Study on the economic, social and environmental impact of the modulation provided for in Article 10 of Council Regulation (EC) No 1782/2003

Directorate General for Agriculture and Rural Development
Contract Nº 30-CE-0162480/00-47

LEI, The Hague – IEEP, London

June 2009

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Study on the Impact of Modulation

This is a study on the economic, social and environmental impact of the modulation provided for in Article 10 of Council Regulation (EC) No 1782/2003. The objectives of the study are:

> … to provide a quantitative and qualitative assessment of the impacts of modulation on rural areas, social and economic performance, environment, competitiveness, community and national budgets. The study will take into account the re-distribution effects of modulation, within and between Member States, between economic sectors and types of holdings.[1]

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The project team gratefully acknowledges the encouragement and support of the European Commission Directorate General for Agriculture and Rural Development, and in particular of Peter Wehrheim, the project manager on behalf of the Commission. Any shortcomings of the study are, nonetheless, the responsibility of the project team.

[1] Reference to the specifications of Contract Nº 30-CE-0162480/00-47 established by Directorate General for Agriculture and Rural Development with LEI and IEEP.

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AWU	Annual Work Unit
BG	Bulgaria
CAP	Common Agricultural Policy (EU)
CAPRI	Common Agricultural Policy Regional Impact Analysis model
CM	Compulsory Modulation
CO_2	Carbon dioxide
DE	Germany
DE-BAV	Bavaria
DE-NRW	Northrhine-Westphalia
DE-SAXA	Saxony-Anhalt
DE-THU	Thuringia
Dyna-CLUE	Dynamic Conversion of Land Use and its Effects model
EAFRD	European Agricultural Fund for Rural Development
EAGGF	European Agricultural Guidance and Guarantee Fund
EEA	European Environment Agency
EEC	European Economic Community
ES	Spain
ESIM	European SImulation Model
EU	European Union
EU-10	Ten Countries in CEE that became Member States of the European Union in May 2004
EU-15	Fifteen Member States of the European Union before May 2004
EU-27	EU-25 plus Accession countries (Romania and Bulgaria)
FAO	Food and Agriculture Organisation of the United Nations
FI	Finland
FR	France
GDP	Gross Domestic Product
GHG	Green House Gases
GTAP	Global Trade Analysis Project
GVA	Gross Value Added
ha	hectare
kg	Kilogram
LEITAP	Extended GTAP version implemented by LEI (Landbouw Economisch Instituut)
LFA	Less Favoured Area
m	Metre
mio	Million
MS	Member State (of the EU)
MTR	Mid-Term Review (2003)
NL	Netherlands
OECD	Organisation for Economic Co-operation and Development
p.a.	per annum
P1	Pillar 1 of CAP
P2	Pillar 2 of CAP
PL	Poland
PT	Portugal
RD	Rural Development
RDP	Rural Development Plan
RO	Romania
SAPARD	Special Accession Programme for Agriculture and Rural Development
SAPS	Single Area Payment Scheme
SFP	Single Farm Payment
SI	Slovenia
t	Tonne
TRQ	Tariff Rate Quota
UAA	Utilised Agricultural Area
UK	United Kingdom
VM	Voluntary Modulation
WFD	Water Framework Directive (EU)
WTO	World Trade Organisation

EXECUTIVE SUMMARY

Introduction and Background

'Modulation' is a policy mechanism for shifting funding from the part of the CAP budget dedicated to providing direct payments to farmers (Pillar 1) to the European Agriculture Fund for Rural Development (Pillar 2), which aims to provide targeted support to rural areas, to improve the competitiveness of the farming and forestry sectors, enhance the environment and improve quality of life.

In keeping with requirements under the World Trade Organisation (WTO), changes have been made to the way the EU Common Agricultural Policy (CAP) operates in recent years to ensure greater market orientation. Central to this were the 2003 reforms, which introduced the decoupling of direct payments from production as well as, amongst other changes, modulation on a compulsory basis for the EU-15 under Article 10 of Council Regulation (EC) No 1782/2003.

Greater market orientation within the agriculture sector means that the influence the CAP once had on patterns of production through production related payments and market interventions has significantly decreased, and will decrease further over the coming years. The market now plays an increasingly significant role in determining what gets produced, where and how, and is becoming increasingly global in nature as legal arrangements governing trade, through bilateral and multilateral agreements, become less constraining to the free movement of goods. At the same time, support within the CAP has started to place a greater emphasis on sustainability, the environment and rural development, encouraging the provision of public or non-market goods.

One means of assisting this transformation of agricultural production policy into a rural development policy – in which agriculture plays a key role – has been to adjust the balance of the budget allocated to the two Pillars of the CAP. Former guarantee and guidance measures are now transformed into a support fund for the farming sector (Pillar 1 of the CAP) and a rural development fund for both farmers and other rural actors as well (Pillar 2). The balance of funding between these two Pillars is progressively being shifted – or 'modulated' – from Pillar 1 to a series of programmes that provide incentives within Pillar 2: (a) to improve the competitiveness of the agricultural and forestry sectors, (b) to maintain and enhance the environment and countryside, and (c) to improve the quality of life in rural areas.

The aim of this study has been to explore what the economic, social and environmental effects of introducing compulsory modulation are, both under current rates and rules (the baseline scenario), and a potential future scenario (the Health Check scenario), based on the Commission's proposals for increasing modulation as part of the CAP Health Check. The results should help to bring about a greater understanding on the degree to which these benefits are tangible, and how they might change under possible higher rates of modulation in the future.

