal distribution among farmers and missing indicators. Severini and Tantari (2013) found that DP resulted in a reduction in farm income inequality in Italy. They also found that the inequality-reducing effect was bigger before the CAP reform of 2003. These results regarding Italy are confirmed in another study based on 2013 data, which found that DP reduced farm income inequalities (Ciliberti and Frascarelli 2015). The lack of indicators to evaluate the need for income support through DP has been criticized (Koester & Loy 2016).

There are substantial doubts that the unequal distribution of DP is appropriate to achieve the income objective of the CAP. According to the goal of "ensuring a fair standard of living", as well as SDG targets 10.1 (to achieve a higher income growth for the bottom 40%) and 10.4 (to implement policies that lead to greater equality), an efficient distribution of payments would entail that farmers with the lowest incomes should profit most from CAP payments. In the EU-28 in 2015, 32.6% of all payments went to only 1.8% of beneficiaries, who received more than 20,000 € per year. By contrast, 78.8% of beneficiaries received 5,000 € or less (EC 2016c). A Lorenz-curve indeed illustrates that a minority of recipients receive a very large share of the DPs, especially in the New MSs **(Fig. 4.5.1**). Similarly, while the support per hectare decreases with farm size, the share of DP in farm income increases with farm size and stabilizes for farms above 100 ha (**Fig. 4.5.2**). This means that smallest farm benefit less – if eligible at all to obtain CAP payments at all.



igure 4.5.1: *Distribution of direct payments in the EU 2015 shown by a Lorenz Curve, depicting the accumulation of payment shares as the share of the population of farmers increases. Source: own calculations based on reports of the EU Commission on the distribution of direct payments; Note: The area between the even distribution and the Lorenz curve expresses the degree of inequality of direct payments; Every point on the curve shows that e.g. e.g. 40% of farms receive about ca. 3% of direct payments.*

Unequal distribution in DP are related to fundamental structural differences between larger and smaller farms. Larger farms have fewer working forces per hectare because of more extensive production types and economies of scale. Smaller farms have higher value added either due to high animal density or very productive farm systems such as horticultural production, which are overrepresented in the small

farm size groups. Matthews (2017) argues that the largest proportion of DP is allocated to enterprises that have no clear need for such payments. This suggests that DP are not addressing their objective efficiently.

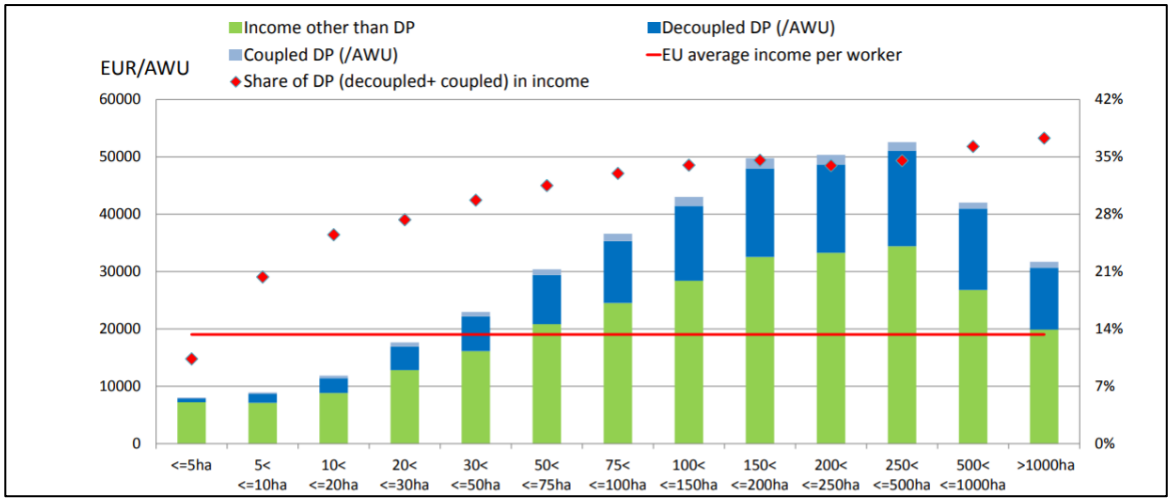
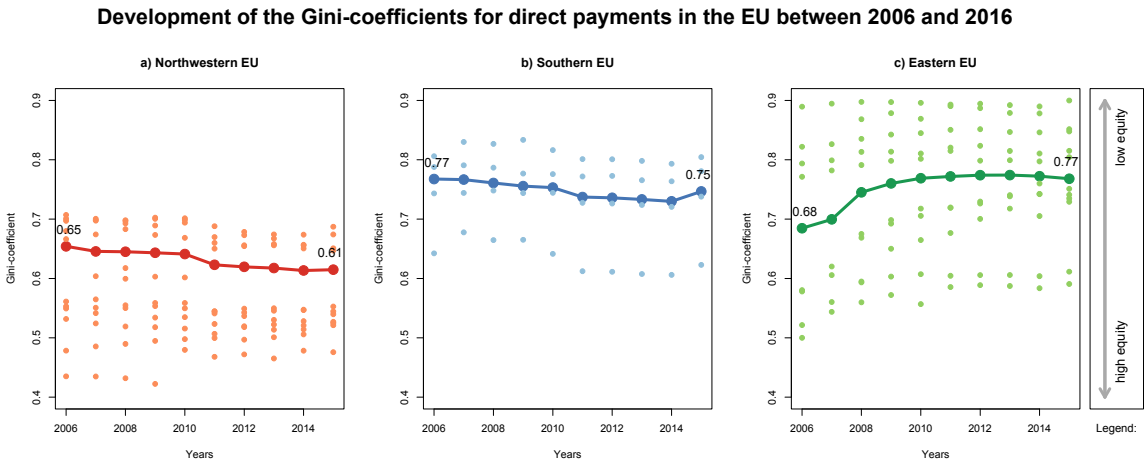
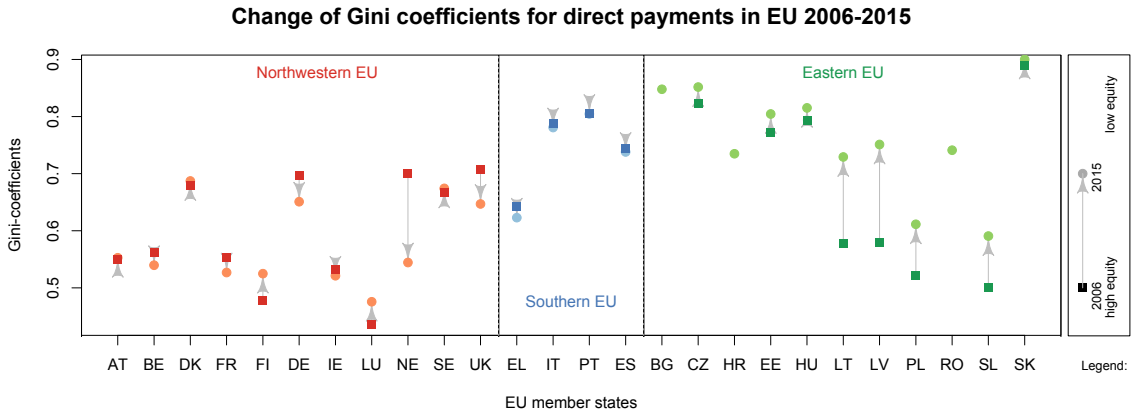


Figure 4.5.2: *Farm income and contribution of DP to it, including share of DP in farm income, divided into farm size classes. Source: DG Agriculture and Rural Development, Presentation "Did you know that?... Part I". The CAP: have your say, Brussels, 7 July 2017. Data based on FADN.*



(a)



(b)

Figure 4.5.3: Distribution of direct payments in the EU 2005-2015 according to farm size, as summarized using the Gini-coefficient of inequality – higher values indicating higher inequality (i.e., less equity in payment distribution). a) Development of the Gini-coefficient in West, South and East EU, b) Changes of the Gini-coefficient from 2006 to 2015 in the member states.

Source: Own calculations based on data from the EU Commission 2005-2016. **Note**: The GINI coefficient is a measure of inequality, ranging from 0 to 1. The higher the value is, the more uneven is the distribution of payments across farm-size classes.

The analysis of inequality reveals that the distribution of direct payments are (probably) inefficient. The EU commission does not state a specific income objective for farms. Besides, there is no mechanism to link payments to poor farms or poor farm households. If analyzed according to farm size, the level of payment inequality (as represented by the GINI coefficient of inequality) is heterogeneous. In some old MS the GINI decreasing (e.g. significantly in NL, slightly e.g. in DE). But in most new MS (e.g. in LT, LV, PL, SL), it is increasing (**Fig. 4.5.3b**). Some of the changes observed in new MSs relate to post-socialist developments (structural changes resulting and rapid intensification) and shifts in farm sizes following the accession to the EU, as well as to the phasing in of the CAP's direct payments (DP). Some of these influencing factors are independent of the CAP. However, the uneven distribution of DPs, and the high (and even increasing) levels of inequality, cast serious doubts whether this specific distribution of DP is appropriate and efficient toward fulfilling a) the CAP's objective with respect to fair standard of living (Art 39(1)b), and b) the 2010-priority of reducing disparities in rural development especially in new MSs and other disadvantaged regions.

Evidence suggests that the efficiency of DP is low due to the leakage of DP to landowners. Land is required to receive support under both implementation of decoupled DP, i.e. the 'regional model' and the so called 'historic model' of the Single Payment Scheme (SPS; OECD 2011). The eligibility to receive DP depends therefore largely on the land area owned. Matthews (2017) emphasises a major inefficiency resulting from leakage of payments out of the agricultural sector into land-rent. Ciaian and Kancs (2012) analysed land rental prices in new EU member states by applying the Single Area Payment Scheme (SAPS, a flat rate payment per hectare) in 2004 and 2005. They found that for every Euro/ha of DP, land rental price increased by 19 cents. They concluded that, on average, 10 % of the SAPS leak to non-farming landowners (ranging from 5 % in Poland to 18% in the Czech Republic and Slovakia). Van Herck et al.

(2013) found in a set of new MSs (such as Czech Republic, Hungary, Latvia, Lithuania, Poland and Slovakia) that 13 to 25 % of the DP were capitalized into land rents. They observed that capitalization is higher where access to capital is constrained, and lower in countries with a higher share of corporate farms, due to their bargaining power. In countries where farmers have difficulties accessing capital, the introduction of DP creates an appealing collateral. Therefore, DP loosen the credit constraint and thus increase the demand for land (Ciaian and Swinnen, 2009). Agrosynergy (2011) suggests that leakage to active farmers with low incomes was rather low, although differences between sectors and regions were observed. Based on data from 2004, 2006 and 2007, 6.1 % of recipients were above the threshold defined as the regional GDP per employee without DPs and 5.9 % of recipients received more DPs than was necessary to get beyond the threshold (Agrosynergy 2011).

Evidence suggests that decoupling increased the capitalization of DP into land rents, although results may vary between regions and farm types. Michalek et al. (2014) analysed the capitalization of the Single Payment Scheme (SPS) into land rental prices in the EU-15 during the period 2004-2007. They found that 6 to 7 % of the SPS goes towards covering higher land rental prices resulting from DP, and 4% of the SPS leaks to non-farming landowners collecting these higher rents. While this is not a high proportion, they also showed that the capitalization of lower value entitlements (200 €/ha or less) was significantly higher and more variable (from 11-94%) than the capitalization of higher value entitlements. Feichtinger and Salhofer (2016) compared the effect of coupled DP (2001) and decoupled DP (2007) on land sale prices in the German federal state of Bavaria. They showed that a decrease of DP by 50 €/ha would have resulted in a decrease of the sale price by 444 €/ha in 2001 and 984 €/ha in 2007. They concluded that decoupling triggered an increase in the capitalization of DP. Kilian et al. (2012) determined that the ratio of entitlements to eligible land as part of SPS is a key driver of capitalization of DP into land values in Bavaria. They also argued that ties to land have been strengthened through the inclusion of the animal payments into the SPS. Feichtinger et al. (2014) observed a capitalization of 36 % of coupled area payments and a capitalization of 8 % of animal payments into land rental prices in 1999/2000, compared to a capitalization of 47 % of SPS in 2010/11. In contrast, O'Neil and Hanrahan (2016) found a high capitalization into land rends before decoupling (67-90 %) and a decline in capitalization after decoupling for dairy, sheep and tillage farms in Ireland.

Finally, some evidence suggests that a basic income scheme would reduce income variability between farms more efficiently. Deppermann et al. (2014) simulated the effect of the abolishment of various CAP measures in 2020 in Western Germany. They found that the abolishment of DPs would decrease income gap in absolute terms, although lower income farm households would lose a higher share of their income in relative terms. O`Donoghue and Howley (2012) compared the situation of Irish farms in 2008 with a hypothetical situation of a uniform, basic income paid to every farm or person involved in agriculture. Their results suggest that a basic income scheme would reduce the income variability between farms even more than the current system, indicating that a system without any targeting mechanism might be more efficient than the one in use. These findings suggest that the current distribution of payments is unlikely to be the most efficient way to support farmers' income.

4.5.2 Climate action and energy

Question: Are the CAP costs and burdens proportional to the benefits (also compared to other instruments), with respect to climate change?

Relevant CAP objective: "Sustainable management of natural resources and climate action" (2010-priority 2)

Relevant SDG: 13 "Take urgent action to combat climate change and its impacts"

Number of publications scanned: 22 publications

Key findings

CAP measures do not take into account potential costs and benefits of measures addressing climate action. It is therefore unlikely that the CAP can be efficient in terms of climate action and energy.

Only few publications evaluate the efficiency of CAP measures related to climate change. The cost efficiency of the inclusion of climate action under AECM is difficult to evaluate since little is known about its effects on GHG savings. It is questionable whether less intensive production can be GHG efficient. It is therefore difficult to assess the CAP efficiency in terms of climate action and energy.

CAP measures do not take into account potential costs and benefits of measures addressing climate action. Several studies evaluated potential costs and benefits of GHG mitigation measures, e.g. Moran et al. (2009) calculated marginal GHG abatement costs, van Doorslaer et al. (2015) used the CAPRI model to identify feasible reduction strategies. However, these costs and benefits do not seem to be included in CAP measures addressing climate action (see section 4.4.1 on CAP effectiveness on climate action and energy).

Only a few publications evaluate the efficiency of CAP measures related to climate change. Pérez & Holm-Müller (2005) as well as Good & Beatty (2011) highlighted that EU policies, primarily the Nitrates Directive included in the CC, were efficient in reducing nitrogen fertilizer use in the past, thus mitigating GHG emissions in a cost-effective way - however without being conceived as climate action. Casey & Holden (2006), for AECM on beef farms in Ireland, and Gocht et al. (2016), for the promotion of natural grasslands as a greening measure, found that environmentally-friendly production as promoted under the CAP is slightly more GHG efficient than intensive production. The study by Casey & Holden reports a decline from 13 to 12.2 kg CO2e per kg living weight and year, while the latter study by Gocht et al. (2016) find possible GHG reduction at possible costs under 50 EUR/t CO2. This is rather expensive compared to the European Emissions Trading Scheme where between 2010 and 2017 CO2 prices were in a range between 4 and 20 Euros. For northern Italy, Solazzo et al. (2016) also modelled a small potential for GHG reduction due to greening (1-2%) that would be cost-efficient at least from the farmers point of view since the CAP payment would cover lost income from shifting to less intensive production. The cost efficiency of the inclusion of climate action under AECM is difficult to evaluate since little is known about its effects on GHG savings (see section 4.4.1 on CAP effectiveness on climate action and energy).

It is however questionable whether less intensive production can be GHG efficient. Weiss & Leip (2012) found that intensive beef production in Austria and the Netherlands was more GHG efficient than extensive production in Latvia or Cyprus, due to higher productivity. Erjavec et al. (2016) even recommend more intensive production to save GHG.

4.5.3 Biodiversity and ecosystem services

Question: Are the CAP costs and burdens proportional to the benefits (also compared to other instruments), with respect to measures supporting biodiversity and ecosystem services (ESS)?

Relevant CAP objectives: "Sustainable management of natural resources and climate action" (2010-priority 2)

Relevant SDGs: 15 Life on land

Number of publications scanned: >100

Key findings

The CAP is highly inefficient with respect to the efforts, allocation, and use of resources toward the aims of protecting biodiversity and ESS. The literature on AECM is diverse and shows mixed levels of efficiency, indicating much room for improvement due to low uptake, lack of spatial design and in some cases poor design and implementation, leading to inefficient spending and limited benefits. Evaluations of greening measures indicate much lower efficiency: EFA utilize substantially more public funds for less effective measures, as about 75% of EFA area is allocated to options having little potential for biodiversity; and some options require no actual delivery by farmers, thus serving as payments for no service attached ('windfall gains', e.g. Lakner and Holst 2015, Pe'er et al. 2017). The funds dedicated to Natura 2000 are too low to address the objective of protecting biodiversity. The literature therefore indicates a negative relation between effectiveness and investment, forcing very low efficiency. An expansion of the range of requirements over the 2013-reform (i.e., from AEM to AECM), combined with a budget cut of 8.6% as a conservative estimate, entails a further reduction in efficiency. The literature also demonstrates that a) implementation costs play an important role within AECM; b) increased administrative burdens yield higher costs; and c) funding for Natura 2000 is proportional neither to their benefits (public goods and insurance value) nor to the costs for farmers (transaction costs and income foregone). Finally, it is noted that regulations are more efficient than subsidies (or financial penalties) toward achieving basic standards that should be complied with.

The literature on CAP efficiency for biodiversity and ESS is heterogeneous. Some studies evaluate the impact of different programs, in particular AECM, without any reference to non-participating farms (Kleijn et al. 2006; Lakner and Kleinknecht 2012; The European Court of Auditors 2011). Some of these studies evaluate administration costs (Armsworth et al. 2012; Fährmann and Grajewski 2013). In contrast, some studies investigate factors influencing the participation in programs such as AECM (Niens and Marggraf

2010; Pufahl and Weiss 2009; Russi et al. 2016; Schroeder et al. 2013). We included both types of studies in this review, with a specific focus on AECM.

Additionally, we used the comparison between effectiveness and budget spent for different measures as an indicator of the global CAP efficiency regarding biodiversity (Aldanondo-Ochoa et al. 2014; Kantelhardt et al. 2009).

4.5.3.1 Agri-environment-climate measures (AECM)

Few studies suggest that AECM can be efficient if well-designed and implemented. Kantelhardt et al. (2009) compared different agri-environmental programmes with a group of conventional farms, most of them not participating in AECM. They showed that the support for organic farms was particularly successful in combining economic objectives and ecological requirements, organic farming performing slightly better than extensive grassland management and diversification of arable farms. However, the number of farms was too low to draw general conclusions for the design of AECM.

Schroeder et al. (2013) compared action-based AES with the implementation of a 'payment per result' approach in England. Most of the farmers seemed to prefer to maintain existing species on their land than to enhance new protected species. Farmers that would reject an introductory scheme, expressed the concerns that it is too complicated and involved risks. The authors estimated the necessary payment per species to maintain as circa 250 €/ha for one, 293 €/ha for two, and 370 €/ha for maintaining five species. This roughly reflects the level of a 'dark-green', action based measure on grassland with e.g. restricted mowing dates.

A range of authors identified conditions for higher effectiveness, which can also be demonstrated for efficiency (see e.g. review by Batáry et al. (2015)). However, a number of factors reduce the efficiency of AECM. These include:

- Complex design and administrative burdens lead to low uptakes due to competing payments (primarily DP) with less requirements. Complexity also biases choices toward less effective measures (Batáry et al. 2015), resulting in lower efficiency (i.e., lower effectiveness for the same costs).
- Insufficient training in environmental management compared to training in agricultural production instead (Batáry et al. 2015). 'Zonal schemes' were shown to be potentially much more effective and efficient, as shown in the UK, with bird diversity increasing per unit cost as compared to simplified horizontal schemes – and yet without the need to accompany them with incorporated elements of training or advice (Armsworth et al. 2012; Batary et al. 2015).
- Lack of spatial design: while case studies have demonstrated that spatial targeting and design can help optimising AES and make best use of investments (e.g. Merckx et al. 2009), most AES still focus on farm level actions – thus resulting in inefficient distribution of spending over space, leading to dampening or even cancelling of (potential) benefits.
- When compared to other, more targeted payments, AECM are inefficient. Especially for particular (rare) species groups, payments to support protected areas are suggested to be much more efficient that AECM. For instance, while in the Netherlands €21 millions were spent on AES to target meadow bird conservation, conservation efforts within protected areas at a cost of €4

millions resulted in better population densities and breeding parameters (van Paassen & Teunissen 2010; van Egmond & de Koeijer 2006).

Evidence suggests that the design and implementations of AECM are inefficient. Horrocks et al. (2016) draws into question the efficiency of funding short term AECM (5, 7 or 10 years), which are shown to be ineffective to promote species richness and provide ecosystem services. Using a simulation modelling approach, Drechsler et al. (2017) find a 5-year contract to be more cost-effective than a 10-year contract for the maintenance of butterfly conservation in Germany. Some perverse use of AECM payments was reported e.g. by European Court of Auditors (2011). Pe'er (2014, SM section E, page 13) also reports on cases where "*thousands of nest boxes installed, at exceptional density, at the fringes of small forest parcels in Hungary and at a cost of €45 per box*", yet without any consideration of the natural density and behaviour of any relevant bird species.

The establishment of greening measures has affected AECM as well. Direct competition with greening measures has been observed, where payments are used to support both greening and AECM. For example, Zinngrebe et al (2017) reports that "*It is possible to register nitrogen-fixing plants that are mandatory for the crops diversity scheme and at the same time register them as agri-environment measure*".

The 2013-reform also introduced a budget reduction and the addition of a new objective on climate action. The share of AECM budget was reduced from 5.38 bn. EUR/year in the period 2007-2013 to 4.91 bn. EUR/year in the period 2014-2020, I.e. 8.6% reduction for the overall financial period. The reduction of 8.6% (**Table 4.5.1**) is a very conservative estimate, since the reported budget value for the period 2007-2013 does not contain the budget increases for AEM in 2009/2010 following the 2009 Health-Check. Inflation is not taken into account either. Pe'er et al. (2014) noted that "*Whilst the proportion of Pillar II funding earmarked for environmental measures has been increased to 30%, the budget also covers a range of other activities, including climate change mitigation, organic farming, and so-called climate and environment investment measures – with the potential for both positive and negative impacts on biodiversity*". Adding another objective also reduces AECM efficiency in spending according to Tinbergen's rule (one instrument for one objective) as more requirement are added whilst reducing payments. Thus, with a substantial budget reduction yet an additional set of requirements, the efficiency of AECM has clearly diminished following the 2013 CAP-reform.

Table 4.5.1: *Changes in Agri-environmental & Climate Measures (AECM) funding as share of Rural Development programmes (RDP) over the last reform.*

Funding	RDP 2007-2013[1]		RDP 2014-2020		Change	
	Spending (in bn. EUR)	**Share (in %)**	**Spending (in bn. EUR)**	**Share (in %)**	**Spending (in bn. EUR)**	**Share (in %)**
Sum Rural Development Programmes	22,115		22,228		0.113	0.51%
Agri-environmental & Climate Measures [2]	5,375	24.30%	4,915	22.10%	-0.461	-8.57%

Source: Own calculation; Data 2007-2013 are from EU Commission 2010; Data 2014-2020 are from country sheets for the RDP 2014-2020. Note 1: Figures are average yearly expenses for the EU-27. Croatia is not included. The RDP-figures are

including Co-financing by member states and include technical assistance. Budget increases of the Mid-term-review-reform 2009 are not included. Note also that figures are not deflated. Therefore, this decrease is a 'conservative estimate'. Note 2: The figures for Agri-environmental & climate measures include the payments for organic farming but they do not include payments for less favoured areas (LFA, now referred to as "areas facing natural or other specific constraints").

There is a great heterogeneity in AECM implementation across MSs (**Fig. 4.5.4**). As a result, the literature on AECM is quite diverse and strongly depends on the regional focus of a program. For example, Bonfiglio et al. (2016) found that the "*Complete removal of direct payments (scenario 3), in place of the decoupling regime, would have produced a decrease in the consumption of fertilisers and pesticides of 41.4% and 46.1%, respectively* [and their impact on biodiversity]". Vesterager et al. (2016) found substantial differences in the national implementation of AECM, which reflects different farm structures and political and economic priorities. Notably, however, AECMs are playing an important role in preventing the abandonment of agriculture in areas with difficult conditions for agriculture (e.g. ANC), preserving pasture and hunting fields of value for biodiversity and creating and restoring wetlands for biodiversity and nutrition retention (Smith et al. 2016).

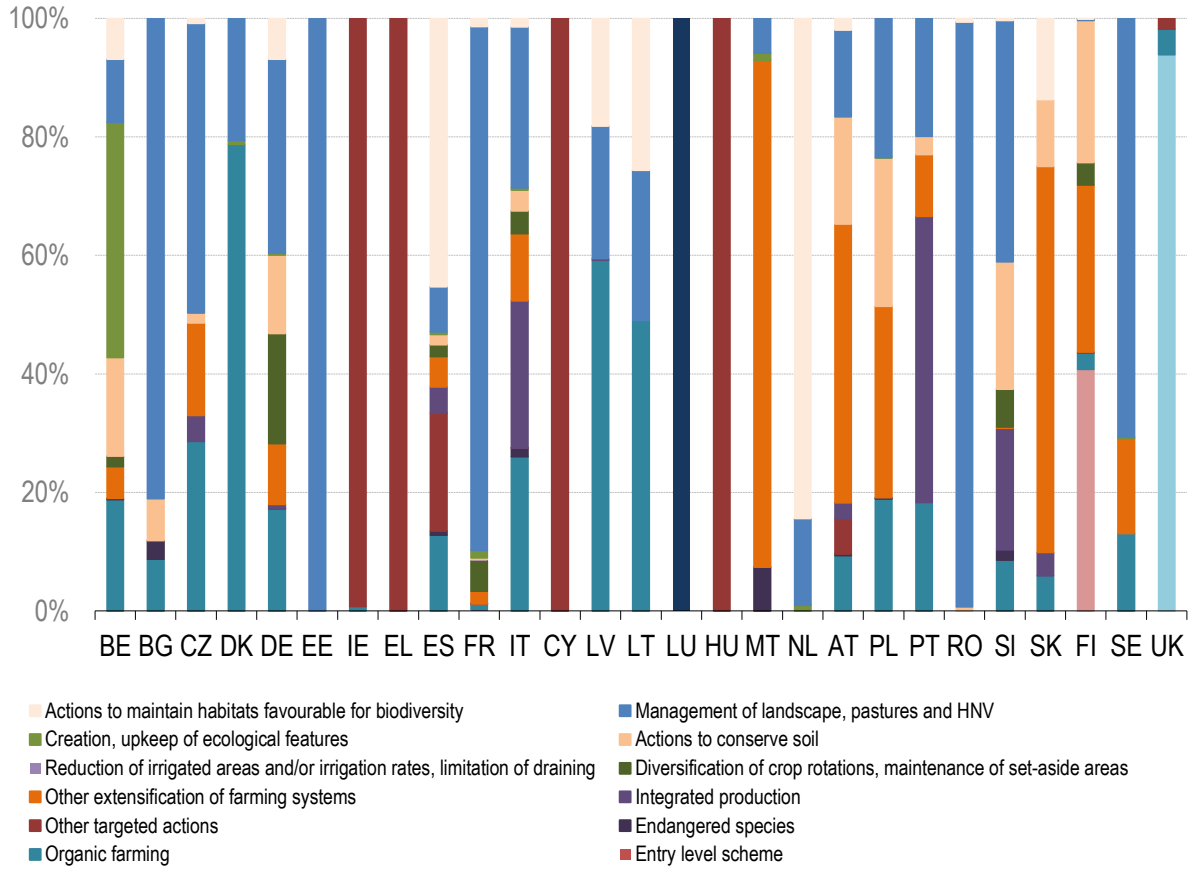


Figure 4.5.4: *Breakdown of UAA under agri-environment measures by type of action by countries (%), for the year 2009. EU-N12. Source: DG Agriculture and Rural Development, Eurostat (2015).*

4.5.3.2 Comparison of investments vs. effectiveness between EFA, AECM and Natura 2000

The largest investment per hectare is allocated to EFA, whereas AECM receive only half and Natura 2000 receives 3% of EFA investment per hectare. We assessed the average investment per hectare for three measures (EFA, AECM and N2000) based on the total area covered by each measure and the budget allocated to each measure. Greening represents 30% of payments of Pillar I, i.e. about 12 bn EUR per year. AECM represent 3.3 bn EUR and payments within the LIFE-fund represent 0.29 bn EUR. Payments per hectare are ca. 790 EUR/ha for EFA and 250 EUR/ha for AECM. Comparison with LIFE payments is slightly misleading because LIFE funds are only for instalment and implementation of large nature protection areas within Natura 2000, but not for maintenance, which is part of AECM. The budget necessary to implement and manage Natura 2000 have been estimated at 5.8 billion EUR per year (EC 2011; Milieu et al. 2016). Natura 2000 are associated with a total budget of 290 Mio. EUR and an investment per hectare of ca. 25 €/ha (**Table 5.5.2**).

Table 4.5.2: *Uptake and programmed funds per year in the period 2014-2020 for agri-environmental programs within the Pillar I and II and outside the CAP.*

Policy measure	Agricultural Area (in Mio. ha)	Public funds (in Mio. EUR)	Relation funds to area (EUR/ha)
Greening: Ecological Focus Area (EFA)[2,3,4]	8.00	12.638,21	789.89
Agri-Environmental Measures (AECM) **(Including areas and payments for organic farming, but without payment for areas with natural constraints)**	13.15	3,250.92	247.17
Natura 2000[4,5] **(Grassland area in SCI reported as by the EU commission)**	11.65	290.00	24.89

Source: Own presentation; **Data**: EC (2015, 2017b), Eurostat (2010). **Note 1:** The sum of all EU national ceilings per year is on average 42.127.354.000 EUR. If multiplied by 30% we get 12.638.206.000 EUR. **Note 2:** 8.00 Mio. ha is the only figure from the commission on EFA, and it is far from clear, whether this is before or after applying weighting factors. **Note 3:** We were assuming, that only 50% of the greening payments of 12 billion EUR goes into EFA. Otherwise, the payment per hectare would have been 1.579,78 EUR/ha. **Note 4:** Natura 2000 and Agri-environmental programs are partly overlapping in terms of area. The available funds are also highly connected, since the management of Natura 2000-sites is mainly financed by the agri-environmental schemes. Within the RDP, about 118 Mio. EUR are spent p.a. (EU Commission 2014). However, specific nature-protection tasks can be financed by the EU Life-fund, which is the fund connected to nature protection within the Natura 2000-framework. **Note 5:** Eurostat lists 11.652.978 ha as SCI targeted agricultural habitats. The greening-report (EU Commission 2015: p.31) of the EU commission refers only to Natura 2000 grassland. Since Natura 2000 goes beyond grassland use, we have cited the wider figure of ca. 11 Mio. ha.

