



POLICY REVIEW REPORT: OPTIMISING LAND USE TO MITIGATE CLIMATE CHANGE IN FINLAND

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Contents

1. Introduction	3
2. Sustainable intensification	3
3. Obstacles for sustainable intensification	5
3.1. Support based on payment entitlements and decoupling from production.....	5
3.2. Restrictions for fertilization – Nitrate Directive.....	6
3.3. Restrictions for fertilization – CAP agri-environment payments	6
4. Synergies for sustainable intensification	6
4.1. Support for agricultural investments.....	6
4.2. Green direct payment	7
4.3. Agri-environment payments based on commitment	8
4.4. Agri-environment payments based on agreement.....	9
4.5. Coupled support for arable crops	9
4.6. Payment for areas with natural and other specific constraints (ANC)	9
4.7. Northern hectare-based aid.....	10
4.8. General hectare-based aid.....	11
4.9. National aid for sugar beet	11
4.10. National aid for apiculture	11
5. Obstacles for extensification.....	11
6. Synergies for extensification.....	13
6.1. Green direct payment.....	13
6.2. Agri-environment payments based on commitment	13
6.3. Agri-environment payments based on agreement.....	14
6.4. Support for non-production related investments	14
6.5. Joint policy effects on extensification.....	15
7. Obstacles for afforestation	15
7.1. Separation of agricultural and forestry policy	15
7.2. No support system for afforestation of agricultural land	15
7.3. Taxation.....	16
8. Synergies for afforestation	16
9. Joint effects and indirect obstacles and synergies between policies and SI	17
9.1. Availability of agricultural land	17
9.2. Intensity of production	17
9.3. Collision of policies.....	18
9.3. Climate and energy policy.....	18
10. Conclusion.....	19
References	21
Appendix 1.	22

1. Introduction

This report is a policy review on the current potential obstacles and synergies in regards of the execution of proposed land use optimisation method in the OPAL-Life -project. The purpose of the report is to foresee and minimize the possible policy related obstacles and risks in the implementation phase of the project. We also foresee that several aims in the current Common Agricultural Policy (CAP), especially regarding land use allocation to greening purposes, as such support the aims and activities in OPAL-Life -project. Along with the policy obstacles review, we also compare how different policies and strategies at their current state promote opportunities for sustainable intensification (SI).

This review examines the financial support instruments of the CAP together with a couple of relevant policy instruments in forestry management, Finnish climate and energy strategies implementing common EU decisions, the Water framework directive and the Nitrate directive. These are presented in detail in Appendix 1 (in Finnish). The review also discusses recent research findings on the subject, mainly from the 2014 Follow-up Study on the Impacts of Agri-Environment Measures (MYTVAS 3) and the research project "Poliittisten ohjauskeinojen arviointi ja kehittäminen luonnonvarojen kestävä hyödyntämisen edistämiseksi (Polkeva)" finished in 2015. Also other relevant research papers were shortly reviewed as background material.

First in chapter two, sustainable intensification as a term is defined and its usability in Finland is explained. Sustainable intensification actions are also briefly discussed. In the chapters that follow (three to eight), different individual policy schemes are evaluated for their effects on each of the three main aspects of OPAL-Life -project, namely intensification, extensification and afforestation. Effects of the individual policy schemes will be grouped as policy related obstacles and inhibiting factors, and as policy promotions of the three aspects. Possible synergies between the targets of different policies and targets of SI are especially highlighted. Chapter nine discusses important joint effects of the policy schemes, and their indirect impacts in the context of the OPAL-Life project. Conclusions are given in chapter ten.

2. Sustainable intensification

Sustainable intensification is a means to develop agricultural systems to combine environmental benefits with improved productivity, competitiveness of agriculture and farm economy, and social acceptability of agriculture.

Sustainable intensification is especially interesting for Finland because of the following:

- High yield gaps
- Since Agri-environmental program has been implemented for the last 20 years a lot of experience and follow-up information has become available about its impacts on productivity (yield, quality), environment and farmers' socio-economic situation
- Potential for higher agricultural production in a changing climate
- Potential for more diverse crop production in a changing climate
- Potential and need for large-scale land use planning and optimization
 - Highly variable fields with wide differences in yielding capacity and responsiveness to inputs
- Valuable ecosystem services, natural handicaps and vulnerable environment

The main hypothesis of the OPAL-Life project is that Finnish agricultural systems can be intensified in a sustainable way by optimizing agricultural land use. This can be done by:

- Allocating production to intensively cultivated fields with high, but presently underutilized production capacity
- Allocating land to extensification, i.e. low productive, poorly responsive fields in vulnerable environments
- Allocating more inputs into responsive fields according to need (i.e., by following IP production principles). Inputs and practices include for example fertilizers, manure, green manure, fungicides, insecticides, herbicides, plant growth regulators, irrigation
- Minimizing input use to extensified fields

