

COMMON AGRICULTURAL POLICY REFORM AND ITS IMPACT ON BIODIVERSITY AND LIVELIHOODS IN DEVELOPING COUNTRIES – A REVIEW OF SCIENTIFIC LITERATURE

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SUMMARY

This paper provides a review of scientific literature on the European Common Agricultural Policy (CAP) and its impacts on biodiversity in developing countries. The review was requested by *Europe External Policy Advisors* (EEPA) and Tilburg University to validate the findings of the study by Van Reisen and Ramanjaneyulu (2011). It serves as a contribution to their study for the Dutch Foreign Ministry, in the light of the upcoming CAP reforms (due in 2013). Since this topic is hardly covered by scientific papers and books, the review had to be built on a rather small sample (N=46). The main findings retrieved from these publications are the following: (1) CAP's promotion of intensive and unified large-scale agriculture has definitely impacted biodiversity in Europe. This system also indirectly affects developing countries by its impact on global ecosystems and its contribution to climate change; (2) Biodiversity outcomes for developing countries are a result of the expected shift of commodity markets under a further liberalised CAP. Certain developing countries will be able to intensify and expand their agricultural sectors, which may lead – besides higher production outputs – to higher use of pesticides and fertilizers and loss of natural habitats, plant and animal species. Additional environmental risks arise because of the conversion of tropical forests for agricultural expansion with loss of carbon stocks and high nature value landscapes; (3) Small-scale and low-intensity agriculture in developing countries often benefit biodiversity and rural livelihoods. These systems will be under pressure to upscale when commodity markets expand. In conclusion, biodiversity and livelihoods in developing countries are indirectly affected because of externalities on global ecosystems from Europe's intensive agricultural sector, while direct impacts of CAP on developing countries differ, depending on whether the country is a net importer or exporter from certain agricultural commodities and their exposure to the world market. It is expected that transformations of commodity markets promote large-scale agriculture rather than small-scale and diverse farming. This process can be harmful for smallholders in developing countries. Fragile areas and valuable ecosystems are under most threat in terms of biodiversity loss and loss of farming diversity. However, the effects of CAP on developing countries are not happening in isolation and need to consider coherence in policy responses with food and energy security, poverty and climate change. The new CAP reform offers an opportunity to look critically into both positive and negative effects for developing countries and how farmers worldwide can be involved in maintaining sustainable agricultural systems.

1. INTRODUCTION

This paper aims to contribute to a scientific understanding of the European Common Agricultural Policy (CAP) and its impacts on biodiversity in developing countries. In the light of the upcoming CAP reforms (due in 2013), social and environmental effects of Europe's agricultural sectors are again subject to debate and research. Scientific studies did confirm the link between CAP and biodiversity losses in Europe at various scales (e.g. Berendse *et al.* 2004; Bureau 2004; Baldi *et al.* 2005; Lovett *et al.* 2010; Stoate *et al.* 2001). However, impacts outside Europe and particularly the environmental consequences in developing countries are less acknowledged and studied, let alone those of *future* CAP reforms.

A review of recent academic literature served to present current insights in the relation between CAP (reform) and biodiversity and livelihoods in developing countries. It first describes the links between CAP, its environmental impacts within Europe and its indirect global consequences. This assessment is made to better understand the potential future environmental effects in developing countries that adopt similar agricultural systems. In addition, past CAP reforms and present trends suggest what direction the future CAP may take and how, as a result, shifting commodity markets could aggravate or relieve pressure in developing countries. However, CAP needs to be considered in the context of other current debates on food safety, energy security, poverty and climate change, because all these issues are strongly intertwined with agricultural development. This intertwinement is also expressed in the EU's Policy Coherence for Development, to avoid cross-sectorial negative impacts on developing countries.

This review was requested by the research group *Europe External Policy Advisors* (EEPA) and Tilburg University, so as to validate field findings with scientific literature, as a contribution to its study for the Dutch Foreign Ministry on the consequences of the upcoming CAP reform for biodiversity in developing countries. The original research findings, from research in 2011 on the impact of CAP and CAP reform on biodiversity among local organisations working with farmers in developing countries, were published in an internal report by Van Reisen and Ramanjaneyulu (2011). This research was conducted in parallel to research undertaken by ECDPM (Engel *et al.* 2011) on CAP reform and Policy Coherence for Development and PLB (Van den Berg *et al.* 2011), which modelled the potential impact of proposed CAP reforms by the European Commission on biodiversity.

1.1 Background

The CAP mechanisms were adopted in 1962 to subsidize and upscale European agricultural production. The funding nowadays represents about 40% of the total EU budget and comes from the European Commission (EC). It is based on a two-pillar structure. Pillar 1 support involves direct payments to farmers and market management measures and Pillar 2, co-financed by the member states, focuses on improving structural and environmental performances of agriculture and on promoting rural development (Cantore *et al.* 2011).

The CAP has been criticized for its adverse impacts on the environment, on landscape and farming diversities and on commodity markets, both in Europe and in the rest of the world (Bureau 2004; Poux 2004; Henle *et al.* 2008; Plesch *et al.* 2010; Van Rheenen and Mengistu, 2009). Price mechanisms that subsidized European agricultural products and that put tariff barriers for products from other regions in the world have disadvantaged both commodity markets and agricultural smallholders in developing countries (Gibb 2004; Matthews 2010). Additionally, agricultural intensification and unification supported by CAP have been associated with a strong reduction of farming and landscape diversities and with all sorts of environmental impacts, such as environmental pollution and biodiversity loss, both in Europe and outside, particularly in developing countries. Over the past three decades, though, there have been various policy responses to these economic and environmental concerns, such as preferential trade agreements for developing countries to enable their market access to Europe and

agro-environmental schemes to better reconcile agricultural production and environmental and landscape protection (Cantore *et al.* 2011; Prins *et al.* 2011).