To understand the impact of modulation it is necessary to understand the economic drivers influencing both the agricultural sector and the economies of rural areas more generally. This sector has been undergoing a profound transformation for decades,

and policy can only encourage inflections in trends that are otherwise driven by factors outside of the policy arena to a greater or lesser degree. The impacts of compulsory modulation, therefore, must be set against the broader changes taking place in relation to factors including macro-economic developments (often dominated by technological evolution), population growth (and migration), and market forces generated by commerce at the world level (in which consumer preference has a significant influence).

Methodological Approach

The methodological approach that has been taken to understand the impact of modulation is based on several different types of analysis, which can be divided into two broad categories: a modelling approach and a non-modelling approach. The modelling approach allowed for results to be generated on impacts across the EU-27, and for simulations of the likely changes of these impacts under different rates of modulation, while the non-modelling approach allowed for more qualitative, context specific insights into the impacts of modulation to be made. The use of models also permitted an exploration of any differences that might emerge from changes to rules relating to franchise levels, co-financing requirements, or allocation of funds within Pillar 2 to specific measures, albeit based on a set of generalised assumptions.

The modelling approach consists firstly of a custom-built budget model, which allows the transfers of money involved from the national cuts in the first pillar through to the expenditure for each Rural Development measure within Member States' Rural Development Programmes to be tracked. Secondly there is a suite of economic models that place the Pillar 1 reductions and the additional budget available for Pillar 2 measures within the framework of the world economy, from both a general and partial, or sector-specific (agriculture), perspective. Finally a land-use model attributes changes in land-use that are calculated by the economic models to particular areas, on the basis of a 1 km grid covering the European Union. The use of economic models to understand the impact of Pillar 2 expenditures has been carried out for the first time, and has been informed by insights acquired from the non-modelling approach. The non-modelling approach included a literature review, case studies undertaken in eight Member States, questionnaires to Member State authorities for agriculture and rural development, and an assessment of standard indicators compiled within the Common Monitoring and Evaluation Framework for EU rural development policy.

A number of difficulties were encountered in identifying the precise impacts of compulsory modulation on the range of themes addressed by this study, some methodological, and some relating to data availability. These are to be expected in a relatively new policy area and included: the lack of empirical studies (*ex post*), especially on the effectiveness and efficiency of pillar two measures, lack of data, the use of analytical tools that are not in every case specifically designed to accomplish the task required, and the need for complementary research in a context where time and human resources are limited. The quantitative modelling approach is therefore limited to *ex ante* analyses and based on strong assumptions. One way to control the robustness of the results obtained from the model outputs with regard to crucial assumptions has been through conducting 'sensitivity analyses', in which counterfactual hypotheses were investigated using the same tools but with changes in

variables (one at a time). The differences in magnitude of the outputs demonstrate the sensitiveness of the results with regard to some key assumptions that are uncertain. The qualitative analysis has to a slight degree been limited by the fact of a policy review on modulation occurring at the same time as the study. As a result, eliciting reliable information about the likely response of authorities in the Member States to hypothetical increases in modulation was a challenge, given the political sensitivity of the topic and the inherent uncertainty of future policy choices.

The impacts of modulation

The study of the impact of modulation has been undertaken through a double perspective of two different scenarios: a baseline scenario of compulsory modulation at 5%, and a Health Check scenario based on a 13% modulation rate, as elaborated in the Commission proposals in May 2008. As the effects of modulation *per se* are quite limited, in comparison with the macro-trends affecting agriculture since the 1950s, it is often the higher modulation rate that provides an indication of what the influence of modulation might in fact be.

The results of the combined analysis are consistent for the two primary observations coming from the study. Firstly, the reduction of first pillar payments made through the modulation process – at the level that occurs at present – has a negligible influence on agricultural commodity production and on the viability of farm businesses generally. However, the impact on farm income is naturally negative. Secondly, there are beneficial effects in evidence as a result of the availability of additional modulated funds within the second pillar – both for farmers and to other actors within the rural economy. This is in a large part due to the fact that these measures have clear objectives, are targeted at areas of identified need and the total amount of money available is higher due to co-financing requirements. As a result, the second pillar measures are able to provide the leverage that they are intended to, whether it is in increasing productivity and competitiveness through Axis 1, maintaining and improving the environment through Axis 2, enhancing the vitality of the rural economy through Axis 3, or encouraging local leadership and partnership through Axis 4 (the LEADER programme). However, the transaction costs of targeted payments and the monitoring costs are not quantitatively taken into account in this study.

Modulation can lead to a significant transfer of support between farms of differing type and size. Logical deduction from the existing pattern of payments suggests that, in general, modulation tends to lead to a redistribution of funds from:

- Larger to smaller farms, although the participation of rather small farms in many Pillar 2 measures is low in many Member States
- Larger arable farms to:
    - Livestock farms, including a significant proportion of more extensive farms, which are the main recipients of Axis 2 money, but also dairy farms, potentially accessing funding under all axes.
    - Other farm types which are able to access physical and human capital investments under Axis 1.
    - Forestry and farm/forestry enterprises (through the forestry measures).
    - Beyond the agricultural sector to the broader rural economy.

It is important to remember, when considering the impacts of compulsory modulation, however, that its effects extend considerably beyond a simple readjustment to the funds available within the two pillars, as the additional funds that are made available for Pillar 2 are then augmented by national co-financing and, for certain measures, by private sector contributions. The funds provided by the Member States themselves, therefore, make a substantial contribution to the impact of second pillar resources. In contrast, the financial gain or loss from changing the level of the 'franchise' – the part of Pillar 1 payments that are not taken into consideration for the modulation amounts – is minor. As such, compulsory modulation acts as a conduit for leveraging an increase in funding available for rural areas, both to the agricultural sector and beyond.