Measures associated with the largest investment per hectare, i.e. EFAs, are the least efficient measures. First, Pe'er et al. (2016) found that most EFA options declared by farmers are not effective for biodiversity. Second, based on interviews with agricultural ministries, farmers and extension services (n = 35), Zinngrebe et al. (2017) examined the factors guiding farmers' implementation decisions regarding EFA. They found that farmers seem to decide mainly based on administrative, legal and economic considerations. Ecological motivations played a rather little role. The low uptake of the more effective EFA options buffer strips and landscape elements was explained by complex design and administrative burdens. Further inefficiency was indicated by the uptake of already existing features and practices (meaning that money is spent for no attached service), and insufficient ecological knowledge of extension services, suggesting that investments made into consultancy reduce rather than enhance effectiveness. A study on farmers willingness to pay concluded that farmers perceive greening as a costly constraint, which is especially true for among dairy farmers with high cow stocking (Schulz et al. 2014). The authors recommend to focus and clarify management requirements within greening (Schulz et al. 2014). Lakner and Holst (2015) showed that the implementation of EFA depends on the production focus of a farm and the regional cost-structures. There are other comparisons of cost-structures and examples of optimal implementation on the farm level with different outcomes (Lakner and Bosse 2016; Lakner and Holst 2015; Witte and Latacz-Lohmann 2014). Matzdorf (2011) showed that in theory, around 1.740 €/ha can be paid for ecological focus area (EFA), whereas for the payments for buffer strips on arable strips are between 600-750 €/ha. This suggests some degree of "*windfall gains*", i.e. subsidies without services by farmers in return (Lakner and Holst 2015). Consequently, the implementation of greening is criticized as an inefficient use of taxpayers' money (Oppermann et al. 2016). Finally, Lakner et al. (2018, in press) compared costs and ecological impact of EFA and AECM on arable land in Lower Saxony in the year 2016: they showed that EFA require 612 EUR/ha per biodiversity score point, whereas AECM only require 307 EUR/ha per biodiversity score point (**Table 4.5.3**). **This result suggests that AECM measures are less expensive for the provision of biodiversity and ESS from a taxpayer's perspective, and that greening of Pillar I is largely inefficient.**

Table 4.5.3: *Payments and ecological impact of agri-environmental and climate measures (AECM) and the Ecological focus area (EFA) in Lower Saxony 2016.*

	Ecological Focus Area (Pillar I)		Agri-environmental and climate measure (Pillar II)[1]	
Area for Biodiversity and Ecosystem Services	304,014	ha	84.879	ha
Total Payment for measures on arable land	114.71	Mio. EUR	20.63	Mio. EUR
Payment per hectare [2]	377,32	EUR/ha	243,05	EUR/ha
Ecology Points	187.259	points	67.167	points
Payment per Ecology Point	612,57	EUR/points	307,14	EUR/points

Source: Lakner et al. 2018, in press. **Note 1:** Agri-environmental and climate measures (AECM) on arable land and comparable to Ecological focus area (EFA) such as Catch crops, flowering strips and buffer strips and hedges. **Note 2:** We assume, that 50% of the greening payment goes into maintenance of grassland and crop-diversification. Therefore, the calculus is rather conservative.

Our comparison of budgets allocated to different measures highlights a disproportionate use of the CAP's budget, with highest investments in the seemingly least effective measures for biodiversity and ESS. Some evidence, however, suggests that the efficiency of different CAP instruments may depend on which objective is considered as the main objective of the CAP. For instance, Mouysset (2014) identifies single cheapest strategies according to what should be the main objective of the CAP. In particular, if the objective is cost-effective management of biodiversity, working on the first Pillar is the cheapest strategy, while if the objective is sustainable, then playing on the second Pillar is the most efficient strategy (Mouysset 2014).

4.5.3.3 Ecosystem services

In a literature review, Reed et al. (2014) noted that AECM could be far more efficient in addressing ESS, especially when spatial targeting is applied. Some of the sources of inefficiency identified include (i) payments that are not targeted towards results but management input instead (Hanley et al., 2012, Burton and Schwarz, 2013); (ii) standardised payments that do not reflect on spatial or temporal variations in local conditions, costs and outcomes (ECA, 2011; Armsworth et al., 2012); and (iii) emphasis is put on individual rather than collective land management, while the latter may harness spatial linkages and scale effects (Glenk et al. 2014).

The question of efficiency with respect to ecosystem services is critical from the perspective of defining the beneficiaries. Since it is both the public and farmers that are recipients of public goods, a key issue relates to who bears the costs of, e.g. land degradation, water pollution or the presence or absence of aesthetic services used for recreation. The TEEB approach "The Economics of Ecosystems and Biodiversity" (TEEB, 2010) offers an economic valuation of ESS from a utilitarian perspective, trying to explicitly name beneficiaries as well as cost-carriers of land-use changes. The TEEB approach is taken up by its successors, like Natural Capital Germany – TEEB DE that provided examples for inefficiencies in agricultural policies (see **Box** 4.5.1 below).

Box 4.5.1: Natural Capital Germany – TEEB DE

Author: Bernd Hansjürgens

The German TEEB project "Natural Capital Germany – TEEB DE" offers an example for the economic costs of losing peatlands, by comparing farmer's gains, when high organic, peat soils are drained and used for plants like maize, with the societal costs that are associated with this practice (Bonn et al. 2015; Wüstemann et al. 2017).

Fig. 4.5.5 shows the estimates in €/ha/y for biogas electricity from energy crops, maize cultivation for dairy cattle fodder, and rewetting for nature conservation and climate change mitigation. It can be seen that from the commercial micro-economic perspective, private gains can be enhanced through biogas or fodder production. From a macro-economic perspective, efficiency is though reduced or even negative, as production of energy crops grown on peat soils clearly damages the climate, as draining the peat soils for energy crop cultivation produces far more emissions than are avoided through the substitution of fossil fuel (Bonn et al. 2015). Here, government incentives for planting maize on drained peat soils, which are also based on financing mechanisms of the CAP, have a counterproductive effect. As the example of dairy farming shows, arable farming on peat soils, even without subsidies for renewable energies, generates significant private gains due to the market price of milk and high productivity, but public costs are much higher, when losses of carbon, groundwater deterioration from nutrient leaching, and biodiversity are considered. Intensive farming of peatlands is therefore associated with high societal costs due to significant GHG emissions from drained peatland soils that are under intensive grasslands or arable production. The same applies to intensive grassland use, which is also widespread on peat soils.

So, under present conditions, from a farmer's business perspective, rewetting, possibly combined with site-appropriate farming (e.g. paludiculture), is not an attractive option compared to arable farming. From a societal perspective, however, rewetting is by far the best use of peat soils. It contributes to significant gains in avoided carbon losses and nutrient leaching, and has thereby less harmful effect on the climate and water resources and can enhance other ecosystem services in many cases (Bonn et al. 2016). The use of peat soils will only meet the needs of society, however, if there is more coherence between regulatory frameworks, funding policy and site-specific ecosystem management. Dedicated payments for ecosystem services on peatlands (Bonn et al. 2014) or greater spatial targeting of existing CAP payments (Reed et al. 2014) could enhance a higher return on ecosystem services.

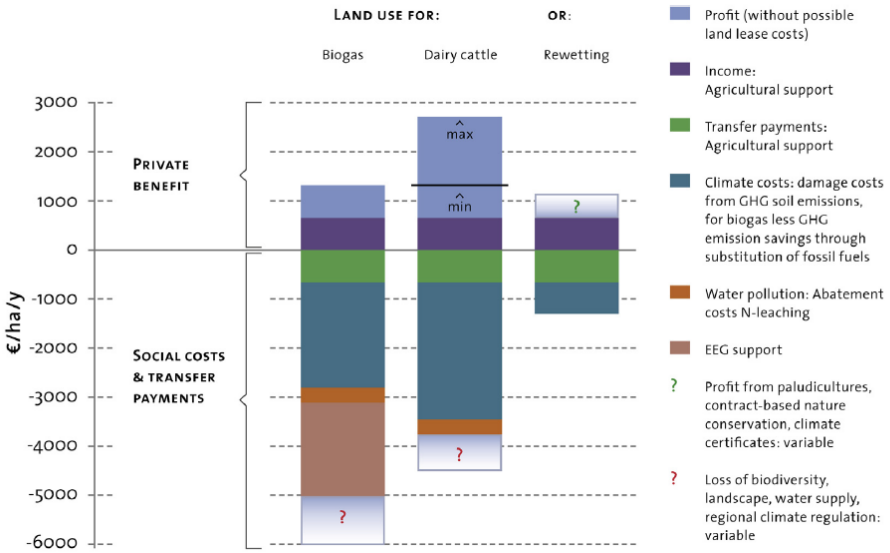


Figure 4.5.5*: Costs and benefits of arable farming on high organic, peat soils (from Bonn et al. 2015, p.141, based on analyses by Berghöfer and Röder; EEG = Renewable Energy Sources Act / Erneuerbare-Energien-Gesetz)*

When including studies like TEEB or Natural Capital Germany – TEEB DE into the analysis, one has to be aware that there is a shift from farmers' costs and benefits to societies' costs and benefits. Since many (benefits and) costs of agricultural practices have to be borne by "third parties" that are not directly linked to the agricultural sector (e.g. through market activities), one has to analyse the amount of these "external effects". There are several methods that have been developed in the literature, ranging from avoidance costs, over travelling costs, hedonic pricing to Willingness To Pay (WTP) methods.

4.5.4.6 Compensation of income foregone vs. insurance investment

An underlying assumption justifying payments to support environmental aims, is that farmers should be compensated for their income foregone. This is made explicit e.g. through the World Trade Organisation (WTO) rules, which require payments to farmers under AECM and LFAs to cover farmer's extra costs or loss of income involved resulting from "complying with the government programme [agri-environment]" or in "undertaking agricultural production in the prescribed area [LFA]" (Agreement on Agriculture, 1994). The EU rules also allow adding an amount of up to 20% to cover so-called transaction costs caused by signing up to such schemes (e.g. Time and Hessle XXXX).

The concept of income foregone is however questioned by several authors. In the context of HNVf, Beaufoy et al. (2012) highlights that environmental land management is still perceived as a cost to the farm business because it would inhibit production and reduce current or future market income. They explain that this is however not true where HNV farms are already delivering a high level of environmental public goods at a financial loss. In such cases, there is no income to forego and farmers would simply abandon farming without AES or LFA. Other authors question the income foregone concept, since farm income is primarily determined not by production per se but, more so, by the price obtained for a product, and hence more affected by price volatility (REF??). Moreover, a farmer engaging in AECM a) may do so without a

significant reduction of production, b) may be gaining e.g. from pollination and pest-control services that could reduce costs and hence maintain or enhance profits (i.e. benefit from the public goods provided), c) gain from access to the organic market and hence higher prices, and finally, d) can gain from income-diversification e.g. if those payments enhance aesthetic values and therefore ecotourism. Finally, by reducing long-term and large-scale risks such as land degradation, farmers may be gaining rather than losing from environmental actions. **Payments associated with environmental aims are therefore increasingly considered as insurance investments rather than compensation payments** (see Box).

4.5.4.7 Administrative efficiency

Fährmann and Grajewski (2013) analysed the implementation costs of rural development programs in Germany. They found especially programs with specific target area such as nature protection programs (Natura 2000) or erosion control to have comparatively high implementation costs. These programs on the other also show a higher effectiveness, so higher implementation costs go in line with a more targeted and more effective measures. The authors point out that the political and financial incentives for MSs or regions are rather to "*focus on 'easy-to-manage', standardized measures and instruments",* with insufficient emphasis on control systems, information, appropriate evaluation methods and indicators sets (Fährmann and Grajewski 2013). This indicates that a focus on efficiency may shift the emphasis away from effectiveness.

The European Court of Auditors (2011) investigated the implementation of AECM in the EU. They identified two main approaches: a broader and easier to implement entry-level scheme ('light-green' measures) attached to lower payment, versus more specific and high-level programs, which have complex requirements, are more targeted but also offer a higher level of payments ('dark-green' measures). The Court finds that entry-level schemes are often less effective, insufficiently justified regarding their environmental impacts, and therefore less efficient. They suggest a focus on the more complex and efficient AECM. However, for all types of AECM they see the need to improve justification, the objectives and also the evaluation methods for AECM (The European Court of Auditors 2011), which would in sum also improve the efficiency of AECM.

Armsworth et al. (2012) found that a policy-simplification can lead to a 49-100% loss in biodiversity benefits. They conclude that implementation costs are worth bearing, since the loss is disproportionate to the saving in costs. The authors also find that a locally differentiated program with flexible payment rates might perform better and therefore is a more efficient form of investment than programs with uniform payments (Armsworth et al. 2012). Lakner and Kleinknecht (2012) found that complex programs had a positive impact on the implementation of Natura 2000 areas, whereas the simple entry schemes had no significant influence of this implementation. Their finding also suggest a higher efficiency of complex programs for Natura 2000-implementation, though this was not directly measured.

Finally, in terms of costs versus benefits, Möckel (2016) suggested that regulations may be far more efficient than subsidies (or reduced subsidies as a penalty) since they bear much lower costs for achieving at least a minimum set of requirements that farmers should comply with (**Table 4.5.4** and **Box 4.5.2**). Note, for example, that in the case of cross-compliance it was suggested that the penalty for infringements - which is up to 5% of the farmer's annual payment entitlement - is too low to deter against non-compliance (Milieu et al. 2016).

Table 4.5.4: *Comparison of ecological minimum requirements for agriculture in regulatory law and by direct payments – some conceptual considerations. Source: Möckel (2016).*

	Regulatory standards	**Cross-Compliance standards with GAEC and Greening standards**
Purpose	Ecological minimum requirements for agricultural farming	
Liability	Towards every farmer	Only for recipients of direct payments
Control	Similarly necessary and intricate	
Enforcement	Regulators instruments of enforcement (orders, fines, penalties, substitute performances, detention)	Cutback of direct payments
Permission	Agricultural soil use usually do not need a permission (exception in conservation areas)	Annual
Costs	Only for control and enforcement	For the incentive (annual premia of the direct payment) + for control and enforcement + for administration of annual permission
Efficiency	**High for minimum standards**	**Low for minimum standards**

Box 4.5.2 Administrative efficiency of ecological minimum requirements for agriculture in regulatory law versus direct payments

Author: Stefan Möckel

To offer a general background to the question of efficiency of agricultural payments toward achieving environmental goals, there is a need to first consider what alternatives exist. In some countries such as Germany, ecological requirements are set through regulatory legislation – an alternative mechanism with significantly differing costs attached to it. A comparison between regulatory legal requirements and the mechanisms installed in the greening of the direct payments on a conceptual basis indicates that subsidies have considerable disadvantages in terms of effectiveness and efficiency (Möckel 2016).

First, ecological requirements attached to direct payments oblige only those farmers who apply to receive these payments, in contrast to regulatory standards which apply for ***all*** farmers. This means that subsidies only reach those farmers who are interested in the payments and conditions attached to them. Secondly, regulatory law involves a large number of supporting enforcement measures such as official powers of inspection and order, notification and permit duties, compulsory administration, and administrative and criminal offences. In terms of the financial cost of implementation, financial incentive of direct payments is not a guarantee that farmers meet the ecological conditions. So environmental conditions attached to subsidies require supervision like regulatory requirements as the European Court of Audit had still pointed out for cross compliance requirements ((European_Court_of_Auditors 2008, 2011, 2013). The time and resources needed for supervising conditions attached to subsidies are at least at a similar level than regulatory requirements, since in view of their nature and extent, practical checks cannot be carried out differently from those for regulatory requirements (cf. Articles 96-101 Regulation 1306/2013/EU and the delegated Regulations of the European Commission 639/2014/EU, 640/2014/EU, 809/2014/EU).

Another advantage of regulatory requirements that should not be underestimated is that they are imposed for an unlimited period and can only be modified by a parliamentary legislation process. They thus offer a transparent long-term perspective for farmers and provide legal and investment certainty. By contrast, subsidies are always subject to budgetary constraints, which means that subsidy payments may be delayed or totally eliminated in difficult financial situations (cf. for direct payments the recital 2 and Articles 3, 16 et sqq., 24 et sqq. of Regulation 1306/2013/EU). Moreover, DP like most of the direct subsidies are regularly granted only for specific periods, so the conditions attached to them are also limited in time (in the actual CAP until 2020). The assistance period of DP is even smaller with one year (Articles 72 Regulation 1306/2013/EU). Thus DP are only of very limited use for bringing about long-term impacts and changes in farmers' behaviour.

Since reasonable requirements and prohibitions under regulatory law have to be observed without any financial compensation, the state only has to bear the cost of monitoring and, where appropriate, licensing procedures. By contrast, requirements attached to subsidies always have to be linked with an adequate financial incentive. When examining the efficiency of subsidies for ecological standards, therefore, the cost of the incentive and their administration (European Court of Auditors 2013, 2017) has to be added to the cost of supervising the subsidy conditions. Both are high for DP (see relevance section 4.8 and, e.g., European Court of Auditors (2013, 2017). Therefore, in the absence of financial incentives, ecological management requirements under regulatory law are generally and substantially less expensive for the state and hence more efficient than conditions imposed under subsidy legislation. Regulatory law is therefore the more efficient means to achieve generally-binding minimum standards (see **Table 4.5.4**).

4.6. Internal coherence

Question:

Relevant CAP objectives: all

Relevant SDGs: all relevant SDGs, and particularly the balance between 1, 8, 13 and 15

Number of publications scanned: 36

Key findings

Internal coherence of the CAP is challenged by the multitude of its political objectives and instruments. In order to integrate both production and sustainability objectives, new instruments were added. In the absence of specified objectives and indicators it is, however, difficult to assess consistency and complementarity of both objectives and instruments. A certain level of complementarity between different CAP mechanisms has been reported, especially focussing on DP in general, AECM, CC and greening. That, however, varies across different regional settings and thematic foci due to differences in implementation. Shortcomings in internal coherence have particularly been revealed in poor policy design and weak implementation that were found to diminish their effectiveness and particularly their efficiency. The literature indicates challenges for internal coherence resulting from a) competing interests between conservation and production, b) insufficient complementation and even direct competition between instruments both between and within the two pillars, c) lack of transparency due to the absence of clear indicators and targets, often resulting in non-transparent tradeoffs, d) lack of coherence between the CAP's objectives and on-the-ground implementation by MSs. Lessons from past CAP reforms and national-level experiences indicate that the specification of clear objectives in a transparent way, and a simple set of instruments, can prevent the risks of the CAP being compromised again by power struggles in the shade of its complexity. Furthermore, a low level of participation and cooperation undermines the potential of local bottom-up strategies and multi-functional land-use innovation, to better integrate the different CAP objectives.

4.6.1 Competing interests of production and environmental protection within the CAP

The challenge of integrating the interests of production, balanced territorial development, and environmental protection (i.e., sustainable use of natural resources) within the CAP has been addressed through different approaches with varying degrees of success. Instruments for environmental protection were integrated into both CAP Pillars *inter alia* through **AECM**, **CC** and **greening**. However, political resistance, and diverging interests have led to watering down these approaches and compromising their effectiveness and efficiency.

As a political strategy for reducing environmental threats resulting from agricultural practices, CAP reforms in the 1980s and 1990s aimed at a general reduction of environmental pressures that had been caused by continuous intensification (Hodge et al., 2015, Hilden et al. 2012). After introducing AEMs (now AECM) as optional measures in 1985, and as accompanying measures in 1992, the Agenda 2000-reform strongly increased the CAP's budget to farmers for providing ecosystem services to society. While AECM have been attested strong potential for incentivising conservation activities, a soft policy design and incoherent incentives reduce their overall impacts (Batáry et al. 2015; see also Effectiveness, section 4.4.3). The inclusion of less effective, productive AEM options such as nitrogen-fixing crops and catch crops, the difficulties to design and implement regionally-adapted and site specific measures (through a uniform and transparent policy process), and low levels of uptake of effective AECM have been shown to limit overall effectiveness of AECM as a policy instrument (Batáry et al. 2015). Further, while expenditures for AECM show a strong variation in amounts ranging from 15 €/ha in Spain to 200 €/ha in Austria (2007-2013), a competition with high commodity prices and high related opportunity costs was considered a key factors explaining the low uptake levels of AECM (Feindt, 2010). Other studies point to the importance of personal attitude, self-identity and social norms in determining AECM uptake and hence the land-use decision between production and conservation (van Dijk et al. 2016). AECM uptake across Europe was found to vary according to landscape characteristics, farm location, farm types and personal characteristics of the farmer, such as age, education and level of farming engagement (Pavlis et al. 2016) - indicating the need for training, transparent communication and simplification of the measures to be important factors for effective implementation.

While overall spending on AECM has been growing throughout the 2000s, dedicated budgets were reduced in the 2013-reform with the introduction of Pillar I "greening" mechanisms in 2013, while concomitantly the number of requirements have increased with the introduction of climate-related objectives into AECM. Considering that EFA have been evaluated as much less effective, competition between the two instruments, greening and AECM, has resulted in a weakening of the latter and, potentially, overall environmental performance.

According to **Table 4.5.1** ('Efficiency')**,** Pillar II budget has remained the same in the last reform but AECM funding has diminished, while the number of issues to address has increased. De facto this erosion in budget indicates competition between greening of Pillar I and investments in AECM in Pillar II.

The CAP reform 2013 also introduced drastic changes to the co-financing requirements by national governments. Additionally, each MS could decide whether to shift budgets from Pillar I to Pillar II or vice versa, with a maximum limit of 15% or 25%, respectively. 11 MSs used the option to transfer money from DP (Pillar I) into RDP of Pillar II, totalling 6.4 billion EUR for the six years 2015-2020. Six countries used the opposite option and transferred funds from RDPs to DP in Pillar I with the amount of 3.4 billion EUR. Overall there was a net transfer of 3 billion EUR from Pillar I to the RDPs in Pillar II. However, this is still subject to decisions in the MS, who can still change budget allocation for the years 2018 and 2019 (**EC 2015c: p. 4**). Accordingly, prior to actual implementation of the CAP, one could not anticipate whether the actual Pillar II payments would increase or decrease, and where would production versus environmental objectives be prioritised.

The **Cross Compliance** (CC) mechanism was introduced in 2005 to condition DP to compliance with 19 standards defined by regulations and directives concerning environmental management, animal welfare, and food safety, as well as standards defining a 'good agricultural and environmental condition' (GAEC). Linking payments to CC enables a stronger enforcement of existing regulations and directives, expands

the number of farmers aware and accepting/complying with EU regulations and directives ('crowding-in'). This approach also saves transaction costs of managing several implementation mechanisms in parallel. However, this approach also runs the risk of reducing the level of compliance with these regulations and directives in the absence of payments or in the case of reducing payments to farmers (crowding-out) (Mayer et al., 2014). Mayer et al. (2014) identify clear communication and training, a linkage of payments to ecosystem services outputs and a strategy for sensitising farmers to comply with regulations as more effective long-term implementation strategies than CC. Based on a study of CC implementation in England and Finland, Juntti (2012) found that imposing uniform standards on farmers impedes the potential of CC to integrate their local knowledge on farm management into the implementation in order to identify and employ best practices according to both economic and ecological conditions. Juntti (2012) argues that, instead, flexible and participatory implementation approaches would incentivise stronger ownership and compliance with CC policy. Overall, according to existing literature, there is little incentive for farmers to comply with CC given the present combination of controls and sanctions (Bartolini et al. 2012). Milieu et al (2016) state as well that the penalty for cross-compliance infringements, which is merely up to 5% of the farmer's annual payment entitlement, is "*too low to be a deterrent against non-compliance*".

During the last CAP reform 2013, some elements were taken from Cross Compliance (e.g. maintenance of grassland or the protection of landscape elements in GAEC) and light green AECM (e.g. the support of catch crops and leguminous plans) into the Greening. However, this has not increased the coherence, since Greening brought a number of new contradictions, such as the double funding and at the same time competition between Greening and AECM (see Zinngrebe et al. 2017).

As a reaction to the EU target of "halting the loss of biodiversity and the degradation of ecosystems in the European Union by 2020" (European Commission 2011), 30% of direct payments were conditioned to greening obligations/measures in the 2013 reform. However, cost-effectiveness of greening has been found to be limited (Pe'er et al., 2017), mainly because farmers choose production-compatible options and register structural elements and measures that were anyway part of farm structures and current farming practices (Zinngrebe et al., 2017). Furthermore, a growing complexity of conservation obligations has blurred environmental objectives, leading to limited effectiveness and cost-efficiency (Persson, 2016; Batary et al. 2015; Pe'er et al. 2017; Underwood and Tucker, 2016). In its current design and implementation, the CAP does not coherently follow its objectives, but compromises one interest for another one.

There is limited research on the relationship between less favoured area (LFA) payments (now ANC) and conservation objectives. Milieu et al. (2016, p. 431) mention that "these payments do not include any specific land management requirements that benefit biodiversity conservation (beyond adherence to cross-compliance)". On the contrary, if payments are used for intensification in environmentally-sensitive regions such as HNVF, ANC payments can present perverse incentives for biodiversity threatening activities. Reports from different MSs (in Oppermann et al. 2012) suggest that in some MSs HNVF gain from LFA (e.g. Czech Republic, UK) and in others, they induce risks of intensification (e.g. France). An empirical analysis of treatment effects of LFA programs on the area under cultivation of farms in Germany showed a positive and slightly significant effect, i.e. farms with LFA programs tended to increase their cultivated farmland while farm output and sales did not grow significantly (Pufahl & Weiss 2009). In a 2013 report, the Ministry of Environment highlighted the same perverse effect ANC spending could have on the environment through support to the intensification of agriculture (Hyyrynen, 2013). Although support is targeted at small farms through a higher payment rate, contradictory signals are given to

farmers under this scheme through increased requirements for livestock density and minimum area under contract.

These results indicate that the effect on intensification and biodiversity threatening management practices depend on MS decisions on implementation requirements. These results indicate a better integration of policy design and management requirements bears however potential for strengthening those effects.

4.6.2 Coherence between Pillar I and Pillar II measures

Along with the different objectives, studies have assessed **coherence and complementarity of the different policy instruments of the CAP**. In the recent reform (2013), biodiversity measures were included in Pillar I's greening obligations, while Pillar II was revised to take a stronger focus on climate measures (Hodge et al., 2015; Rietig, 2012). Shifting the environmental agenda between water, biodiversity, climate and other environmental threats can produce trade-offs and hence compromise the effectiveness of one objective towards the other (e.g. Burrascano et al. 2016), as elaborated above.

On the other hand, Berger et al. (2006) have pointed to the win-win potential of incentivising farmers to conserve low-productive areas of their farmland by combining set-aside (corresponding to permanent grassland or EFA set-aside requirements in the current greening legislation) with payments for AECM practices. A variation in the vertical implementation of the instruments can be observed too. In an analysis of greening in Germany, Zinngrebe et al. (2017) found that nine of thirteen federal states offer the option of combining Ecological Focus Areas (EFAs, as part of the greening obligations) with AECM support. It could, however, not be shown that this leads to an increase in the area of biodiversity-supporting measures on agricultural areas in those federal states (Zinngrebe et al., 2017). This detail also results in an even-increased budget for a policy measure with low effectiveness. For example, in the German Federal State of Lower Saxony, from the 17,920 ha of AECM-buffer strips, about 18.7% was at the same time used to comply with EFA within the Greening-framework (data from 2016, own calculations based on data from the State Ministry for Agriculture and Consumer Protection, Lower Saxony). On the other hand, a combination of e.g. buffer strips or fallow land is restricted to complex and partly contradictory technical and administrative requirements (Lakner et al. 2017a). Table 4.6.1 provides an overview shows the complex technical requirements to comply with EFA and AECM at the same time:

Table 4.6.1: Technical requirements for the combination of AECM* and EFA* in some selected federal states of Germany (Lakner et al. 2017)

	Requirement regarding			Own LPIS** parcel	utilization possible?
	Width (in m)	Plot size (in ha)	Extent per farm		
Requirements of Ecological Areas (EFA)					
Field Margin	[1-20 m]	n. a.	EFA should not exceed 7-8% of arable area	no	no
Buffer Strip	[1-10 m]	n. a.		no	some
Forest Margin	[1-10 m]	n. a.		no	some
Fallow Land	n. a.	> 0.1 - 0.5 ha		yes	no
Agri Environmental and Climate Measures (AECM) as flowering strip and flowering plot combined with Ecological Focus Area (EFA)					
North Rhine-Westphalia	$\begin{pmatrix} [6-12\ \text{m}] \\ \text{and} \\ < 20\%\ \text{of the plot} \end{pmatrix}$	or ≤ 0,25 ha	-	yes	No
Lower Saxony	([6-30 m]	or ≤ 2 ha)	and ≤ 10 ha		
Thuringia	[5-36 m]	or ≤ 4 ha	-		
Saxony-Anhalt	$\begin{pmatrix} \text{width} > 5\ \text{m} \\ \text{and} \\ \text{length to width} > 2:1 \end{pmatrix}$	or $\begin{pmatrix} \leq 2{,}5\ \text{ha} \\ \text{and} \\ < 20\%\ \text{of the plot} \end{pmatrix}$	-		
Mecklenburg-West Pomerania	-	-	≤ 5 ha		
Bavaria	-	-	≤ 3 ha		
Baden-Wurttemberg	> 5 m	-	-		

Source: own presentation based on the regulation in the federal states;
* Combination of AECM types a.) flowering strips and b.) flowering areas combined with EFA types a.) buffer-strips and b.) fallow land; ** LPIS = Land parcel identification system.

Overall, despite the existing option to 'upgrade' EFA-area with AECM, this option is hardly used in Lower Saxony, primarily due to the complex regulatory EFA-framework (Lakner et al. 2016, 2017a, Zinngrebe 2017). This indicates low coherence between policy objectives and implementation due to design- and administrative complexities, reducing the efficient implementation of EFA.

A synergetic effect was reported for the combination of CC with AECM on conservation practices on Italian farms, even though the overall incentive for conservation remained low due to weak monitoring and enforcement practices (Bartolini et al., 2012).

Another weakness in terms of coherence between objectives and implementation results from the fact that many small, semi-subsistence farms are still excluded from accessing some CAP mechanisms (particularly several Pillar I measures), as, for example, reported for fruit and vegetable producers in Romania (Marcu et al., 2015). Comparing potential impacts of different CAP reforms on Romanian farmers in a scenario modelling analysis, Jitea et al (2011) found that a reform that strengthening of Pillar II would be essential for Romanian farms to avoid strong revenue cuts.

4.6.3 Coherence among instruments within Pillars

Despite potential incoherences between Pillar I mechanisms – e.g. young farmers support and greening; or evident conflicts and tradeoffs between the objectives of some Pillar II instruments – we could only find very few studies addressing these topics. One key source of identified incoherence results from the flexibility which is given to MSs in implementing Pillar I measures. According to OECD (2011), the level of coupled payments (Article 69 of Council Regulation (EC) No 1782/2003 and Article 68 of Regulation 73/2009) was restricted to 10% in the last financial period between 2007 and 2013. At the end of the implementation of the health check reform in 2014, the share of coupled payments reached an historical low at 6.8% (Matthews 2015).

Following the 2013 CAP-reform, some obligatory flexible elements (basic payments, Greening payments and the young farmers payments) were included in pillar I, which forced MSs to decide on total budgets and specific implementation. Other flexible elements within pillar I were voluntary (payments for natural constraints and (re-)coupled payments for specific sensitive markets). MSs could also choose to implement a simplified payment for small farmers. Flexibilities resulted in a substantial heterogeneity within MSs (see Fig. 2.4.1 in section 2.4.1), which might even affect the level playing field within the common market.

Potential incoherences appeared during the CAP-Reform 2013, when the EU commission reopened the option to link parts of the direct payments to specific sectors. MSs could decide to link up to 15% of the national envelope (Pillar I), in some cases even 25% to coupled payments. In consequence, the share of payments coupled to production has increased after the CAP-reform 2013 to 10% (4.8 bn. EUR) in 2015 (EU Commission 2015: p.9, Matthews 2015). With an increase of 3.2% in Pillar I (Matthews 2015), this change marks a halt in the long-term downward trend of production-distorting payments (OECD 2017: p.103). The most important sectors and markets supported by the coupled payments are beef and veal, dairy products, sheep and goat meat, fruits and vegetables, sugar, and protein crops (**Fig. 4.6.1**).