Significant improvements can be achieved in the cropping system also by better combining plant breeding induced opportunities with developments available for crop management and cropping systems:

- Modern high-productive and highly input-responsive cultivars
- High quality seed
- Improved cultivar resistance or tolerance against diseases, pests, weeds
 - Means also to extend the lifespan of resistance
- Improved resource use efficiencies in cultivars (nutrients, water)
- Improved crop and cultivar robustness and climate resilience
- Diversified cropping systems
 - Crop rotations , cultivars, intercrops
 - Green manuring
- Better integration of crop and animal farms
 - Efficient utilization of manure and recycled nutrients
- Water management systems
- Information and communication technologies (ICT).

In summary: SI is about increasing the use of inputs and agricultural production on the most fertile and productive land where crop yields respond clearly positively to the increased use of inputs, es-

pecially when utilizing new technology and other improvements of production. This also means, and even requires (due to limited market demand), exclusion of less productive land and production facilities from production, or reduced intensity of production of less productive land. Such intensifications and extensifications also improve the resource use efficiency in the aggregate agriculture. Extensive use and even exclusion of less productive resources provide direct reduction in negative environmental effects of agricultural production, such as greenhouse gas (GHG) emissions, nutrient leaching and soil carbon loss, and in producing environmental and societal benefits, such as increased biodiversity and nature conservation.

3. Obstacles for sustainable intensification

3.1. Support based on payment entitlements and decoupling from production

According to recent research, the gap between genetic yield potential and attained yield in Finland has increased after 1995, when the implementation of the agri-environmental program (AEP) began. Together with least favoured area (LFA) payments and the CAP pillar one payment, where the payments were decoupled from production 2006, the AEP strengthened the incentive for extensified production during 2007-2013 (Peltonen-Sainio ym. 2015).

The cross compliance rules of the current CAP concerning good agricultural and environmental conditions state that the farmer should strive to produce harvestable and market worthy yield. EU direct payments the basic payment scheme, green direct payment and the EU funded young farmers scheme are decoupled totally from production since 2006. Finland has chosen coupled support for certain production lines as voluntary measures in the EU direct payment scheme. The Finnish coupled support is targeted at the production of cow and goat's milk in Southern Finland and at the production of beef, sheep meat and goat meat in the whole country. In arable farming, support coupled to production is granted to starch potato, protein crops, rye and sugar beet in the whole country and to field-scale vegetables in Southern Finland.

When production is not required for the eligibility for the agricultural support payments, this might favor extensified cultivation. According to Kässä et al. (2015) the 50 percent obligation for harvesting in the former LFA support (now payments for areas with natural or other specific constraints, ANC) could be seen as a hindrance for extensification in the CAP 2007-2013.

As the environmental aspects of agricultural production are even further emphasized in the current CAP together with decoupling, it is likely that the same problems for supporting extensified production will continue in the future. This also has impacts on the price and availability of agricultural land with reduced incentives for the pursuit of higher yields. This will be discussed in more detail later in the report.

3.2. Restrictions for fertilization – Nitrate Directive

The statutory management requirements in the cross compliance rules set strict upper limits for nitrogen fertilization originating from the Nitrate Directive (91/676/EEC). These rules are incorporated into Finnish national legislation (Valtioneuvoston asetus eräiden maa- ja puutarhataloudesta peräisin olevien päästöjen rajoittamisesta 1250/2014). These limits are the same for all fields in the whole country regardless of the production capacity of individual field parcels. There are different limits for different soil types and plants, but the same rules apply all regions and fields regardless of their actual production capacity, or environmental vulnerability of the surrounding environment.

In some cases this might pose a problem for sustainable intensification when a clearly higher yield could be attained by increased use of N fertilizer, and the environmental risks were minimal due to long distances to watercourses or important ground water areas.

3.3. Restrictions for fertilization – CAP agri-environment payments

If a farmer has committed to the five-year long agri-environmental scheme, the fertilization limits are set even lower than the Nitrate Directive would allow. This might pose a problem for sustainable intensification efforts if more fertilization would in some fields result to higher yields.

However, if committing to certain rules on “more precise use of nutrients” a farmer does have the opportunity to increase the amount of fertilization based on yields obtained with grains and oilseed plants; the cross compliance rules (Nitrate Directive) still setting the upper limits. In this case, the farmer has to show records proving the high yields for one of the past five growing seasons before the increase of fertilization is possible.

4. Synergies for sustainable intensification

4.1. Support for agricultural investments

The Finnish government supports certain agricultural investments. The investments eligible for investment support include building agricultural production facilities, renewable energy production systems, machinery investments in certain limited cases, drainage systems for agricultural lands or improvements for working conditions, production hygiene, animal welfare or state of the environment.