In relation to the impact of compulsory modulation on the specific study themes, the key findings are summarised below. These are more fully elaborated in the conclusions of the study.

Farm Structure: Modulation on the scale examined here is not seen to have a significant net impact on changes in the number or size of farms within the EU-15 – although it may accelerate existing trends towards fewer, larger farms and certain categories of investment, particularly as a result of the availability of additional funds for the physical and human capital investments in Pillar 2. However, compulsory modulation may also serve to slow down structural change as a result of increased support for Pillar 2 measures, such as LFA and agri-environment, which can help maintain the economic viability of farm businesses, particularly in marginal areas, that would otherwise disappear.

Production: According to the models, the net overall agricultural production effect due to modulation under the Health Check scenario appears to be positive, albeit small, for primary agriculture in the EU-15 (0.48%) and the EU-27 (0.4%). Taken alone, the reduction of Pillar 1 direct payments has a minimal negative production effect (-0.06%), which is to be expected, given that payments are decoupled.

There are some differences between products. The net production effect is slightly positive for all broad groups of products (e.g. oilseeds, vegetables and permanent crops, meat), with the meat sectors being the most strongly influenced by modulation in terms of production. The exception to this is cereals, where the models indicate a slight net decrease in production of durum wheat, which at present still receives coupled payments in some areas, and, benefits from significant Article 69 support, particularly in Italy.

The main cause of this positive effect is the availability of additional money for Pillar 2 measures, particularly physical capital investment measures. While investments in human and physical capital measures through Axis 1 may increase production, however, investments in Axis 2 measures will equally require the maintenance or introduction of more extensive management practices, which may conversely constrain production.

Competitiveness: Increased rates of compulsory modulation appear to have a small net positive impact upon competitiveness within the agriculture sector, albeit measured in the narrow sense of gross value added within agriculture.

Outputs from the economic models suggest that the increased rates of modulation under the Health Check scenario have a small net positive impact on GVA, compared with the baseline scenario. The impact on welfare is slightly positive. This is the case, without taking into account the anticipated impacts of the additional funds on the delivery of environmental non-market goods, which it is not possible to quantify as part of this analysis. On the other hand, transaction costs are not taken into account.

The positive impact is mainly caused by the impacts of Pillar 2 measures, particularly the dynamic impact of measures that increase the productivity of production factors such as human and physical capital mainly in Axis 1, for example those that enable investments in new technologies and physical infrastructure to be made, as well as those that focus on improving human capital, thereby helping to rationalise production processes, or to improve the quality of products. In relation to the service and processed food sectors, Axis 3 measures also have a role to play in contributing to increased competitiveness outside the agricultural sector, particularly those focused on incentivising diversification, improvements to rural infrastructure and stimulating tourism.

Farm Income: The impact of modulation on farm family income is unclear, with different economic models giving slightly differing results. These results, however, have to be treated with extreme caution as they are very dependent on the assumptions made about which Pillar 2 measures are considered to have an income effect. General conclusions mask more significant local and regional differences, particularly between farm types, whereby some type of farms/businesses are likely to benefit and some will lose out in terms of income.

Accepting that most measures within Pillar 2 will only have a small income effect, it seems that, looking at the overall impact of modulation, the main farm types to 'lose' from modulation would be arable/permanent crops, and beef producers. These types of farm tend to be recipient of higher levels of direct payments through Pillar 1; and although they may receive money back through Axis 1 and Axis 2 measures, it is conditional on meeting additional obligations in many cases and probably will not be sufficient to make up for the losses in their direct payments.

Those that are more likely to gain from modulation include dairy farms and fruit and vegetable producers, due to the lower level of direct payment receipts, and the possibility of them accessing funds through Axis 1 (and possibly Axis 2), as well as suckler cows and sheep and goats, due to the likelihood of their being able to access Pillar 2 funds, particularly agri-environment and LFA support, but also support through Axis 1.

In addition, there may be some counter-intuitive effects, whereby farms with attributes highly compatible with Pillar 2 objectives lose out under modulation because they experience Pillar 1 reductions but cannot access any further Pillar 2 measures, for example because they are participating in all the schemes for which they are already eligible. Such farms are most likely to be those enrolled in multi-annual schemes such as LFA and agri-environment schemes and will include some farms providing significant public goods.

Employment: While some changes in employment both within agriculture and the services, energy and industry sectors are likely to be experienced as a result of compulsory modulation, these changes are very minor. Overall, under the Health Check scenario, employment in the food processing and services sectors increases very slightly (0.02%) and decreases within the primary agriculture sector, albeit only by 0.12%. In relation to the agricultural sector, the main reason for this decrease stems from the reductions in Pillar 1 direct payments. This is then reinforced by the Pillar 2 investments in physical capital (mainly Axis 1), some of which may encourage further structural change. Modernization implies that some labour might be released in the short run but that the remaining farmers are more competitive in the long run. The ones who leave agriculture find a job in other sectors due to Axis 3 measures and a small GDP growth. Modulation therefore encourages and accommodates the process of structural change.