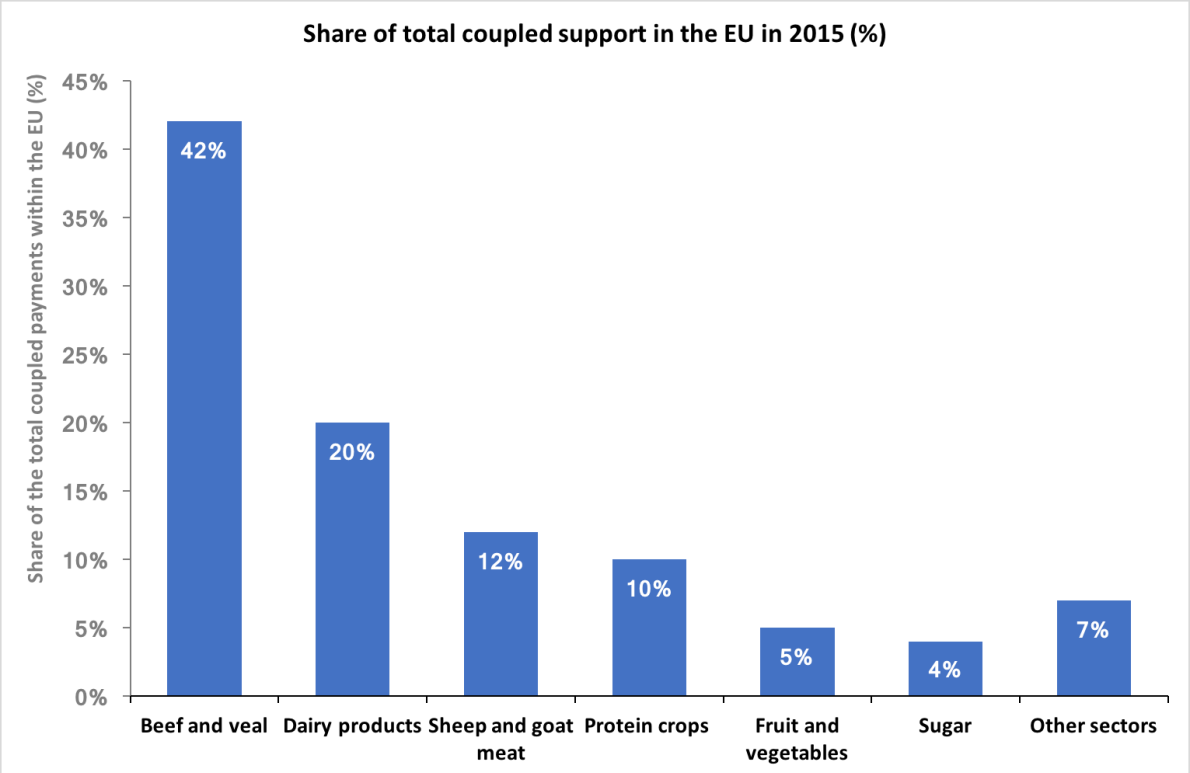


Figure 4.6.1: *Share of total coupled support in the EU in 2015 (%). Source: EU Commission (2015: p.9).*

The different levels of specific coupled support in the MS might affect the equal conditions of competition within the EU's common market. Overall, the coupled direct payments are incoherent with the principle of a common market. This might especially affect the milk sector, which went through a crisis since the price decrease in 2015/16. As Matthews (2016) points on the incoherence within Pillar I through the case of coupled payments in view of the milk market situation. Member States use part of the national envelope to pay (re)coupled direct payments for the milk sector, amounting to 830 Mio. EUR. In parallel, the EU-Commission has re-introduced buying out of skimmed milk powder (SMP) and other dairy products in July 2015. The amounts of SMP interventions since 2000 have shown abrupt periods of intervention, one of which currently undergoing (**Fig. 4.6.2**).

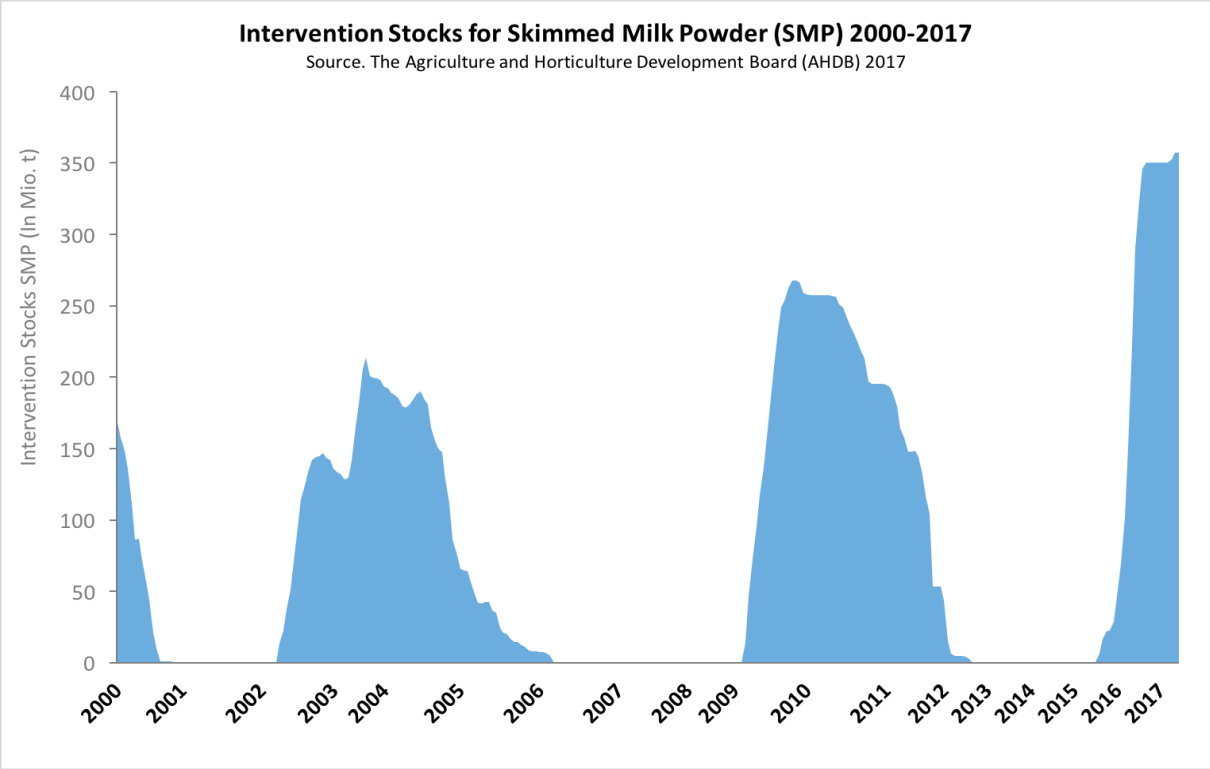


Figure 4.6.2: Intervention Stocks for Skimmed Milk Powder (SMP) 2000-2017. Source: The Agriculture and Horticulture Development Board (Source: AHDB; 2017).
https://dairy.ahdb.org.uk/resources-library/market-information/processing-trade/intervention-stocks/#.WgXSPrYlx5M

The problem of the decreasing prices is partly linked to the end of the milk quota in March 2015. Decreasing demand from China and the trade embargo to Russia also added to this trend. The end outcome is that coupled payments on the one hand provide income support to farmers and help farmers to maintain production capacities, yet in parallel overproduction of milk (butter, skimmed milk powder) has to be bought from the market by the EU Commission. Both measures are strongly incoherent, since they achieve conflicting effects for the same policy field (Matthews 2016).

4.6.4 Conditions for effective integration of CAP objectives

Existing scientific studies explain incoherences in the CAP mainly with strong opposing interests and a missing specification of its objectives, resulting in diffuse and ineffective policy designs (Rutz et al. 2014). The challenge of producing a coherent European CAP is shaped by existing power constellations/asymmetries and discursive framing. Throughout its history, the CAP has changed and expanded its objectives (e.g. Rietig, 2012; Persson et al. 2016; Holden et al. 2012, Feindt, 2010). For example, Holden et al. (2012) identified and elaborated on an internal political discourse on the CAP among sectoral Finish actors that widened from an initial focus on the farm economy to incorporate organic farming in the 1990s and rural livelihoods in the 2000s that only slowly allowed for 'external' aspects to be discussed. By contrast, they showed how environmental concerns in the external, i.e. non-

CAP related Finish discourse have strongly shifted from water pollution in the 1980s to biodiversity and rural issues in the 1990s and climate change, bioenergy, and life cycle analyses in the 2000s. Importantly, they found that sustainable agriculture is a very vague and contested term and environmental concerns have only entered the external discourse on the CAP, after they had already been institutionalised in its policies (Holden et al. 2012).

Studies connect incoherent CAP implementation with a missing operationalisation of objectives in indicators and targets that define environmental, social and economic development in scales and dimensions that are meaningful to different stakeholder groups (Rietig 2012, Persson et al. 2016). The lack of clear evidence of benefits to biodiversity, uncertainty caused by complex objectives avoiding a clear coordination of biodiversity, climate, and other environmental concerns has been found to further weaken the call for strengthened environmental measures in a coherent CAP (Persson et al., 2016; Matthews, 2013). Furthermore, they find that the growing complexity of CAP objectives requires more careful identification of trade-off. However, the CAP in its current form bears intransparent trade-offs, which cannot be exposed without proper indicators and especially indicator-systems that unify different aspects of the policy's objectives.

In the environmental context, the 2013 CAP reform has resulted in more complex structures with higher administrative hurdles and costs, and limited effects (Persson et al., 2016, Pe'er et al. 2014, 2017, Zinngrebe et al., 2017).

The CAP reform was conducted with the idea that status quo was unacceptable, negotiations were initiated in private, the Commission acted as policy broker, and major conflicts were not only normative (Nedergaard 2008, p. 183). Negotiations on environmental aspects, in particular, seem to have been wrapped in conflicts on different normative perspectives. Environmental issues, such as biodiversity conservation and climate change have entered the policy agenda of the CAP as response to environmental obligations and international commitments, as well as public demand for public goods (Zahrnt 2009), but their final design and implementation seems to have been conditioned by powerful, often opposing interests (Feindt, 2010; Rietig, 2012, Rutz et al. 2014). **Power struggles among interest groups have compromised the outcomes, resulting in expensive, incoherent policy with little impact.**

4.6.6 Bottom-up approaches to coherent policy implementation

As an alternative (and complementary) approach to adjustments in policy design, studies point to the potential and challenge of bottom-up approaches in integrating different CAP mechanisms and producing local solutions to coherently implement different CAP objectives. As a response to the growing variety of ecosystem services provided by agricultural landscapes (Hauck et al., 2014), the concept of multi-functionality has entered political objectives of the CAP (Erjavec et al. 2009). As a major challenge of vertical integration across political levels, the EU is required to produce a clear, manageable and transparent framework policy, while at the same time leaving flexibility to local implementation taking into account the strong variations in the ecological and socio-economic contexts across Europe. Buizer et al. (2016) suggest that local experiences demonstrate the potential of bottom-up integration to achieve multi-functionality. . Buizer et al. (2016) demonstrate how local pilot studies in the Netherlands have provided new approaches to multi-functional land uses based on local knowledge, offering a way out of the "agriculture versus nature" discourse which generates power interests and conflicts on national and EU levels.

Despite the initial approach of preventing agricultural intensification to produce ecological outcomes, the concept of "sustainable intensification" aims at intensifying the provision of different ecosystem services (Garnett et al. 2013). While this concept has been proposed as a potential solution for the conflict between agricultural intensification and environmental protection, it has also been criticised for the lack of operational guidelines or show-cases of good implementation (Garnett et al. 2013)

As a specific challenge for vertical integration and effective implementation, the cost-effectiveness in AECM requires a spatial coordination in order to achieve connectivity of habitats. Possible approaches are strategic contracts with groups of farmers, linking the payments to ecological results or coordinating producing environmental contracts for coordinated AECM implementation (see overview in Hodge et al., 2015). As successful national experience for environmental policy integration, national environmental quality goals introduced clear targets for organic farming in Sweden. Persson et al. (2016) describe a process, in which formal and informal think tanks evolved and the Federation of Swedish Farmers took ownership of the process and campaigned for becoming the "world's cleanest agriculture".

All those local initiatives coordinating production of ecosystem services, the implementation of AECMs or other land-uses require an institutional setting that allows an inclusion of local knowledge and bottom-up approaches in their implementation (Goldmann et al. 2007; Prager et al. 2012). Local initiatives require certain flexibility for its implementation that stand in contrast to the "command-and-control" style requirements that have been connected to DP (Rietig 2013) and are rather top-down (Repohl et al. 2015). The literature on green infrastructure (GI) highlights the potential for the provision of ecological services and connectivity in coordinating policy arrangements (e.g. CAP with regional planning processes) by improving information flows and cooperation between actors and policy processes related to agricultural land use (Llausas and Roe, 2012; Hauck et al. 2017; Schmidt & Hauck 2017). While Trinomics B.V. (2016) state that GI is already well integrated into the CAP, Repohl et al. (2015) find that the objectives of the European GI strategy and the CAP's greening measures are matching, but highlight possible difficulties for implementation. Collective EFAs, one way mentioned to enhance connectivity at landscape level through CAP instruments, have been rarely implemented (Pe'er et al. 2017). All analysed case studies indicate that CAP implementation does not yet provide adequate support for collaborative approaches to policy integration, it even produces obstacles to it (Leventon et al. 2017).

4.7 External Coherence

Key findings

Governing agricultural landscapes, the related human-nature interactions as well as related value chains and economic processes touches on a wide variety of EU policy fields and sectors. Coherence with some policies, producing synergistic effects, were found in policy areas with common interests such as Cohesion policy. Some coherence was also found in terms of objectives and instruments (e.g. CC) with Nitrate- and water-framework directives, organic farming as well as trade liberalisation. However, other areas with conflicting interests and obscure or split responsibilities, such as biodiversity conservation, nutrition and health, and the mitigation of GHG emissions from feedstock production which shows strong shortcomings and conflicts in both the alignment of their objectives and their effective implementation. The absence of specific political targets and indicators for aspired outcomes and impacts within the dimension of sustainability, hinders both guiding possible political adjustments and improving the transparency of synergies and trade-offs.

4.7.1 Trade policy and CAP

Relevant CAP objectives: 3, 2010-priority 2, "harmonious development of world trade" (article 206 in the TFEU).

Relevant SDGs: 1, 2, 8, 12, 13, 15.

Relevant policies in the EU: Trade Policy

Number of publications scanned: 7 publications

Throughout the history of the CAP, European agricultural policy has been criticized for being incoherent with the **political objective of an 'harmonious development of world trade'** as e.g. stated in Article 206 TFEU (see also Tangermann & von Cramon-Taubadel 2013). Beside the internal pressure from escalating budgetary costs, the external pressure from GATT/WTO negotiations and political commitments on agriculture played a crucial role in shaping past CAP reforms (Kiryluk-Dryjska 2016; Daugbjerg & Swinbank 2011). With the enforcement of the WTO Agreement on Agriculture in 1995, common rules for agricultural trade were established. Additionally, constraints for domestic support were introduced to limit the use of measures that directly affect production decisions and distort trade. Until the early 1990s, the CAP supported farmers by keeping domestic prices above world markets at politically fixed levels. As a result, **supply in the EU was greater than the demand** (conflict with SDG 12) and the surplus was released on world markets through public intervention and export refunds (Hodge et al. 2015). This system was strongly criticised for its distortive effects on world markets and the negative effect on countries outside the EU (Boysen et al. 2016; Urban et al. 2016; Matthews 2008). The first step towards a greater market orientation was achieved by the MacSharry reform in 1992 and strengthened by following reforms. As a result, public intervention was lowered to a safety-net level and direct support was mostly decoupled from production.

During the last reforms (MacSharry, Agenda 2000 and Fischler-reform), the EU has decreased the intervention price for different products. Following the GATT-agreement, tariffs have also been lowered. As a consequence, for many products the EU prices are more closely following world market prices, which

is for most commodities above the intervention price (see **Fig. 4.3.11**, wheat prices in the EU and on the world market). Hence, the intervention price system was practically phased out for many commodities but remains as a safety-net for some specific markets.[29] Export refunds were successively reduced which was also favoured by higher world market prices (Matthews 2010). Thus, as the EU reduced the distortions through public intervention, tariffs and export subsidies, the overall distortive impacts of the CAP on world markets could be significantly reduced which improved the coherence between trade policy and CAP (Tangermann & von Cramon-Taubadel 2013: 27-29).

Other market barriers and ecological footprints of European consumption, trade policy and growing imports, however, produce negative impacts and strong **challenges in the quest of reaching the SDGs in those countries** (particularly SDGs 1,2,8, 13, and 15) and producing coherent policies for development (see section on PCD below). For instance, growing trade with agricultural products incentivised by European Consumption, the resulting ecological footprint and impacts on developing countries point to the interdependencies of related policy sectors, such as agriculture, trade, development cooperation, and environment (please see section on international impacts below for more detailed information).

4.7.2 CAP and Conservation policies

Relevant CAP objectives: 2010-priority No. 2 ("Sustainable management of natural resources and climate action"), 2010-priority No. 3 ("Balanced territorial development").

Relevant SDGs: 15 (Life on Land).

Relevant policies: Birds and Habitats Directive, Biodiversity Strategy, and the national conservation regulations within the EU. Beyond the EU: CBD

Number of publications scanned: 24

The integration of agricultural and conservation interests/objectives into a coherent policy mix on the EU level remains a major challenge. Besides conservation instruments within the CAP (e.g. AECM since 1992 or Greening since 2014), a variety of conservation policies are being implemented on agricultural landscapes across the EU. As the main conservation policies at the EU level, the EU Birds Directive (Directive 79/409/EEC) and the EU Habitats Directive (EEC 1992) cover 18 % of the EU's land area. The **objectives** of these directives are potentially coherent with the CAP's objectives aiming at sustainable practices and conservation. Potential conflicts arise, however, from the potential intensification-support by Pillar I and the missing recognition of biodiversity supporting semi-natural habitats as eligible for DP (Milieu et al. 2016). Literature points to conflicts of CAP measures with the Habitats Directive (Dobrev et al. 2014, Förster et al. 2008, Burrascano et al. 2016). These conflicts rise from the conversion of grasslands to arable land incentivised by direct payments per area (Dobrev et al. 2014, Förster et al. 2008) or, more surprisingly, support for afforestation (Burrascano et al. 2016). In this latter case, it was shown that the

[29] There is one main exception from this development, which is the milk-market, where the EU Commission phased out production quotas in March 2015. Following a two years price decrease, the EU Commission re-introduced the intervention for milk-powder in 2015 in order to stabilize the prices.

afforestation of grassland at EU level may harm grassland biodiversity, hence conflicting with the habitats directive. While the value of HNVF for supporting biodiversity has been demonstrated (Keenleyside et al. 2014; Oppermann et al. 2012), HNVF has not been coherently defined, mapped and supported by CAP instruments across the EU landscape. Mismatches and overlaps in definitions, instruments, labels and spatial locality between HNV, organic farming and Natura 2000 impede synergetic implementation with the Nature Directives.

With GAEC and SMR requirements of cross-compliance, and part of the available greening and AECM measures, the CAP has more **instruments** to support biodiversity than to threaten it (Milieu et al. 2016). Cross-compliance conditions CAP payments on the compliance with Natura 2000 sites (EC, 2011c, pp. 2–3, Articles 4,9). Lakner & Kleinknecht (2012) have shown that agri-environmental payments of Pillar II in the German federal state of Saxony support the development of management plans as part of the implementation of the habitat regulation. The authors also point out, that this effect is strongly influenced by the specific regional implementation within the federal state. Further, the Agenda 2000 reform introduced so-called Art. 16 measures which allowed for farmers (for a limited time period) to apply for AEMs in Natura-2000 designated areas (Laschewski et al. (2004). This was meant to be a way to 1) win farmers to accept restrictions induced by Natura 2000, and 2) to increase compliance of farmers with this regulation. The coherence of AECM and EFA with the Habitats and Birds Directive is mainly determined by the type of measures chosen by national governments, and how farmers implement them (Milieu et al. 2016).

Recent studies on the **impacts** of the Natura 2000 system however indicate that there are still 50% species and 80% habitat types with unfavourable conservation status (EEA, 2015). Weak incentives and enforcement procedures of cross-compliance have revealed little evidence for benefits to biodiversity (Milieu, 2016). Financing modalities for Natura 2000 activities are provided in the frame of EAFRD support of the CAP's Pillar II (Kettunen et al. 2014). According the rural development plans of the MS, about 118 Mio. EUR p.a. (incl. national co-funding) are spent within the RDPs 2014-2020, which is just about 0.5% of the total RDP-budget. 18 of 28 MS offer the option of funding Natura 2000 policies within RDP, however often with comparatively low amounts: Just 8 of 18 MS spend more than 1% of their total RDP-budget on Natura 2000 (own calculations based on EU Commission 2014). Overall, a funding of only 1-2% of CAP funds to Natura 2000 sites is complemented with insufficiencies in monitoring and site designation (Hodge et al. 2015, Kettunen et al. 2011). In order to increase coherence and to improve the cost-effectiveness of Natura sites, Santana et al. (2013) recommend to better coordinate the policies while strengthening the focus on local biodiversity needs and flagship species. Overall, there is not only a need to compare cost-effectiveness of individual conservation policies within and outside of the CAP, but also to find studies to assess their joint performance.

The dominating influence of agricultural interest groups and the strong 'productivist discourse' have been found to actively weakening the policy design of environmental measures (Hodge et al. 2015, Erjavec and Erjavec, 2015). The absence of clear environmental targets was found to further weakening the process of integrating conservation into the CAP (Hilden et al. 2012). For instance, Batary et al. (2015) show a higher cost-effectiveness for conserving meadow birds in protected areas than through meadow bird AEM schemes. Thus, the low cost-effectiveness of greening and AEMs in current policy designs (see effectiveness section above) puts in question the capacity of CAP in ensuring biodiversity conservation in agricultural landscapes. Alarming trends that fail international and national biodiversity targets therefore call for cost-effective packages of conservation policies while reducing harmful subsidies.

4.7.3 CAP and Climate policy

Relevant CAP objectives: 3, 2010-priority 2

R**elevant SDGs**: 7, 12, 13

Relevant policies in the EU: European Climate Change Programme (ECCP climate strategy, Kyoto protocol, LULUCF proposal)

Number of publications scanned: 9 publications

Political commitments on combatting **climate change** have entered the CAP discourse. Particularly the Cardiff process and Agenda 2000 reforms were identified as turning points in climate integration in agricultural policy (Matthews, 2013; Hodge, 2015; Rietig, 2012). In 2000, the EU initiated its European Climate Change Programme (ECCP) for the period from 2000-2004 aiming at a 8% reduction of greenhouse gases (GHG) by 2012 (compared to 1990 levels). In the context of the Kyoto protocol, this has developed into much more ambitious targets of a 20% reduction till 2020, a 40% reduction till 2030 and a 80% reduction till 2050 (EU Commission, 2016).

Not being part of the European Emissions Trading Scheme, the CAP is the primary policy instrument for implementing climate policies in the agricultural sector. The CAP defines both greening measures in Pillar I and AECMs in Pillar II as mechanisms to incentivise agricultural practices that are "beneficial for the climate and the environment" (EU Commission 2013: article 37, 40 and others). While climate has gained much importance in the objectives formulated for the operational instruments of the CAP (Rietig, 2016), no significant contribution of the CAP to GHG reductions could be found (see section 4.4.1). While emission reduction before 2005 were explained with economic decline in the 1990s in Eastern Europe, herd size reduction and N-fertilizer reduction, no further net reductions could be observed after 2005 (EEA 2017). The reduction of N-fertilizer as a consequence of the Nitrate directive required for Cross Compliance indicates synergies in combating water pollution and climate change.

An important part of emissions occurs outside the EU through forest clearing for feedstock production (see PCD section on importing biocapacity below). At the same time, the EU supports programs under REDD+ (Reducing emissions from deforestation and degradation) that grant incentives for a reduction of GHG emissions from land use change in the tropics (e.g. www.euredd.efi.int). The fact that feedstock import as an important cause of deforestation is not addressed under agricultural policies shows a lack of coherence between climate policy and the latter.

As further draw-back, Burrascano et al. (2016) point to the trade-offs with other environmental objectives including biodiversity conservation as a result of a stronger emphasis on climate mitigation. Instead, scholars emphasise the potential of incentivising a variety of ecosystem services as environmental outcomes instead of fixed activities to integrate climate and biodiversity objectives in multifunctional agricultural landscapes (Burrascano et al. 2016; Hauck et al., 2014). The "legislative proposal to integrate greenhouse gas emissions and removals from land use, land use-change and forestry" (LULUCF) proposal summarises the limited potential for climate integration in agriculture as follows (EU Commission, 2016: article 5):

“The European Council of 23-24 October 2014 also acknowledged the multiple objectives of the agriculture and land use sector, with their lower mitigation potential as well as the need to ensure coherence between the Union food security and climate change objectives”.

Hart et al. (2017) showed that, in comparison to other sectors, even after the Paris conference in 2015, “there remains no clear decarbonisation agenda or GHG emission reduction targets for the agricultural sector at EU level".

4.7.4 CAP and the EU’s Cohesion policy

Relevant CAP objectives: 2010-priority 3 (‘Balanced territorial development’)

Relevant SDGs: 1, 8

Relevant policies in the EU: EU's cohesion policy

Number of publications scanned: 3

Crescenzi and Giua (2016) argue that ‘space blind’ and top-down CAP policy measures can support rural development in most deprived areas, especially where local lobby groups block developments and where the absence of local institutional structures and conditions limits the effective implementation of other regional policies. It can be complemented with spatially-targeted bottom-up policies in order to further increase regional growth. Hansen and Herrmann (2012) find positive trends for cohesion both spatially (e.g. across German federal states) and convergence over time for the period 1991-2009. For the first dimension (across regions), they identify decreasing regional disparities within the agricultural sector and for society as a whole. In the second dimension, they also detect a positive influence over time within the agricultural sector, but no economic cohesion for society as a whole.

Furthermore, the positive effect for cohesion can only be supported when calculated per farm, but not if calculated per hectare. In case of a CAP reform that would further condition direct payments to societal services or shift payments to Pillar II measures, it will depend on appropriate economic measures to particularly compensate small farmers for possible/potential income losses (Jitea et al. 2011).

Further studies will need to differentiate the effects of the CAP from general structural developments.

4.7.5 Water and soil and Integrated Pest Management

Relevant CAP objectives: 2010-priority 2

Relevant SDGs: 6

Relevant policies in the EU: Water Framework Directive (WFD), Nitrate Directive Floods Directive

Number of publications scanned: 9 publications

Potential synergies of the EU water policy objectives and the CAP are limited by the weak design of CAP regulations. The European Court of Auditors (2014) concludes that the two main CAP-related instruments, Cross Compliance and AECMs, have been conducive, yet largely insufficient. Cross Compliance, for example, does not include several important water‐related issues like the use of phosphorus in agriculture and the application of pesticides in the immediate vicinity of water bodies; as GAEC standards do only require national standards, no further water improvements are achieved, particularly in countries with weak water policies (European Court of Editors, 2014). Opposing to the "polluter pays principle", penalties of CC consist of reduced payments and do not imply further liabilities. The effects of AECMs have been assessed as insufficient in addressing water‐related problems and their underlying causes (European Court of Auditors, 2014). Further complementarities between the WFD and the CAP have been undermined by delays in the implementation of the WFD, a low level of capacity and coordination in providing targeted and coherent monitoring and evaluation processes for the two policies (European Court of Auditors, 2014).

Existing evaluation points to an increased coherence of the CAP with the objective of groundwater protection. Giordano et al. (2014) argues that increasing subsidies due to recent CAP reforms support farmers in purchasing processed water for irrigation instead of ground water. Opposing this tendency, the authors point to the risk that a scarcity of available water from collective irrigation systems related to climate-change induced droughts and limited technological capacities for water storage and treatment might limit this synergy. In the implementation of water related directives (e.g. WFD, Nitrate Directive), a strong and effective reduction of some critical aspects (e.g. ammonia concentration) is contrasted with low advances in others (e.g. diffuse pollution with nitrogen from agricultural production), while unequally distributing costs and benefits across farmers (van Grinsven et al. 2016). Van Grinsven et al. (2016) identify the potential of better targeted financial compensation schemes for farmers to reduce their emission levels or local cooperation for compensating affected farmers. Here, other studies shed light on the potential of voluntary cooperative agreements (CAs) between water companies, farmers, and authorities to find site specific, cost-effective solutions for improved water quality and Cross Compliance with water regulations (Heinz, 2008). Apart from compensation payments for implementing certain farming practices, the agreements often include the provision of free (agricultural) advisory services, investment aids (e.g. for enlarging storage capacities for semi-liquid manure and improving spreading practices), and monitoring soils and waters. In most cases, the lion's share of funds is provided by water suppliers and is either directly paid by them to the farmers, or via AECM (Heinz, 2003).

With respect to **pesticides**, Urruty et al. (2016) demonstrate how the CAP can influence overall pesticide use at national level through its effects on land-use (see section 4.2.1). European policy on pesticides aims to reduce overall pesticide use through the mandatory application of the principles of Integrated Pest Management (IPM), as enacted through National Action Plans (see section 4.2.3). Many IPM measures, such as crop diversification or field margin management to encourage beneficial organisms, can be directly supported by the CAP through AECM greening, and/or cross compliance measures. Thus, there is potential for and indications of an increasing coherence between the CAP and EU pesticides policy, but implications of the CAP on overall pesticide use through its effects on crop choices (Urruty et al 2016) must also be taken into account.

Additional synergies arise since most soil and water protection measures within AECMs are designed to reduce soil erosion and nitrate leaching and to foster climate policies in a production-friendly way as they decrease GHG emissions without loss of crop yield. For example, undersown spring cereals support

decreased inputs and emissions per unit of crop yield. The most effective AECM options with respect to soil and water protection identified are already included in the proposed EFA options. These options receive a lower priority (i.e. low weighting factors; Warner et al. 2017), but cover a large share of area (EC 2016). It is important to highlight that there is not yet an EU legislation on soil protection in place with a Soil Framework Directive being negotiated since 2006 (Henricksen et al. 2016).

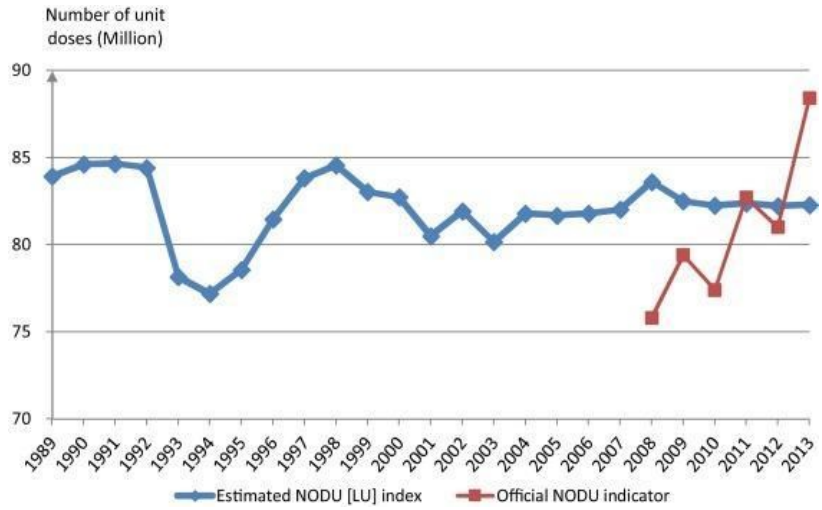


Figure 4.7.1: *Overall index of pesticide use in France, showing a clear effect of the CAP set-aside policy from 1992-1998. Source: Urruty et al (2016).*

4.7.6 Coherence with Health and Nutrition

Relevant CAP objectives: none

Relevant SDG(s): 3 and 12, as well as indirectly 6 and 15

Relevant EU policies: Sustainable Use of Pesticides Directive (Directive 2009/128/EC)

Number of publications scanned: 9 publications

Structural differences in legal mandate, available policy instruments and target groups are adding to the uncertain relation between CAP and the policy field of **nutrition and health** (Walls et al. 2016). While agricultural policy primarily focuses on production (supply side), health issues are a 'supporting competence' that is supposed to focus on research, health information and education, mostly directed at consumers (demand side). Especially In the absence of one consistent food policy in the EU, the CAP has a role in affecting both consumption and production, and the provision of healthy food to consumers. This well is reflected by the EU's Fitness Check of the Food chain (EC 2013), which explicitly points to the importance of incorporating the concerns of public health and healthy consumption into all policies related to the food chain, particularly the CAP with CC and AECM being central instruments for this purpose.