Effective mitigation of negative impacts of CAP seems more critical than ever. The United Nations estimate that already by 2030, the world will need at least 50 percent more food, 45 percent more energy and 30 percent more water (United Nations 2012). As the world's population seems to grow to nearly 9 billion by 2040, from 7 billion now, and the number of middle-class consumers increases by 3 billion over the next 20 years, the demand for resources will rise exponentially. The urgency for food safety and sustainable use of ecosystems increases at the same rate.

1.2 Research questions and hypotheses

This scientific literature review addresses the original research questions of Van Reisen and Ramanjaneyulu (2011):

1. What is the impact of CAP (including its future reform) on biodiversity in developing countries?
2. What are the implications of CAP (including its future reform) for livelihoods in developing countries, especially for poor communities, due to its effects on biodiversity?

In the research by Van Reisen and Ramanjaneyulu (2011) field information available in local organizations working with small farmers in developing countries was reviewed. The conclusions of their work serve as 'preliminary hypotheses', to be confirmed – or falsified, or partly so – by the scientific literature review of this study:

1. Given the size of the EU CAP budget and the globalization of trade in agricultural goods, the impact of the CAP is significant for small farmers worldwide.
2. The strain on biodiversity is associated with the pressure on farming diversity.
3. As is the case in Europe, fragile areas in developing countries are most under threat in terms of biodiversity loss and loss of farming diversity.

1.3 Methods and materials

The literature search of this paper was conducted in the scientific data bases of Google Scholar (books, reports) and ISI Web of Sciences (papers) and based on various combinations of key terms related to CAP, agricultural reform, developing countries, biodiversity and livelihoods. It focused both on English and French literature. As a result, it yielded 46 unique relevant sources. References were stored in EndNote and literature was content-wise analysed on the themes derived from research questions and hypotheses.

The opinions expressed in this paper are a reflection of the scientific literature that was reviewed. The authors tried their best to mirror the different voices in the debate. The study was restricted by the limited number of studies available that deal specifically with the outcomes of CAP in developing countries and the fact that the findings are not firmly embedded yet in a scientific tradition and community. That does not make them less valuable, credible or relevant, but does put them into perspective.

2. RESULTS

2.1 European Common Agricultural Policy and environmental aspects

Over the past three decades, mitigating environmental impacts associated with intensified agricultural practices, such as environmental pollution and biodiversity loss, featured in various CAP reforms. In

the early 1980s, the first mechanisms were developed to compensate farmers for adopting more environmentally friendly practices (Henle *et al.* 2008). The 1992 CAP reform led to voluntary mechanisms for promotion of Agri-Environment Schemes (AESs) (Stoate *et al.* 2001). These AESs, implemented through voluntary agreements that offer farmers payments in return for more ecological farming practices, are still the main environmental mechanism within the agricultural policy today (Garrod 2009). The Agenda 2000 that followed from the 1998 reforms introduced ‘environmental cross-compliance’ that links direct payments to compliance by farmers with basic standards concerning the environment, food safety, animal and plant health and animal welfare. These include several international treaties that relate to environmental goals: the UN Convention on Biological Diversity; the Natura 2000 network of protected areas, and the Nitrates Directive (Matthews 2010). The initial food production objective of CAP became inclusive to wider values, including diverse and cultural landscapes. However, the 2003 reform brought the focus back to production, but still with conditions set for farmers receiving a Single Farm Payment to comply with environmental directives (Including Bird and Habitats Directives) and to maintain land in good environmental conditions. The most recent reform, the ‘Health Check’ in 2008, introduced phasing out of milk quotas by 2015 and encouraged programmes in the field of climate change, renewable energy, water management and biodiversity (Cantore *et al.* 2011). Despite these various mitigation measures now in place, funds for environmental protection remain relatively small compared to direct payments (Cantore *et al.* 2011).

The 2010 communication of the EC about the new CAP shows some directions the policy reforms will take, but adoption of new proposals is only expected around mid 2012 (Matthews 2010). Full impact of new CAP can only be known after the EU has decided upon its budget expenditure on the different elements of CAP (Barry *et al.* 2010; Matthews 2010). Nonetheless, Cantore *et al.* (2011) identified that food and agricultural income will remain the main objectives of CAP, since Europe’s responsibility to protect the agri-food chain and to contribute to world food demand figure prominently in the communication. Moreover, it aims to preserve farming and farming communities in Europe. The EC also proposes greater targeting and greening of direct payments in Pillar 1. However, environmental objectives are not clearly stated and it is not well elaborated what activities would be supported under the green part of the direct payments. Pillar 2 does not involve much change, although there are promises of more attention to environment, climate change and innovation (Matthews 2010; Cantore *et al.* 2011). Import tariffs and direct farm payments, the interventions with greatest adverse impacts at present, are likely to survive next reforms (Cantore *et al.* 2011). It is as well expected that the EU will continue applying tariffs to keep price fluctuations minimal to EU consumers, which amplifies effects of such price fluctuations for other parts of the world (Matthews 2010). Yet, it is likely that the new CAP reform will be less price distorting because it must meet Green Box criteria of WTO commitments (Barry *et al.* 2010; Matthews 2010).

In conclusion, CAP reforms since the 1980s have addressed environmental issues in the agricultural sector through its various policies. Farmers who receive payments need to comply with environmental policies and Agri-Environmental Schemes (AESs) facilitate more sustainable farming. However, the environmental objectives of the new reform are not fully known yet and outcomes will depend on the EU’s decision on budget allocations and on (maintaining) price mechanisms.

2.2 CAP and biodiversity loss in Europe, and its global consequences

“Environmental problems arising from modern arable management are now associated with changes to landscapes and plant and animal communities, and a deterioration in soil, water and air quality. Few of these consequences are confined to the farm on which they arise, the majority being ‘externalised’ to become a cost to society as a whole” (Stoate *et al.* 2001: 338).