The models, CMEF indicators and case studies, all suggest that, under the Health Check Scenario, higher employment levels are likely to be experienced than would be the case with no modulation, as a result of the input of additional funds in Axis 2 and Axis 3 of the second pillar. However these do not outweigh the decreases seen as a result of reductions in Pillar 1 and the additional availability of funds for physical capital measures. The LFA and agri-environment measures help maintain and generate additional employment both directly within the agricultural sector as well as indirectly within other economic sectors. LFA payments, for example, contribute to farm income and the maintenance of employment in rural areas, and agri-environment schemes can have beneficial employment effects, for example by promoting organic farming, which is generally more labour intensive, and through generating the need for the use of contractors with specialist and traditional skills. In addition, the environmental benefits that accrue from these schemes can lead to indirect employment benefits resulting from increased tourism and recreation. Axis 3 measures relating to creating diversification opportunities, new business start-ups, improving service provision in rural areas an enhancing an area's tourism potential, as well as activities funded through the Leader approach, all have the potential to increase employment in rural areas, largely outside the agricultural sector. While the impact of these measures on employment creation will be small, given the limited resources allocated to these measures, the impact may be locally significant, contributing to a more diverse and secure job market in rural areas.

Quality of Life: Overall the quality of life in rural areas is expected to benefit from increased levels of modulation, although it has not been possible to quantify this impact. Taking GDP as a somewhat crude proxy to reflect the material wellbeing across the EU, any increase in GDP can provide some indication of the potential improvement in the quality of life insofar as this relates to the growth in the economy overall. The models indicate that increased rates of modulation under the Health Check scenario have a positive, albeit very small, impact on GDP growth (0.04% at rates of 13% modulation). This positive result is entirely due to the increased availability of funds, and their associated national co-financing, within Pillar 2. The effect is largely caused by those Axis 3 measures which are focused predominantly on investments outside of the agricultural sector, for example on the setting up of new businesses, improving rural services and promoting tourism.

Looking beyond GDP, at low levels of modulation, reductions in Pillar 1 would not appear to have any real impact on the quality of life in rural areas, as no significant effects in terms of farm restructuring or land abandonment are experienced. However, drawing mainly on evidence from the case studies, increases in expenditure in Pillar 2 do have a positive effect on quality of life by increasing the funding available for measures that promote innovation, create employment opportunities, improve access to services for the rural population or provide funding for activities that can improve the economic attractiveness of, and thereby encourage investment in, rural areas. Beyond Axis 3 and the Leader approach, the LFA and the agri-environment measures stand out as having the potential to enhance the quality of life in rural areas in relation to their role in maintaining and enhancing the attractiveness of rural areas, and hence in attracting increased tourism. In addition, the case studies highlighted the value of these measures for keeping people in farming.

Environment: Overall, the impacts of modulation on the environment are positive for all environmental parameters including biodiversity, water quality, soil quality, landscape and climate change. These positive impacts are the result of the availability of additional funds within Pillar 2 and relate to a whole range of measures across all four Axes. The extent of these impacts, however, is hard to quantify beyond general terms.

The reductions in Pillar 1 direct payments do not appear to have had significant impacts on the environment. This is unsurprising, given that the impacts on agricultural producers (in terms of influencing factors of productivity, farm structure and income) of reducing Pillar 1 payments have been shown to be limited. The models show that there may be a small increase in land leaving agriculture as a result of reductions in Pillar 1 payments; however, these appear to have been more than compensated for by increases in the availability of funds within Pillar 2, particularly for the LFA and agri-environment measures. These impacts could, of course become more significant as the modulation rate increases and/or the franchise level changes.

The availability of additional funds within Pillar 2, however, is likely to have a significant impact upon the environment across the EU-15, but particularly in Finland and the UK (England) where the additional funds have been specifically focused on the agri-environment measure. In all Member States, modulation can be seen to have a positive impact on the trends identified for the CMEF impact indicators relating to the area of HNV farmland, the farmland bird index, nutrient surplus and production of renewable energy. In relation to the CMEF result indicators, modulation, under the baseline scenario, is estimated to enable over 5 million hectares of land to be managed in ways that benefit biodiversity, 3 million hectares to be managed to help improve water quality and soil quality and 1 million hectares to be managed in ways that will help with climate change mitigation and/or adaptation.

The results also suggest that the availability of additional funds for, in particular, the agri-environment and LFA measures is likely to retain slightly more land under agricultural management that would be the case without modulation. The models show that this land is more likely to be grassland than cropped land. The CMEF impact indicators also show that a significant area of land is anticipated to be prevented from being abandoned over the 2007-13 programming period. While the proportions of land indicated by the models are very small (under 1% of all

agricultural land), in reality, the effect could be much greater. It would certainly not be a uniform impact across the EU-15 and will depend crucially on local factors such as succession, land ownership, remoteness from markets etc.

Gaps / Research and analytical issues that need follow-up

The study has sought to explore the impacts of modulation through the use of economic models and national case studies. This has revealed the considerable methodological and data challenges inherent in a complex policy evaluation exercise of this kind. This is particularly the case in seeking to specify and quantify the impacts of rural development policies in Pillar 2. Since these measures are a growing element of the CAP it is recommended that further investment both in analytical tools and data collection (at different geographical levels) is prioritised at both the Member State and EU level.

The availability of good quality, precise and comparable empirical evidence on the impacts of Pillar 2 measures at local, regional and Member State level is critical to inform future policy evaluations. While the CMEF indicators are a helpful step towards facilitating a more informative analysis of the impacts and estimates provided by Member States within their RDPs on the anticipated outputs, results and impacts of the various measures within Pillar 2, these need to be complemented by detailed monitoring programmes at the Member State level.

The newly established rural development and evaluation networks could offer a timely opportunity in this regard. These networks could be used to provide an assessment of current monitoring and evaluation programmes within individual Member States. They could work with the national networks to share good practice, and improve monitoring programmes to ensure that the benefits of Pillar 2 measures can be assessed more precisely and the information disseminated widely across all Member States.