Internal and external experts of the EU policy process identify clear guidelines on healthy diets provided by the World Health Organisation (WHO) and other international organisations and a clarifying political debate with extended civil society engagement on the legal mandate and competencies of the EU in incentivising the production of healthy foods or the provision of healthy products by the food industry as possible factors to stronger integrate health concerns into agricultural policy (Walls et al. 2016). Matthews (2017) shows that direct payments represent a much larger share of the income of livestock farms in comparison to other sectors, which can be considered a hidden subsidy for animal products. The CAP supports **organic farming** as well (see respective section). Michelsen (2009) found a correlation of national financial support for organic agriculture and the level of political conflict at the time the country entered the EU's CAP mechanism. Front runners, such as Austria, Finland and Sweden are countries with truly low conflict and stronger financial support, but have nonetheless not managed to transform organic agriculture in more than a marginal activity (Michelsen, 2009).

To date, the CAP (and other policies) do not manage to connect the demand for healthy nutrition with production; neither does the CAP favour the production of healthy food in its support scheme.

4.7.7 Policy Coherence for Development and Impacts on Developing Countries

Question: "Is the CAP coherent with the EU's objective of Policy Coherence for Development (PCD) and a harmonious development of world trade, taking into account economic impacts on other countries and the externalization of environmental impacts out of the EU?"

Relevant CAP objectives: The key commitment of the EU for the policy coherence for development is stated in the 'European Consensus' (EU Commission, 2006). The EU is requested to "prioritise support to the least developed and other low-income countries (LICs)" (article 10). According to article 83 agriculture and rural development are seen to be key elements of poverty reduction. At the same time the EU should respect "the capacity of eco-systems" (article 83) and the "protection of the environment" has to be included in all policies (article 105). Additionally, in the context of the CAP's external coherence with trade policies, TFEU Article 206 states the '*harmonious development of world trade*' as an objective for the EU's trade policies. According to Boysen et al. (2016, p.2) the PCD requires the EU to consider this concept "in all policies that it implements which are likely to affect developing countries, and that these policies should support development objectives where possible".

R**elevant SDGs**: 1, 2,8,10 12, 13 and 15.

Relevant policies in the EU: Policy Coherence for Development

Number of publications scanned: 38 publications

Given the complexity of the topic, we divide it into the following sub-topics: 1) Subsidies, market distortion and impacts on developing countries and global markets; 2) Trade barriers and trade partnerships; and 3) The CAP impact on the ecological footprint.

Key findings

Policy Coherence for Development (PCD) as well as WTO agreements require the CAP to consider its impacts on international markets and (sustainable) development in other countries, where EU consumption and production has socio-economic and ecological impacts (cf. footprint). Abolishing export subsidies and reducing the distortive effect of domestic support to European farmers has led to a greater market orientation, but with mixed effects. Competitive, middle-income countries are the main beneficiaries from the liberalisation of the European market, while it leads to an "erosion" of special trade preferences and agreements with poorer countries. Preference erosion and market barriers result also from high product- and production-standards but these extend beyond the CAP, e.g. require mechanisms such as Economic Partnership Agreements (EPAs) or support for capacity building.

Increasing European demands for feed supplies, bioenergy, meat and other agricultural products can have significant ecological impacts in countries outside the EU, leading to habitat loss, shrinking forests as carbon sinks, declines of biodiversity and ecosystem services, and other environmental threats, including enhanced vulnerability of populations to environmental risks. The CAP here lacks a coherent policy mix which would acknowledge, identify, and address trade-offs to reduce the EU's global ecological footprint and help poor countries meet the SDGs.

4.7.8.1 Developing countries and global markets

Before successive reforms, the EU used a number of policy instruments which aimed at supporting market prices (e.g. import tariffs, export subsidies and market intervention) and were categorized as being distortive to trade (Mittenzwei et al. 2014; Matthews 2008; Josling & Tangermann 1999). According to the Agreement on Agriculture and further WTO commitments, DP were transformed to be decoupled from production to meet 'green box'[30] requirements. Additionally, the EU agreed on limiting the use of export refunds (Figure 4.7.2) which were strongly criticised due to their price dumping effects. However, one must acknowledge that the consequences of low food prices for developing countries are not uniform: On the one hand consumer in net-importing countries can potentially benefit from low food prices (at least in the short run), while on the other hand low prices negatively affect producers in net-exporting countries (Boysen et al. 2016; Urban et al. 2016; Swinnen & Squicciarini 2012; Swinnen 2011; Bureau & Gohin 2009; Matthews 2008). Cantore et al. (2011) noted that differences of winners and loser among and within countries require coherence analyses to consider more than country averages, as often done in equilibrium models of most studies.

[30] Due to the AoA domestic support measures were placed into three boxes with respect to their distortionary effect on international production and trade. As defined in Annex 2 of the Agricultural Agreement the 'green box' includes measures with no or minimal distortion to trade and must not involve market price support (WTO 2002).

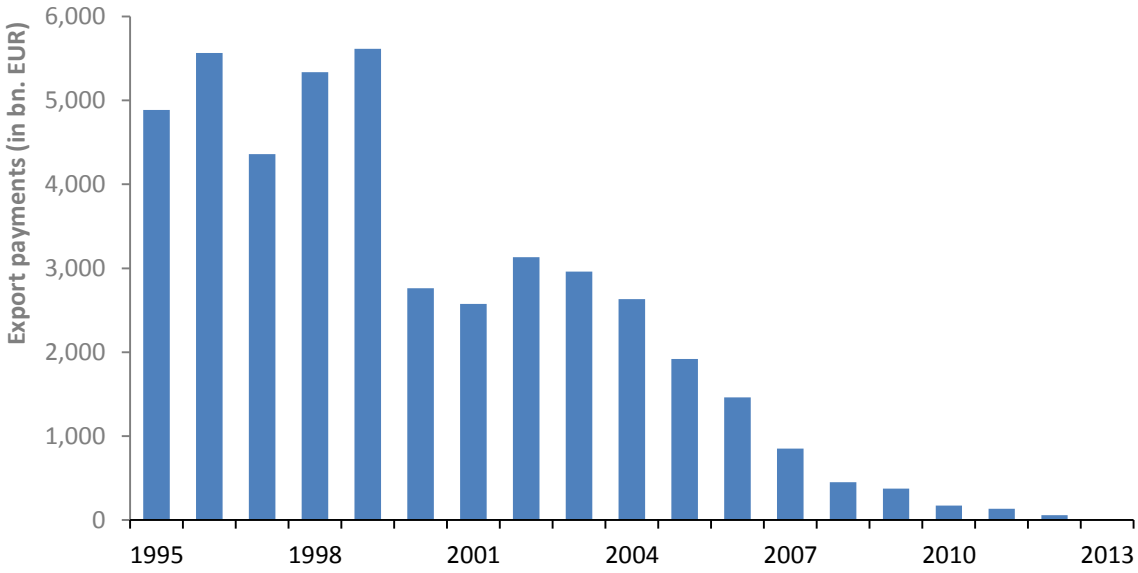


Figure 4.7.2: *Export subsidies for agricultural products paid by the European Union 1995-2013. Source: own presentation, based on database of the World Trade Organization (2017).*

Besides the effect of price support measures on price levels, there is also a risk for increasing volatility on international markets. A reduction of direct price support measures in past reforms was expected to have a positive impact on international market stability and price volatility (e.g. Pinstrup-Andersen 2013; Swinnen et al. 2013; Tangermann 2011; von Ledebur & Schmitz 2012; Rudloff 2009; Matthews 2008; Tyers & Anderson 1992). However, to our knowledge there is no empirical research yet on these effects.

Recent reforms of decoupling DP had the objective to reduce market and trade distortions. Mittenzwei et al. (2014) found only minor distortive effects on production and trade of support measures under the green box scheme. Modellings from Gohin & Latruffe (2006) show that both fully or partially decoupled payments have limited distortionary effects on production and trade. Urban et al. (2016) found that decoupling in general reduces the distortive effect but the assumed degree of decoupling plays a crucial role for the outcome of the modelling. A case study modelling the impact of removing all CAP support, including import tariffs and export subsidies on the economy in Uganda, found marginal (positive) effects the country's GDP (+0.03%) and its indicators of poverty. However, the authors noted that results might be overestimated and suffer from strong methodological and theoretical challenges (Boysen et al. 2016). With regard to decoupled payments Matthews (2008, p.3) presumes that "*it is highly unlikely that the payment of such large sums to farmers makes absolutely no difference to their production decisions*".

The European Commission itself concludes that the past reforms "have significantly improved market access opportunities for developing countries and reduced market distortions, thereby progressively reducing CAP impact on the trade and development opportunities of these countries" (European Commission 2013, p.105).

4.7.8.2 Trade barriers and trade partnerships

Even though the nature of trade barriers has changed and reducing important border measures has significantly reduced agricultural protectionism in the EU, there are still significant hurdles to market access of developing countries. As one effect of a liberalised CAP, preferential trade conditions for developing countries lose their value, which is described as "preference erosion" (see figure 4.7.3 for an overview of past and current trade regimes). As an example, preferential trade agreements were estimated to support agricultural exports from African sub-saharan countries with € 1.2 billion annually (Perez and Jallab, 2009 in Desta and MacMahon, 2015). Different preferential trade schemes, such as Generalised Scheme of Preferences (GSP), GSP+ and Everything but Arms initiative (EBA) accounted for 4.18 %, 0.46 % and 0.46 % of total EU imports, respectively (Carbone and Keijzer, 2016). As channeling commodities through this preferential market access produces an additional income for these countries (rent), these preferential trade agreements were found to function as indirect development aid for partner countries (Milner et al. 2009). Accordingly, the poorest countries lose with preference erosion, while other countries that had been excluded from preferential trade access (e.g. Brazil, Argentina, Uruguay, Thailand, China), benefit (Matthews, 2008).

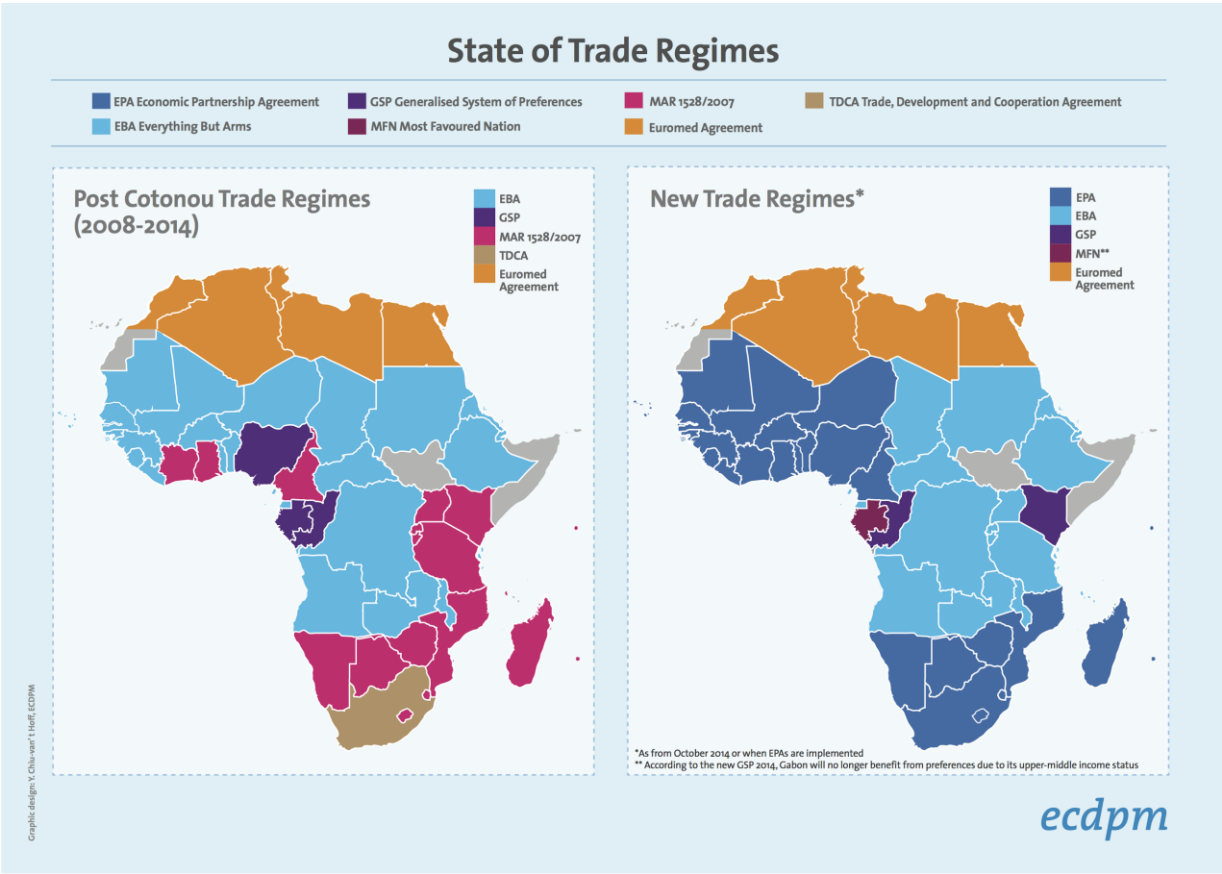


Figure 4.7.3: *The new trade agreements with African countries 2008 and 2014. Source: European Centre for Development Policy Management (2015).*

As a new instrument for agricultural trade, Economic Partnership Agreements (EPAs) should facilitate market access for poor countries. While EPAs were meant to be finalized by 2008, in 2015 there was only one agreement signed defining duty and quota agreements for rice and sugar for CARIFORUM countries[31] (Desta and McMahon, 2015). In their analysis of preferential trade agreements, Desta and McMahon (2015) found a frequent exclusion of CAP products from preferential schemes, whereas typically tropical products, such as cocoa, coffee and tobacco are easily introduced and receive most of their added value within the EU.

Sanitary and phytosanitary standards, Technical Barriers to Trade (TBT Agreement) and private certification standards are particularly challenging for small and subsistence farmers in developing countries that do not have the capacity to meet these standards (Desta and McMahon 2015, Matthews 2011, 2008). Desta and McMahon (2015) conclude that these standards pose new market barriers to the European market, after liberalizing the CAP through market reforms. Winners of trade liberalisation are mainly middle-income countries with strong agricultural production while the vulnerable population in low-income countries does not benefit (Matthews, 2008).

As the above findings display, a market orientation of the CAP alone does not guarantee market access and benefits to poor countries, neither for poor farmers therein. As an important component of the policy mix, it was proposed that development aid can be used to support the less competitive countries and support the capacity building to comply with standards in the EU (Matthews, 2008, 2011). These market barriers are still obstacles for developing countries to develop their economic potential and reach SDGs 1, 2 and 8.

4.7.8.3 Ecological footprint

Although largely ignored by the PCD literature, the CAP and its context of European agricultural production and consumption patterns have a strong ecological and socio-ecological impact on other countries (figure 4.7.4). In a global perspective, a *"business as usual"*-scenario of agricultural production and consumption patterns projects the global biocapacity required for cropland production to increase by 60 % from 2002 to 2050, which will further be strengthened by demands for bioenergy and other biomass for industrial uses (Kitzes et al. 2008).

[31] 15 member countries of the Caribbean community and the Dominican Republic

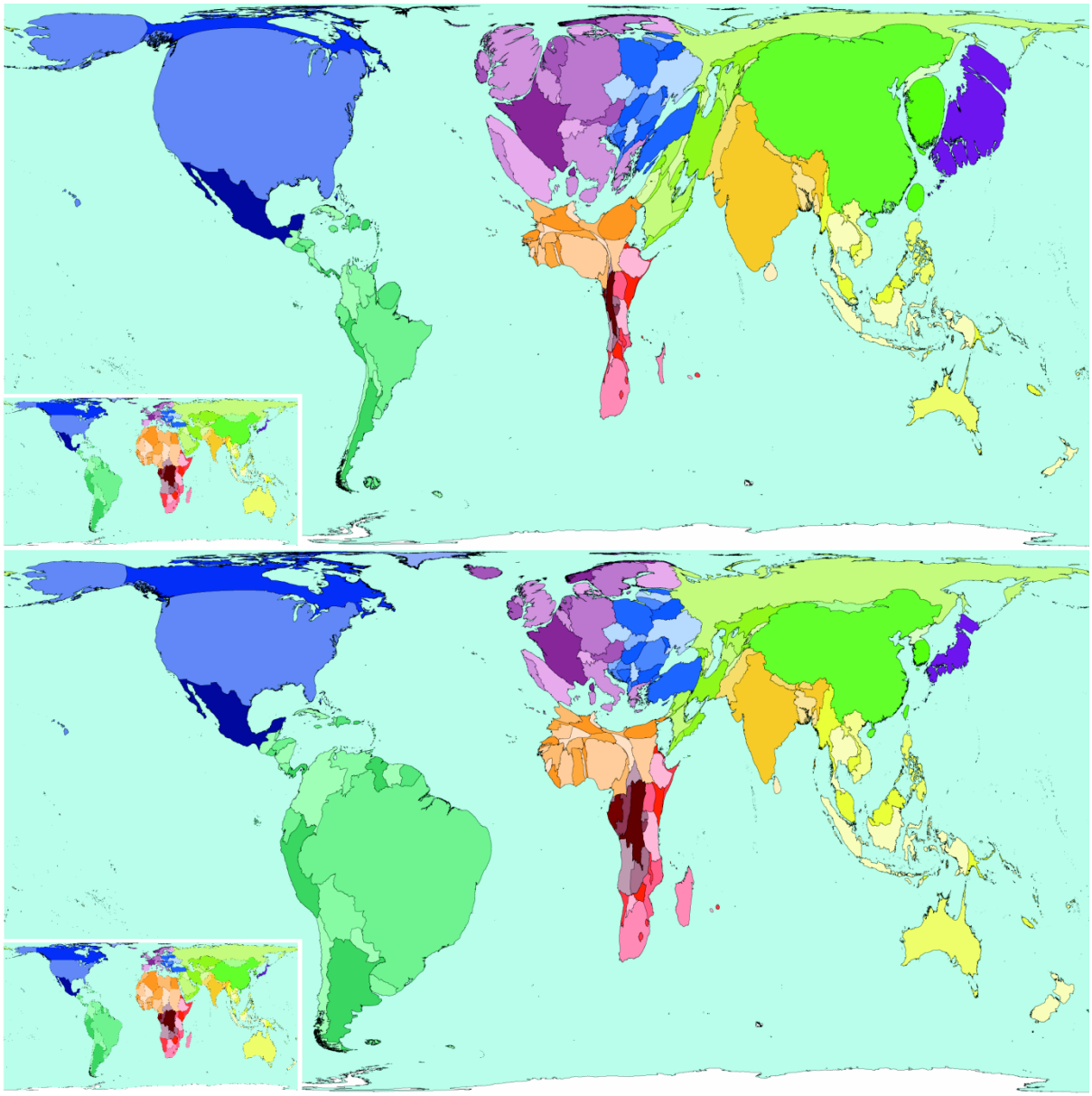


Figure 4.7.4: *The **Top Image** shows the territorial size in proportion to its share of the global footprint as a measure of for the consumption of natural resources and environmental pollution. The **Bottom Image** shows the territorial size in proportion to the nationally available biocapacity, measuring biologically productive land including cropland, pasture, fisheries and forests. You can find a global map with proportional dimensions in the lower left corner for comparison. (Taken from EEA, 2007, based on data from WWF, 2006).*

Contradicting the theory of the Kuznetz curve, recent projections predict that developing countries will not reduce their ecological footprint but will be locked into their role of biocapacity providers for growing consumption in the political north, including Europe (Asici and Acar, 2016, Mills and Waite, 2009, Teixido-Figueras and Duro, 2014).

Particularly livestock production in Europe depends on feed imports (e.g. Antonelli 2015). Free import of oilseeds in combination with subsidies for animal production was found to incentivize the import of virtual land since the 1960s (Khatun 2012). Virtual land for European animal feed is predominantly provided by South American countries leading to deforestation, mainly in Brazil, associated to loss of biodiversity and ecosystem services as well as GHG emissions (Boerema et al. 2016, Khatun 2012). Von Witzke & Noleppa (2010) report an increasing net import of virtual land, reaching some 35 million hectares in 2007/08. Also Serrano (2012) projects that the latest CAP reforms together with trade liberalization will further increase this phenomenon. Removal of subsidies and trade liberalization on the other hand lead to increased import of animal products (mainly beef) from developing countries with even worse environmental consequences, due to lower efficiency of beef production in the tropics (Antonelli et al. 2015, Verburg et al. 2012).

Zahrnt (2011) highlights the role of the world market as a buffer, helping the global South to adapt to disastrous climatic events such as droughts in specific parts of the world by securing food supply from other regions (Zahrnt 2011). Also EU biofuel policies have been shown to drive land-use change outside the EU (Miyake et al. 2012). Although biofuel production is a lucrative market for biofuel exporters, it has been reported for causing (violent) social conflicts in the global South (Ide and Selbmann, 2016). However, a stronger competition for agricultural land leads to higher food prices (Matthews, 2008). Land uses and prices as well as ecological footprints point to the interdependencies (and incoherences) of biofuel policies and the CAP objectives of affordable food and sustainable production.

Based on market-models, Pelikan et al. (2015) find that a possible increase of EFA (Greening measure under pillar I) in the EU may lead to increased land use outside the EU causing GHG emissions of 21 tons CO2e (yet this is under the assumption that 7% of arable farm land would be converted away from production and devoted to EFAs, whereas the literature indicates little land-use change and registration mostly of productive options as EFA). Also other measures fostering environmental benefits that may reduce productivity in the EU could have similar effects elsewhere (von Witzke & Noleppa 2016).

EU policies on genetically modified organisms (GMOs) and pesticides impact areas outside the EU as well. Masip et al. (2013) point out that current policies are paradoxical, since use of GMOs and pesticides are handled for cultivation in the EU rather than for import, leading to lower productivity with possible effects on land use and use of GMOs/pesticides elsewhere.

These findings and others, as pointed by various authors, illustrate that production and consumption patterns in a global economy are coupled and require systemic analyses in order to track impacts and enable sustainable development of agricultural production and land use (e.g. Liu et al. 2015; Lenschow et al. 2016, Watkins et al., 2016). Answers to those question will determine pathways to reaching SDG 1, 2, 8, 13 and 15, and particularly exposing trade-offs between the targets that are currently not transparent enough.

4.8 Relevance

Questions: Is the CAP relevant in terms of a) its different objectives, b) the needs, priorities and challenges perceived by EU citizens, farmers and policy makers, and c) the use of relevant knowledge, including monitoring and evaluation?

Relevant CAP objectives: all

Relevant SDG: all

Number of publications used: 54

Key findings

The CAP's objectives are no longer relevant or clear. Some of the CAP's original objectives are outdated as they have largely been achieved (e.g. "ensuring the availability of supplies") or no longer reflect current key challenges ("…reasonable prices"). Three new overarching objectives (or priorities) were added in 2010 to the original constitutional objectives defined in 1962. Additional objectives are also mentioned in official EU documents such as the handbook on CAP monitoring. This multitude of objectives contributes to the CAP's objectives being no longer clear. Evidence suggests that a large share of the CAP budget is not sufficiently grounded in CAP objectives. There is insufficient evidence that DP support the objective of "viable food production". Moreover, new environmental objectives are considered relevant, both in the literature and by the public, but they remain insufficiently addressed.

The public's priorities for agriculture differ from the CAP objectives. The Eurobarometer evaluation in 2015 ("Europeans, Agriculture and the CAP") and the EC's Public Consultation in 2017 ("Modernising and Simplifying the CAP") showed that consumers care about the quality of the food, rather than its quantity, the state of the environment and farm animal welfare. Farmers seem to share most of these views, although they also prioritize farmer's standard of living. Interestingly, both farmers and other citizens would favour investments in rural development over direct payments to secure farmers' standard of living. Two independent Eurobarometer surveys showed that societal acceptance of the CAP as a whole has seen a recent erosion.

The use of available knowledge into the CAP's monitoring and evaluation framework has recently increased but important deficiencies persist. For instance, a baseline evaluation and relevant indicators are still missing to evaluate the contribution of DP to farm income while DP represent the CAP's largest budget. Current indicators on biodiversity and climate are insufficient to evaluate how they are influenced by the CAP. The vast knowledge available on possible ways to improve CAP's environmental performance are not sufficiently used in the CAP's design and implementation. For instance, there is still no uptake of knowledge on GHG sources in the design of climate change mitigation measures, and no uptake of the vast experience from AECM in the design of greening measures.

4.8.1 Relevance of the CAP's objectives

4.8.2.1 Relevance of the original TFEU objectives prior to 2010

Despite several reforms, the CAP's five key objectives have not changed since the CAP's establishment in 1962. The TFEU objectives were formulated in a post-war context when food security was still a prominent issue in Europe (Matthews 2017, Zahrnt 2011, von Cramon-Taubadel 2017).

The CAP objective of increasing agricultural productivity (39a) can be considered fulfilled and thus outdated. This objective originally aimed at ensuring food security and has been achieved during the first decades of the CAP from 1962 to 1990. The CAP's price support even resulted in overproduction in the 1980s. The MacSharry reform (1992) and the Fischler reform (2005) addressed this overproduction issue and the distortive effect of the CAP was reduced to a large extent. This objective is considered as not relevant anymore in the EU (Zahrnt 2011 and Matthews 2017), there is no need to stimulate higher agricultural production in Europe (Tangermann 2011). It is currently more relevant to find the right balance between productivity and other objectives such as environmental protection (Tangermann 2011). New measures that reduce per-hectare output (see sections on organic farming or Greening, for example) partially correspond to this shift in priorities. To go further, agricultural productivity should be defined in a way that includes non-market outputs such as environmental goods and cultural amenities (von Cramon-Taubadel 2017).

The relevance of the CAP objective of ensuring a fair standard of living (39b) is mixed. Today, it is often argued that the agricultural sector is associated with lower incomes, higher risk exposure (Severini et al. 2015; see also section 4.3.2) and therefore lower attractiveness and stronger decline in employment (EU Commission 2013). These facts suggest that objective 39b is still relevant. The literature is however critical about whether the CAP is taking relevant measures to achieve this objective. Direct payments have a clear positive effect on farm income and maintenance of agricultural jobs, but they are found to be inefficient and inequitable (e.g. Matthews 2017, see section 4.3.2). Moreover, income support is likely to enhance the standard of living in contexts where the standard of living is less than fair without such subsidies. As a result, income support may be a question of social policy rather than agriculture (von Cramon-Taubadel 2017 and Matthews[32]). Finally, objectives 39a and 39b can be considered as potentially contradictory according to economic theory. Objective 39a aims to increase productivity, especially the partial productivity of labour whereas objective 39b aims at "*...increasing the individual earnings of persons engaged in agriculture*". An increase of productivity results in an increase of outputs per labour unit, therefore reducing the remuneration of labour and ultimately wages. Both objectives can therefore not be achieved simultaneously. This tends to be confirmed by long term structural changes in agriculture which show that labour declines with increasing productivity. Objective 39b is nevertheless tightly linked with 39a by the word "*thus"* in the original text[33]. This implies that a fair standard of living is meant to be reached by improving productivity (von Cramon-Taubadel 2017). Therefore, while objective 39b is often used to justify income support, the word "*thus*" hints that this interpretation does not meet the original intention of this objective.

The CAP objective to stabilise markets (39c) is mostly fulfilled today, but remains relevant due to the threats of world market instabilities. Stabilizing agricultural markets is generally a relevant objective, but the interpretation of this objective has dramatically changed over time. In the past, the main challenge of the CAP was to form a common market and to stabilize farm incomes by keeping domestic prices above world market price levels. Market stability was interpreted as having domestic prices at fixed levels. This came at the expenses of high budgetary costs and had negative effects on world markets (see section 4.3.3 on market stability and section 4.7.8 on external coherence). Nowadays market stability is interpreted as the integration of the EU market into world markets. The recent liberalization process has brought considerable progress in integrating the EU market into world markets and reducing distortive

[32] http://capreform.eu/leaked-draft-of-the-commission-communication-on-future-of-the-cap/

[33] http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:12012E/TXT&from=EN

effects on the latter (e.g. Meijerink & Achterbosch 2013 and Section 4.3.3). However, the magnitude of current CAP payments, even if they are decoupled from production, most probably still have strong secondary effects on agricultural markets (e.g. Boysen et al. 2016, Matthews 2017). Finally, the better integration of the EU market into world markets also means that the price volatility for the EU markets can potentially increase (Matthews 2010).

The CAP objective of assuring the availability of supplies (39d) has been achieved and is therefore mostly outdated, except in some new MSs. There is large evidence that food security is no longer a major issue in the EU (e.g. von Cramon-Taubadel 2017, Matthews 2013, Tangermann 2011, Zahrnt 2011). Accordingly, it is not perceived by most European citizens as a key challenge (Eurobarometer, 2016). Both objectives can therefore be considered as having already been overachieved in the past, since overproduction has led to excessive production[34] and, even nowadays, 20% of all food produced (173 kg per person) are wasted in the EU (Stenmark et al. 2016, EU Court of Auditors 2017). Nonetheless, some new MSs do occur on the World Bank's map of poverty (e.g. Romania) and some authors highlighted the need to assure the availability of supplies after the collapse of socialism (e.g. Miklos 2014). This objective has therefore regained some relevance with the expansion of the EU, and cannot be completely considered completely outdated. Yet, the risk of a food crisis in the EU is considered still largely implausible (e.g. Matthews 2017).

The CAP objective of ensuring that supplies reach consumers at reasonable prices (39e) is potentially relevant but requiring a clearer definition of "reasonable". The cost of food may be considered somewhat less central in the EU, as seen for instance in the EC's Public Consultation of 2017 (ECORYS 2017; see also next section on societal acceptance). However, it is also important to acknowledge that 33% of the respondents to the "special Eurobarometer 440" on agriculture did not agree that the EU is fulfilling its role in ensuring reasonable food prices. In some cases, consumers are actually criticizing that prices e.g. for meat are too low nowadays[35], reflecting neither actual production-costs nor internalizing environmental costs. Previous CAP reforms had the explicit aim to reduce market distortions (see section 4.3.3: Market stability), meaning that "reasonable prices" is an objective of the CAP only to the extent of ensuring that food prices send clear signals of demand and supply, and price distortions are avoided to the extent possible.

4.8.2.2 The three new 2010 CAP priorities

The addition of three new objectives in 2010 can be seen positively as a will to adapt to current conditions and challenges. However, an "inflation" of CAP objectives can also be seen as a strategy to justify the maintenance of a large budget (Heinemann 2017). We refer here to the wording of EU Reg. No 1306/201 Art. 110, as well as to the specific CAP objectives as described in the Monitoring and Evaluation Framework (EC 2015 and **Fig. 4.8.1**).