The price mechanisms of CAP have contributed to biodiversity decline in Europe’s agricultural landscapes through substitution of multiple land use and mixed crop-livestock systems by unified cropping systems (Poux 2004; Henle *et al.* 2008). This pressure of Europe’s agricultural policies on farmland biodiversity was amplified by international trade negotiations, biomass production for energy, policies on the use of genetically modified organisms (GMOs) and the enlargement of the EU

(Henle *et al.* 2008). The original function of CAP, to improve agriculture productivity, has led to over-production of meat and milk products (Orskov 2002). Large surfaces of irrigated lands with subsidized maize caused the loss of habitats of multiple species (Bureau 2004). High nature value farmlands with less productive capacity have often been abandoned.

A large body of literature describes the ecological impacts resulting from intensive agro-systems at local, national and regional scales throughout Europe (e.g. Winter and Gaskell 1998; Stoate *et al.* 2001; Berendse *et al.* 2004; Bureau 2004; Baldi *et al.* 2005; Wretenberg *et al.* 2007; Lovett *et al.* 2010). The intensification and up-scaling of agriculture result in specialized animal or crop production with high input of fertilizers and pesticides. The main impacts of this are a decline in biodiversity, loss of non-crop habitats, decline in non-farm species and soil, water and air-pollution (Stoate *et al.* 2001; Orskov 2002). The introduction of GMOs and new crop varieties tend to accelerate the effects of intensification and dependence on fewer agro-cultures, although they can also positively contribute to reducing use of pesticides. Increase of irrigation areas in the EU is competing with other water uses and is of particular concern for Southern European countries where seasonal water shortages occur. In Central Europe the main concern is not intensification yet, but rather the abandonment and fragmentation of agriculture land and loss of valuable landscapes (Henle *et al.* 2008).

The success of reducing biodiversity loss depends on the agricultural sector. The reflections on past CAP reforms in Europe brought more attention to the concept of agricultural multi-functionality, embracing spatial functions, production functions and service functions (Amekawa *et al.* 2010). Although the degree of intensification has reduced somewhat following the Rural Development Regulation, in East Europe intensification is still expected to grow in the coming years with adverse effects on high nature value landscapes. Especially in the dairy farms, continued economic pressure is likely to result in up scaling of herds and lands and greater environmental damages (Henle *et al.* 2008). Picazo-Tadeo *et al.* (2010) assessed farming eco-efficiency by measuring five indicators of environmental pressure: specialization; nitrogen balance; phosphorus balance; pesticide risk; and energy balance. Their overall conclusion is that most farmers do not act eco-efficient and largely ignore environmental externalities. This illustrates the necessity of enforcement of environmental regulation and enabling of more environmental friendly practices. CAP Agri-Environment Schemes could be a useful way to improve eco-efficient performances of farmers, but successes have varied largely from one country to the other (Hofreither 2011). Doubts have been raised on the cost effectiveness of AESs and their potential to halt biodiversity loss at a landscape level (Primdahl *et al.* 2003; Kleijn *et al.* 2004; Henle *et al.* 2008; Wrba *et al.* 2008; Picazo-Tadeo *et al.* 2010). The success of AESs should be measured for the intended time scale, target species and geographic area and depends on the spatial distribution of participating farmers (Garrod 2009; Hofreither 2011).

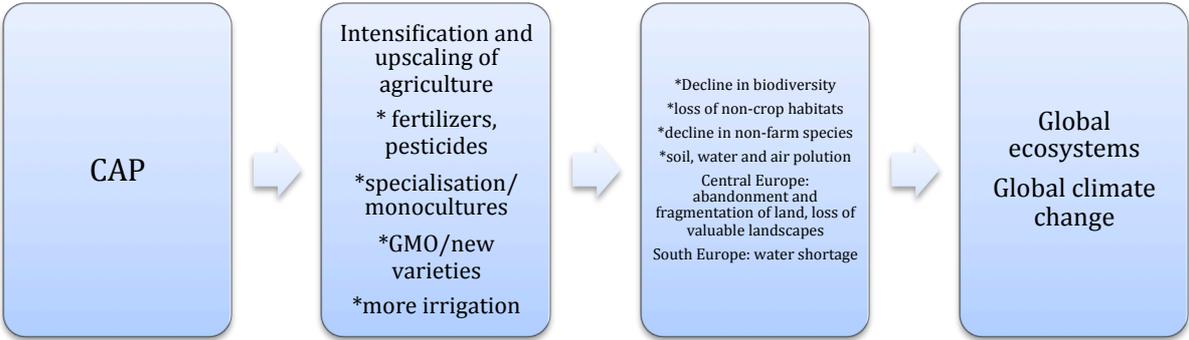
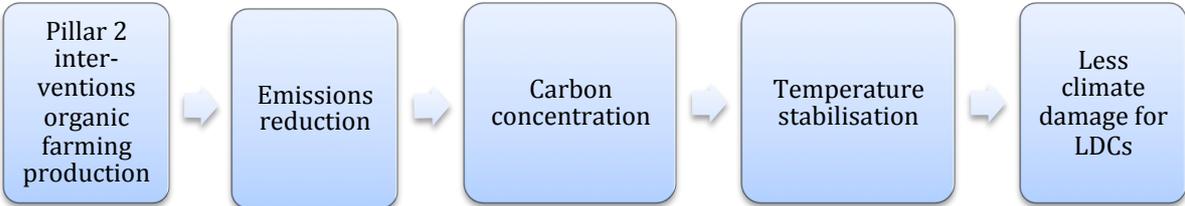


Figure 1: CAP; environmental outcomes in Europe; global environmental externalities.