If modelling is to be used to predict the impacts of different policy scenarios in relation to Pillar 2 measures with greater confidence, then again empirical evidence of the efficiency and effectiveness of these measures is crucial. For example, information about the rates of return to human and physical capital investments is needed, the level of deadweight or crowding out effects, transaction costs, and the impact of environmental measures on yields. Europe-wide economic models need to be developed further to enable them to reflect more locally differentiated impacts, including by farm type, based on the different ways in which measures are implemented in different locations. The work currently being undertaken in EUruralis 3.0 and the FP7 project ‘CAPRI-RD’ is a good start in this regard. Another large area of research is the conceptualization, modelling and monetization of public goods.

Considerations for interpreting the results of the study

The results of modelling and other forms of analysis should not be taken to represent the impacts of shifting funding from Pillar 1 to Pillar 2 of the CAP *per se*, rather they represent the potential impact of a shift in funding between the two Pillars subject to a very specific set of assumptions and criteria, and the analysis is based on a number of necessarily simplified assumptions about how these criteria might change under different scenarios. If these criteria and scenarios have an important impact on the results and if they were to change, then the results of the study would also change. The specific criteria assumed for the operation of modulation are set out in Chapter 1 and the scenarios used in the study are set out in Chapter 2.

A further note of caution should be raised specifically in relation to the results of the economic models. The complexity of Pillar 2 measures and the range of ways in which they can be implemented across the EU-27 means that a series of assumptions have had to be made about the impacts of specific Pillar 2 measures on economic drivers in order to calibrate the models. These are based on the best available evidence derived from the literature, and follow the logic of intervention for each measure, however they are nonetheless generalisations. The outputs of the models, therefore, are clearly to a considerable degree a function of the assumptions that are fed into them and have not been able to take into account the differing impacts that measures might have in different Member States. The conclusions of the study should be read with this in mind.

Despite these caveats, however, the study team feels that the study offers several important and useful insights into the way the agricultural sector, and rural areas more generally are affected by the shift of funding from direct payments under Pillar 1 to a more targeted support mechanism under Pillar 2 through the mechanism of modulation, and provides a useful basis for future research.

SOMMAIRE

Introduction et Contexte

La ‘Modulation’ est un mécanisme de la politique agricole en vue du transfert des financements d’une partie du budget de la CAP consacrée aux paiements directs des agriculteurs (Pilier 1) vers le Fonds Européen Agricole de Développement Rural (Pilier 2), qui a pour objectif d’offrir aux zones rurales un soutien ciblé, pour améliorer la compétitivité des secteurs agricole et forestier, améliorer l’environnement et la qualité de la vie.

Ces dernières années, tout en respectant les règles de l’OMC, des changements ont été apportés sur la façon dont la CAP fonctionne afin d’assurer une plus grande orientation vers le marché. Les réformes de 2003 sont au cœur de ces changements : le découplage des paiements directs de la production est introduit ainsi que, entre autres changements, la modulation obligatoire dans l’Europe des 15 en application de l’article 10 du Règlement du Conseil (CE) N°1782/2003.

Une plus grande orientation vers le marché au sein du secteur agricole signifie que l’influence de la PAC autrefois sur les modes de production par le biais des paiements directs et des interventions de marché a diminué de manière significative et continuera à décroitre dans les années à venir. Le marché joue aujourd’hui un rôle de plus en plus significatif pour déterminer ce qui est produit, où et comment, et devient de plus en plus global par nature tandis que les accords juridiques qui gouvernent le commerce, au travers d’accords bilatéraux et multilatéraux deviennent moins contraignants pour la libre circulation des biens. En même temps, pour l’aide apportée au sein de la PAC une plus grande importance commence à être donnée à la durabilité, à l’environnement et au développement rural, encourageant les prestations de biens publics ou non marchands.

Pour accompagner cette transformation d’une politique agricole de production vers une politique de développement rural, l’un des moyens utilisés – dans lequel l’agriculture joue un rôle clé – a été d’ajuster l’équilibre du budget alloué entre les deux piliers de la PAC. Les anciennes mesures de garanties et d’orientation sont maintenant transformées en un fonds de soutien pour le secteur agricole (Pilier 1 de la PAC) et un fonds de développement rural destiné à la fois aux agriculteurs et aux autres acteurs ruraux (Pilier 2). L’équilibre du financement de ces deux Piliers est en train d’être progressivement modifié – ou ‘modulé’ – du Pilier 1 vers le Pilier 2 pour offrir une série de programmes incitatifs en vue (a) d’améliorer la compétitivité des secteurs agricoles et forestiers, (b) de maintenir et améliorer l’environnement et le milieu rural ainsi que (3) d'encourager la diversification de l'économie rurale et d’améliorer la qualité de la vie en zone rurale.

L’objectif de cette étude a été d’explorer ce que sont les effets économiques, sociaux et environnementaux de l’introduction de la modulation obligatoire, à la fois en fonction des taux et règles actuels (le scénario de base) et en fonction d’un futur scénario potentiel (le scénario Bilan de Santé), basé sur les propositions de la Commission d’accroître la modulation lors du Bilan de Santé de la PAC. Les résultats devraient contribuer à mieux comprendre comment ces avantages sont tangibles, et

comment à l'avenir ils peuvent changer en fonction de taux plus élevés de la modulation.

Pour comprendre l'impact de la modulation, il est nécessaire de comprendre les facteurs économiques qui influencent à la fois le secteur agricole et l'économie des zones rurales en général. Depuis des années, ce secteur est en profonde transformation et la politique ne peut qu'encourager des tendances qui sont de toute façon le résultat de facteurs externes à la sphère politique, à un degré plus ou moindre. Les impacts de la modulation obligatoire doivent donc être comparés aux changements plus vastes qui ont lieu, en lien avec les facteurs de développements macro-économiques (souvent dominés par l'évolution technologique), la croissance de la population (et les migrations), et les forces du marché générées par le commerce au niveau mondial (là où les préférences des consommateurs ont une influence significative).