[34] https://ec.europa.eu/agriculture/cap-overview/history_en

[35] http://www.rp-online.de/digitales/internet/aufschrei-gegen-billig-steak-angebot-von-aldi-aid-1.6848633), https://www.newscientist.com/article/mg22530052-900-the-world-pays-too-high-a-price-for-cheap-meat/

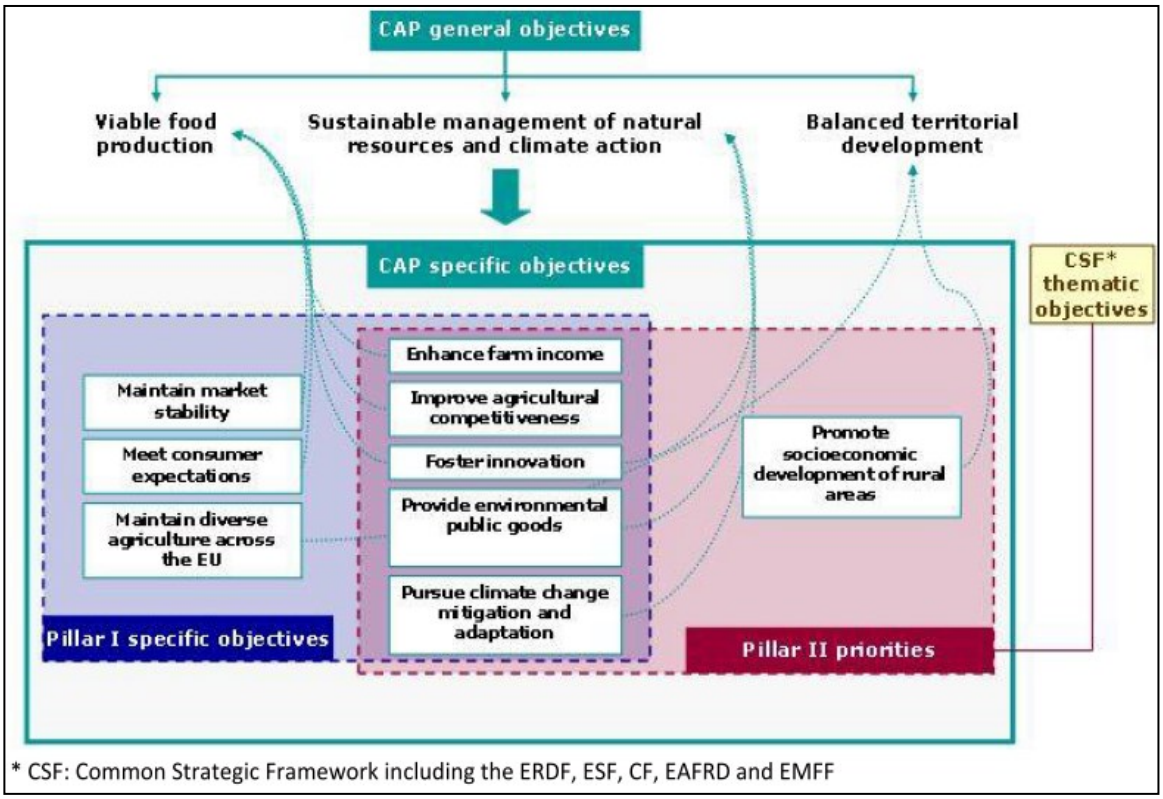


Figure 4.8.1: *Specific CAP objectives as defined for the Monitoring and Evaluation Framework. Source: EC (2015a).*

The new CAP objective on viable food production is not relevant per se, and links with income support need to be justified. The definition used in EU Reg. No 1306/2013 Art. 110 relates viable food production specifically to a "focus on agricultural income, agricultural productivity and price stability". While the wording of the general objectives includes a "focus" on farm income, the specific objectives (**Fig. 4.8.1**) use the word "*enhance*" farm income, implying an active role in providing income support. The EU Court of auditors (2016) criticised this lack of clarity: "*... neither the regulation nor its preamble define their specific objectives in a sufficiently clear manner...*". The link between DP and income support received considerable attention and is greatly questioned in the literature. Tangermann (2011) highlighted the need for a justification of the link between income support by DP and viable food production. A number of authors questioned the relevance of DP for income support since most recipients don't need DP to ensure their economic viability (von Cramon-Taubadel 2017, Matthews 2017, Tangermann 2011, Heinemann 2017). Economic modelling showed limited effects of abolishing DP on overall production and EU food security (Deppermann et al. 2016, Nowicki et al. 2009). Moreover, von Cramon-Taubadel (2017) highlighted a "*double irrelevance*" since income support via DP is neither a goal of the CAP, nor efficiently implemented. DP were introduced as a transitional solution to compensate farmers for the cut of direct subsidies due to decoupling (Heinemann 2017). Today, the maintenance of the budgetary *status quo* seems to be the first motivation for maintaining DP and objectives seems to be developed only to justify maintaining DP. One of the arguments for DP concerns the attenuation of price volatility or an "insurance" against unforeseen losses. Indeed, Severini et al. (2016) found that DP provide some income

stabilization, but in a limited and untargeted way. Finally, although several studies criticised the lack of a targeted action, none of them actually evaluated the need for income support for some farm types.

The new CAP objective on sustainable management of natural resources and climate action can be considered relevant. Environmental protection was not on the agenda in the early days of the CAP and therefore not mentioned in the TFEU. It was established as a horizontal element to be integrated into all EU sectoral policies in the Treaty of Amsterdam (1999), with a view to promoting sustainable development. 'Combating climate change' became a specific goal with the Treaty of Lisbon (2009). There is thus a broad consensus on the importance of the environmental component in different policy fields, including agriculture. This objective marks the introduction of a clear environmental component in the CAP, and specifically a "focus on greenhouse gas emissions, biodiversity, soil and water". The relevance of this general environmental objective as such is not questioned by any of the references we reviewed. There is strong evidence on the continued environmental degradation, biodiversity decline and climate change in the EU (see section 4.4 on 'Effectiveness').

The new CAP objective on balanced territorial development is relevant but lacks specification and integration with other policies. This objective focuses on "*rural employment, growth and poverty in rural areas*". The relevance of this objective as such is hardly addressed directly in literature. It can however be stated that it is generally not questioned, especially given the many indications of large disparities between and within MSs. The variety of studies criticizing the deficient adjustment of the CAP to conditions in new MSs (e.g. Ciutacu et al. 2015, Gorton 2009, Miklos 2014, Sutcliffe 2015), for example, implies that a balanced development is found important and relevant. In relation to general rural development under this objective, Heinemann (2017) states that it is not fully clear how it relates to cohesion policy which is the inherent EU policy to reduce geographical disparities. The specific CAP objectives (**Fig. 4.8.1**) additionally mention "*Maintain diverse agriculture across the EU*", an objective that is not specified in EU Reg. No 1306/2013 Art. 110. As such, Lefebvre et al. (2015) state that there is a lack of integration with specific existing instruments such as the Pan-European Biological and Landscape Diversity Strategy (PEBLDS) and the European Landscape Convention (ELC).

Table 4.8.1 summarises our conclusions with respect to the relevance of the key CAP objectives.

Table 4.8.1*: Summary table of the relevance of each of the TFEU CAP objectives and the 2010-priorities.* Source: own presentation.

Objective / priority	Relevance in 2017
Increase agricultural **productivity** (39a)	Mostly fulfilled, thus outdated, would need clarification
Thus Ensure a fair **standard of living** and increasing the individual earnings in agriculture (39b)	Views on the relevance of this objective are highly heterogeneous
Stabilise markets (39c)	Mostly fulfilled, but remains relevant. Clarification needed on relation to EU/world markets
Assure the **availability of supplies** (39d)	Achieved and thus outdated

Ensure that **supplies reach consumers** at reasonable prices (39e)	Outdated: CAP reforms actively acted to reduce market intervention and market distortions
Viable food production (2010 Priority 1)	Not relevant per se: it is not clear what viable is and what is the relation to income support
Sustainable management of natural resources and climate action (2010 Priority 2)	Relevance not questioned, but not achieved
Balanced territorial development (2010 Priority 3)	Relevant, but not well defined and integrated with other policies

4.8.2.3. Other specific CAP objectives

Additional components of the 'specific objectives' listed in the Monitoring and Evaluation Framework go beyond the eight objectives (**Fig. 4.8.1**). "*Meet consumer expectations*" should obviously be relevant at any time since the CAP is funded by EU's taxpayers who are all consumers. The question about *how* the expectations should be defined and met is partly discussed in the following section on societal acceptance (Section 4.8.3). "*Foster innovation*" meets a high EU priority, often listed by the EU in the contexts of industry and competitiveness. It seems to be a relevant objective, and may have both positive and negative implications that are beyond the scope of this assessment to judge.

Additional "objectives" which should be considered as well in the context of the CAP's relevance are the six priorities for Rural Development Policy[36] (**Box 4.8**). Presented in the fact sheet about RDP in the EU's official website, these priorities include several new aspects that do not occur in other objectives: a) knowledge transfer and social inclusion, b) forest and forestry aspects, c) an explicit reference to entire food production chains, and d) the promotion of animal welfare - an aspect which was shown to be highly relevant to EU citizens (see next section, societal acceptance).

Box 4.8: The six priorities for the new rural development policy for 2014-2020

Source : http://www.europarl.europa.eu/atyourservice/en/displayFtu.html?ftuId=FTU_5.2.6.html

1. to promote knowledge transfer and innovation in agriculture and forestry (developing the knowledge base in rural areas; fostering links between agriculture, forestry and research);
2. to increase the viability and competitiveness of all types of agriculture, promote innovative agricultural technologies and support sustainable forest management;
3. to promote the organisation of the food production chain, animal welfare and risk management in farming;
4. to restore, preserve and enhance agricultural and forest ecosystems (biodiversity, water and soil);
5. to promote the efficient use of resources (water and energy) and support the transition to a low-carbon economy (renewable energy use, greenhouse gas emission reduction, carbon sequestration and storage);
6. to promote social inclusion, poverty reduction and economic development (facilitating job creation, promoting local development and improving access to information and communication technologies).

[36] http://www.europarl.europa.eu/atyourservice/en/displayFtu.html?ftuId=FTU_5.2.6.html

4.8.3 Societal Acceptance

4.8.3.1 "Special Eurobarometer 440": Europeans, agriculture and the CAP

The "special Eurobarometer 440" Europeans, agriculture and the CAP (EC 2015) indicates that agriculture and food are a key topic to EU citizens. An alarming outcome is the indication that **the overall public support for the CAP has substantially declined since 2013** (62 %, -15 percentage points since 2013). This decline might be attributable to criticisms by both farmers and environmental organizations in response to the 2013-reform, about excessive administrative burdens and insufficient environmental commitment, respectively. Key findings of the most recent survey, performed among 27,822 representatively selected EU citizens, are the following:

- When asked about the main responsibilities of farmers, the largest share of EU citizens mentioned the supply of the population with a diversity of quality products (42 %, +4 % points since 2013) and ensuring the welfare of farmed animals (35 %, +8). Maintaining economic activity and employment in rural areas was only mentioned in the fourth place, after environmental protection, and dropped 7 % drop between 2013 and 2015. Also ensuring food self-sufficiency was found less important in 2015 (**Fig. 4.8.2**).
- The majority of Europeans continue to agree that the CAP benefits all citizens and not only farmers: "*A growing majority of Europeans (94 %) holds the view that agriculture and rural areas are important for their future*", with a particular increase in the number of citizens considering agriculture and rural areas as "very important" (62 %, + 16 % points since November 2009).
- Europeans do believe that the EU is fulfilling its role in securing the food supply in the EU (70 % agree) and in ensuring agricultural products are of good quality, healthy and safe (65 %). Whilst an absolute majority agree the EU is fulfilling its role in ensuring a fair standard of living for farmers (52 %), a high proportion of respondents do not hold this view (35 % disagree). Similarly, important minorities disagree the EU is fulfilling its role in ensuring reasonable food prices (33 % disagree) and protecting the environment (31 % disagree).
- "Very important" priorities for EU citizens are to invest in rural areas to stimulate economic growth and job creation (47 %), and strengthening the farmer's role in the food chain (45 %).
- A large proportion of EU citizens (87 %) are somewhat, or totally, in support of the CAP investing in greening payments to farmers for carrying out agricultural practices beneficial to climate and the environment
- A large majority also thinks that the CAP budget (support to farmers) is either about right (41 %) or too low (29 %), and 45 % also would like to see an increase to the EU financial support for farmers over the next ten years.

The most cited justification for the CAP's budget is "financial aid to farmers makes it possible to guarantee the food supply of Europeans" (40 %). However, support for this reason has declined by four percentage points since the last survey. A similar decline has been observed for the second most mentioned reason, "… ensure the sustainable production of food products" (33 %, -5 percentage points since 2013). Compared with 2013, a greater proportion of respondents now recognise the "heavy human and financial costs involved in agriculture as a justification for the EU spending a large proportion of its budget on the CAP" (32 %, +4)." We note that environmental reasoning or public goods were not an option one could

choose from for this question, i.e. the public money for public goods' debate did not receive a reflection here.

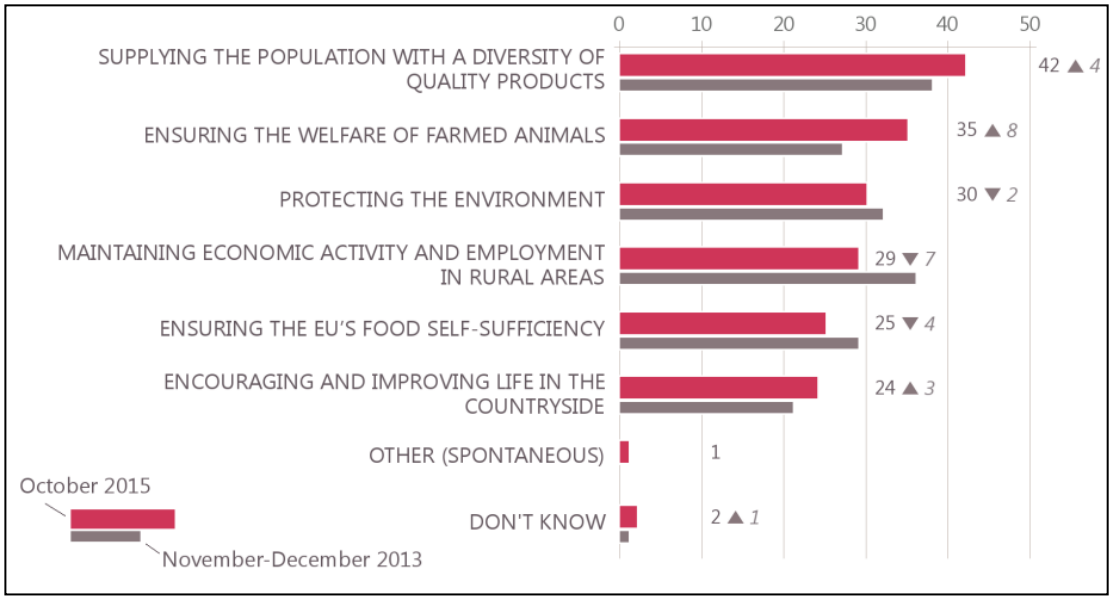


Figure 4.8.2: What do you think should be the two main responsibilities of farmers in our society? Source: Special Eurobarometer 440, survey requested by EC (2015).

4.8.3.2 General Eurobarometer

The general Eurobarometer, i.e. the "Public Opinion" assessment, asks EU citizens twice a year about the relevance of policies and topic and allows assessing trends in public opinions and policy acceptance. Citizens are asked to name the most important result of the EU. The proportion of citizens listing the CAP as the most important result of the EU has seen a recent decline, from circa 10-12% until 2014 to circa 8-9% thereafter, indicating a certain erosion in public acceptance (**Fig. 4.8.3**).

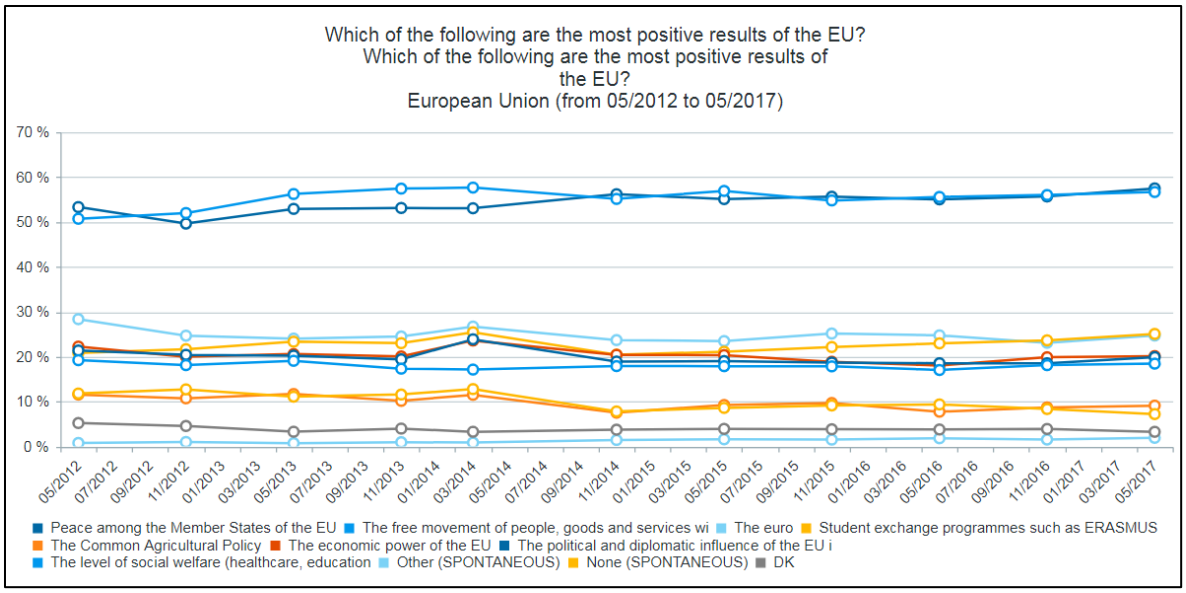


Figure 4.8.3: *Proportion of citizens listing different policies as the "most important result of the EU", from 2012-2017. Source: Eurobarometer, based on survey among circa 30000 citizens.*

4.8.3.3 EU Consultation on "modernising and simplifying the CAP"

In 2017 the EC launched a consultation on modernising and simplifying the CAP (ECORYS 2017), harvesting detailed opinions across different groups of respondents. The consultation revealed interesting results, in spite of several limitations (e.g. von Cramon-Taubadel 2017): participants were volunteers rather selected, their opinion can therefore not be considered representative of the whole EU population; some stakeholders groups have been known for trying to bias the outcomes; some stakeholders chose to leave some questions, considered too biased, unanswered, however, analyses do not account for the proportions of respondents choosing to leave replies blank (ECORYS 2017). Raw results (including no responses) were unfortunately not available for us to (re-)analyse. The consultation differentiated between "farmers" and "other citizens", as well as between submissions through the Living Land campaign[37] and others. However, there seems to be no way to quantify the contribution of farmers through the Living Land campaign, or to identify the level of input by smallholders to the consultation.

The most important challenge of the CAP was "securing a fair standard of living" for farmers and "pressure on natural resources and the climate" as well as "supply of healthy and quality food" for other citizens. "Food availability at reasonable prices" was mentioned by fewer respondents, suggesting that food *quality* is more important for EU citizens responding to the consultation. "Rural development" was also among challenges considered important by both farmers and other citizens, in accordance with the responses to the special Eurobarometer 440 (EC 2015). Other citizens ranked "animal welfare" among important farmers' contribution to society. **The most important CAP tools** were RDP measures for

[37] living-land.org

environmental protection and for investments in rural development both for farmers and other citizens. Direct payments were only cited at the third place by farmers (**Fig. 4.8.4**).

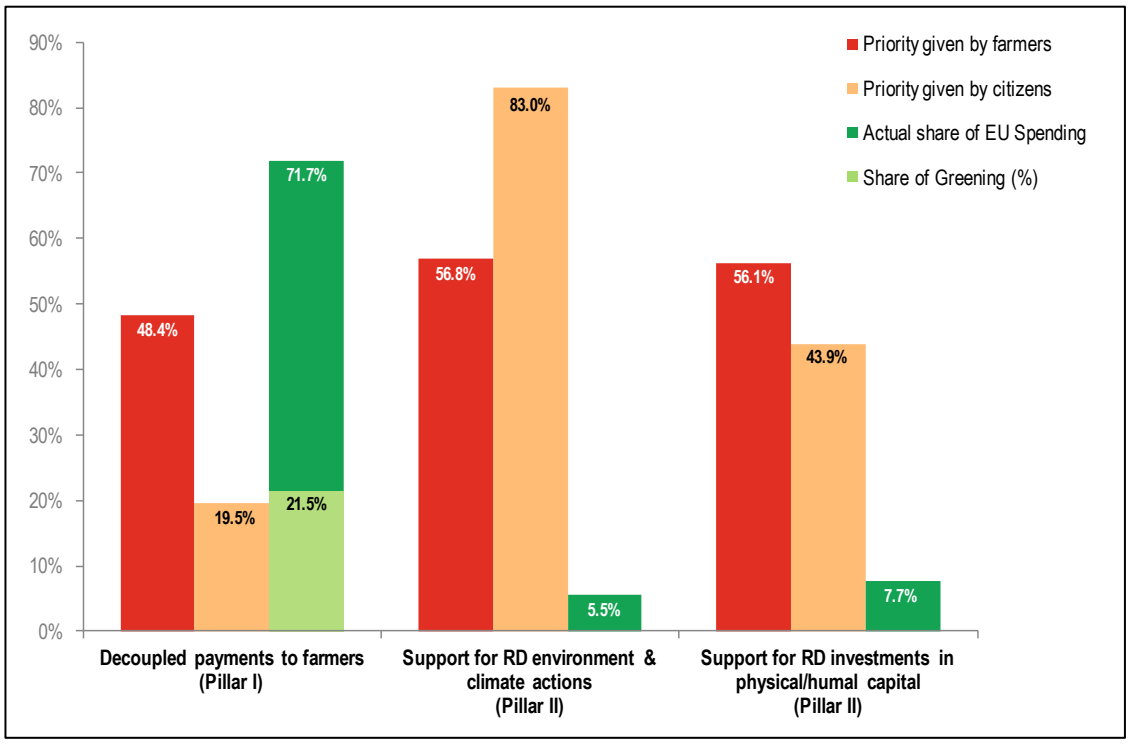


Figure 4.8.4: *Public Consultation outcomes with respect to the question which tools are best suited to meet challenges, as voted by farmers versus other citizens; and both of these compared to actual budget allocation (2014-2020). Source: own compilation; Data from EU Commission 2017; Database on EU spending in RDP; EC (2017): Modernizing and Simplifying the Common Agricultural Policy. Summary of the results of the public consultation. DG Agriculture & Rural Development. Brussels. Note 1: only 52,000 respondents out of 330,000 chose to reply to this question; Note 2: 13.6% of farmers and 38.1% of citizens indicated regulatory approaches as an effective means to achieve goals. These cannot be compared to any budget allocation and is hence not presented here. Note 3: The shares of EU-spending do not add up to 100%, since the part of the RDP and the market measures in pillar 1 (2.4 bn. EUR) are not included in the shares. Note 4: The numbers on responses do not sum up to 100%, since respondents could potentially select up to three options.*

4.8.3.4 Relevance of the CAP in meeting society's expectations

Expectations of EU citizens are not reflected in the objectives of the CAP. Food quality is more important than quantity and price to farmers and other citizens, yet it is not included as an objective. Animal welfare of farm animals is highly important to other citizens. Yet, animal welfare is not included as an objective of the CAP. Standards associated with animal welfare are however included to a certain extent in Cross Compliance (see below).

Expectations of EU citizens are also not reflected in the budget of the CAP. As shown by all three surveys, the environmental objective added in 2010 is highly relevant both to farmers and other citizens. Rural development is also considered important by EU citizens. Income support by DP seems to rank lower in importance. Yet, this ranking of priorities is not reflected in the budget allocation of the CAP.

Currently, over 70% of the budget is spent on direct payments[38], with the expressed purpose of providing "income support" to farmers (EC 2011). Farm income is also identified in the literature as the most important objective of the CAP (e.g. Tangermann 2011). Comparing responses to the consultation with actual CAP budget allocations of the CAP therefore suggests that the current design and implementation of the CAP does not meet expectations of EU citizens. The investment of the largest proportion of the CAP's budget in Pillar I does not match the perceived importance of rural development in the public debate, as well as the preference towards Pillar II for both farmers and other stakeholders.

4.8.4 Use of relevant knowledge, including monitoring and evaluation

In this section, we assess how the CAP generates and uses relevant knowledge for measuring its performance, policy design and optimal implementation.

4.8.4.1 The Common Monitoring and Evaluation Framework of the CAP

The 2013 reform (programming period 2014-2020) improved the CAP monitoring by integrating Pillar I and II in the Common Monitoring and Evaluation Framework (CMEF; Article 110 of Regulation (EU) No 1306/2013, EC2013b). Procedures are explained in the Technical Handbook on the Monitoring and Evaluation Framework 2014 – 2020 (EC 2015a). This completed the Common Monitoring and Evaluation System (CMES) already part of the CMEF for rural development (Pillar II). Three levels of indicators are defined to measure the CAP's performance: impact indicators, result indicators and output indicators (Fig. 4.8.5). Result indicators refer to the specific CAP objectives.

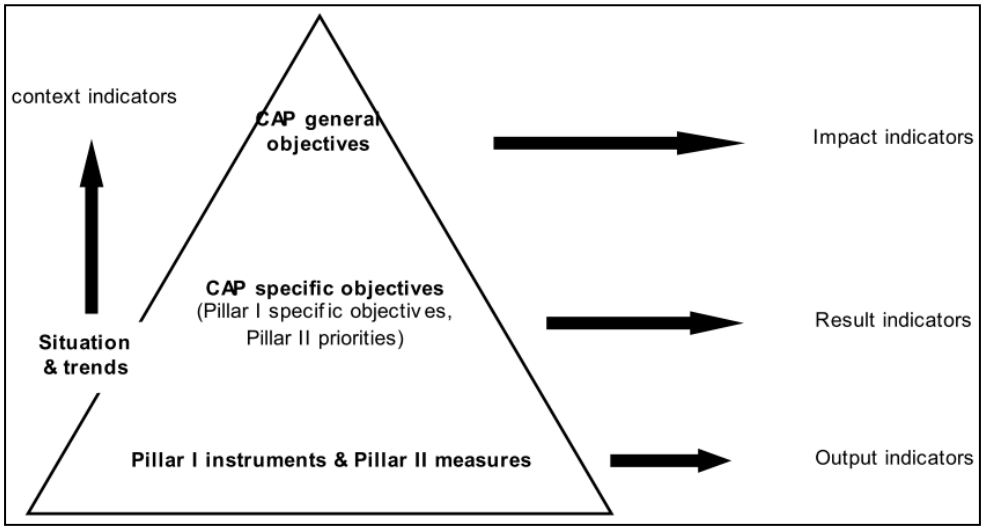


Figure 4.8.5*: Levels of indicators for CAP monitoring and evaluation and list of 16 impact indicators. Source: EC (2015a).*

[38] https://ec.europa.eu/agriculture/direct-support/direct-payments_en

This new CAP monitoring system is still recent and there are too few publications on its evaluation. We therefore provide only a preliminary evaluation of monitoring procedures for a subset of topics: income support, biodiversity (incl. HNVf), and climate.

4.8.4.2 Monitoring of income support for farmers

The current framework and indicators are inadequate to conduct an effective performance assessment of CAP measures in supporting farmers' incomes. Hill & Bradley (2015) brings major caveats with current indicators and monitoring of farm incomes in the EU, since "*profit from agriculture is only part of the income picture for many farm households and a focus on their returns from agriculture will therefore present only a partial picture of the farm household's income, which is a main determinant of the farmer's standard of living*". IAMO (2016) highlights that the evaluation approach "*only focuses on potential benefits, and completely neglects economic costs*". Tangermann (2011) argues that the quantification of agricultural income per work unit is not an appropriate measure to compare it with other sectors, for which the total household income would be relevant. Finally, the current framework does not seem to adequate to compare farm income with income of other sectors.

There is a lack of clearly defined indicators and measurable targets to conduct an effective performance assessment of CAP measures in supporting farmers' incomes. The Court of Auditors (2016) found that the Objective of "*Viable Food production*" has "*so far not been translated into measurable targets*". Indicators selected to evaluate income support have strong limitations since "*no baselines have been established*" (i.e. comparison situations with and without direct payments) and "*changes in these indicators are mainly due to changes in prices and not to the effect of CAP measures*" (Court of Auditors 2016). IAMO (2016) found that, in the case of direct payments, *"the EC has failed to suggest a clear definition of objectives to measure the expected positive changes resulting from the policy intervention*". The Court of Auditors (2016) concluded that the EC "*has not defined relevant indicators allowing for an effective performance assessment of CAP measures in supporting farmers' incomes*". More specifically, unclear objectives and missing baseline impede an effective assessment of different CAP measures based on performance indicators. Indicators that are related to viable food production and farmers' incomes are "*not sufficiently reliable or are not linked clearly enough to CAP measures to show that they contributed effectively and efficiently towards the desired effects*" (European Court of Auditors 2016).

The current lack of data hampers targeted monitoring of income support. The most important data source, FADN, constitutes a valuable source of farm data but is neither designed to be representative of all CAP beneficiaries, nor to be applied at the EU level, in particular because thresholds of minimum farm size included in FADN differ among MS (European Court of Auditors 2016). Moreover, some important components of farm profitability are not measured (e.g. land rent, capital costs). Finally, FADN is not designed to evaluate all forms of farm holdings, e.g. holdings with family structures but without unremunerated labour. Hill & Bradley (2015) highlighted that "t*here is currently no working statistical system at EU level for agricultural household incomes".*

4.8.4.3 Monitoring of biodiversity and HNVf

Biodiversity indicators included in the CAP monitoring framework are insufficient. Indicators on biodiversity's response require: (i) high relevance to particular global biodiversity targets and a clear link

to the status of biodiversity; (ii) scientific or institutional credibility; (iii) data series ending as close to the present age as possible; (iv) at least five data points in the time series; and (v) broad geographic coverage (Tittensor et al. 2014). **The only current official *impact indicator* to measure biodiversity's response is the farmland bird index** (Indicator I.08; EC 2015a). This indicator is already widely available and relatively cheap due to good coverage obtained through European-wide, systematic data collection by professional and amateur ornithologists. Birds are seen as a good indicator for biodiversity as they reflect wider ecosystem changes and are sensitive to environmental change (Gregory and Strien 2010). However, the indicator only considers a single taxon and is limited to biodiversity at the species level. This is problematic, because single taxa are not a reliable surrogate for overall biodiversity across spatial scales (Billeter et al. 2008; Westgate et al. 2017). Further indicators are at the *result level* and refer to land under biodiversity-supporting management (Priority 4, EAFRD: Restoring, preserving and enhancing ecosystems related to agriculture and forestry), without however considering the effectiveness of the specific measures (**Table 4.8.2**). As such, these indicators bear the risk of mixing up the means, i.e. the policy and management strategies, with the ends, i.e. the final objectives of such strategies and would rather class with output indicators. This is a common mistake when designing biodiversity indicators for policy (Failing and Gregory, 2003).

Table 4.8.2: *Result indicators linked to ecosystems and biodiversity for Pillar II. Source: EC (2015a).*

R.06_PII	*percentage forest or other wooded area under management contracts supporting biodiversity (focus area 4A)*
R.07_PII	*percentage agricultural land under management contracts supporting biodiversity and/or landscapes (focus area 4A)*

Knowledge from existing national and regional monitoring schemes is not integrated in the CAP monitoring framework. Many datasets for biodiversity monitoring exist already at national and regional levels, however they are still not integrated in the obligatory CAP indicators (Underwood and Grace, 2017). For example, there are many good examples of long-term grassland butterflies monitoring in various MSs, which could complement bird data with regard to environmental changes on a finer spatial scale (EEA 2013, Van Swaay et al. 2016), and there a currently several more monitoring schemes proposed to improve biodiversity monitoring and also ecosystem service information in order to inform agricultural policy (e.g. Targetti et al. 2014, Carvell et al. 016, Maes et al. 2016, Mononen et al. 2015). Geijzendorffer et al. (2016) proposed that the "*costs for the nine farmland biodiversity monitoring scenarios corresponded to 0.01%-0.74% of the total CAP budget, and to 0.04%-2.48% of the CAP budget specifically allocated to environmental targets*". The knowledge uptake has been limited and a robust set of indicators of sufficient coverage of biodiversity has not yet been defined and adopted at the EU level, despite the prevalence of many approaches, national-level schemes, and cross-EU schemes and frameworks.