The support for agricultural investments creates synergies between the structural policy objectives (developing productivity and competitiveness of agriculture) with sustainable optimisation objectives, because the investments eligible for the support aim at enhancing productivity of agriculture thus making intensification of production possible. Especially the support for drainage system investments has a direct impact on the soils and the water conditions in the fields thus allowing better yields. The level of investment support for drainage system investments is currently 30 percent of the total cost of the drainage investment, eligible for support. The percentage is even higher if the investment concerns controlled drainage (35%) or if it's being realized in connection to European Innovation Partnership projects (50%).

4.2. Green direct payment

Green direct payment rewards farmers for respecting three obligatory agricultural practises beneficial for the environment and climate. These are crop diversification, maintenance of permanent grassland and ecological focus areas. Green direct payment is applied together with the basic payment scheme of the CAP and the conditions set cover all the farms' agricultural lands that are regarded as payment entitlements. Ecological focus area and crop diversification is applicable only in certain areas in the southern parts of Finland, while the maintenance of permanent pastures (which are rare in Finland; only appr. 30 000 ha can be considered as grasslands older than 5 years, out of the 650 000 hectares under grass cultivation) other to apply in the whole country. Ecological farmers can be exempt from green payments requirements and also small farms and farmers cultivating mainly grasslands on some requirements.

Crop diversification measure stipulates that a certain minimum number of different plants (two or three) have to be cultivated with a certain percentage of land area depending on the location and the size of the farm. This encourages farmers to implement crop rotations and avoid monocultures, both of which are beneficial for the quality of the land. Better soils can produce better yields and therefore this demand of the green direct payment can be seen to have synergies with sustainable intensification goals. Maintenance of permanent grassland and ecological focus areas have the same beneficial impact for agricultural land supporting the targets of sustainable intensification actions – namely those of extensification or exclusion of the relatively less productive land.

All the measures of the green direct payment strengthen biodiversity in the agricultural lands. This is an important feature in the sustainable intensification tool set.

4.3. Agri-environment payments based on commitment

Agri-environment payments are based on measures that strive to reduce stress to the environment from agriculture. The payments compensate for the loss of income and costs that follow when a farmer implements agri-environment measures. If a farm chooses to follow the agri-environment measures but if they do, the commitment period is five years. The basis of these actions comes from the Rural Development Programme and they are co-financed by EU and Finnish government. The number of farmers that make the commitment has been very high in Finland since the beginning of the payment programme in 1995. In 2012, around 90 percent of farmers receiving agricultural support and 94 percent of arable land were covered with agri-environmental practises from the Rural Development Programme of 2007-2013 (Aakkula & Leppänen 2014).

Even when the agri-environment payment scheme includes elements that can be regarded as obstacles to SI as previously mentioned, it also has elements that support sustainable intensification. The reasoning follows those made in connection to green direct payments.

The minimum requirements for the balanced use of nutrients demands farmers to plan crop rotations for five consecutive years together with a yearly, more detailed cultivation plan. The requirements also stipulate that a farmer has to make soil fertility analysis every five years, keep parcel specific notes, perform the quality control test for agricultural land (“peltoaan laatutesti”) once in the commitment period and have training on agri-environmental issues. All these actions are beneficial for the production capacity of the agricultural land.

The minimum requirements concerning plant protection following IPM practises encourage farmers to closely observe the development of the yield leading to more careful consideration of the input (pesticide, herbicide and fungicide) use. The approach has many benefits from the sustainable intensification point of view; it preserves biodiversity, prevents chemicalisation of the agricultural land and saves money when plant protection products are used in a more targeted manner.

The voluntary measures of the agri-environmental payment scheme support sustainable intensification by enhancing the quality of the agricultural lands in the long run. Agri-environment payment scheme has many advantages for extensification and these are discussed later in the report.

4.4. Agri-environment payments based on agreement

Agreement-based agri-environment measures are targeted for complementing water conservation measures on agricultural lands, promoting biodiversity, landscape and genetic diversity and the preservation of the Finnish cultural heritage. All the measures of this 5-year long, voluntary agreement have synergies with sustainable intensification targets because of their pursuit to sustainability and enhancement of biodiversity. The management of wetlands action has also additional benefits.

Although one third of the Finnish agricultural lands are situated with direct contact to a shoreline or an inland waterway, climate change could increase water deficiency in the future (Peltonen-Sainio et al. 2015). The wetland management action strengthens the adaptive capacity of farming systems and at the same time act as an additional resource for sustainable intensification, because the wetlands can be used to store irrigation water.