Approche méthodologique

Pour comprendre l'impact de la modulation, l'approche méthodologique choisie s'appuie sur différents types d'analyse qui peuvent être divisés en deux grandes catégories : une approche par la modélisation et une approche sans modélisation. L'approche par la modélisation a permis d'obtenir la production de résultats des impacts à travers l'Europe des 27 et de simuler les changements probables sous différents taux de modulation. Quant à elle, l'approche sans modulation a permis d'obtenir des informations plus qualitatives, liées au contexte spécifique des impacts de la modulation. L'emploi de modèles économiques a également permis d'explorer les différences qui peuvent émerger des changements de réglementation liées aux niveaux de franchise, les règles de cofinancements ou encore l'allocation de fonds à certaines mesures au sein du Pilier 2, bien que ces modèles aient été basés sur des hypothèses généralisées.

L'approche par la modélisation consiste tout d'abord en un modèle budgétaire construit sur mesure, qui permet de suivre les transferts d'argent lors des prélèvements sur les budgets nationaux du Pilier 1 jusqu'aux dépenses prévues pour chaque mesure de Développement Rural au sein des Programmes de Développement Rural des Etats membres. Deuxièmement, une série de modèles économiques situent les réductions du Pilier 1 et le budget supplémentaire disponible pour les mesures du Pilier 2 dans le contexte de l'économie mondiale, offrant à la fois une perspective générale et partielle ou encore spécifique au secteur agricole. Finalement, un modèle territorial attribue à des zones particulières les changements d'utilisation des sols qui sont calculés par les modèles économiques, en un quadrillage de 1 km couvrant toute l'Union européenne. C'est la première fois que l'on emploie des modèles économiques pour comprendre l'impact des dépenses du Pilier 2 ; ils ont été renseignés par les informations recueillies par l'approche sans modélisation.

L'approche sans modélisation a consisté en une analyse documentaire, des études de cas menées dans huit Etats membres, des questionnaires adressés aux autorités compétentes en matière d'agriculture et de développement rural des Etas membres et en une évaluation des indicateurs communs du Cadre Commun de Suivi et d'Evaluation (CCSE) pour la politique de développement rural.

Plusieurs difficultés ont été rencontrées pour identifier les impacts précis de la modulation obligatoire sur les thèmes variés abordés dans cette étude, certains d'ordre méthodologique, d'autres en lien avec la disponibilité des données. Ces difficultés, auxquelles il faut s'attendre en étudiant une politique relativement nouvelle, comprennent : le manque d'études empiriques *(ex post),* en particulier sur l'efficacité des mesures du Pilier 2, le manque de données, l'emploi d'outils analytiques qui ne sont pas toujours conçus pour accomplir la tâche requise et le besoin de recherche complémentaire dans un contexte où le temps et les ressources humaines sont limités. L'approche de modélisation quantitative se limite donc à des analyses *ex ante* et s'appuie sur des hypothèses solides. Par rapport à ces hypothèses cruciales, des 'analyses de sensibilité' ont été menées pour contrôler la solidité des résultats obtenus par les modèles : des hypothèses contrastées ('counterfactual') ont été étudiées en utilisant les mêmes outils mais en changeant les variables (une à la fois). Les différences d'ampleur des résultats démontrent la sensibilité des résultats par rapport à certaines hypothèses qui sont incertaines. L'analyse qualitative a été légèrement limitée par le fait qu'une révision de la politique de modulation avait lieu au même moment que l'étude. En conséquence, extraire de l'information fiable à partir des estimations en provenance des autorités des Etats-membres face aux augmentations hypothétiques de la modulation a été un défi, étant donné que le sujet était sensible sur le plan politique et les futurs choix politiques implicitement incertains.

Les impacts de la modulation

L'étude de l'impact de la modulation a été menée avec une double perspective grâce à deux scénarios différents : un scénario de base avec modulation obligatoire à 5% et un scénario Bilan de Santé avec un taux de modulation de 13%, comme présenté par la Commission dans ses propositions de mai 2008. Comme les effets de la modulation *per se* sont très limités par comparaison aux tendances majeures qui affectent l'agriculture depuis 1950, c'est souvent le taux de modulation le plus élevé qui offre une indication de ce que pourrait être en fait l'influence de la modulation.

Les résultats de l'analyse combinée sont consistants avec les deux observations principales qui ressortent de l'étude. Premièrement, la réduction des paiements du Pilier 1 due au processus de modulation – au niveau actuel – a une influence négligeable sur la production de denrées agricoles et sur la viabilité des exploitations en général. Cependant l'impact sur le revenu agricole est naturellement négatif. Deuxièmement, il y a des effets bénéfiques clairs qui résultent de la disponibilité de fonds supplémentaires modulés dans le second pilier – à la fois pour les agriculteurs et pour les autres acteurs dans l'économie rurale. Ceci est dû en grande partie au fait que ces mesures ont des objectifs clairs, sont ciblées sur des zones dont les besoins sont identifiés et le montant total de l'argent disponible est plus élevé en raison des obligations de cofinancement. En conséquence, les mesures du second pilier peuvent offrir l'effet de levier recherché, que ce soit pour accroître la productivité et la compétitivité dans l'Axe 1, améliorer l'environnement dans l'Axe 2, améliorer la vitalité de l'économie rurale dans l'Axe 3 ou encourager la dynamique locale et le partenariat dans l'Axe 4 (Programme Leader). Cependant les coûts de transaction des paiements ciblés et les coûts du suivi administratif et technique ne sont pas pris en compte de manière quantitative dans cette étude.