HNVf indicators are not clear enough and monitoring frameworks are too variable among MSs to allow the effective monitoring of HNVf. The multifunctional character of HNVf covers not only a wide range of provisional and regulating ESS (see Section 4.4.3), but also cultural ESS with regard to aesthetic value,

recreation and ecotourism (Bernués et al. 2016). During the 2007-2013 programming period, 3 CMEF (baseline, result and impact) indicators targeting HNVF were included within the legislation (EENRD, 2010; **Table 4.8.3**). Several caveats have been highlighted in what concerns HNVf monitoring among MSs for the period of 2007-2013, which are likely to persist during the programming period of 2014-2020. Among them, the definition of UAA set aside important categories of HNVf that are found off the farm holding e.g. common grazing land and off-farm grazing land. As a result, some MSs excluded off-farm grazing land from HNVF calculations, while others included it. Many challenges exist that MSs have to face for a successful implementation and operationalization of HNVf-related indicators such as identifying and testing a set of indicators that can accurately inform devising approaches to assess to what extent and how such changes and trends have been influenced by RDP and measures are priorities (Keenleyside et al. 2010; Lomba et al., 2014; 2017). Moreover, caveats regarding low thematic, spatial and temporal resolutions of data expressing HNVf land cover types, and limited access to datasets expressing intensity and management of HNV farming practices (IACS and LPIS; see Lomba et al. 2014; Lomba et al. 2017), hamper MSs ability to determine accurately the baseline indicator and consequently ascertain about trends related to RDP programs. Overall, each MS selects the methodological approach to follow, feeds HNVf monitoring with selected datasets and builds on distinct indicators. Thus, no common methodology for HNVf assessment and monitoring is available at EU level and implemented across MSs, to produce an overall, coherent indicator for assessment.

Table 4.8.3. *Overview of High Nature Value indicators integrated in the Common Monitoring and Evaluation Framework for the programming period of 2007-2013. Source: EENRD (2010).*

Indicator	Indicator title	Measurement
Baseline indicator 18	Biodiversity: HNVf and forestry	UAA of HNVf (ha)
Result indicator 6	Area under successful land management contributing to biodiversity, HNVf/forestry	Total area of HNVf/forestry under successful land management (ha)
Impact indicator 5	Maintenance of HNVf/forestry	Changes in HNVf/forestry, defined in terms of quantitative and qualitative changes

4.8.4.4 Monitoring of Climate Action

The impact indicator for climate is "Emissions from agriculture". There are further indicators at the result level (**Table 4.8.4**) referring to land and livestock units under GHG saving management, without however elaborating on the success of this specific management. Therefore, these indicators rather belong to the level of output indicators (e.g. UNDP 2009). A third indicator at the result level refers to Methane and N_2O emissions, which is however mainly the same as the impact indicator since, according to UNFCCC monitoring criteria, emissions under the category "agriculture" only include these two gases (EEA 2017). As shown in the effectiveness section, these gases only represent approximately half of agriculture-related emissions, which implies that the other half is not specifically evaluated for the CAP (though they are mostly reported to the UNFCCC under other categories which means that information is available). GHG monitoring occurs independently of the CAP, due to the requirement of GHG-emission reporting to the UNFCCC. However, there is a lack of detailed evaluation of the different sources and reduction potentials as a basis for the design of targeted measures under the CAP. Domingo et al. (2014) performed a systematic analysis of possible measures based on important GHG sources in agriculture, and discussed

monitoring feasibility for the different measures that are analysed. Van Doorslaer et al. (2015) evaluated abatement costs for different GHG reducing options (see section 4.4.1). Weiss & Leip (2012) provided a detailed assessment of GHG emissions from the livestock sector, and quantified the important share of GHG emissions due to land-use change outside the EU for feedstock production - a source that is not considered in the CAP at all. Monitoring of climate action thus seems to be insufficient. It does not rely on the entire range of data available on agricultural GHG sources, neither are GHG reduction potential evaluated systematically.

Table 4.8.4*: Result level indicators for climate action. Source: EC (2015a).*

R.16_PII	*percentage of LU (Live-stock Unit) concerned by investments in live-stock management in view of reducing GHG (Green House Gas) and/or ammonia emissions (focus area 5D)*
R.17_PII	*percentage of agricultural land under management contracts targeting reduction of GHG and/or ammonia emissions (focus area 5D)*
R.18_PII	Reduced emissions of methane and nitrous oxide (focus area 5D) (*)

Monitoring with respect to sustainability and SDGs: In 2017, the EU has adopted 100 SDG indicators[39], based on current monitoring activities i.e. under the EU SDS[40]. Given their recent adoption, they cannot be evaluated here. Their implications and operationalization with respect to the CAP remains to be assessed, yet an initial examination already implies that some indicators may be missing in the CAP and may require extending the existing system of indicators and their monitoring to achieve the required extent and integrated level with respect to sustainability and farmers' wellbeing.

4.8.4.5 Uptake of existing knowledge in CAP design and implementation

Our review of the literature demonstrates the existence of a wealth of knowledge on the effectiveness, efficiency coherence and relevance of the CAP as a whole, its different instruments and measures. A substantial part of this literature provides recommendations on how to improve the design and implementation of the CAP. Yet, this knowledge and recommendations seem to be taken into account neither in the overall design and implementation of the CAP, nor in the design and implementation of specific measures. Sticking examples of the lack of knowledge uptake include DP, greening, adaptation to new MSs, monitoring and communication with farmers.

The wealth of knowledge on DP does not seem to influence the evolution of this instrument. Numerous publications suggested that DP are either not effective, efficient or relevant (e.g. Cramon-Taubadel 2017, Heinemann 2017, Matthews 2017, Tangermann 2011). Many others question the justification of direct income support by viable food production (e.g. EU Court of Auditors 2016, Nowicki et al. 2009,

[39] http://ec.europa.eu/eurostat/documents/276524/7736915/EU-SDG-indicator-set-with-cover-note-170531.pdf
[40] http://ec.europa.eu/environment/eussd/

Deppermann et al. 2016). Yet the system of DP has been maintained and no serious attempt seems to be made to replace it by a more suitable instrument.

The wealth of knowledge on AECM was not used to design the greening measures. There is a considerable literature on the effectiveness and efficiency of measures for biodiversity. The lack of knowledge uptake was particularly striking for the design of EFAs, with the inclusion of options that do not support biodiversity, and for the design of the crop diversification measure, with the exclusion of crop rotation. Moreover, the implementation greening measures, like most AECM, at the farm level rather than landscape level (e.g. Lastra-Bravo et al. 2015, Whittingham 2007; see section 4.4.3) clearly confirm the deficiency of knowledge uptake in the CAP design.

The wealth of knowledge on new MS does not reflect in the design and implementation of the CAP. Numerous papers have repeatedly stressed that the CAP is not well adapted to differing conditions in new MS, with negative consequences on both equity (e.g. Ciutacu et al. 2015, Gorton 2009, Miklos 2014, Sutcliffe 2015) and biodiversity (e.g. Bezak & Mitchely 2014, Mikulcak et al. 2013; section 4.3.4 on balanced territorial development and section 4.10.12 on reducing inequalities). These failures can be seen as another case of deficient use of knowledge on conditions of agriculture in the different new MS.

The CAP monitoring has insufficiently been improved. The CAP uses modern technology and powerful tools for some aspects of its monitoring (IACS, LPIS) and it supports state-of-the-art modelling technologies such as the CAPRI model (Common Agricultural Policy Regionalised Impact). Literature shows that numerous improvements are still possible in several areas (e.g. harmonizing IACS and LPIS across MS, Inan et al. 2010). Yet the uptake of this knowledge remains insufficient.

Communication on CAP instruments to farmers remains deficient. The Farm Advisory Services (FAS) are a critical tool providing advice to farmers about the CAP. FAS are the responsibility of MS. Evidence suggested important deficiencies particularly in communicating on biodiversity and climate change (Poláková et al. 2011, Zinngrebe et al. 2017). However, this knowledge has been integrated too recently.

4.9 EU Added Value

Question: Do CAP measures demonstrate the adoption of EU-level regulations, guidelines and interventions that address challenges better than country-, regional- or local-level solutions?

Relevant CAP objectives: All

Relevant SDGs: All

Number of publications scanned: 25

Key findings

EU added value is difficult to define and assess, because of a lack of reference points, numerous confounding factors and the term "value" in itself is perceptual rather than factual. Nonetheless, we found evidence suggesting a mixed EU added-value of the CAP performs, i.e. a mixed ability to perform better than national, regional or local level policies in addresses relevant challenges.

Our review of the literature indicates a positive EU added value in terms of forming a common joint market for agricultural and food products within the EU. There is an EU added value in supporting farmers' fair standard of living. The added value in terms of balanced territorial development, which obviously requires supranational cooperation, is limited due to the lack of regionalization and adaptation. It is particularly poorly suited to local contexts in the New MSs, where most farmers are smallholders. There is much potential to achieve a balanced territorial development but the 2013 CAP reform did not sufficiently adapt to the specificities of former socialist agriculture in new MSs. There seems to be an EU added value for market regulations and for a uniform legal framework within the EU. We did not find evidence that the CAP delivers an economic EU added value.

We found mixed results in terms of EU added value from an environmental perspective. Regulations such as CC criteria or the support for organic farming often offer a positive EU added value. On the other hand, we found evidence that the development of over-simplistic EU-wide requirements had negative effects. For instance, the requirement for a minimum of 2 or 3 crops to satisfy the crop diversification measure are set below current crop diversity levels in most MSs, and the permitted loss of grasslands is higher than current rate of losses in some regions.

Finally, the OECD noted that MSs generally chose to endorse the flexibility in implementation provided by the new CAP (2014-2020). As a result, budgets allocated to compulsory measures have generally decreased and a larger budget is devoted to choice measures, reducing the commonality of the CAP, and therefore its EU added value.

EU added value is difficult to define and assess, because of: a) a lack of reference points, b) being part of the EU entails a set of policies, which implies numerous confounding factors, and c) the term "value" in itself is perceptual rather than factual. Nonetheless, studies addressed EU added value by inspecting temporal changes (e.g. responses to CAP reforms), processes after accession to the EU, comparing the

situation in countries in and outside the EU, and conducting surveys and simulations to assess the potential outcomes of hypothetical changes (e.g. CAP abolishment).

4.9.1 Agricultural productivity

Assessing the EU added value of the CAP on agricultural productivity is difficult due to the high heterogeneity of national contexts. There is strong evidence that the effects of the CAP on agricultural productivity vary considerably between countries (see section 4.3.1). Most evidence available on the EU added value of the CAP is based on before-after comparisons of productivity in former soviet countries that are now EU members. For example, Miklos (2014) states that, after the EU accession of Hungary, CAP subsidies contributed to improve productivity and profitability, and led to higher specialization of farms. In a comparative analysis between West and East Germany, Niedertscheider et al. (2014) observed an increase in productivity in Eastern Germany after the reunification. The fact that the CAP also seeks to promote more environmentally friendly agriculture, such as organic farming, makes it even more difficult to evaluate its added value on productivity.

4.9.2 Market stability

The CAP initially aimed at giving price support by fixing prices and managing quantities and later for reduced market distortion (see section 4.3.3). Fixed prices before 1992 came at the expense of overproduction and distortions to the world market, whereas decoupling after 2003 and liberalization led to better integration into the world market at the cost of higher price variability in the EU (section 4.3.1).

4.9.3 Fair standard of living

We found some evidence that the CAP has contributed to maintain a fair standard of living though the stability of prices and incomes as well as job security for EU farmers (section 4.3.2). Matthews et al. (2017) showed that DP have accounted for 47% of farm net income on average over the period 2004-2013, and have helped to improve the resilience of farmers to unexpected economic shocks. However, data from new MSs suggest that EU accession, and possibly the CAP, also brought a huge reduction of agricultural jobs (Gorton et al. 2009, Niedertscheider et al. 2013). But there seems to be a positive EU added value for this topic.

4.9.4 Balanced territorial development

The availability of a large share of budgets to support farmers in weaker EU MSs, with some countries serving as net-contributing and (more) MSs being net-recipients, clearly demonstrates an added value of an EU-wide policy. The CAP certainly helped reducing gaps in agricultural production in new MSs (e.g. Miklos 2014, Niedertscheider et al. 2014, Strelecek et al. 2009). The CAP also had some effects, although sometimes weak or mixed, on balanced territorial development (section 4.3.4). Although the CAP has been criticized for its lack of flexibility, achieving a balanced development between MSs necessarily

requires supra-national policies (see section 3.5.3 on cohesion policies) and necessarily implies trade-offs between MSs.

However, many studies stressed the inability of the current CAP design and implementation to address challenges associated with the heterogeneity of contexts, especially in new MSs. Several publications questioned the EU Added Value for balanced territorial development in Central and Eastern Europe (e.g. Miklos 2014, Niedertscheider et al. 2014, Strelecek et al. 2009). Indeed, the CAP reform seems to have failed to adapt to specificities of former socialist countries, which present both large cooperatives or state farms and small family farms (e.g. Gorton et al. 2009) whereas Western Europe mostly present medium-sized family farms (Swain 2013). The CAP largely benefited "landlords" (Miklos 2014) whereas many small farms, particularly in Romania and Bulgaria, could not receive any support from the CAP due to administrative shortcomings or simply because they fall below a 1 ha threshold (Gorton et al. 2009, see also section 3.9.1 on equity). Land abandonment has been more important in the former Soviet-Union MSs than in Eastern Europe while recultivation occurred more intensively and faster in the latter, possibly as a result of the CAP (Griffiths et al. 2013). Additionally, payments for Less Favored Areas (LFAs), which directly aim to balance territorial development, have been reported to fail in placing resources in areas where public goods are most apparent and hazards of land abandonment are highest (Ferrer & Kaditi 2007). Further indication of mixed effects of LFA on socio-economic and environmental dimensions within HNVf also suggest a missed opportunity in terms of an EU added value of this instrument (Oppermann et al. 2012).

4.9.5 Sustainable management of natural resources and climate action

The CAP has been shown to have mixed effects on biodiversity, climate and water (see section 4.4). The added value of supranational policies such as the CAP on the environment depends on the baseline situation in specific MS on each dimension.

In some cases, the CAP had a positive effects across the EU. For instance, GAEC criteria under CC seem to be successfully mitigate soil erosion (Panagos et al. 2015). The Nitrate Directive (included in CC), contributed to the reduction in nitrogen fertilizer use across most countries. The increase in nitrogen efficiency reported in Eastern Germany after the reunification supports the EU added value of the CAP on nitrogen use (Niedertscheider et al. 2014). The CAP was found to have a positive impact on GHG reductions in Slovenia by reducing N fertilization (Erjavec et al. 2016). Finally, EU-wide the support for organic farming (Sanders et al. 2013) can be seen as a clear EU added value.

In other cases, the weak adjustment of the CAP to the heterogeneity of regional contexts has jeopardized potential environmental benefits of the CAP, in particular in NMS (Sutcliffe et al. 2014; Lieskovský et al. 2015). CAP rural development policies have failed to maintain traditional farmlands in areas such as Central Romania, which are associated with small family farms and exceptionally high biodiversity levels, due to missing adaptation to local context, strong focus on economic development and missing communication (Mikulcak et al. 2013). Finally, the CAP may have decreased environmental policy integration (EPI) in some countries with high national standards, e.g. in Sweden (Persson et al. 2016).

The development of over-simplistic EU-wide thresholds has also had negative effects (Pe'er et al. 2014), for instance, the requirement for a minimum of 2 or 3 crops to satisfy the crop diversification

measure are set below current crop diversity levels in most MSs, and the permitted loss of grasslands is higher than current rate of losses in some regions.

4.9.6 Economic added value

We could not find evidence that the CAP has an economic EU added value in terms of expenditures. Von Cramon-Taubadel et al. (2013) investigated, whether the income objective could be better addressed by national agricultural policies instead of a European agricultural policy. In theory, a European agricultural policy can avoid a wasteful "subsidy race" between the national agricultural policies and create a level playing field. On the other hand, it is challenging for the EU Commission to grasp the preferences of taxpayers in the different MS for income policies. Von Cramon-Taubadel et al. estimated the theoretical preferences for income payments to farmers in the Member states. However their result do not clearly indicate, whether the EU is over- or underestimating the preferences in the member states, since the results are mixed. The study does not find clear evidence that the CAP has greatly increased or reduced public expenditure on agriculture compared to the national agricultural policies that would have replaced it (von Cramon-Taubadel et al. 2013).

Plankl et al. (2010) used the costs structure in the Ukraine with German farm data in order to determine the hypothetical additional costs of Cross Compliance within the EU. They mainly referred to legal requirements regarding fertilization and plant protection measures and to potential costs to keep landscape open. They find e.g. a cost difference of on average 9 €/ha for plant protection and 8 €/ha for restriction within the fertilization law. This might give an indication of the EU added value of Cross Compliance in terms of costs. However, the authors state, that such calculations only give a rough indication, since such comparisons are explorative and challenging in terms of methods.

4.9.7 EU governance between subsidiarity and EU value added

An important question in the EU added value context is whether, and to what extent, governance should be executed on a regional, national or European level. The principle of "subsidiarity" states that governance should take be as decentral as possible. Oates (1997) showed that fiscal decentralization can increase welfare. On the other hand, centralized governance can regulate policy fields with overarching impacts, which go beyond the national borders. Referring to the CAP, these include core policy instruments such as AECM, CC, young farmers, small farmers' schemes, or support for organic farming or Natura 2000; as well as market standards to create a common market.

In the last CAP reform 2013, the EU Commission has introduced a number of "flexible elements", where governments have been provided with choices on application and implementation of measures within Pillar I (EU Commission 2015). The most important elements are:

- MSs can choose whether or not they apply **coupled payments**. 27 of 28 have used this option, leading to an increased budget share of coupled payments from 6.8% in 2014 to 10.0% (4.8 bn. EUR in 2015; Matthews 2015).
- MSs could choose the method of **redistributive payments**: 6 MSs chose to apply the option of the first hectares, 9 MSs applied capping and 15 MSs applied the option of a minimum reduction of at least 5% (EU Commission 2015: p.7/8).

- MSs could choose whether to use the **flexibility between Pillars** and transfer funds from the first to second Pillar or vice versa. 11 MSs used the option to transfer funds to Pillar II, 5 MSs have opted to transfer money to Pillar I, and the overall net transfer to Pillar II was about 3 bn. EUR between 2014-2020. This is, however, subject to future decisions of Ms who can still decide to transfer additional funds in both directions (ibidem, p.4).
- Other options were the **small farmers scheme** (in 15 of 28 MSs), the **active farmer clause** and the **payments for natural constraints** (in 1 of 28 MSs).
- MSs have some choices within the **Greening framework**: which **EFA-options** they would make eligible for the farmers to comply to the EFA-rules. There were also some flexibilities on how to implement the protection of **sensitive grassland.** They were also given the option to allow **"equivalent practices"** for the compliance to EFA, which was chosen by five member states, however only with significant share of participation in Austria (EU Commission 2016e: p. 11). Poland and The Netherlands offered the **"collective implementation"** of EFA, however with very low numbers of participants (PL: 33, NL: 12, see EU Commission 2016: Annex III).

The question is whether this flexibility contributes to decentralization and therefore to more efficient and more targeted governance, or alternatively, reduce the CAP's strength and added value. Lakner et al. (2013, 2014) observed that, within the Trilogue-process, the Council of the EU developed a "menu paper" providing options for the MSs to choose from, yet with the risk that MSs would choose the simpler and 'easier' options for farmers (see section 4.6.3), thereby watering down the CAP's regulations. In the case of greening, this was confirmed true by Pe'er et al. (2014,2017) and Zinngrebe et al. (2017).

The main motivation of the EU Commission to offer wide flexibility seems to have been the need to gain majorities within the negotiation process of the Trilogue (Rutz et al. 2014). Therefore, the primary choice of flexible elements seemed to have been guided not by reflexions on subsidiarity or EU value added, but simply by the need to reconcile contrasting requirements and interests by MSs *en route* to voting on the council and the parliament (Lakner et al. 2013; Rutz et al. 2014; see also 'Internal Coherence'). Hence, the current design in terms of the available sources of flexibility and their implementation indicates a reduced EU value added rather than an advanced capacity to adapt to regional and local conditions.

4.9.2.8 Standards and regulations

The CAP has significant EU added value in defining and implementing EU-wide environmental standards. This is especially true for Cross Compliance, which significantly contributes to the development of standards for food quality, animal welfare, and regulations on chemicals (GAEC). The CAP also contributes to developing higher standards by supporting organic farming, including by labelling (see section 1.5.8). In combination with the Sustainable Use Directive (Directive 2009/128/EC), which obliges all MSs to assure professional pesticide users adhere to its principles (Möckel 2015), the CAP is also contributing to the development of Integrated Pest Management (IPM). Standards, regulations and other market instruments (such as labelling) that extend beyond the CAP, are not evaluated in this assessment.

4.10 Cross-cutting issues

Three topics of our assessment emerged primarily from the focus on sustainability and the CAP's performance with respect to SDGs. Such topics do not directly meet the Fitness Check evaluation criteria (albeit, they can be related to 'Effectiveness'). We therefore categorized them as 'cross-cutting issues' and explore them in the following sections on a) Health, sustainable consumption and production, b) Reducing inequalities, and c) Global effects of EU's agriculture and the CAP.

4.10.1 Health and wellbeing, responsible consumption and production

Question: Have CAP measures affected changes in, or incentivised, a) the provision of good quality and healthy food? b) responsible consumption and production?

Relevant SDGs: SDGs 3 (Good health and wellbeing) and 12 (Responsible consumption and production)

Number of publications assessed: 25

The CAP has had positive effects on consumers' health, mainly indirectly by a) making the EU a leader in food standards (Matthews 2017), b) granting support to organic farming (see section 4.4.4), c) reducing health risks for producers and consumers through regulations e.g. on pesticide and fertilizer-use, acting to reduce pollution (see section 4.2.3). The CAP also has a direct influence on consumption patterns by **supporting school schemes**[41], in particular the fruit scheme, which was found to have clearly positive health effects (de Sa 2008).

The CAP also has negative effects on nutrition and thereby, indirectly, on health. While food security is nowadays considered much less of a challenge in the EU (Zahrnt 2011, Matthews 2017), obesity and overweight are seen by the public as severe problems, partially triggered by high consumption of animal products (Lloyd et al. 2008). Lloyed et al. (2008) calculated that CAP subsidies for dairy products in the past (before decoupling) increased per-capita saturated fat consumption by 1%, resulting in approximately 9,800 more coronary heart disease deaths and 3,000 more stroke deaths each year. These calculations only offer a correlation and not causation, and need to be taken cautiously. But still today, the area-dependency of direct payments translates into indirect subsidies for meat and dairy products as their production, through grazing and feedstock production, requires a much larger area per calorie than vegetable farming (Pushkarev 2015). Matthews (2017) shows that DP comprise 70% of the income on 'other grazing livestock' farms (predominantly beef and sheep 2017), compared to just 7% of the income of horticultural farmers, for instance. This can be considered as an over-proportional support for animal products, which may indirectly indeed subsidize and therefore stimulate - e.g. by lowering prices - higher consumption of animal products and thereby affecting consumers' health (Pushkarev 2015).

The production of animal protein is also relevant for SDG 12, since it involves important externalities which are currently not sufficiently taken into account in the CAP. The dependency of animal production on imported feedstock (mainly soy) leads to a large ecological footprint (Alexander et al. 2015), leading to deforestation, environmental and social problems, mainly in South America (e.g. Khatun 2012). In

[41] https://ec.europa.eu/agriculture/school-scheme_en

addition, Masip et al. (2013) identify strong contradictions in regulations on GMOs and pesticides, with much stricter rules applying for the production within the EU than for imported products. In relation to SDG 12, the balance between production and consumption needs to be considered in terms of the large amounts of wasted food, namely 20% of EU food production (173 kg per person per year; Stenmarck et al. 2016). The EU Court of Auditors (2017) finds that the CAP has an influence on food waste by the different sources of funding provided for production through its instruments, and that this problem could therefore be addressed under the CAP, e.g. in the context of promoting resource efficiency.

The CAP affects wellbeing also by influencing the availability of recreational landscapes supporting mental and physical health. The recreational service of rural landscapes has been shown to have direct effects on health and wellbeing. Analysing the effect of regular group-walks on city dwellers, Marselle et al. (2013) found that group-walks in farmland, compared to urban environments, could be "*significantly associated with less perceived stress and negative affect, and greater mental well-being.*" Lee et al. (2015) found that "*exposure to a rural environment reduced stress hormone secretion and sympathetic nervous activity and increased parasympathetic nervous activity. Short-term exposure to a rural environment also improved mood states*". The recreational functions of landscapes depend on factors such as farm structure and management (i.e., high attractiveness of mosaic landscapes), which are indirectly influenced by the CAP through its impacts on socioeconomic factors including farmer's choice of products, production systems or management. Support of rural areas through specific RDP measures is particularly relevant in this context. Although we could not identify studies on direct effects of the CAP on wellbeing, impacts of the CAP can be seen along positive and negative lines. The overall support of landscape intensification is associated with the degradation of mosaic landscapes (see section on land use), and insufficient support for HNVF as well as Natura 2000 may contribute to negative effects on the aesthetic value of agricultural landscapes. On a positive side, the contribution of designated instruments such as AECM may support landscape attractiveness and rural tourism, with indirect effects on jobm welfare and wellbeing of farmers in these regions. For example, CAP payments and particularly AECM have clearly shaped landscapes in Tuscany (Bartolini & Brunori 2014, Bartolini et al. 2014,2015).

As a whole, the absence of sufficient indicators for health and wellbeing and their relation to the CAP; and the lack of explicit consideration of these aspects in official CAP documents, result in a paucity of literature but also point at a gap - not only in knowledge, but also in policy design with respect to SDGs 3 and 12.

4.10.2 Reducing inequalities

Question: Have CAP measures affected changes in, or incentivised, a reduction in inequalities?

Relevant CAP objectives: 2010-priority 3 – 'Balanced Territorial Development'

Relevant SDGs: SDGs 5 and 10

Number of publications assessed: 6

Both SDGs 5 and 10 require examining whether the CAP helps reducing inequalities - among regions, genders, ages, or socioeconomic background. Some of these topics are covered in the section on 'Balanced territorial development'. An analysis of inequality and its changes makes the following findings.

Although some publications suggest that inequalities may be lower with the CAP than without (e.g. Bonfiglio et al. 2016), payments are still **allocated extremely unevenly across MSs**. This is particularly true for direct payments, which represent 70% of the CAP budget. Imbalances in DP vary according to MSs and farm sizes. Ciutacu et al. (2015) state that "*the amount of aid received by Romanian farmers is ridiculously diminutive compared to what is granted to farmers in other European countries*", calculating, for example, that a farmer in Ireland received on average 32 times more subsidies than a farmer in Romania. This is partly due to the fact that payments in new MSs are phased in gradually, but it is mainly due to the fact that there are many more farms in Romania, so the per-hectare payments is much lower.

Inequalities are even more striking when comparing farm sizes and economic sizes. Larger-farm holders and farmers of higher economic income are benefiting much more from CAP payments. On EU average, 20% of farms receive 80% of payments (Matthews 2017, Pushkarev 2015); while in Bulgaria and Romania, 1% of beneficiaries receive 50% of direct support (Pushkarev 2015). These countries are associated with a large proportion of very small farms, who often cannot receive any support from the CAP, either because of administrative shortcoming or because they are below the 1ha threshold (Gorton et al. 2009). The CAP largely benefited "landlords" (Miklos 2014), "*many of whom (re)gained entitlements under post-Socialist land reform programmes and have few current connections with agriculture*" (Gorton et al. 2009). A comparison of Gini coefficients calculated for farm income from direct payments (**Fig. 4.10.1**) confirms that there is a **trend towards growing inequality in terms of payment distribution in most new MSs since 2006**, while there is a slight improvement in the EU as a whole.

Inequalities seem to be mainly related to per-hectare DP, which have also been criticized for being inefficient, unnecessary for large commercial farms and with distorting effects on land markets (e.g. Ferrer & Kaditi 2007). The recent CAP reform aimed at reducing inequalities by allowing MSs to cap large payments instruments (Matthews 2017, Pushkarev 2015). However, Matthews (2017) estimated that these instruments will not make a big difference, and that the direct per-hectare payment is simply not suitable for equitable income support.

Rural development funds have also been criticized in terms of equity as well, in particular for being insufficiently attuned to regional specificities of new MSs (Bezak & Mitchely 2014, Pelucha et al. 2013, Mikulcak et al. 2013) and providing insufficient support of underdeveloped rural communities and small scale farms, among others due to limitations in administration and communication.

The role of "**least favoured areas (LFA)**" (now "Area with natural constraints (ANC)") in reducing inequalities resulting from geographic constraint. However, Pufahl (2009) could show by propensity score matching, that the payments for LFA do not address any natural or environmental constraint and consequently they can be rather interpreted as income support than as payments to equalize geographic or natural constraints.

The absence of gender-related payments entail that no instruments are installed to address gender inequalities, but again, this was not addressed in this assessment.

4.10.3 Global effects of EU's agriculture and the CAP

Being a key player in the global trade of agricultural products, both as an importer and exporter, the EU has a strong impact on global agricultural markets and thereby on other countries. Article 208 of the TFEU explicitly requires that the "*Union and the Member States shall comply with the commitments and take account of the objectives they have approved in the context of the United Nations and other competent international organisations*". The 'European Consensus' requires the EU to produce coherent policies in a way that particularly supports developing countries in meeting international sustainable development goals (EU Commission, 2006; see also section 4.7.8 on PCD). This section gives a short synthesis of important global effects of the CAP as emerging from the various sections thus far.

Reforms of the CAP and trade policies have made an important step in reducing negative effects on global markets, with an ongoing need for support of the poorest countries. Despite all problems, the benefits of the CAP certainly inspire similar supra-national cooperation in other parts of the world. Suzuki et al. (2007) discuss the feasibility of a Southeast Asian CAP in order to reduce the gaps between more and less productive countries and farmers. Examples for positive spillover-effects of European agricultural policy are food standards and animal welfare (Matthews 2017). Similar policies have been adopted in third countries that are trade partners of the EU. Much less has been done to reduce the exceptionally high ecological footprint of the EU's agriculture. Current consumption patterns require the import of biocapacity from other parts of the world, where it increases the competition for land and induces land-use changes. Particularly feedstock import from South America is an issue. This negatively affects the ability of those countries to meet international environmental targets, such as the Aichi biodiversity targets defined by the strategic plan of the CBD and the Paris Agreement to combat climate change. The evaluation of the sustainability of European consumption and production patterns therefore significantly vary depending on whether global effects are taken into account or not.

Socio-economic impacts, mainly caused by coupled payments and trade barriers (variable tariffs and export subsidies), have been significantly reduced during recent CAP reforms (Matthews et al. 2017, see also sections 4.7.2 and 4.7.8). Prices for agricultural products in the EU are in line with world market prices and liberalised markets have strengthened competition and facilitated market access. Additionally, agricultural markets were also affected by bilateral and multilateral trade agreements which are beyond the CAP. Altogether this results in an increased coherence of CAP and trade policies.

Nevertheless, some issues remain. Fading out market barriers reduces the benefits for least developed countries to benefit from preferential trade preferences (see section 4.7.8.3). Furthermore, importing countries from outside the EU are faced with high product standards and remaining tariff production for sensitive products, while decoupled payments are assumed to have some limited impacts on the structure of EU agriculture and secondary effects on world markets (Matthews et al. 2017, Boysen et al. 2016)

Ecological impacts of the CAP and related EU trade policies become tangible when looking at the high global ecological footprint of EU consumption. The overall footprint in terms of area 'used' by the EU is twice its biocapacity[42]. On the level of MSs, cropland and grazing products contribute together between 19% in Estonia and Latvia and 48% in Denmark (EU average for 25 MSs = 30.2%; **Fig. 4.10.2**).