4.5. Coupled support for arable crops

As already mentioned, Finland has decided to supplement the EU direct payments with coupled support for certain agricultural products. The objective of support coupled to production is to maintain a stable raw material supply to local food and feed industries. Besides the support for milk and meat production, a few arable crops receive support based on the area they are cultivated. Support is granted to starch potato, protein crops (such as peas, faba beans and oilseeds), rye and sugar beet in the whole country and to field-scale vegetables in Southern Finland. These crops are important break-crops for spring cereals which have long heavily dominated land use on cereals producing farms and aggregate land use in areas specialized in cereals production.

Thus coupled support for arable crops has synergies with sustainable intensification targets because they encourage cultivation of certain crops feasible for sustainable crop rotations. In this way the coupled support at least indirectly promotes good condition of the land and biodiversity. However the limited demand of the crops mentioned above is the primary reason for monocultures of (spring) cereals. Coupled support, which increase production above the levels of free market conditions (no coupled support), cannot be the primary solution for monocultural cereals cultivation.

4.6. Payment for areas with natural and other specific constraints (ANC)

The ANC (formerly the LFA) support is paid to ensure the continuation of agricultural production despite Finland's harsh conditions due to its northern geographical location. The

support is based on Rural Development Program and financed by EU together with the Finnish government.

Support for ANC especially for the more northern part of Finland (C-area) is quite significant and contributes to the resumption of agriculture in areas it would have otherwise already been finished even from the fields giving good yields. This may serve sustainable intensification in an indirect way, when the high productive agricultural lands are kept in agricultural production. Most importantly, however, the ANC scheme allows fields with less production capacity to be extensified or kept as set aside land without any reductions in the support payments. This means that ANC payments are largely decoupled from production.

4.7. Northern hectare-based aid

National agricultural aid is fully funded by the Finnish government. The purpose of national aid is to complement EU support schemes, safeguard the operating conditions and profitability of agriculture and horticulture, and to maintain the vitality of rural areas. The most important form of national aid is *Nordic aid* paid in Central and Northern parts of Finland (and Northern Sweden). It comprises almost 90 percent of all national aid paid in Finland and is divided into aids paid per litre of milk, head of bovine animals, and per head of sheep and goats, and into northern hectare-based aid, general hectare-based aid, and young farmers' aid. The key objective of the Nordic aid is to maintain production in the region, to develop the production structures, ensure products' access to market and to support environmental protection and the preservation of the countryside. Nordic aid paid for livestock, especially for dairy farms as a payment per litre of milk (7.5-14 c/l, depending on the area), is directly increasing intensity of production at livestock farms (MTT & SLI 2007). However, Northern hectare-based aid, on the other hand has relatively less direct impact on intensity of production since it is paid per hectare of certain listed crops such as protein crops (peas, faba beans), oilseeds, vegetables, starch potato and sugar beet

The synergies between the targets of sustainable intensification and national northern hectare-based aid are similar to those mentioned in connection to ANC and coupled support for arable crops. In short, Nordic aid contributes in maintaining profitability of production and thus supports crop rotations and biodiversity. In this way Nordic aid, coupled to production in large extent, contributes in preserving the highly productive lands in agricultural use. Since Nordic aid payments are coupled to production they also contribute in regional concentration of agricultural production.

4.8. General hectare-based aid

General hectare-based aid, paid per hectare of cultivated area irrespective of crop (or set aside) choice, has the same synergies with sustainable intensification as the ANC discussed above. However, the small payment level per hectare, mostly 14 eur/ha but 30-70 eur/ha in most northern areas (with little farmland available), means that the effect of the general hectare-based aid on SI is marginal.

4.9. National aid for sugar beet

Sugar beet has been seen as important for the EU wide and also national self-sufficiency and EU sugar policy has been in place from 1968. National aid has been seen as vital in maintaining sugar beet production in Finland (Liesivaara et al. 2011). The European commission abolished the quota systems in the current CAP for all agricultural production and the quota management will come to an end by 2017 for sugar beet. National aid systems were still allowed, and in Finland sugar beet produced for sugar production is granted 350 euros per hectare as national aid.

As sugar beet is a demanding crop to cultivate in terms of soil conditions and nutrients, fields with sugar beet in the crop rotation are very well maintained and give very good yields with directly benefiting the goals of sustainable intensification. The national aid for sugar beet encourages farmers to take sugar beet in their crop rotations.

4.10. National aid for apiculture

Apiculture is an important factor in maintaining biodiversity and offering pollination as an ecosystem service. For Finnish beekeepers with at least 15 hives, there is a national aid in place of 18 euros per beehive. National aid for apiculture encourages farmers to take up beekeeping and an abundance of pollinators help in crop formation resulting in better yields. This is a direct synergy with sustainable intensification efforts.