La modulation peut entrainer un transfert de fonds entre exploitations de tailles et types différents. A partir de la configuration actuelle des paiements, on peut logiquement déduire que, en général, la modulation a tendance à mener vers une redistribution des fonds :

- Des plus grandes vers les plus petites exploitations, bien que la participation des petites exploitations dans de nombreuses mesures du Pilier 2 est faible dans de nombreux Etats membres.
- Des plus grandes exploitations arables vers :
    - Les exploitations d'élevage, y compris une proportion significative d'exploitations plus extensives qui sont les principaux bénéficiaires des fonds de l'Axe 2, mais aussi les exploitations laitières, qui ont la possibilité d'accéder aux financements de tous les Axes.
    - Les autres types d'exploitations qui peuvent accéder aux fonds pour les investissements physiques et en ressources humaines dans l'Axe 1.
    - Les exploitations et entreprises forestières (grâce aux mesures forestières).
    - Au-delà du secteur agricole vers l'économie rurale.

En étudiant les impacts de la modulation obligatoire, il est cependant important de se souvenir que ses effets s'étendent considérablement au-delà d'un simple réajustement des fonds entre les deux piliers, car les fonds supplémentaires mis à disposition du Pilier 2 sont augmentés par les cofinancements nationaux et, pour certaines mesures, par des contributions du secteur privé. Les fonds en provenance des Etats membres eux-mêmes contribuent donc de manière substantielle à l'impact des ressources du second pilier. Par contraste le gain ou la perte financière de la modification du niveau de 'franchise' – la partie des paiements du Pilier 1 qui ne sont pas prises en considération dans les chiffres de la modulation – est mineure. En tant que telle, la modulation obligatoire agit comme un conduit pour faire levier et augmenter les financements disponibles pour les zones rurales, dans le secteur agricole et au-delà.
Pour l'impact de la modulation obligatoire sur les thèmes spécifiques de l'étude, les principaux résultats sont résumés ci-dessous. Ils sont présentés de manière plus complète dans les conclusions de l'étude.

Structure des exploitations. A l'échelle utilisée dans cette étude, on ne voit pas que la modulation ait un impact net significatif sur le changement du nombre ou de la taille des exploitations dans l'Union Européenne des 15 – bien qu'elle puisse accélérer les tendances actuelles vers moins d'exploitations de plus grandes tailles et certaines catégories d'investissements, en particulier grâce à la disponibilité de fonds supplémentaires pour les investissements physiques et en ressources humaines du Pilier 2. Cependant, la modulation obligatoire peut aussi permettre le ralentissement de changements structurels en raison d'un soutien accru aux mesures du Pilier 2, telles que les mesures des Zones Défavorisées et agro-environnementales, qui peuvent contribuer à maintenir la viabilité économique des entreprises agricoles, en particulier dans les zones marginales qui autrement disparaitraient.

Production. D'après les modèles, dans le scénario Bilan de Santé, l'impact net de la modulation sur l'ensemble de la production agricole, se montre être positif, quoique faible, pour l'agriculture primaire dans l'UE-15 (0.48%) et dans l'UE-27 (0.4%). Prise à part, la réduction des paiements directs du Pilier 1 a un effet négatif minimal

sur la production (-0.06%), comme prévu, étant donné que ces paiements sont découplés.

On constate certaines différences entre les produits. L'effet net sur la production est légèrement positif pour toutes les grandes catégories de produits (par exemple, les oléagineux, les cultures légumières, les cultures permanentes, la viande), la production des secteurs viande étant le plus fortement influencée par la modulation. Les céréales constituent une exception, les modèles indiquent une légère baisse nette dans la production de blé dur qui reçoit encore actuellement des paiements couplés dans certaines zones et bénéficie d'une aide significative de l'Article 69, en particulier en Italie.

La principale raison de cet effet positif est la disponibilité de fonds supplémentaires pour les mesures du Pilier 2, en particulier les mesures d'investissements en capital physique. Alors que les investissements dans les mesures de capital physique et humain de l'Axe 1 peuvent accroitre la production, cependant les investissements des mesures de l'Axe 2 demanderont également le maintien ou l'introduction de pratiques de gestion plus extensives, ce qui inversement pourra contraindre la production.

Compétitivité. Des taux accrus de modulation obligatoire ont un petit impact positif net sur la compétitivité du secteur agricole, bien que mesuré dans le sens étroit de la valeur brute ajoutée dans l'agriculture.

Les résultats des modèles économiques suggèrent que, par comparaison avec le scénario de base, les taux accrus de modulation sous le scénario Bilan de Santé, ont un petit impact net positif sur la valeur ajoutée brute. L'impact sur le bien être ('welfare') est légèrement positif. C'est toujours le cas sans prendre en compte les impacts anticipés des fonds supplémentaires sur la production de biens environnementaux non marchants, ce qui n'est pas possible de quantifier dans cette analyse. D'un autre côté les coûts de transaction ne sont pas pris en compte.

L'impact positif est principalement dû à l'impact des mesures du Pilier 2, en particulier l'impact dynamique des mesures qui augmentent la productivité des facteurs de production, tels que le capital physique et humain principalement dans l'Axe 1. Par exemple, ceux qui permettent d'investir dans les nouvelles technologies et les infrastructures physiques, ainsi que ceux qui mettent l'accent sur l'amélioration du capital humain, contribuant ainsi à la rationalisation des processus de production ou à l'amélioration de la qualité des produits. Pour les secteurs des services et de l'agro-alimentaire les mesures de l'Axe 3 ont aussi un rôle à jouer pour améliorer la compétitivité du secteur agricole, en particulier ceux qui mettent l'accent sur l'encouragement à la diversification, l'amélioration des infrastructures en milieu rural et ceux qui stimulent le tourisme.