Whereas in developed countries food safety, consumer demands and environmental values are the main concerns related to sustainable agriculture, in developing countries key concerns address food security, smallholder farmer livelihoods and development issues (van Rheenen and Mengistu 2009;

Amekawa *et al.* 2010). Many developing countries face rapid population growth, which amplifies the need for sustainable intensification of their agricultural sectors to combat food insecurity and enhance rural economic growth (van Rheenen and Mengistu 2009). The question is how CAP and biodiversity loss in Europe might aggravate or relieve these concerns for the developing world.

Most environmental consequences of EUs intensive agriculture practices are felt outside of the farmland, putting a burden on entire regions and ecosystems across borders (Figure 1). Decline in biodiversity and loss of crop varieties affect global ecosystems. The emission of greenhouse gases (CO₂ and NO₂) from arable farming impact climate change with consequences for terrestrial and aquatic ecosystems (Stoate *et al.* 2001). Vulnerable ecosystems and developing countries, especially in Sub-Saharan Africa, will suffer most from global warming. In an opposite trend, environmental requirements under Pillar 1 and Pillar 2 payments intended to benefit local rural development in Europe may contribute to reducing environmental impacts in other parts of the world. Production methods that diminish greenhouse gas emission from agriculture will also help to mitigate negative consequences in developing countries (Figure 2) (Cantore *et al.* 2011).



Source: Cantore *et al.* 2011

Figure 2: Transmission channels from Pillar 2 environmental interventions to developing countries.

To conclude this section, impacts on biodiversity in Europe are a result of CAP’s promotion of intensive and unified large-scale agriculture. This system indirectly affects developing countries by its impact on global ecosystems and its contribution to climate change.

2.3 Effects of CAP on agriculture in developing countries

Effects of CAP economic instruments (Box 1) on developing countries differ, depending on whether the country is a net importer or exporter from certain agricultural commodities and their exposure to the world market. Three different groups of developing countries need to be distinguished: exporters without preferential access to the EU market, exporters with preferential access (preferences, Free Trade Agreements, potential accession countries), and net importers (Matthews 2010; Cantore *et al.* 2011). Exporters without preferential agreements have difficulties to compete against subsidized European commodities and to access European markets (Bureau 2004). Countries with preferential access agreements with Europe benefit probably more from current arrangements than they would under a liberalised commodity market (Gibb 2004). Net importing countries will suffer when removal of CAP mechanisms lead to increase of product prices. The fact that EU’s price protection mechanisms cannot be seen to impact all developing countries equally is illustrated by Gibb’s study on the sugar sector in Southern Africa. Gibb (2004) predicts that this region as a whole actually benefits more from the current EU Sugar policy than it will from liberalization, but on a country level, there are clear winners and losers of such a reform.

In general, major expansion of agricultural production in developing countries is expected over the next decades. Decoupling of payments under CAP will increase the export of Brazilian beef to Europe at higher world prices (Prins *et al.* 2011). The sugar sector in Latin America and Sub-Saharan Africa could even grow twice as fast when CAP abolishes its import quotas. At present, dairy, meat and grains are under highest tariffs, dairy products benefit from greatest export subsidies, dairy, sugar and

some grains receive intervention prices and cotton and beef farmers benefit from non-decoupled payments (Cantore *et al.* 2011). A recent study by the Overseas Development Institute (ODI) (Cantore *et al.* 2011) provides an overview of countries¹ most likely to experience transformations in the view of CAP policy changes. These are:

- Main agricultural exporters of CAP affected products to EU: Morocco, China and South Africa (dairy); Argentina, Brazil, Uruguay, Chile, Namibia and Botswana (meat); and Ukraine, Thailand, India, Argentina, Chile, Pakistan, Mexico, Uruguay and Brazil (grain).
- Countries with CAP-affected products as high share of total exports: Nicaragua, Djibouti and Uruguay (dairy); Uruguay, Paraguay and Nicaragua (meat); and Belize, Paraguay, Uruguay, Guyana, Pakistan, Ukraine and St Vincent (grains).
- Countries with CAP-affected products as high share of total imports: Tonga, Samoa (meat); Somalia, Cape Verde, São Tomé & Príncipe, Senegal (dairy); Yemen, Côte d'Ivoire, Guinea-Bissau, Haiti, Gambia, Senegal (grains); Somalia, Bangladesh (vegetables) and Niue and Djibouti (fruits and nuts) (Cantore *et al.* 2011).

Box 1: CAP economic instruments and developing countries

The main economic instruments under CAP with consequences for developing countries are:

- Import tariffs. Lower tariffs for least developed countries increase their market access to EU. However, even for these countries tariffs are still high for milk (54.6%), grains (34.6%) and meat (32.5%).
- Export subsidies. Mainly dairy products are still subsidized but these will now likely decrease following Doha negotiations.
- Intervention prices. European beef, veal, butter, skim powder and soft wheat have benefited from fixed minimum intervention prices.
- Coupled payments: A price premium for EU commodities that advantages EU agricultural development.
- Direct payments: payments to farmers not linked to a specific product but with the condition that the land remains usable for farming.
- Pillar 2 payments for structural and environmental improvements in Europe, possibly with positive externalities for developing countries.

Source: Cantore *et al.* 2011

The main agricultural exporters to the EU and countries with CAP-affected commodities as high share of total exports are likely to benefit when CAP reduces price-distorting mechanisms and tariffs because of better access to the EU market. The expanding agriculture sectors will however affect biodiversity and livelihoods of farmers in these countries as will be detailed in the next sections. Countries that are net-importers of CAP-affected products will likely suffer under the same CAP reform because the reduced subsidies lead to an increase of prices for consumers in those countries.

In brief, although it is generally believed that less price-distorting mechanisms will improve opportunities for the developing world, distinguishing outcomes of CAP for different groups of developing countries is important, as these will be positive for some and negative for others.