5. Obstacles for extensification

National aids and coupled CAP payments for livestock and milk are clearly the ones which promote more intensive production and its regional concentration. This means that such coupled supports provide incentives for higher use of production inputs (payments per litre of milk provide incentives to increase e.g. grain or protein crop based (often purchased out-

side farms) feeds because of their positive milk yield impacts which however would not be equally economically profitable without such price support. Payments per litre of milk or per head of animals also contribute to farm size expansion on dairy farms, i.e. increasing the number of dairy cows and other animals. Such supports are however considered needed in order to maintain livestock production in especially northernmost regions, due to unfavourable climate, long distances and other natural handicaps (poor quality of soils, topography, and farm structure) (MTT & SLI 2007).

When looking at each individual support schemes analysed above, it may seem first that obstacles for extensification of agriculture are few in the case of hectare-based supports. This is because payments per hectare do not induce increasing use of inputs per hectare of any single crop. However, coupled support, even paid per hectare, provides an incentive to increase the area of crops eligible for such payments. If the input use of the eligible crops is higher than the alternative crops (not eligible for coupled payments) the outcome is likely to be more intensive production, on the aggregate. This may mean, in practice, that those farmers who find production of the crops eligible for coupled hectare based payments profitable, may increase their production especially if crop prices decrease, when the relative importance of coupled payments increase. Hence the area based payments on certain crops obviously contributes in maintaining the eligible crops in production, which is, in fact, the purpose of the coupled hectare based payments. At the same time such supports inhibits extensification which could take place without such payments. However, the payments per ha of the coupled area based supports are not high compared to the value of production per ha. Thus the area coupled area based supports do not make big obstacle for extensification, if that is favoured by market conditions, e.g. reduced demand and/or increased input prices and reduced output prices.

Joint effect of all hectare based payments is capitalisation of the support payments in land values. This will be discussed more in chapter 9 (joint and indirect policy effects on SI). Since a major part of the farm support payments are paid per hectare basis some farmers, most likely those with relatively higher production costs, or those who do not want allocate significant amounts of working time and resources in agriculture, may minimise costs to be eligible for the subsidies instead of active production aimed for markets. This may stagnate land markets and weaken land supply on land markets. Clear cases and strong signals of this were detected in Polkeva project. High land prices and weak land supply provides an incentive for market oriented farms to intensify production (Kässi et al. 2015).

Overall, increased land prices due to these factors work as an effective obstacle for extensification in regions where land demand is strong. Land demand is further increased by coupled payments and investment supports mostly paid for livestock farms in the case farm size expansion, implying increased need for additional land for feed production and manure spreading.

On the other hand, the support payments, mainly paid per hectare irrespective of production, are hardly any obstacle for extensification or SI in many regions in Finland where (es-

pecially livestock) production is decreasing and land demand is weak compared to the demand. In such cases production intensity is relatively low and many farms rely on extensive cultivation and low input use instead of market oriented production which often requires a certain level of input use to ensure product quality and efficient use of capital and labour. Thus the contribution of agricultural policies on extensification is somewhat farm, context and region specific. On the average, the current agricultural and agri-environmental supports are not any big obstacle for extensification, but may be so in cases of already intensive farms and regions.

6. Synergies for extensification

6.1. Green direct payment

From the three measures of green direct payment, two can be seen directly encouraging farmers to extensify agricultural production, namely maintenance of permanent grassland and ecological focus areas. Payments for maintaining permanent grasslands help the farmers' decision to leave some low productive fields uncultivated while placing the inputs on the more productive fields. The same applies for ecological focus areas, but this payment is targeted geographically to only the most southern parts of Finland. The rest of Finland is exempt from ecological focus areas measure because of extensive forest areas.

6.2. Agri-environment payments based on commitment

Similarly as the green direct payments, the agri-environment payments based on commitment aim at diminishing the environmental impact of agriculture as discussed earlier. The voluntary measures of environmental grasslands (ympäristönhoitonurmet) and biodiversity of arable lands (peltoluonnon monipuolisuus) offer financial aid for extensification of agricultural production thus supporting OPAL-Life project targets for extensification and for biodiversity.

Risk free payments and general fertilisation limits provide incentives for risk averse farmers (all farmers are somewhat risk averse of certain degree, i.e. they care about the uncertainty of revenues and profits) to refrain higher fertilisation levels even if that is possible according to certain rules. Such rules of "more precise fertilisation" mean that a farmer can fertilise more than the general fertilisation levels of the A-E scheme, but a farmer must show then higher than average yields, at least in a 5-year period. This however increases farm level bookkeeping at farms. In the course of increased volatility of crop and output prices it may be more lucrative for a farmer to comply with the relatively low general fertilisation levels of the A-E scheme and refrain from attempts for higher yields through higher fertilisation. It is suspected that the A-E scheme, together with decoupled payments per hectare, may have a

significant extensifying effect on crop production (Peltonen-Sainio et al. 2015 (AMBIO)). This is because the choice of committing to the A-E scheme concerns the whole farm and not only some individual field plots at a farm. Thus a risk averse farmer may cultivate extensively the whole farm, not only the poor quality field parcels, if committing to the A-E scheme.