[42] https://www.eea.europa.eu/data-and-maps/figures/ecological-footprint-variation-per-region-1

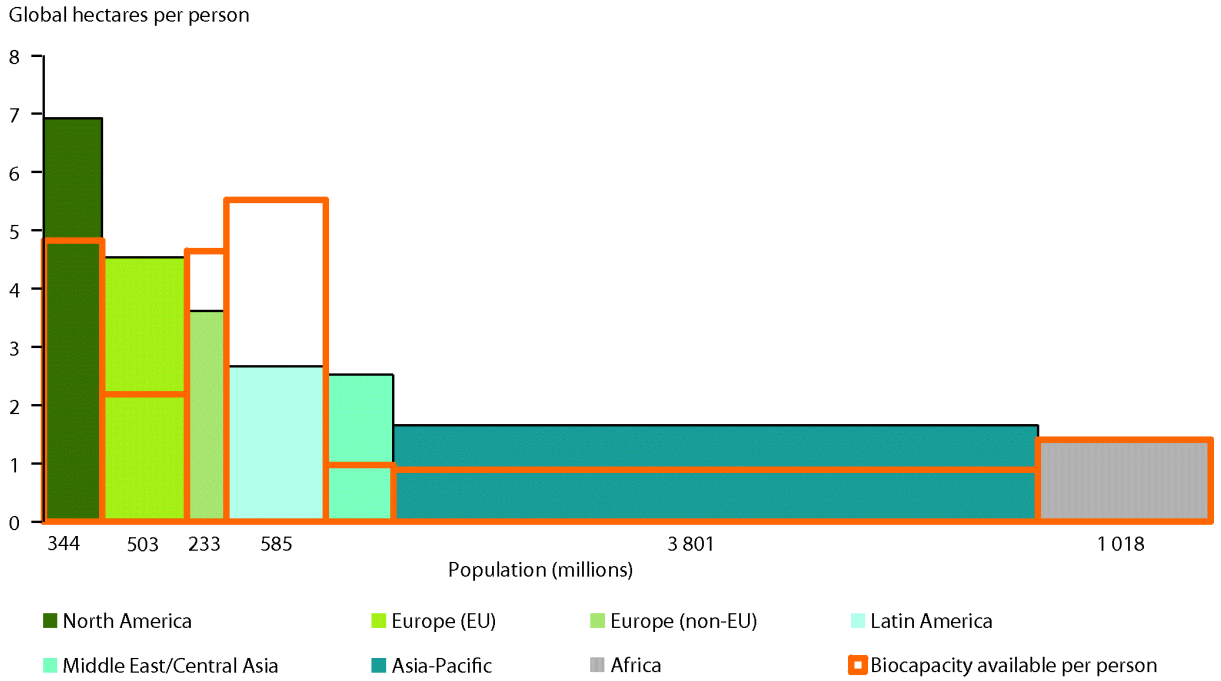


Figure 4.10.2*: Ecological footprint variation per region (plain bars), compared to available biocapacity (orange boxes). Source: Lazarus et al. (2014).*

Several studies mention the dependency of the EU agriculture on imported feedstock, mainly based on soybean, in order to produce meat and dairy products. This can be referred to as import of "virtual land" (e.g. Antonelli 2015), i.e., land needed for agricultural production in the EU but situated elsewhere, mainly in South America. Consequences are deforestation, mainly in Brazil, associated with loss of biodiversity and ecosystem services as well as GHG emissions (Boerema et al. 2016, Khatun 2012). Von Witzke & Noleppa (2010) report an increasing net import of virtual land, reaching some 35 million hectares in 2007/08. Serrano (2012) finds that the latest CAP reforms, together with trade liberalization, may further increase the ecological footprint through an increased import of animal products (mainly beef) from developing countries, with even worse environmental consequences due to lower efficiency of beef production in the tropics (Antonelli et al. 2015, Verburg et al. 2012). Additionally to these, EU biofuel policies cause land-use change outside the EU, mainly in Southeast Asia due to palm oil cultivation (Miyake et al. 2012). It is, however, mainly driven by energy policies such as the RED (Renewable Energy Directive).

It was also suggested that set-asides and lower agricultural productivity due to environmentally friendly farming in the EU may cause a negative footprint outside Europe (e.g. Pelikan et al. 2015; von Witzke & Noleppa 2016). However, we are not aware of indications productivity has been reduced by such measures to an extent that reduces overall productivity or resulted in such impacts.

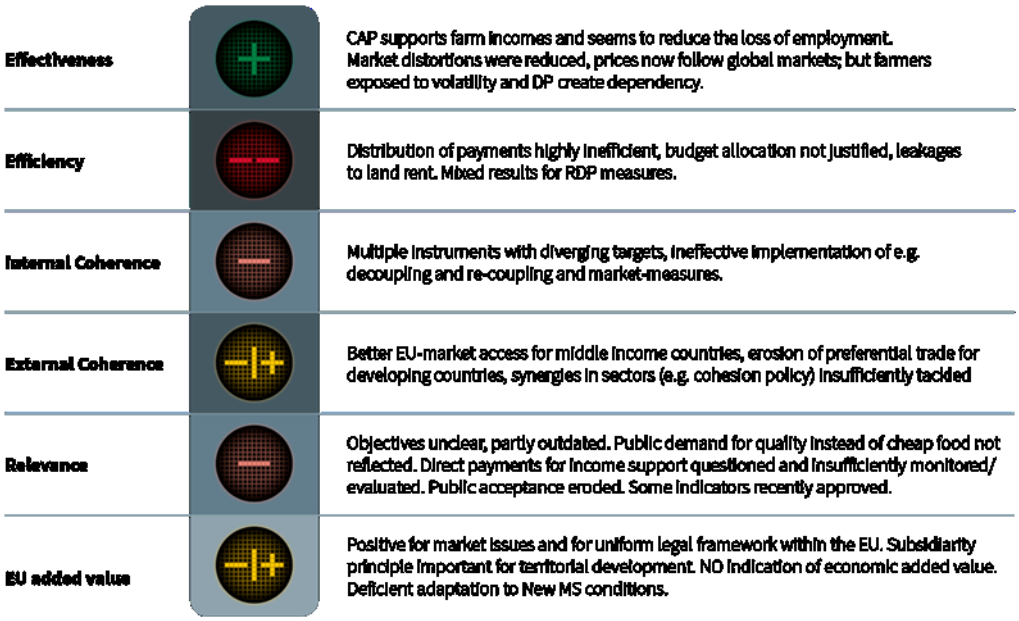
5. Discussion

5.1 Is the CAP fit for purpose?

European agricultural landscapes are going through fundamental changes in land use, farm structure and management that result from multiple, co-occurring factors. This study aims to isolate the impacts of the CAP in order to understanding the CAP's effect on socio-economy and the environment. Additionally, we also analysed trends and developments of the European agriculture in order to identify, which of the CAP-objectives and challenges the CAP has not resolved. The direct and indirect effects of the CAP on these processes have been extensively studied, but show variable and complex outcomes. According to the reviewed literature, the sustainability of European agricultural landscapes remains threatened while the CAP mostly maintains ongoing trends but does not sufficiently act to change them. Against this background, the summary of our findings relates to those impacts and outcomes that can be attributed to the CAP itself.

Table 5.1 offers an **overview of our outcomes with respect to the six evaluation criteria.** Scoring therein are based on the balance between positive and negative outcomes as identified and reported in this assessment.

(a) **SOCIOECONOMY**



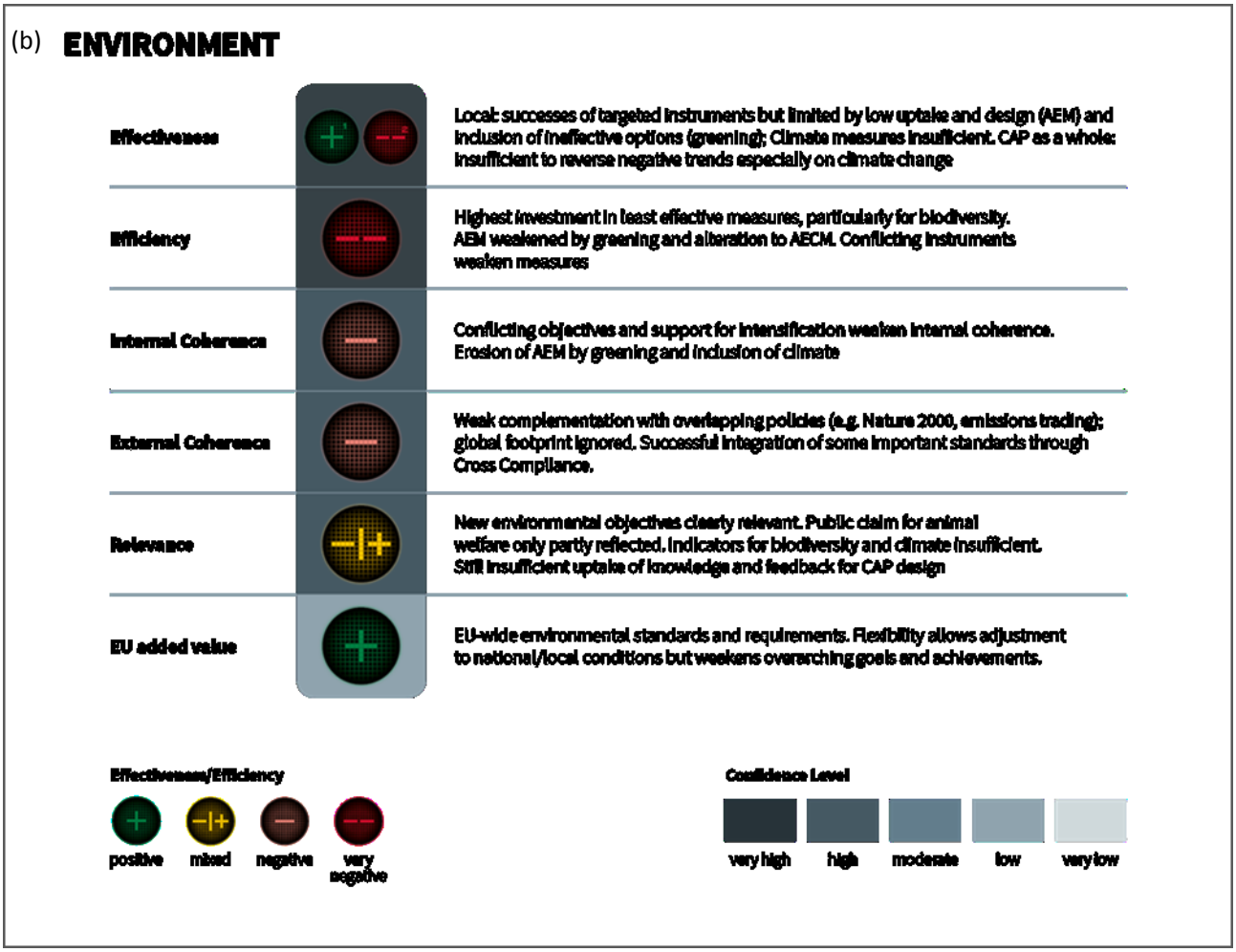


Table 5.1: *Outcomes of our assessment for the six evaluation criteria, separated between a) socioeconomic and b) environmental results. Scoring could range from mostly positive to mostly negative. The level of confidence in the reviewed evidence is reflected by cell shading.*

5.1.1 Effectiveness

Key message:

Socio-economy: The CAP is somewhat effective in terms of socio-economic impact by providing instruments to maintain farmers' income. CAP seems to slow down the decline of the agricultural employment compared to some non-EU regions, and is contributing to the EU's economy and jobs. The CAP has successfully reduced market distortion and integrated domestic markets into the world market by reducing public intervention, variable import tariffs, and abolishing export subsidies. Notwithstanding, agricultural employment is still declining throughout the EU, and farmers in the EU are now more exposed to price volatility and relating market risks. Liberalising markets while increasing domestic market standards has facilitated market access to competitive producer countries, while reducing economic potentials for some of the least developed countries.

Environment: The CAP shows mixed results with respect to environmental effectiveness. Designated instruments such as AECMs and EFAs show demonstrated potential for producing local and regional effects of available measures in supporting biodiversity and ecosystem services, albeit with limited effectiveness due to low uptake, limited extent, and often poor implementation on the ground. Effects on soils and water exist, e.g. through CC, but are limited depending on national legislations and socio-economic contexts. Greening measures have not instigated significant changes in land-use or management. The impacts of Greening, AECM and CC are limited due to weak policy design and implementation and do not scale up to the EU (and hence the CAP) as a whole. Consequently, overall trends of environmental degradation and farmland biodiversity declines continue with agricultural intensification and abandonment, and the design and implementation of. Contribution to climate change mitigation is marginal and targeted instruments fail to tackle the most important GHG sources (mainly related to livestock farming). The EU's global footprint, mainly due to land-use changes outside Europe (primarily for feedstock import), is not tackled by the CAP.

The socio-economic perspectives evaluated here indicate some successes and some mixed effectiveness of the CAP. The CAP has an overall positive effect on farmers' income, achieved mainly through Direct Payments (DP). Pillar II payments also contribute to balanced territorial development. The decoupling of DP from production has successfully reduced (global) market distortions, allowing prices signals from global markets to transmit to domestic producers and consumers. This acts towards stabilization of markets but it bears costs of exposing farmers to higher price fluctuations and market risks - acknowledging that price fluctuations are part of a functioning market also in other sectors. The impacts of the CAP on productivity were mixed, as it funds technology and innovation but also reduces farm efficiency and leads to dependence of farmers on subsidies. Inequities among beneficiaries are large, with

32.6% of the payments being made to 1.8% of beneficiaries in the EU-28 in 2015 (European Commission 2016b; See Section 4.5 'Efficiency').

The largest part of the CAP-budgets consist of the **direct payments** (DP), which are the main instrument to meet the income objective. While DP are directed at farmer, they partly leak to land markets and support landowners who are not necessarily farmers. Additionally, the EU Commission is not clear on the income objectives and there is a lack of indicators to evaluate the success of this policy instruments. The Court of Auditors (2016) has investigated the implementation of DP, and concluded the following:

> "***IV.*** *The Court concludes that the Commission's system for measuring the performance of the CAP in relation to farmers' incomes is not sufficiently well designed and the quantity and quality of statistical data used to analyse farmers' incomes has significant limitations.*
>
> ***V.*** *The Commission has not clearly established the statistical data needed to effectively assess the performance of CAP measures in support of farmers' incomes. No representative data are available on the disposable income of farm households, which would facilitate assessing the achievement of the treaty objective of ensuring a fair standard of living for farmers. Furthermore, there is no reliable system to allow comparisons to be made between agricultural incomes and those in other sectors of the economy, which could justify EU income support for farmers.*" (Court of Auditors, 2016).

Environmental effectiveness is addressed by the largest bulk of available scientific literature, focusing mostly on biodiversity and ecosystems and primarily on environmentally-oriented instruments of the CAP, especially AECM. Much less knowledge is available on the (direct) impacts of instruments that are not designated toward the protection of natural resources, consequently supporting intensification and further environmental pressures. Our outcomes indicate that **specific instruments do show local to regional successes on biodiversity, soil and water quality and other ecosystem services, but these do not reverse the overall impacts of ongoing agricultural intensification and abandonment, leading to continued environmental degradation and biodiversity decline.**

- **AECM** contribute positively toward the **protection of biodiversity and ecosystem services**, especially under specific conditions (e.g. spatially targeted, focusing on non-production areas and best practices), but are not always implemented optimally. The literature offers ample examples of good implementation and good practice, but low uptake and lack of spatial planning impede success. The often over-simplistic design and implementation of AECM has yielded mixed effectiveness. Budgets to support Natura 2000 grassland are limited. The support for High Nature Value farmland is particularly insufficient since a) AECM measures are not yet well tailored towards HNVF, b) most farmers are not eligible to receive funding, and c) there is no specific funding line for HNVF in the CAP's RDPs. Consequently, HNVF continue being degraded or lost.
- **Agricultural GHG emissions** are stagnating since 2005, after some declines due to reductions of herd sizes and fertilizer use that were not consequences of climate action. Targeted action based on existing GHG mitigation potentials is still missing, particularly for livestock farming which is responsible for over ⅔ of agricultural GHG emissions. Also in fertilizer use and management of high organic soils (peat soils) there is untapped potential of reducing emissions. Spending on climate

measures within AECM is marginal. Emissions outside the EU caused by land-use due to feed and feedstock imports are not taken into account by the CAP. This further contributes to a negative global climatic footprint of the EU.

- **Results for soil and water protection** show some positive effects of GAEC criteria in slowing down soil erosion. Water pollution is mitigated mainly through other policies included in cross compliance and AECM, while the control of water uptake for irrigation remains weak. However, these specific instruments are insufficient to reverse the overall trend of environmental degradation.
- **Impacts of greening measures** are suggesting very limited effectiveness for biodiversity and ecosystem services due to (i) low demands requiring little or no changes in practise (especially in crop diversification), (ii) broad flexibility and the inclusion of ineffective options for biodiversity (EFA; e.g. catch crops) and (iii) insufficient management criteria for all three greening measures. The design and implementation of environmentally beneficial greening measures is further hampered by administrative burdens that serve as barriers to effective implementation (Zinngrebe et al. 2017), economic grounds for farmers to take up productive and simpler but less beneficial options for biodiversity (Dänhardt et al. 2017), lack of advisory services with sufficient ecological knowledge (Zinngrebe et al. 2017) and lacking coordinated biodiversity management by the CAP (Leventon et al. 2017; Dänhardt et al. 2017).
- **HNV farmland** areas provides some of EU's highest biodiversity value, yet receives insufficient support from the CAP: Subsidies are not well target and most farmers are not eligible for support, thus HNVF continues to be degraded or lost.
- **Organic farming** is supported by the CAP and offers an example for a policy success. Its recent expansion demonstrates relative coherence between clear standards, designated requirements and labelling, and overall meets the requirements for "green growth". Notwithstanding, in some regional cases it is not sufficiently coherent with AECM, HNVF or other instruments for promoting biodiversity or climate-change mitigation. Additionally, the EU offers insufficient support for HNVF, while on the other hand offers a larger share of its support to unsustainable farming systems.
- **Animal welfare** is supported through CC and takes an important component of the requirements for relevant AECM. The EU sets standards that make it a world leader in the field. Yet the extent of available instruments and funding does not meet the perceived importance of animal welfare by the public.

5.1.2 Efficiency

Key message:

Socio-economic efficiency is very low, especially for DP. Payment distribution does not reflect needs, payments leak out of farm economy and the farming sector, and the choice of investment in Direct Payments is poorly justified. There is no indication as to who is entitled for payments and who the beneficiaries actually are. Smallholders are disadvantaged. Mixed socioeconomic results were found for RDP measures.

Environmental efficiency is very low: Highest investments per hectare are made to the least effective instruments (greening) and the lowest to most effective ones (Natura 2000 payments). Inclusion of climate into AEM, with an eroded budget, has further weakened AECM. Lack of spatial design and a disproportionately large support to unsustainable farming sectors further diminishes the efficiency of environmental investments. Administrative burdens bias farmers' choices to less effective measures, e.g. EFA uptake becomes an investment with no gained attached (i.e., 'windfall gains'). Regulations could achieve some of the aims with far lower costs.

Our outcomes on efficiency are overall quite negative, indicating a large range of inefficiencies from both socio-economic and environmental perspectives.

5.1.2.1 From a socio-economic perspective

- Direct Payments are inefficiently distributed among farm size classes. Inequality levels of farmers, as indicated by the GINI coefficient, are stable or slightly decreasing in old Member States, and are overall higher and sometimes even increasing in the new Member States. These results might be related in some countries to the phasing in of EU direct payments and to historical impacts of the post-socialist era, but also relate to structural changes resulting from rapid intensification and shifts in farm sizes following the accession to the EU. Such levels of unevenness hamper the CAP's capacity to achieve its income-support objectives and particularly addressing rural development disparities.
- Leakages of DP away from farmers, e.g. to land rental and via entitlements, entail that large proportions of DP do not necessarily support active farmers.
- The literature indicates that the EU Commission does not provide sufficient justifications and reliable indicators as to why and which farmers need income support and whether payments according to farm size are the most efficient means to address the income objective. Various studies highlight that efficient allocation and monitoring of payments require consideration of the economy of farm families and households and their actual capital, as well as differentiating the income and wealth of landowners, farmers and other workers in agriculture, and to quantify the leakage extent to increased land rentals**.**

5.1.2.2 From an environmental perspective, cost-benefit evaluations indicate very low efficiency of the CAP

- The largest proportion of budgets designated to environmental protection is assigned to the least effective instruments (i.e. greening measures), causing an opposite relation between effectiveness and spending. An exemplary analysis indicates investment per ha to be smallest for grassland protection in Natura 2000, ten times higher for AECM (with lower effectiveness) and thirty times higher for EFAs that have been repeatedly evaluated as having lowest effectiveness.
- Effective instruments are either not implemented broadly enough or their effects are cancelled by other instruments with other objectives, such as DP and RDP payments with other aims (and hence fostering intensification in sensitive regions).
- Administrative burdens have increased through the introduction of greening, introducing large transaction costs and resistance to cooperation.
- Competition between instruments (e.g. DP versus AEM), where farmers can obtain somewhat similar support with differing environmental requirements, hamper efficiency even further.
- The focus on farm rather than landscape level reduces the efficiency of environmental interventions too, as it entails inefficient spatial distribution of payments.

Table 5.1.2 in the next pages offers an overview of our outcomes for effectiveness and efficiency according to the key topics addressed.

Table 5.1.2: Overview of our outcomes for effectiveness and efficiency according to themes. Results are divided e separate between overall baseline/trend and the CAP impacts. Results are divided also based on local versus EU-wide.

Objective (Measure)	Background situation (Agriculture beyond CAP)	Effectiveness	Efficiency	Justification	Confidence Level
Growth of Agricultural Productivity	Productivity slightly increasing after 2000 but overall mixed trends	**+ / -**	**-**	CAP supports productivity but reduces farm efficiency. No indication that the objective itself is relevant given overproduction and waste.	**moderate**
Fair Standard of Living	Agricultural income seems lower than average and depends on international price and subsidies. Small farms less economically viable	**+**	**- -**	Direct payments stabilise farm income, Rural Development Programme too limited and less effective. Payment distribution inefficient and untargeted. No evidence that direct income support is efficient means to ends. Missing indicators and monitoring of farm household economy.	**high**
Market Stability	Agricultural markets mostly integrated into world markets	**+**	**+**	Better world market integration by recent liberalization, but reduced price stability at EU level and exposing farmers to price volatility. Reduced but still prevalent distorting impacts on developing countries.	**high**
Balanced Territorial Development	Remaining disparities e.g. old/new member states; loss of small farms	**+ / -**	**-**	Support especially by DP reduces spatial disparities, subsidiarity helping poorer MSs, support exists for Areas of Natural Constraints, but measures poorly adapted to new MSs,	**moderate**

				disadvantaging small farmers, and inefficient.	
Climate Action	Agricultural GHG emissions not reduced since 2005. Earlier reductions due to fertilizer and herd reduction, not targeted climate action.	**- -**	**- -**	Lack of dedicated instruments to tackle main GHG emissions (livestock farming and fertilizer use). Inclusion of climate in AECM (formerly AEM) makes marginal difference and reduces overall efficiency. Carbon footprint outside EU not addressed.	**high**
Soil and Water Protection	Loss of soils and water reservoirs, water quality stable	**+ / -**	n.a.	Cross Compliance (GAEC) and AECM contribute to mitigating erosion risk. Less pollution but mostly through nitrates directive. Weak control of water uptake. Yet overall impacts at large scale limited.	**low**
Objective (Measure) cont.	**Background situation (Agriculture beyond CAP)**	**Effectiveness**	**Efficiency**	**Justification**	**Confidence Level Effectiveness**
Biodiversity and Ecosystem Services (Agri-Environment Climate Measures - AECM, Greening)	Sharp and continued decline of farmland biodiversity, particularly in new member states	**+**	**- -**	Moderate positive effects of AECM at local level and specific contexts, but limited uptake and extent. Recent erosion in budget weakens AECM. Ecological Focus Area (EFA) show some potential, but too weak to change trends. Crop diversification unlikely to contribute. Highly inefficient instruments: highest investment in least effective measures, lack of spatial design	**very high**

				and targeting, administrative burdens reduce efficiency.	
Biodiversity and Ecosystem Services (CAP as a whole)		**-**	**- -**	Bidodiversity losses in some regions lower due to AECM, local positive improvements from EFA (higher fallow land), but overall incentives for intensification weaken targeted measures and cancel positive effects. Conflicting instruments dampen efficiency. Regulations can achieve some of the same aims with much lower costs.	***moderate***
Support for Sustainable Agriculture systems - Organic Farming	Both ongoing intensification and increase in organic farming	**+ -**	n.a.	Support to organic farming contributes to expansion and can be considered a success. However parallel support to unsustainable farming and intensification, and insufficient support to High Nature Value Farming (HNVF).	**moderate**
Animal Welfare	Slightly and slowly improving	**+ / -**	n.a.	EU standards higher than outside EU, but too little integration of the topic into the CAP.	**low**

5.1.3 Internal coherence

Key message:

Internal coherence is low. Expanding the range of objectives and instruments, the implementation of the manifold objectives and instruments reveals important remaining inconsistencies and conflicts. Weak integration of parallel (partly competing) policy processes leads to high administrative burdens and compromise both effectiveness and efficiency in producing aspired impacts, particularly visible in the design of environmental instruments, such as AECM and greening. Organic farming or fallow land are examples for thematic fields with synergetic effects while other policy areas, particularly the reduction of GHG and biodiversity conservation have not yet reversed trends of environmental decline. In the absence of clear targets and indicators, trade-offs decisions during the implementation on the different political levels remain intransparent and are subject to political power struggles. Existing experiences and potentials for bottom-up integration are poorly explored nor supported.

Overall the literature indicates low internal coherence and a need for integrating and streamlining objectives, instruments and indicators across all three dimensions of sustainability (economic, social and environmental).

The literature on internal coherence seems poor and insufficient, but overall the CAP is trying to address often-conflicting objectives, consequently resulting in poor internal coherence, budget competition between instruments, mixed implementation, and power struggles – all of which impede effectiveness and particularly efficiency. Having in mind potential winners and loser among stakeholders and interest groups, the challenge remains to identify possible synergies and possible complementation instead of taking ineffective compromises. Well-defined objectives and targets, aligned with corresponding indicators, is missing so as to guide implementation, expose potentials for synergies, and identify and address trade-offs that currently remain non-transparent.

Reviewed studies addressed coherence in terms of objectives and implementation (mostly the latter).

- The CAP offers some potential complementarities between different mechanisms, especially focussing on DP, AECM, CC and greening. Case studies demonstrate that instruments could potentially align ecological and economic interests. However, the levels of complementarity versus conflict vary across regional settings and thematic foci.
- The CAP lacks clear overarching targets, with several objectives and a multitude of instruments with differing and even conflicting targets. This, and particularly the attempt to combine production and environmental-protection objectives, has resulted in political conflicts and led to policy- and measure-designs that compromise effectiveness and/or efficiency.
- While flexibility in adjusting CAP instruments to varying institutional and socio-economic settings in MSs can facilitate bottom-up approaches and context specific implementation, it also runs the risk of compromising some CAP objectives and sustainability targets for agricultural areas.
- The reintroduction of coupled payments generates conflicts in Pillar I, e.g. by supporting milk production and buying excessive milk quantities (EC 2015, p.9).
- Both pillars are pursuing multiple targets. Beyond decoupled DP, Pillar I supports small farms, farming in disadvantaged area and young farmer. Following the 2013-reform MS can also (re)couple DP for specific sectors. While multi-functionality may be unavoidable or even desirable, the current circumstances

result in direct and well-documented conflicts between instruments and therefore internal coherence within Pillar I.

5.1.4 External coherence

Key message:

Results on external coherence are mixed and depend on the policy field assessed.

Related **socio-economic policies** could be better integrated during last CAP reforms. Decoupling direct payments and reducing market barriers has effectively reduced market distortions. Synergetic effects in for instance cohesion policy are contrasted with limited progress on mechanisms addressing energy, health and sustainable consumption. Liberalised markets are projected to facilitate access to importing countries, particularly strong producers from middle income countries. As remaining obstacles to market access, the reduced benefits from preferential trade agreements and remaining market barriers, e.g. product standard, reduces the EU support to economic development of least-developed countries as required by PCD.

Related **environmental policies** show overlapping objectives. Weak policy design uncoordinated implementation and weak incentives and enforcement levels impede potential synergies and effects. Potential synergies are found with Nitrate and Water framework directives, but AECM policies are insufficiently targeted and coordinated to meet local challenges. In the absence of a European soil directive, CC requirements are limited to national regulations. Exported environmental footprint is ignored and harmful incentives have not been cancelled. Consequently, and in light of ongoing decline of biodiversity, coherence is low with the Nature Directives and the CBD's Aichi Targets.

The coherence of the CAP with other policies at the national, EU and international levels were examined within the thematic context, the results depending on the policy field assessed. The European Consensus on Development requires an assessment of synergies and tradeoffs of CAP effects within and outside the EU. Assessing policy outcomes according to a transparent indicator base would make transparent possible winners and losers, and help guide possible political adjustments.

Levels of **external coherence were mixed**, indicating improvements for trade, cohesion policy, water and soil protection, mixed outcomes with respect to biodiversity, but quite negative for climate. Decoupling of DP and liberalising market structures had mostly positive socioeconomic effects outside the EU. However, with exported ecological footprints generated by European consumption taken into account, a systematic assessment of political incentives provided by the CAP is required. The assessments of the impacts of EU trade and agriculture policy outside the EU clearly shows that political incentives provided by the CAP have to be looked at in combination with related policy fields, such as development cooperation and environment. Only a coherent policy mix taking into account winners and losers of political adjustments can support the global attempt in reaching the SDGs. The overall evaluation of **global socio-economic impacts is positive**. But despite attempted improvements, the CAP still **scores quite negatively when examining the EU's global environmental impacts**. Analyses of past CAP reforms and their compromised effects have shown that producing effective policies is not

only a technical challenge of identifying appropriate measures and practices. Instead, political will and cooperative strategies are crucial when striving for an effective and coherent CAP.

- The development of new priorities and instruments into the CAP has produced some potential for synergies with between policy areas, such as between the CAP and Cohesion Policy, organic farming sector, or N_2O reduction.
- Coherence with Trade agreements and the Policy Coherence for Development, affecting international trade and agricultural production in developing countries, has improved but reveals complex interrelations and trade-offs. The decoupling of DP, phasing out of public intervention and production quotas, and the reducing of variable trade barriers and export subsidies have successfully reduced market distortions, stabilised markets and facilitated market access to the EU. Exporting middle-income countries with competitive production are seen to be the main beneficiaries. However, EU standards may be difficult to meet for less competitive producers especially in least developing countries and thereby act as non-tariff trade barriers.
- The interplay with the Nature directives indicates a significant remaining conflict (see also Milieu et al. 2016). For instance, payments for Natura 2000 areas are perceived as necessary either as compensation for lost incomes or burdens resulting from regulations, or as positive incentives for the provision of public goods. However, with merely 1 to 2 % of CAP funds, these payments are insufficient to address a substantial share of farmers and avoid conflicts between production and nature conservation.
- Greening is not addressing connectivity and the overall implementation of the EU's Green Infrastructure strategy which should be supposedly implemented through the CAP.
- The CAP still lacks coherence with global environmental agreements due to the EU's high environmental footprint. It generates conflicts with internationally agreed environmental targets, such as biodiversity conservation and climate protection by failing to reduce environmental impacts both within and outside the EU.