2.4 CAP and biodiversity in developing countries

¹ See Cantore *et al.* 2011 for a full overview (Table 11, p. 27).

“Considering the abolishment of CAP subsidies only at the European scale can show a positive effect for European biodiversity due to abandonment or less intensive management. However, the impact on biodiversity globally can be negative due to changing agricultural trade patterns, expansion of agricultural land towards natural areas, and intensification of management systems” (Prins *et al.* 2011).

Developing countries cover world’s most valuable ecosystems in terms of biodiversity that hold important functions as carbon stocks and resilient systems in the view of climate change and other anthropogenic impacts (Naughton-Treves *et al.* 2005; Chazdon 2008). The 20th century land use model was largely based upon separating agricultural production from conservation areas. Recently, it is more acknowledged that conserving of biodiversity does not only involve pristine forests or protected areas (Naughton-Treves *et al.* 2005; Scherr and McNeely 2008). Agricultural landscapes, particularly with low(er)-input agricultural systems, can host high levels of biodiversity and serve to connect patches of vegetation that play a major role in the movement of organisms (Perfecto and Vandermeer 2008). The question is how CAP interacts with these agricultural systems and biodiversity in developing countries.

Towards 2030, total agriculture areas are predicted to increase in the world, with 60% of this expansion located in Sub-Saharan Africa (Prins *et al.* 2011). The agricultural systems in developing countries are generally smaller-scale, with less energy or chemical inputs and better-integrated livestock and crop production (Orskov 2002). Although this is often due to lack of investment possibilities, these systems at present have far less environmental impact compared to the intensified agriculture in Europe. Opening up of agricultural markets, such as the EU market under CAP, bare new risks for biodiversity in expanding sectors of developing countries. The main changes in land use will occur because of the transfer of agriculture activities from one region to the other and up scaling of production. Large-scale agriculture can harm carbon stocks and threaten biodiversity and ecosystem services. The loss of native crop varieties increases vulnerability of farmers and ecosystems (Amekawa *et al.* 2010). Especially in developing countries, these impacts are amplified by demographic growth and the pressure to expand agricultural production on marginal lands (Solonet *et al.* 2011).

Today’s increasing need for food and fuel show related patterns of cross-border land acquisition by public and private actors (Kugelman and Levenstein 2009). The long-term vision needed for environmental land use does often not meet the short-term approach of foreign investors. Government officials may sell land that is part of long rotational fallow systems by local farmers as ‘unused’ land for large-scale production (Kugelman and Levenstein 2009). Fertile land that is attractive for biofuel production is often the same land that is valuable for its biodiversity or other production functions. The large-scale forest clearings in Asian countries for Oil Palm production are an example of this (Jumbe and Madjera 2011). Prins *et al.* (2011) in their study on CAP and biofuel policies, built scenarios to predict outcomes in different parts of the world. Agriculture lands in the EU and USA are expected to become abandoned and natural regrowth will restore part of these natural landscapes with a decrease of land-related CO₂ emissions. Especially in Brazil, EU’s biofuel and agriculture trade policies will result in diminishing natural habitats because of more agricultural production and intensification. Agricultural income in Brazil will rise as a result of higher prices for crops on the world market (Prins *et al.* 2011). In a perfect market scenario, higher prices can contribute to conservation, e.g. of thicker soils (Bulte and van Soest 1999). Whether these higher market prices will indeed enhance sustainable agricultural practices and conservation depends on a number of conditions, such as environmental rules in place, scale of agricultural practices, promotion of research and development and availability of clean technologies.

The CAP and its favoured agricultural production have impacted broader scale land use and forestry in developing countries. An important example is Europe’s intensification of livestock farming and growing need of protein rich crop production that have largely contributed to development of soy cultivation in South America. The absence of tariffs for animal feed and cheap import of soy have led to massive growth schemes and deforestation in the Amazon (Khatun 2011). CAP mechanisms

provided for free market access of soy to European markets. Between 1978 and 1992, the European production of alternative protein crops, such as oil cake, rape and sunflower seeds, received agricultural subsidy. But with the decoupling of aid and agricultural products between 1990 and 2000, these European agro-cultures declined and soy imports expanded even more (Mas 2010). Brazil is the biggest exporter of soy with 53% of the production destined to the EU. Intensive farming of soy has contaminated areas with fertilizers and pesticides and resulted in a considerable loss of species diversity, with extension effects in whole ecosystems. Expansion of GMO soy in Paraguay, Brazil and Venezuela has further reduced crop variety (Mas 2010).

Agriculture is a large contributor to green house emissions but not yet officially part of emission trading schemes outside of the voluntary market (Cantore *et al.* 2011). Incentives for increased production efficiency, carbon sequestration, protection of carbon in soils, and bio energy production could help to reduce green house emissions from agriculture (Matthews 2010). However, there are also great risks involved as production “may rather lead to alienating land for biofuels development at the expense of food crops or hastening environmental degradation, water scarcity and loss in biodiversity due to large-scale production of energy crops for biofuels” (Jumbe and Madjera 2011: 211). Brazil and other tropical areas where the production potentials are high, often hold diverse and valuable ecosystems and large carbon stocks. Clearing these areas lead to ‘carbon debts’ that need to be compensated for before biofuels are CO₂ neutral (Prins *et al.* 2011). If the EU agriculture sector would need to compensate for its emission off sets, its production costs will increase, which brings a competitive advantages to developing countries with less restrictions (Cantore *et al.* 2011). Climate change mitigation activities in forestry and agriculture could offer benefits to developing countries with payments from new market mechanisms, such as ‘reducing emissions from deforestation and forest degradation’ (REDD +). CAP would need to be coherent with these new developments to reduce emissions because it could as easily block this potential by contradicting price mechanisms (Khatun 2011).