Farms oriented in producing to market, often at large scale, may find, however that “more precise fertilisation”, provides a useful way of adjusting fertilisation per each field parcel. They do not consider committing A-E scheme as a significant obstacle or an incentive for extensification. Some other market oriented farms, on the other hand, may see committing A-E already a commitment to extensification of certain level, partly because they find “more precise fertilisation” measure not feasible or convenient for their farm.

Overall, committing to the A-E scheme may significantly promote extensive cultivation, especially on farms with no strong orientation to markets or large scale efficient production.

6.3. Agri-environment payments based on agreement

All the measures of the agri-environment payments based on agreement support extensification and enhance biodiversity thus encouraging the farmer to use the fields appropriate to these measures to conservation and directing the agricultural inputs to other, more productive fields. This is considered as a useful opportunity of both already intensive farms and low intensity farms (Luke seminars 2015 and 2016). Both farm types see voluntary measures as important means of extensifying or excluding poor quality land from production. This, in turn, may help in concentrating efforts and resources on good quality field parcels.

6.4. Support for non-production related investments

Based on the Rural Development program, the farmer can get support for non-production related investments if the investment is targeted for establishing and reclaiming wetlands or establishing and fencing of traditional biotopes or natural pastures. These measures have biodiversity enhancing effects and thus synergies with both intensification and extensification efforts. With the support, farmers have better possibilities to make agri-environmental agreements supporting extensification.

6.5. Joint policy effects on extensification

Most agricultural support is paid through hectare-based payments decoupled from production. Such payments do not require production but require keeping the land in good agricultural condition. Hence the decoupled payments paid per hectare can be seen promoting extensification since less productive land can be allocated to set-aside.

However there are other reasons for intensive production and land use, not least the high land prices and weak land supply, which may be stronger than the incentives for extensification because of decoupled payments or those of A-E scheme. Nevertheless, one may conclude that the main policy schemes, e.g. decoupled payments and A-E scheme provide significant incentives for extensification.

7. Obstacles for afforestation

7.1. Separation of agricultural and forestry policy

All of the CAP instruments are currently based on the principles of preservation of the agricultural land and active farming. If agricultural land is afforested it is no longer eligible to receive the status of a payment entitlement and cannot therefore receive any payments under the CAP. This will of course encourage farmers to keep all agricultural lands in agricultural production, even if the productivity is low or at least within the agri-environmental scheme. High land prices due to capitalised support payments may even trigger land clearance, even if no support payments are paid on cleared land (Kässi et al. 2015, Niskanen & Lehtonen 2015).

7.2. No support system for afforestation of agricultural land

From 1960s onwards, there were incentives in place for farmers to afforest agricultural lands because the need to decrease the area in agricultural production. Research results suggest that afforestation of agricultural lands has not been very successful in the past for various reasons (Hytönen 2009). From the forestry point of view, afforestation of agricultural lands didn't bring any significant results and it was expensive, resulting to the finish of hectare based support for afforested areas. Until June 2015, land owners were able to get national support for the expenditures (for example labour and seedling costs) of afforestation of agricultural lands, but after that date, all agricultural activities were taken off from the forestry legislation. Currently there are no support in place or planned for afforestation of agricultural lands in Finland (Hilka-Aaltonen 2015).

There are no regulations or restrictions on clearance of forest or other land to farmland. There is little coordination or regulation on the land use change between agriculture and forestry, even if such land use change is coupled to relatively large greenhouse gas emissions (Regina et al. 2014).

7.3. Taxation

When considering obstacles for afforestation, taxation has to be considered. Agricultural income is taxed based on either totally on progressive income tax system or a mixture of progression and capital gains tax, according to the farm legal status (e.g. a private farm owned by one farmer / farm family; or a limited liability company) based on farmer's choice. Capital gains taxation system with a fixed 30 percent tax is used for forestry based income. Depending on the size of agricultural activities and which tax system the farmer has chosen for agriculture and how often the forest resources are liquidated, the taxation might favour either owning agricultural land or forest.