5.1.5 Relevance

Key message:

The CAP demonstrates **low relevance in terms of its objectives**. Some of its objectives are vague and some of them have already been achieved or no longer reflect relevant challenges and public demands, for example the demand for quality food. Direct Payments for income support are frequently questioned and lack a sound justification by CAP objectives, moreover, monitoring and evaluation of income support is insufficient. Public acceptance has recently declined. Indicators and monitoring systems were recently improved but remain insufficient to reflect farm income (no monitoring of farm household income) and wellbeing. Environmental priorities are relevant to the public but are not yet resolved. Monitoring and evaluation have improved considerably, but still only few indicators are used for biodiversity and ecosystem services. **Knowledge, tools and concepts**, e.g. for better inclusion of environmental issues into agriculture, are insufficiently taken up in CAP design and implementation.

The CAP **objectives are vague and largely outdated**. Old objectives and new priorities exist in parallel and overlap, and specifications are often missing. Several of the original objectives have already been fulfilled or are less relevant to today's needs. For example, CAP Objective 39d ("*to assure the availability of supplies*") originates from food scarcity in Europe after World War II and is no longer a prime EU challenge; and Objective 39e (*"ensuring that supplies reach consumers at reasonable prices"*) does not reflect the public's concern about food quality. Strong criticism in the literature relates particularly to the lack of a clear justification for income support by direct payments (with no related objective), representing the largest portion in the CAP's budget. At the same time, the 2017 Public Consultation indicated that both farmers and the general public seem to find investments under Pillar II more important than DP.

Two independent Eurostat surveys show that EU citizens still consider the CAP as an important result of the EU, but overall **societal acceptance of the CAP has recently declined**, possibly due to public criticism of the CAP's failure on the environment, versus farmers' criticism on recent increases in administrative burdens.

There is evidence that the CAP can be considered relevant in terms of support of technology and modernisation, but the literature indicates **limited integration of available knowledge, novel concepts and tools into policy design.** For instance, the design of Ecological Focus Areas did not take up from the broad experience gained through AECM, and integrated landscape management remains underdeveloped.

Despite strong criticism on the monitoring and evaluation of direct payments, it should be noted that **EC has updated and expanded its indicators' list in 2015, and adopted advanced techniques and monitoring instruments. However, remaining deficiencies remain**, such as for indicators of farm economy, wellbeing beyond economy, biodiversity, and climate. For instance, indicators of farm economy make insufficient differentiation between the income and wealth of landowners, farmers, and other workers in the agricultural sector, as well as actual capital - thus failing to reflect actual needs; and there is no in-field-monitoring of biodiversity across the EU-28.

5.1.6 EU Added Value

Key message:

The CAP has a positive EU added value for farmers' employment, market issues, as well as the prevalence of EU-wide environmental standards and regulations, but we found no indication of an economic added value. Deficiencies in adaptation to national and local conditions in MS conditions exist both in socio-economic and environmental terms. The CAP lacks sufficient adaptation to the requirements of new MSs, but at the same time offers too much flexibility to MSs in a way that reduces EU added value and allows watering down requirements. Some over-simplistic thresholds (e.g. in the case of crop diversification) fail to reflect realities across most of the EU, particularly in new MSs.

There is an **EU added value** for the CAP in terms of assuring standard of living and balanced territorial development, with benefits particularly to the poorer EU MSs and farmers in the most remote regions; but otherwise we could not identify publications indicating a clear directionality with respect to the effects on markets, the environment, or the economy at the EU level. While there is a strong response to the CAP in non-EU countries, the nature of this response is difficult to ascertain.

We note that the topic of EU value added is difficult to assess, because a) reference points are lacking or hard to define, b) being part of the EU entails a set of policies, and c) the term "value" in itself is perceptual and therefore subjective. We also note that a large proportion of studies address the value of the CAP through hypothetical studies, simulations or surveys.

- The presence of the CAP has some clear positive contributions on supporting farmers' fair standard of living and supporting (a more balanced) territorial development.
- The presence of standards and regulations at the EU reduces variation between MSs and offers a common framework that promotes common (and in some cases high or higher) standards, cross-border cooperation and science, as well as adoption of standards by other countries beyond the EU.
- The literature is often conflicting with respect to the CAP's flexibility, some calling for higher flexibility to allow MSs and regions to adjust to local contexts, particularly in the new MSs; while others demonstrate that too high flexibility reduces the overall EU added value or allows watering down certain measures.
- We found no indication that the CAP per se delivers an economic added value.
- Public surveys could not indicate whether or not the public perceives an EU added value of the CAP compared to national policies.
- From an environmental perspective, EU-wide regulations such as CC criteria or the support for organic farming offer a positive EU added value.
- On the other hand, the development over-simplistic of EU-wide requirements also had negative effects; for instance, the requirement for a minimum of 2 or 3 crops to satisfy the crop diversification measure are set below current crop diversity levels in most MSs, and the permitted loss of grasslands is higher than current rate of losses in some regions.

5.2 Is the CAP supporting SDGs?

A standing out result of our assessment is that sustainability in the agricultural sector emerges repeatedly as a key challenge, both from socio-economic and environmental perspectives. Accordingly, whether the CAP helps fulfilling SDGs may be key to its success.

The thematic division of our evaluation outcomes already indicates some aspects of the CAP's capacities to address a key number of SDGs. Here we examine the most central results in this respect**.**

- The CAP **supports SDG 1** (no poverty) **and SDG 2** (zero hunger) through both DPs and RDP payments. Our results indicate that the presence of the CAP improves farm economy, yet inefficiencies resulting from the distribution of payments, as well as strong leakages away from farmers, weaken its contribution to

these objectives. Various authors highlight that food security or extreme poverty are not key challenges in the EU but rather more relevant to examine from a global perspective, namely, through the EU's impact on other regions and particularly developing countries.

- An efficient distribution of payments according to the goal of SDG 10.1 (to achieve a higher income growth for the bottom 40%) and 10.4 (to implement policies that lead to greater equality) would entail that farmers with the lowest incomes should profit most from CAP payments. The targets set by **SDG 10** (reduced inequities) can clearly be addressed by a better distribution of CAP budgets, given that 80% of payments go to 20% of beneficiaries, or even more so, 32.6% of payments go to 1.8% of beneficiaries. Increasing levels of inequity in payment distributions in some new MSs further indicate **limited capacity to support SDG 10** under the current design.
- In the case of two environmental **SDGs 6** (Clean water and sanitation) and **15** (Life on land), our results largely adhere to those presented for effectiveness and efficiency, namely: designated mechanisms in the CAP offer potential means to address the targets with some demonstrated local successes, yet their limited budget and implementation do not scale up to halt the overall negative trends of environmental degradation. While greening implementation is not yet evaluated, their design strongly indicates that it is unlikely that they can reverse the trends. Therefore, the **CAP's contribution to meeting SDGs 6 and 15 is clearly not sufficient.**
- With respect to climate action (**SDG 13**), the results adhere with our evaluation of effectiveness, efficiency and coherence indicating that the CAP's instruments are **insufficient to address climate change** mitigation requirements. Furthermore, the inclusion of climate within AECM, yet with a reduced budget, as well as competition between AECM and greening, has likely weakened the CAP's capacity to address SDGs 13, 15 and 6.
- **SDG 8** (decent work and economic growth) relates to several topics addressed by the CAP such as promotion of green growth, generational renewal and (un)employment among youth, as well as rural vitality in general. Our results indicate that the CAP supports some forms of sustainable farming and hence green growth, for instance by successfully supporting the expansion of the organic farming sector. However, CAP also supports unsustainable farming systems, and agricultural employment continues to decline.

Two tightly linked SDGs requiring further attention are **SDGs 3** (good health and wellbeing) and **12** (responsible consumption and production).

- The public's well being is partially addressed by regulations on agro-chemicals (some of which are external to the CAP, e.g. the Nitrates' and Water-Framework Directives). Instruments to support biodiversity and ecosystem services (particularly AECM) also contribute indirectly to well-being by maintaining public goods such as aesthetic landscapes, but their extent of impact is limited.
- Healthy diets are promoted by school schemes but their extent is limited.
- The wellbeing of farmers is only considered from an economic perspective, but well-being in its broader sense is neither assessed nor addressed by relevant indicators.
- CAP is not well-designed to address the challenges of unhealthy diets, obesity, and health issues relating to these. Its indirect contribution to consumption behaviour by offering an over-proportionally subsidies to dairy and meat products, **come in conflict SDG 12.**

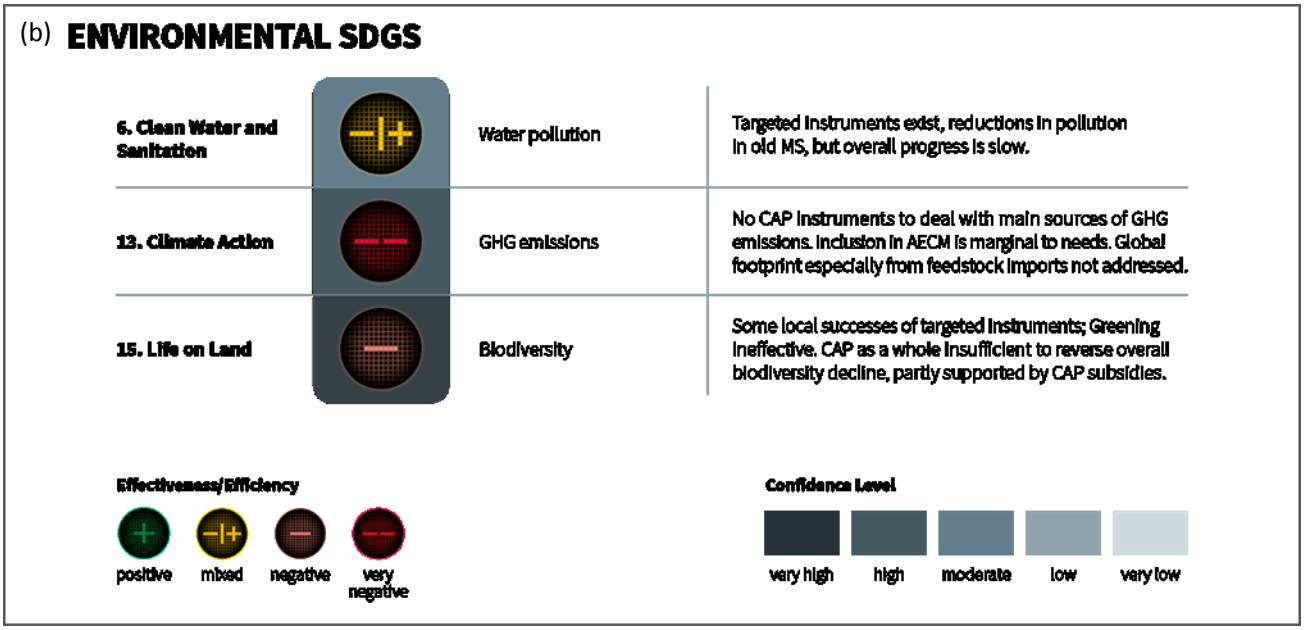
- Externalities and waste emerging from over-production and -consumption are not considered as part of the CAP but largely relate to food policies, but the indirect contribution of the CAP entails limited coherence with these policies and hence again with SDG 12.

Notably, the number of publications addressing SDGs 3 and 12 was low, likely due to both the indirect nature of these impacts and the lack of specific CAP objectives or instruments to address them.

Table 5.2.1: Summery of our outcomes in terms of the SDGs of relevance to agriculture and the CAP, in terms of a) socio-economic and b) environmental goals.

(a) **SOCIO-ECONOMIC SDGS**

1. No Poverty		Livelihood of smallest farmers in EU and farmers in developing countries	Subsidies contribute to income but support for small farmers insufficient, particularly in New MSs. Impacts out of EU are mixed.
2. Zero Hunger		Livelihood of smallest farmers in EU and farmers in developing countries	Recently opened to world markets. Levelling-out of trade preferential agreements with the poorest countries. Hunger per se not a key issue in the EU per se. Impacts out of EU are mixed.
3. Good Health and Well Being		nutritional health of cosumers	Support for organic farming but overall hardly addressing issues of obesity and related diseases. Over-proportional support for animal products fostering unhealthy diets. See also SDG 12.
5. Gender Equality	n.a.		Too few documents available for evaluation (knowledge gap)
7. Affordable and Clean Energy	n.a.		Only marginally addressed by the CAP.
8. Decent Work and Economic Growth		Support for organic farming, rural development	CAP seems to slow down employment losses. Sustainable economic growth supported through organic farming, but counteracted by support to unsustainable farming systems.
10. Reduced Inequalities		CAP funding distribution, balanced territorial development	Supports (more) balanced territorial development but unbalanced distribution of Direct Payments and remaining low accessibility for smallholders counteract improvements to economic disparities.
11. Sustainable cities and communities	n.a.		Paucity of studies, indirect and complex interactions between co-acting factors. See also SDG 12.
12. Responsible Consumption and Production		Consumption and production behaviour, waste, diets.	Reduced problems of overproduction by decoupling but otherwise no targeted instruments to address global footprint and challenges of food waste and unbalanced diets (see SDG 3).



5.3 Key lessons

- **Following a series of reforms since 1992, the CAP has successfully achieved better market integration and coherence with (some) development goals. The introduction of decoupled Direct Payments (DP) has resolved various challenges but created new inconsistencies within the CAP.**

Historically-criticised effects on global markets have been successfully reduced through a series of reforms, to an extent where nowadays the CAP has far lower distorting effects on markets and is more coherent with market and trade related policies. This can be regarded as an overall success.

Nevertheless, decoupled DP introduced a number of new problems and challenges, such as leakages to landowner and land ownership rather than supporting active farming; or a focus on land (area) which results in over-proportionate support for area-demanding products such as beef and dairy. Nonetheless, the introduction of (re)coupled payments in the 2013-reform seems to mark a step backwards.

- **Direct payments are neither efficient nor well justified**

Taking approximately 70% of the CAP's budget, Direct Payments receive the largest budget allocation yet without sufficient justification or clear links to CAP objectives. They are also highly criticised for being inefficient and inequitable (e.g. Matthews 2017), as they lack clarity with respect to reasons who needs to be paid and for which actions. Interestingly, the 2017 Public Consultation of the EC on the CAP seems to indicate that both farmers and the general public perceive Rural Development Programmes as more suitable than Direct Payments for addressing current challenges in agriculture. Thus, budget allocation to DP seem to better reflect historical factors rather than current needs or public preferences.

- **Current trends and CAP's performance indicate that sustainability along its social, economic and environmental dimensions has not been achieved and is unlikely to be achieved under current conditions.**

Emerging from a range of perspectives, a key outcome of our review is that the CAP in its current design is not sufficiently equipped for addressing the challenges of agricultural sustainability in the EU. The CAP does not act to moderate current trends of agricultural intensification, to guide increases in productivity and to support sustainable intensification where need be. The current public discourse around food security widely accepts a need to support a world with 9 billion humans, and it is often stated that this requires higher food production and resource-efficiency. The 2014-2020 agenda has brought back the post-war "productivist" discourse (Erjavec and Erjavec, 2015), but the objective of producing more with less runs the risk of marginalising other objectives of agricultural landscapes, such as multi-functional farm structures, cultural ecosystem services (e.g. tourism, recreation, landscape beauty and cultural identity), agricultural employment, biodiversity, and ecosystem services such as soil retention, nutrient cycling, provision of quality water, and carbon storage and sequestration. At the same time, in most parts of the EU there is no evidence that producing more is needed (e.g. Tomlinson 2013; Matthews 2017 and references therein). Some authors therefore point out that this discourse should be carefully inspected (Tilmann et al. 2011, Garnett et al. 2013, Godfray et al. 2010).

The case of organic farming does offer a positive example where the CAP clearly supports (relatively) sustainable farming systems. While not all forms of organic farming may be sustainable (see Brzezina et al. 2017), other forms of sustainable farming remain unsupported (especially High Nature Value farming), and the larger share of the CAP's budgets supports unsustainable farming. Therefore, in its entirety, the CAP sets insufficient incentives for the EU's agriculture to become sustainable.

- **The CAP lacks a clear, consistent and well-justified set of objectives, necessary to justify its relevance.**

Our assessment indicates that, despite significant changes in the CAP over the course of the various reforms, the basic set of objectives and instruments do not form a coherent structure. The new CAP priorities proposed in 2010 lack constitutional justification and clear specification, while they are overlapping with the original objectives that are partly outdated but still in force. New and revised instruments (decoupled payments, greening, young farmers scheme, AECM) have been added, but their logic is often insufficiently clarified or justified. This results in sometimes unspecific and competing mechanisms and political conflicts, **hampering overall effectiveness and efficiency,** and likely also contributing to the recent erosion in public support (Brady et al. 2017).

- ***There is a breadth of knowledge and experience for significantly improving effectiveness and efficiency.***

Our review indicates on the prevalence of sufficient but unused scientific knowledge and evidence for improved performance of the CAP. This is particularly true for environmental protection, with a breadth of evidence and good-practice examples available. Yes the design of the greening measures in Pillar I has disregarded knowledge and experience gained from AES, and the implementation of both AECM and greening measures on landscape-scale remains the exception rather than the rule. Pillar I retains a strong emphasis on single farm actions with little spatial or socio-economic targeting. Similarly climate action under the CAP is not designed according to well-known GHG reduction potentials. Insufficient indicators and monitoring also impedes evaluation of the actual effectiveness and efficiency of measures, especially because many measures are explicitly multifunctional, i.e. aiming to achieve more than one aim (e.g., greening being an attempted improvement of DP with the prime

aim of income support rather than environmental protection). The literature further highlights that at least some improvements could be achieved with low or no costs, or even with mutual gains ("win-win" solutions).

- **The CAP and other policies are interdependent, but 'policy packages' are missing to produce coherent incentives for sustainable outcomes**

Different policy areas overlap in governing agricultural production and value chains. Yet the CAP lacks the set of instruments to address the entire chain from food production, through processing and distribution to consumption, whereas these processes are tightly linked and affect all actors. Examples of interlinked instruments is the case of farmland environmental protection is implemented through a range of different (CAP and non-CAP) instruments, such as AECMs, greening measures, protected areas, natura 2000 areas, CC and others, yet with weak or missing instrumentation to achieve synergies among these. Similarly, CAP, trade policy, climate and biodiversity policies as well as development cooperation are interconnected in producing impacts on developing countries. However, insofar different CAP instruments and other policies seem to have been mostly assessed and updated in seclusion, resolving one challenge and incorporating another. Experience in some countries indicates that systemic assessments along all three dimensions of sustainability – social, economic and ecological - can help reveal and address trade-offs. "Policy packages" have been suggested as means for policy integration, but such mixes remain underdeveloped within the CAP, as demonstrated, for instance, for the lack of coherence between LFA payments and AECM (Milieu et al. 2016), or the weakening rather than strengthening of AECMs by the inclusion of climate in the 2013-reform.

- **The CAP has a strong social component which is crucial for its socioeconomic and environmental success**

A range of drivers and socioeconomic processes are leading to agricultural intensification, declining employment, loss of rural vitality and lack of generational renewal, far beyond just the CAP. Nonetheless, the CAP does have an impact, both directly or indirectly, on the wellbeing of farmers and rural societies. Our review indicates positive impacts of the CAP on farm income, but large inequalities still prevail between large farm-holders (who maintain the larger share of the EU's agricultural area) and small farm-holders (who comprise the majority of farmers), with remaining deficiencies in terms of the support for the latter. With prevailing yield-gaps, poverty in rural areas and at the same time remaining traditions and valuable cultural landscapes especially in some new MSs, a resonating message from a large number of publications is that the CAP's design and implementation is so far still inadequate to reflect the reality of new MSs, and it is ineffective and inefficient in resolving the challenges faced by many if not most farmers. The extent and use of subsidies, both in terms of accessibility to funding and the way they are used, largely determines whether farmers intensify their management and, if so, whether they do so sustainably or not. Little accessibility to funding due to eligibility criteria and administrative burdens, inequitable distribution of payments and leakages of payments to land rental strongly erode the social contribution of the CAP, and likely also its acceptance by the public. All in all, the EC still fails to sufficiently clarify, justify, or even sufficiently monitor, who needs support, who should be entitled to receive it, and what for (Hill & Bradley 2015, Matthews 2017).

- **Administrative burdens represent important barriers for successful implementation, especially in the area of biodiversity.**

Our assessment confirms that administrative burdens are a key issue affecting farmers' decisions and serving as barriers either to funding or to good implementation. From a socioeconomic perspective, it often affects those farmers in need of most support. From an environmental perspective, it hampers effectiveness and efficiency. Low uptake of AECM is often related to administrative costs to farmers; and in the context of greening, some administrative burdens (e.g. overly detailed requirements for buffer strips, complex rules and ownership issues regarding landscape features, uncertainties about area calculations, risk of sanctions) seem to play a non-marginal role in driving farmers to choose options that are simpler and less costly to implement, yet are known to be less effective in terms of biodiversity.

- **Developing countries and emerging economies gained from facilitated market access and stable markets**

Developing countries and emerging economies have gained from better access to EU markets due to CAP reforms, and export-subsidies for EU products have been abolished. Due to low competitiveness, however, some of the least developed countries are affected by the erosion of trade preferences and by product standards. Political framework conditions and competencies for trade relations with countries outside of the EU overlap with trade policy and development cooperation.

- **The CAP fails in reducing the global ecological footprint caused by the European consumption of agricultural products**

The issue of exporting the ecological footprint to other parts of the world is poorly addressed, resulting in substantial shortcomings in meeting the EU principles for Policy Coherence for Development (PCD). Social and ecological effects of environmental degradation in different parts of the world are coupled by international trade, related production, processing and consumption patterns and other complex interactions (Liu et al. 2007). Yet, the EU's global ecological footprint keeps growing and it is largely not addressed by the CAP. The effects of European production and consumption, through international supply chains, sets a major challenge for achieving the common objectives of the CAP (2010-priority 2) and SDG 15 with respect to sustainably managing natural resources in the EU and in developing countries.

- **Despite recent improvements, indicators and evaluation procedures of the CAP are still weak and incomplete**

The new monitoring and evaluation framework of the CAP has seen considerable improvement. For the first time, it covers both pillars. Different levels of indicators are defined based on the CAP objectives and high-end technologies are used for monitoring, such as LPIS (Land Parcel Identification System) and FADN (Farm Accountancy Data Network). However, the lack of clarity and coherence of the CAP's objectives also affects the monitoring system. Evaluation the CAP's support for farm income (and particularly farm households) is highly insufficient, and impacts on biodiversity and climate are covered by an incomplete set of indicators. There is still no in-field-monitoring of biodiversity across the EU-28. On a higher level, clear and interdependent indicators revealing performance in the different dimensions of sustainability are lacking, e.g. inspired by SDG indicators.

This limits the capacity to identify and address trade-offs or conflicts in policy design, implementation, or outcomes. Likewise, the absence of transparent evaluation procedures limits the potential of stakeholders to engage in political processes related to the CAP, its implementation, and potential reforms and improvements.

- **Flexibility can bring either success or failure in achieving the CAP's objectives**

A range of studies demonstrate that flexibility is essential to enable MSs to develop their implementation plans in a manner that suits their national needs, and enables for adapting large-scale requirements to local conditions. A range of authors have also indicated that the CAP lacks sufficient capacity (or flexibility) to adjust to new MSs conditions. At the same time, flexibility has also led to watering down requirements or generating implementation plans that contrast key objectives. The option of shifting budgets between Pillars or (re)coupling payments with production is one example. The design of greening measures, e.g. in the case of EFA, also demonstrates that too high flexibility results in the exclusion of effective measures (e.g. some MSs did not include landscape features, buffer strips or fallow land) or a biased uptake by farmers towards most productive and less effective options. While the freedom for farmers to take own decisions is valuable, lack of spatial design diminishes the effectiveness and efficiency of actions. In some cases it can also be demonstrated that flexibility itself has acted to reduce the CAP's effectiveness and efficiency by creating vagueness or confusion, and/or by placing burdens on farmers and administrative units. Too much flexibility may also generally reduce the CAP's EU added value.

The evidence collected herein therefore indicates the prevalence of different forms and levels of flexibility. Finding the delicate balance between too little and too much flexibility is clearly a remaining challenge which may play an important role in determining the CAP's success or failure in the future.

5.3 Limitations and knowledge gaps

This study is based on a rapid assessment of a very broad literature, by a small team and through the support of tens of scientists and other experts in providing evidence and advice. This work comprises the desk study component of a fitness check. We did not call for evidence and opinions from the many relevant thousands of people and hundreds of relevant stakeholders, as this was beyond both the scope and capacity of this study.

The review builds primarily on the peer-reviewed literature and is, by nature, biased by the typical biases of this type of literature in terms of language (primarily English), geography (strong skew toward NW Europe, which we tried to balance to the extent possible) and the overall large extent of publications in the natural sciences. We are well aware of many publications in other languages, especially those produced to support policy- and decision-making across Member States, as well as surveys, legal documents and other relevant evidence.

The following list offers an example of topics which we regard important for further investigations but could not address in detail in this report, mostly due to our limited resources:

- We could not include a systematic literature-search and assessment of all CAP instrument, due to their multitude and a lack of sufficient literature on each of them. For instance, Least Favoured Areas (now "areas with natural or other specific constraints") was not assessed in depth. Moreover, we found very little literature assessing internal coherence between (specific) CAP instruments and their interrelations (complementarities, direct and indirect trade-offs).
- The CAP is complemented by various regulations and standards. We limited our assessment to the coherence with complementary policies and important regulations in cross compliance. A detailed

investigation of the CAP's effects in relation to, e.g., labelling and other market instruments was beyond the scope of this study.

- The relation of the CAP to food supplies and accordingly its coherence with food, nutrition and health policies is another topic which we could only cover very partially. It is however relevant for further investigations, due to inherent differences between the interests of producers (farmers), stakeholders involved in food processing and retailing, and consumers - with strong impacts on farming (including employment and profit), production and consumption patterns.
- The topic of health and diets is briefly included but was found complicated to address. Among the 51 publications assessed in this review, only few publications offered more than hints or indirect indications on the CAP's contribution. We find a need for an in-depth evaluation of the various indirect effects which this topic involves.
- We are also aware of a much broader literature in agronomy relating to water and soil. Much of this literature was not assessed because the direct effects of the CAP (as compared to the Nitrates- and Water Framework Directive) was often implicit or difficult to elucidate. We note, however, that significant bodies of knowledge are available through existing assessments (e.g. Sutton et al. 2011; EC 2012), and an initiative for a Fitness Check of the WFD and Floods Directive seems to be underway[43].
- For adaptation to climate change, the case is somewhat similar: While a fair amount of literature is available on climate change adaptation in agriculture, there are few studies explicitly focusing on the CAP. A more detailed research would be needed to address this topic.
- With environmental degradation and climate change farmers are likely to face more environmental risks. Some studies highlighted the role of CAP payments in stabilising outcomes in the face of risks, and others pointed at the role of natural and semi-natural areas as buffer against them. However, our review indicated a surprising paucity of studies addressing the CAP's effects on risk reduction (e.g. fire hazard, flood regulation). Such aspects are particularly important to assess in light of a global review on climate insurances (Müller et al. 2017), also with respect to undesired effects of insurance in reducing risk-avoidance behaviour or dis-incentivising adaptive management.
- Forest and forestry areas cover large extents of the EU's terrestrial area, and specific CAP instruments (especially in Pillar I) do exist to support both afforestation and forestry. However, among 50 publications found that related to forest and forestry, most studies did not address the CAP's direct effects. While some studies pointed at some positive developments (e.g. Maes et al. 2013) or indicating promising opportunities (Merckx & Pereira 2015), others have pointed at a conflict between forest protection and unsustainable forestry (e.g. Jonsson et al. 2015), or potential negative influence of afforestation measures on farmland biodiversity (e.g. Pe'er et al. 2017). Still, CAP's contribution on these issues necessitates a broader assessment.
- SDG 11 (sustainable cities and communities) focuses on both urban and rural areas. Particularly Target 11.x aims to „Support positive economic, social and environmental links between urban, peri-urban and rural areas". Together with SDG 12 (sustainable consumption and production), this emphasises the tight socio-economic, demographic, and environmental links that result from the close exchanges between urban and rural areas. Due to the indirect and intricate nature of these links, assessing SDG 11 was beyond the scope of this assessment.

[43] https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-5128184_en

The following topics were not addressed in this review primarily due to paucity of publications identified in our literature review. We regard them as indicative of knowledge gaps, or requiring a more in depth search of the literature.

- SDG 1 (No Poverty) and SDG 2 (Zero Hunger) were clustered together due to the limited number of publications identified.
- SDG 5 (Gender equality): We found only seven publications in an initial search. Gender issues are clearly a challenge which warrants attention due to patterns of ownership, gender occupation in farming, income, etc. Arguably data are available to analyse patterns with this respect, but we are not aware of existing targeted analyses on the topic with respect to the CAP.
- Impacts on biodiversity by non-designated instruments, such as DP (beyond greening), were found to be challenging to address. It seems that the scientific literature revolves far more around those instruments that have direct and clear effects on biodiversity, but those operating indirectly remain a challenge which can be considered a clear gap.
- The impacts of "young farmers' schemes", as a new instrument in the CAP, could not be evaluated here. We note, however, that the current financial extent of such schemes falls below the relative proportion of such farmers in the population. Based on an EU-wide survey, comprehensive questionnaire, Zondag et al. (2015) identified some of the needs of young farmers in terms of knowledge-exchange. Such studies and others may help examining whether the current focus and efforts meet young farmers' needs.
- We could not find (yet) publications addressing (relatively) novel concepts such as sustainable intensification and nature-based solutions in the CAP context.
- While the EU's Green Infrastructure (GI) Strategy (EC 2013b) makes an explicit reference to the CAP as a key instrument for developing GI, we could not identify documents indicating how the CAP practically contributes to implementing GI. We consider this partly as a knowledge gap and partly as a gap in policy coherence requiring further inspection.
- The paucity of studies addressing the link between environment, productivity and farm efficiency highlights a necessity for further research to link socio-economic and environmental data for a better analysis of the interrelations between public goods and agriculture (Lakner & Breustedt 2017).
- Brexit will undoubtedly have significant impacts on the EU as a whole, and the CAP in particular. So far, publications were unavailable regarding concrete impacts or expectations (but see Matthews 2017b). We therefore could not address this topic.
- While the analyses of CAP impacts has revealed successes and remaining challenges, there is further room for exploring enabling factors of potential CAP improvements. Further exploring underlying facilitators and barriers bear strong potential for exploring potential solutions to CAP objectives and SDGs in agricultural landscapes.

Concluding remarks

Despite the limitations of this rapid assessment, we believe that the outcomes as presented here offer scientific rigour and transparency, and enable further scrutiny of the report and our database. The pointers for improvement should inform further assessments, while some uncertainties are always likely to remain in evaluating a policy of such size, geographic extent, and socio-economic impact. Nonetheless, we are confident that our assessment covers sufficient literature to offer a comprehensive overview of the CAP's performance, as a proposed milestone for assessing the CAP toward further improvements.

Our review primarily indicates a breadth of knowledge, evidence and tools, as well as copious knowledge-holders, whose incorporation can contribute to an effective and hopefully efficient process of CAP-review. To this end, our database is published and available online at https://idata.idiv.de/DDM/Data/ShowData/248. We hope that the evidence base brought forward here can serve in informing a politically intense negotiation, especially in seeking to identify win-win solutions and to avoid unnecessary compromises of the policy.

We call on the European Commission to consider this document as the foundation for a much-needed Fitness Check, complementing the Impact Assessment and Public Consultation.

We encourage the inclusion of this and further evidence in decision making. We hope this report can promote a continued, well-informed and rich science-policy dialogue to support further advances toward a modern, simpler, and smarter CAP in favour of a healthy and sustainable European agriculture.

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