In conclusion, the biodiversity outcomes of CAP for developing countries are a result of shifting commodity markets in which certain countries will attract and expand their agricultural sector. In general, the developing world is expected to increase its agriculture production over the next decades when CAP would further liberalise its commodity markets (and due to other pressures, such as population growth and the need for energy crops). Environmental outcomes are comparable with those of agricultural intensification in Europe and will lead to conversion of forests and grasslands, higher use of pesticides and fertilizers, loss of natural habitats and plant and animal species. Additional risks arise because of the conversion of tropical forests that hold values for nature conservation and large carbon stocks. Reforestation efforts and plantations can mitigate some of these risks and restore biodiversity, but much of the species and habitat composition and resilient features of the original forests will be lost (Chazdon 2008). In addition, developing countries often lack the research and development budgets and regulatory mechanisms to counterbalance these adverse impacts.

2.5 CAP and livelihoods in developing countries

“Critics of CAP highlight that it makes wealthy European agribusinesses wealthier still and denies subsistence farmers in the developing world a chance to make a living” (Plesch *et al.* 2010:23).

Agriculture is the main livelihood source for many of the rural poor in developing countries. Livelihood is ‘the control an individual, family or other social group has over an income and/or a package of sources that can be used or changed to maintain a living’ (Blaikie *et al.* 1994: 9). As described in the previous section, small-scale and diverse agriculture is most likely to protect high-quality matrixes of natural vegetation that benefit biodiversity while maintaining agricultural productivity. Such systems could be managed and supported by small farmers who sustain their livelihoods from these lands (Perfecto and Vandermeer 2008). Diverse ecosystems and diverse agriculture contribute to diversity in income generating activities that help rural families to improve their standards of living (Ellis 1998). Agricultural multi-functionality or diversifying away from

farming activities can assist resource-poor farmers in coping with risks and improving food security, spread of household income, protecting health and cultural values (Amekawa *et al.* 2010).

Considering the important role of farmers in protecting valuable landscapes they should be involved in conservation strategies regarding agriculture or regeneration efforts (Chazdon 2008; Perfecto and Vandermeer 2008). In contrast, agricultural policies in developing countries do often not fit well to the reality of small holders living under marginal ecological and socio economic circumstances. Trade reforms in agriculture could therefore further harm countries and people already living in poverty (Gibb 2004). This can be even caused by less obvious limitations, such as international health standards that actually signify import barriers for areas where such standards cannot be guaranteed. Shrimp cultivation in Madagascar, for example, did employ 12 to 14,000 jobs, but production diminished rapidly after WTO had put in place quality and security rules (Solonet *et al.* 2011).

Over-production and ‘dumping’ of food, stimulated by European agricultural policy, have had detrimental impacts on the developing world, especially in those places where the lowering prices outcompeted local farmers. The livestock sector in Latin America for example has greatly decreased because of CAP border protection measures (Khatun 2011). The peaking prices for food on the world market in 2007-08 and the association made between these high prices and increased hunger, reintroduced the principal of protecting food security in the EU policy discourse (Matthews 2010). Zahrt (2011) however argues that the food security argument in new CAP reforms is not a legitimate one, because the EU is largely self-sufficient in food and developing countries are better off when the EU would promote an open and stable trade regime for their markets. Export funds, price guarantees and import tariffs on sugar have been criticized as EU’s most damaging trade distortions for developing countries. Simulations show that substantial market opening of EU and a major cut in EU agricultural tariffs are required for successful welfare gains for developing countries. Less impacts and negative impacts on developing countries are expected from removal of EU’s Agricultural export and domestic subsidies (Femenia and Gohin 2009).

Removing of remaining trade distortions of farm goods are likely to benefit farmers in developing countries and to contribute to poverty reduction worldwide (Winters 2005; Anderson *et al.* 2011). Sugar is one of the remaining products with high protection measures under EU CAP. For example Mozambique, one of the least developed countries in the world, could potentially have created 20,000 jobs in the sugar industry had such trade distortions not existed (Plesch *et al.* 2010). These outcomes of CAP’s price mechanisms are however not unequivocally distributed throughout the developing world, as trade liberalization and expected increase of commodity prices are likely to benefit those countries that can expand their production potential. Other countries that remain net importers will suffer because fewer surpluses produced by the EU are associated with higher food prices for poor consumers in developing countries (Matthews 2010; Prins *et al.* 2011). Recent agreements within WTO are likely to break down tariff walls and price distortion mechanisms for some commodities. The EU has committed itself to reducing subsidies that distort international trade and harm developing countries (Plesch *et al.* 2010). This will result in shifting some production areas from Europe to developing countries, also relocating their related biodiversity impacts (Henle *et al.* 2008). There already have been large improvements since the start of the Doha Round negotiations, including duty-free quota-free access to all least developed countries in 2001, and the extension of duty-free quota-free access in 2008 to all African, Caribbean and Pacific country signatories to the Cotonou Agreement, who signed an interim Economic Partnership Agreement with the EU. All of Sub-Saharan Africa (except South Africa) can access the EU agri-food market (Matthews 2010). However, the abandonment of export subsidies that were part of negotiations in the Doha round and promised for 2013 are not yet referred to in the EC’s latest communication and it is uncertain whether these will be maintained (Matthews 2010). Special attention should also go to mitigating impacts for producer countries that will be affected by trade preference erosion. So far, the EU’s program to support non-competitive banana producers in diversifying to other commodities has had little results, and better measures are needed in the EU’s action plan for ACP sugar exporters too, or regarding support for other producers (Mather 2008).