In situations where the farm is passed on to the younger generation as a gift, farmers might be very careful with any land use changes. According to the Finnish inheritance and gift tax law, agriculture has to be practised on the farm before and at least five years after the gift tax decision has been issued. This is a prerequisite for the relief of the inheritance and gift tax, which is a considerable tax relief. If considerable field areas are afforested during this timeframe, this could be interpreted as non-practise of agriculture and the gift tax would become payable. Each situation is examined one by one, so clear guidance is not available as to what accounts as considerable land use change away from agricultural lands (Heiska 2015).

8. Synergies for afforestation

Forest is a long-term source of income for the land owner. Afforestation most often means significant (capital) investments while the revenues can be received from wood sales only after many decades. Purchasing existing (well-managed) forest, which may provide revenues soon after the purchase, is far more popular for increasing forest area than afforestation of farmland. Policy incentives to afforestation, especially those providing synergies with OPAL-Life project targets, are hard to find.

9. Joint effects and indirect obstacles and synergies between policies and SI

9.1. Availability of agricultural land

One of the conclusions of the Polkeva -project was that agricultural support payments based on agricultural land area decoupled from production together with incentives towards intensified production slow down the transfer of agricultural lands to farms wanting to expand their activities. The CAP financial support has increased the price of the land. (Uusivuori et al. 2015). This can be regarded as an indirect obstacle for sustainable intensification if there is not enough land available for the farmers willing to intensify their production. This might also result to clearing of the forested areas to agricultural lands that can be regarded as opposite to OPAL-Life targets or SI targets in general, which are to avoid increased environmental burden when increasing agricultural production. Clearing forest to farmland inevitably implies increased negative environmental effects (GHG emissions, erosion and nutrient leaching; Regina et al. 2014), which are most significant in the case of organic soils close to watercourses. Cleared land is almost always inferior in terms of productivity compared to existing farmland. However, land clearance may be a better option than purchasing an expensive plot of farmland (farm away from the farm centre), especially in the case of increased farm size the implied need of feed production and manure spreading area (Niskanen & Lehtonen 2015).

As the markets for agricultural land is currently not functioning properly in Finland, there are also problems with leased agricultural lands. Myyrä et al. (2004) have concluded that insecurities in the land tenure of leased lands have decreased land improvements such as liming. This can also be seen as an obstacle for sustainable intensification, if the leased lands are not properly maintained and at the same time, the availability and affordability of land is weak. Similarly, decoupled payments, low profitability of agricultural production (due to e.g. significantly increased input prices), low expected product prices, as well as increased fluctuation of crop and input prices, inhibit development of agricultural productivity and reduces use of inputs.

9.2. Intensity of production

One part of the national support system is the Nordic aid for milk production. It is coupled support paid based on the litres of produced milk. This, together with support for agricultural investments encourages farmers to bigger production units. Kässi et al. (2015) have concluded that this results to more intense use of agricultural land, when new land is hard to come by, as discussed above. The condition of the soil is one of the most important factors determining the productivity of the land. Intense land use can result to poor soil condi-

tions, e.g. due to heavier axle loads and soil compaction, and depletion of key nutrients such as nitrogen and phosphorous, therefore also generating an obstacle for sustainable intensification.

9.3. Collision of policies

In Finland, livestock and plant production areas are increasingly differentiated from each other geographically. Livestock farms have difficulties to dispose the manure because of the growth of the farm size, lack of sufficient land area and/or a close-by plant production farm able to receive manure. As previously stated in this report, the problem is heightened because of the limits for phosphorous use, especially if the farm has committed to agri-environment measures. This situation has resulted in forest clearances just to be able to dispose the manure by spreading it to newly cleared fields (Kässi et al. 2015, Niskanen & Lehtonen 2014). This presents a problem for greenhouse gas mitigation efforts, especially when the clearances are made in peatlands, and calls for coherence in different policy instruments (Regina et al. 2014, 2015).

9.3. Climate and energy policy

Finland implements EU policy on energy and climate issues by national energy and climate strategies. The current strategy was issued in 2013 and it is now being revised (TEM 2015). During the 2008 strategy implementation, the Ministry of Employment and the Economy issued a target for greenhouse gas reduction from the agricultural sector of 13 percent from 2005 emission levels until 2020. No direct measures were introduced on how these targets should be reached. The current strategy of 2013 didn't elaborate the measures either.

The other directly relevant national strategies include the Government Foresight Report on Climate and Energy Policy (VNK 2009), National Plan for Adaptation 2022 (MMM 2014) and the Energy and Climate Roadmap 2050 (TEM 2014). None of these strategies issue any concrete measures to the agricultural sector. In 2015 a Finnish Climate Act was issued, but it is an administrative outline law with no concrete measures for different sectors.

As Regina et al. (2009) stated, specific measures for the agricultural sector are needed, for the agricultural sector to reach the greenhouse gas reduction goal of 13 percent by 2020. This will put pressure on national government to put concrete mitigation actions in place also for agricultural sector offering synergies to attempts reaching SI targets (targets of the OPAL-Life project). These measures will be tested and implemented e.g. in the OPAL-Life project.