In the EU renewable energy targets, 10% of transport fuels should be sourced from renewable sources, mainly biofuels by 2020 (Matthews 2010). Support of biofuels in developing countries is an important development objective in making these countries less dependent on fossil fuels and combating poverty (Plesch *et al.* 2010). In EU's 2005 biomass action plan, support is promised to developing countries in investing in biomass energy (Plesch *et al.* 2010). Jumbe and Madjera (2011) discuss several possible opportunities that biofuel growth in Sub-Saharan African countries could bring:

- Small-scale production could enhance household income and reduce rural poverty
- Production of biofuels could be an important energy supply for the region, thus making these countries less dependent on fossil fuels
- Biofuels could be exported to other parts of the world. Europe with its alternative energy objectives might open up a market for Sub-Saharan Africa.

The CAP reform process can provide a new stimulus to the production and use of biofuels.

However, large-scale land acquisition for energy and food demands can also lead to mass displacement, land degradation and resource shortages. Livelihoods of farmers living on those lands are threatened, especially for the poorest with less means to access alternative resources (Kugelman and Levenstein 2009). Khatun (2011) suggests that fertile lands should rather be allocated to subsistence farmers than to European market demand for soy, meat, biofuels etc., (2011). Conversely, private investments could also bring positive benefits. Developing countries generally invest little in their agriculture sector. Improved technology brought by foreign investors can increase yields and income from farmers and reduce their labour input. This can lead to better education and welfare of farmers' households (Kugelman and Levenstein 2009).

Dependence on Green Revolution technologies, with improved seeds that need higher amounts of water, pesticides and fertilizers, kept farmers in developing countries poor or sometimes in debt (Dey 2009). Ineffective rural credit markets with high interests rates restricted farmers from sufficient capital to invest. There are different voices on whether biotechnology should or should not be adopted by farmers in developing countries. Amekawa (2010) argues that farmers could better reduce use of external outputs, including biotechnology, to decrease financial risks and increase their profit margins. Use and preservation of local crops can provide local producers with better suited free-of-charge varieties in terms of taste, adaptation to climate, storage quality and seed viability. Moreover it serves to protect the 'other values' that many of those products represent, besides market and subsistence use, such as for traditional medicines and cultural purposes. Graff (2009) conversely criticizes the negative voices around GM technology dominating the public arena in Europe and some developing countries; these hindered the possibility of farmers and the public to make informed decisions. Slowing down of the introduction of biotechnology and lack of research and development will ultimately limit the development of environmentally sustainable agriculture, punish poor consumers and welfare of small farmers living on marginal lands, and lower growth of world food supply (Graff *et al.* 2009).

To conclude, the small-scale and low-intensity agriculture in developing countries often benefit biodiversity and rural livelihoods. However, these systems will be under pressure to upscale when commodity markets expand. This up-scaling is associated with unified systems that could increase national production capacity and local income on the one hand, but might leave smallholder farmers more vulnerable to shocks and stresses on the other. There exist different voices regarding the use of biotechnology and the role of foreign investments in developing countries; some advocate it; others reject it. In either case, farmers and their communities should be involved in decision-making on agricultural development that (might) affects their conservation and livelihood practices (Chazdon 2008; Perfecto and Vandermeer 2008).

3. DISCUSSION AND CONCLUSION

“The window of opportunity to address the nexus between farm subsidies, energy security and developing country interests is now wide open” (Plesch *et al.* 2010: 3).

This review of the recent scientific literature on CAP and its impact on biodiversity and livelihoods in developing countries offered insights in its direct and indirect effects. However, it should be noted that the (potential) effects of CAP on developing countries are not happening in isolation. These are influenced by various factors and drivers, such as food prices, food security, climate change, other policy initiatives of the EU (including Coherence for Development) and the multi-year financial framework for EU spending 2014-2020 (Svatos 2008; Cantore *et al.* 2011). Especially coherence with energy, climate change and poverty are relevant for agricultural policy responses (Plesch *et al.* 2010; Prins *et al.* 2011).

Environmental issues affected by CAP in Europe relate to intensification of agricultural systems, generally associated with decline in biodiversity of non-crop habitats, decline in non-farm species and soil, water and air-pollution. These impacts produce externalities for the rest of the world as the decline in biodiversity and loss of crop varieties affect global ecosystems. Emissions of greenhouse gases from arable farming have climate change consequences for terrestrial and aquatic ecosystems world-wide (Stoate *et al.* 2001). Vulnerable ecosystems in developing countries, especially in Sub-Saharan Africa, suffer most from global warming. Over the past three decades, several mechanisms have been developed to mitigate environmental damages from the agricultural sector. The role of multi-functional landscapes became more prominent in CAP policy as a way to address social and ecological issues. Stronger environmental conditionality under Pillar 1 and improved environmental performances of agriculture under Pillar 2 in the new CAP will possibly have a positive effect on the global environment, including developing countries (Cantore *et al.* 2011). Still, more in-depth assessments of agro-environmental schemes and greater involvement of ecologists in the CAP policy debate are needed (Ormerod *et al.* 2003).

The few studies on effects of CAP outside European borders have mainly targeted indirect effects via expanding or decreasing commodity markets that result from changes in CAP price mechanisms. The exporting countries to the EU are likely to benefit when CAP reduces price-distorting mechanisms. Countries that are net-importers of CAP-affected products will likely suffer under the same CAP reform, because of increased prices for their consumers (Cantore *et al.* 2011). Thus, impacts of changes in CAP's pricing mechanisms are country and sector specific.

Biodiversity impacts could be most severe in those developing countries that expand their commodity markets. Although continuation of small-scale agriculture and protection of natural habitats is well possible, it is expected that developing countries will follow the European model of up-scaling productivity. This agricultural intensification can lead to conversion of forests and grasslands, higher use of pesticides and fertilizers, loss of natural habitats and plant and animal species. Additional risks arise because of the conversion of tropical forests with loss of carbon stocks and high value landscapes. Developing countries often lack the regulatory mechanisms and research and development to deal with these adverse impacts, which will ultimately affect people living from these lands.

The first hypothesis of this review, derived from the earlier EEPA study, was formulated as follows: "Given the size of the EU CAP budget and the globalization of trade in agricultural goods, the impact of the CAP is significant for small farmers worldwide". This hypothesis can be partially confirmed on the basis of the (quantitatively limited) scientific literature of this review. The EU CAP and the globalization of trade in agricultural goods do, according to this literature, impact farmers worldwide. However, this does not mean that all farmers in developing countries are affected in the same way. Some developing countries, including their smallholders, will benefit when new markets open up. It is however likely that these transformations of commodity markets promote large-scale agriculture rather than smallholders farming. Although the green revolution has shown many examples of small farmers suffering from adverse outcomes, the question is whether developing countries should be excluded from new and clean technologies, including GMOs. Since these countries often invest very little in their agricultural sector, private investments can contribute to research and development in these countries. However, policies and standards are needed to direct benefits to rural smallholders.

In confirmation with the second hypothesis –“ The strain on biodiversity is associated with the pressure on farming diversity” – the scientific literature reviewed in this paper shows that agricultural intensification as promoted under CAP has led to intensive and unified cropping systems with adverse impacts on biodiversity, landscapes and farming diversity. This process is often detrimental for smallholders, because farming diversity in developing countries generally contributes to rural livelihoods. Such systems are most likely to be managed and supported by small farmers who sustain their livelihoods from these lands (Perfecto and Vandermeer 2008). Diverse ecosystems and diverse agricultural systems are also likely to offer diversity in income generating activities, which helps rural families to improve their standards of living (Ellis 1998). Moreover, agricultural multi-functionality and diversified farming activities can assist resource-poor farmers in coping with risks and improving food security, spreading household income, protecting health and conserving cultural values (Amekawa *et al.* 2010).

The third and final hypothesis of this review was formulated as follows: “As is the case in Europe, fragile areas in developing countries are most under threat in terms of biodiversity loss and loss of farming diversity”. This hypothesis can also be confirmed by this literature review. Fragile areas in developing countries are most under threat in terms of biodiversity loss and most likely affected when commodity markets increase. A fertile land that is attractive for agricultural production is often the same land that is valuable for its biodiversity and carbon stocks. The large-scale conversions of forests for oil palm plantations in Asia and fuel crops in Brazil are important examples. Another case is the extensive soy production and GMO soy cultures in South America that had severe impacts on biodiversity and forests. The high nature value savannahs in the Brazilian Cerrado district have been most degraded due to soy monocultures (Mas 2010). The link with CAP depends on which commodity markets open up under changing price mechanisms and which countries expand their agriculture in the reformed commodity markets.

Although the details of the new CAP are not known yet, the communication shows food security and growth as central objectives. The new environmental measures under Pillar 1 and Pillar 2 are however still unclear. CAP reforms could nonetheless play an important role in mitigating global carbon emissions from large-scale land conversion. CAP could also limit the current impacts on deforestation, to guarantee future coherence between CAP and REDD+ activities. Growing feed crops in Europe, instead of import of soy from tropical forested regions in Latin America, could solve part of the environmental problems created there (but produce negative income effects as well). At the same time, breaking down CAP’s price distorting mechanisms could encourage more competitive and better land use systems and commodity markets for developing countries (Khatun 2011). Plesch *et al.* (2010) underline the untapped potential of biofuels, also in the EU itself, and advocate that the EU should invest the funding that currently goes into price support for agricultural products in its biofuel sector (Jumbe and Madjera 2011).

In the growing search for land worldwide, for meeting food and fuel objectives, the ecological and social aims in developing countries are under increasing pressure. Some criteria for avoiding the negative impacts of what is also called ‘land grabbing’ are: 1) in-depth knowledge about land use of the area and its vital services concerned; 2) realistic assessment of the investments planned for the land under sale and of the question who will benefit and who will lose from the deal; and 3) understanding of the local ecological conditions and possible positive and negative environmental outcomes in the long term, as well as of their costs (Otte *et al.* 2007; Kugelman and Levenstein 2009). Moreover, the governance of entire commodity chains and the role of multi-actor stakeholder groups become increasingly important in mitigating cross-border issues of land use (Mather 2008).

In conclusion, the literature review largely validates the preliminary hypotheses: The CAP can impact farmers worldwide, depending on the country and sector; Pressure on biodiversity also means less farming diversity, and; Fragile areas in developing countries are most under threat from agricultural expansion. In response to the two main questions: (1) “What is the impact of CAP (including its future reforms) on biodiversity in developing countries”; and (2) “What are the implications of CAP

(including its future reform) for livelihoods in developing countries, due to its effects on biodiversity?”, the review shows that there are diverse possible outcomes for developing countries, as they may gain or lose commodity markets under future reform. It is expected that CAP liberalisation will generally contribute to the growth of commodity markets in developing countries and those countries are likely to follow an intensive large-scale agricultural model, which is associated with impacts on forests, biodiversity, soils, water and carbon stocks. The new CAP reforms, as announced in the EC’s 2010 communication, will offer the opportunity to extend environmental measures and to critically look into the effects, both positive and adverse, for developing countries. Whereas the impact of intensified agriculture on ecosystems in Europe has been well studied, the link between CAP and environmental effects outside Europe, particularly in developing countries, received hardly any attention. Therefore the conclusions of this review should be put into perspective and handled cautiously.

Recent policy debates related to energy, climate change, food and poverty, point towards the need for coherence of EU’s CAP reforms with other policy sectors, to mitigate the negative outcomes on biodiversity and livelihoods of farmers in developing countries. Although developing countries can learn from the earlier negative impacts of intensive agricultural systems in Europe and possibly adopt cleaner technologies, it should also appreciate its low-impact diverse agricultural systems that provide a livelihood to many rural smallholders and protect important ecosystem services. Involving farmers in designing and maintaining sustainable agricultural systems will contribute to better social and environmental outcomes of agricultural growth in developing countries.

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