10. Conclusion

The aim of this policy review report was to gain an understanding on potential policy related obstacles and benefits and possible synergies with respect to the targets of OPAL-Life project, aiming at increased agricultural productivity and simultaneous greenhouse gas emission reduction from agriculture considering the existing policies, most notably the Common Agricultural Policy.

The review shows that the current system of financial support under CAP has many synergies with sustainable intensification and extensification, both of which are the corner stones of OPAL-Life toolkit. Possible obstacles for sustainable intensification also exist, and the most notable of them are connected with fertilization. The Nitrate Directive, binding all farmers in the similar way in the entire country regardless of location and its environmental vulnerability, is the top policy instrument guiding the levels of nutrition allowed. The agri-environment (A-E) scheme also restricts the use of fertilization for the farmers, who have made the agri-environment commitment. A-E scheme incentivises, through a risk free payment, farmers to limit fertiliser use under certain limits. A-E scheme also provides useful voluntary measures, such as more accurate use of nutrients, and various measures to extensify land use. However, A-E scheme, as well as the decoupled area payment, is likely to incentivise many farmers to extensive production, especially in the context of low market price prospects and increased volatility of input and output prices in agriculture which increase farmers' risks of agricultural investments or increased use of inputs.

Afforestation, in the other hand, is not enjoying the same financial support as the agricultural sector does. One of the interesting tasks during OPAL-Life will be to have a dialogue with the farmers on the incentives for afforestation.

There are also some conflicting policies in place with respect to SI and OPAL-Life targets, and policy coherence can be regarded as the first step towards effective implementation of mitigation measures across sectoral boundaries.

The obstacles are summarised in table 1 below. They have been analysed by their magnitude and permanence to see how significant each obstacle is in connection to OPAL-Life project targets and how easy the policy in question is to change. Also some concluding remarks have been inserted into the table.

The summary shows, that there are no policies that could be considered as a high obstacle for the implementation of the OPAL-Life project in the entire country, and that would prevent the large-scale use of ideas presented in connection to sustainable intensification. However, there are some policy conflicts, at least related to decoupled area payments and implied land prices, and A-E scheme, which can be termed as low or medium level obstacles to SI and Opal-Life targets. It is worth noting, that the policies marked to medium category for magnitude, are exactly the policies that the OPAL-Life project results will hope to help develop in the long term.

Table 1. Policy obstacles summarised.

Policy obstacle	Magnitude	Permanence	Conclusion
Support based on payment entitlements and decoupling from production	---	---	These tend to favour extensification and "hobby" farming in the expense of aiming at good yields. These are basic principles of the current CAP, but they can be changed as any policy at the EU level.
Restrictions for fertilization - Nitrate Directive	---	---	Restriction for fertilization is strict and might result to lower fertilization use that good yields require. Nitrate Directive is an European law, it is binding in the whole country now in its strictest sense, but it can be altered if there is political will at the EU level.
Restrictions for fertilization - CAP agri-environment payments	---	---	Restriction for fertilization is strict and is likely to result to lower fertilization use that good yields require – at least on some, relatively risk averse farms. CAP agri-environment payment fertilization levels and the rules of “accurate use of nutrients” are EU policy, but they can be altered if there is political will at the EU level.
Separation of agricultural and forestry policy	-	--	Afforestation is not the only tool for extensification. Change requires national scale political will.
No support system for afforestation of agricultural land	-	--	Direct financial support is not the only incentive for afforestation. The costs can be deducted in taxation and forest offers revenues in the long run. This does not seem to be sufficient to realise large scale afforestation activities National policies are also much easier to change than EU policy if needed.
Taxation	-	--	Afforestation is not the only tool for extensification. Farmers have possibilities for predecision from tax authorities in generation change situations. National tax laws can be changed as any other laws.
Availability of agricultural land	---	--	Availability of land i.e. weak land supply, partly due to decoupled area payments, poses obstacles since profitable and productive farms find it difficult to increase land area. Sustainable intensification of the land resources available can be seen as a partial solution to this.
Intensity of production	---	--	Change of policy guiding and incentivising / allowing more intensive but still sustainable use of land.
Collision of policy	---	---	Streamlining policies and a common understanding of the different aspects of concerns in question. One of the main aims of the OPAL-Life project.

-	Very low
--	Low
---	Medium
----	High

Magnitude

= how big of an obstacle the policy presents to the OPAL-Life project goals

Permanence

= How permanent the policy is; is it easy to change

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Appendix 1.

Appendix 1 contains a thorough summary of the CAP support instruments and other policies considered in this policy report. The summary is in Finnish.