Revenu agricole. L'impact de la modulation sur le revenu familial agricole n'est pas clair, les différents modèles économiques donnant des résultats légèrement différents. Ces résultats, cependant, sont à traiter avec une extrême précaution car ils dépendent beaucoup des hypothèses retenues sur les mesures du Pilier 2 qui sont considérées comme ayant un effet sur le revenu. Les conclusions générales masquent des différentes locales et régionales plus significatives, en particulier entre types

d'exploitations : en terme de revenus, certains types d'exploitations ou d'entreprises en bénéficieront probablement et d'autres y perdront.

Acceptant que la plupart des mesures au sein du Pilier 2 n'auront qu'un petit effet sur le revenu, il semble que, étudiant l'impact d'ensemble de la modulation, les principaux types d'exploitation qui y perdront du fait de la modulation seraient les exploitations de cultures arables et permanentes et les producteurs de viande. Ces types d'exploitations ont tendance à être les bénéficiaires de plus hauts niveaux de paiements directs du Pilier 1; et bien qu'ils recevront probablement de l'argent en retour grâce aux mesures de l'Axe 1 et 2, cet argent est dans de nombreux cas lié à des obligations supplémentaires et ne sera probablement pas suffisant pour compenser les pertes des paiements directs.

Ceux qui bénéficieront probablement plus de la modulation sont les exploitations laitières, les producteurs de fruits et de légumes, en raison du plus faible niveau de paiements directs et de la possibilité qui leur est offerte d'accéder aux fonds de l'Axe 1 (et éventuellement de l'Axe 2), ainsi que les exploitations de vaches allaitantes, élevages ovins et caprins en raison de la probabilité d'avoir accès aux fonds du Pilier 2, en particulier aux fonds agro-environnementaux et de bénéficier du soutien en Zones Défavorisées, mais également du soutien de l'Axe 1.

De plus, il se peut qu'il y ait des effets contraires, des exploitations avec des caractéristiques tout à fait compatibles avec les objectifs du Pilier 2 peuvent y perdent sous le régime de la modulation parce qu'elles font l'expérience des réductions du Pilier 1 mais ne peuvent plus avoir accès aux mesures du Pilier 2, parce que par exemple, elles participent à tous les programmes pour lesquels elles sont déjà éligibles. De telles exploitations sont probablement celles qui sont engagées dans des programmes pluriannuels tels qu'en zones défavorisées et comprendront les exploitations qui fournissent des services écologiques significatifs.

Emploi. S'il est probable que certains changements dans l'emploi agricole, les secteurs des services, de l'industrie et de l'énergie résultent de la modulation obligatoire, ces changements sont très mineurs. Dans l'ensemble, sous le scénario Bilan de Santé, l'emploi dans l'industrie agro-alimentaire et les secteurs des services augmente légèrement (0.02%) et décroit dans le secteur agricole primaire, quoique de 0.12% seulement. Pour le secteur agricole, la principale raison de cette diminution vient de la réduction des paiements directs en provenance du Pilier 1. Ceci est alors renforcé par les investissements du Pilier 2 pour le capital physique (principalement de l'Axe 1), dont certains encourageront probablement plus de changements structurels. La modernisation implique que de la main d'oeuvre sera peut-être libérée à court terme mais les agriculteurs restants seront plus compétitifs à long terme. Ceux qui quittent l'agriculture trouvent un emploi dans les autres secteurs grâce aux mesures de l'Axe 3 et une faible croissance du PIB. Par conséquent, la modulation encourage et accompagne le processus de changement structurel.

Les modèles, les indicateurs CCSE et les études de cas suggèrent tous que sous le scénario Bilan de Santé, il est probable que les niveaux d'emploi soient plus élevés qu'en l'absence de modulation, en raison de l'arrivée de fonds supplémentaires des Axes 2 et Axes 3 du Pilier 2. Cependant, ceux-ci ne compensent pas les diminutions observées par les réductions du Pilier 1 et la disponibilité supplémentaire de fonds

pour les mesures de capital physique. Les mesures des Zones Défavorisées et agro-environnementales contribuent à maintenir et à générer des emplois supplémentaires directement dans le secteur agricole ainsi qu'indirectement dans les autres secteurs. Les paiements des Zones Défavorisées par exemple contribuent au revenu agricole et au maintien de l'emploi en zones rurales et les programmes agro-environnementaux peuvent avoir des effets positifs sur l'emploi, en encourageant par exemple l'agriculture biologique, qui généralement est plus intensive en termes d'emplois et en générant le besoin de contractants aux compétences spécialisées et traditionnelles. De plus, les avantages pour l'environnement qui proviennent de ces programmes peuvent entrainer des avantages indirects pour l'emploi résultant de l'augmentation du tourisme et des loisirs. Les mesures de l'Axe 3 relatives à la création d'opportunités pour la diversification, la création d'entreprises, l'amélioration des équipements de services en milieu rural et l'amélioration du potentiel touristique, ainsi que des activités financées par le programme Leader, toutes ont le potentiel d'accroitre l'emploi en zones rurales, en grande partie en dehors du secteur agricole. Tandis que l'impact de ces mesures sur la création d'emploi sera faible, étant donné les ressources limitées allouées à ces mesures, leur impact peut être significatif au niveau local, contribuant à une plus grande diversité et stabilité du marché de l'emploi en zones rurales.

Qualité de la vie. Dans l'ensemble, on s'attend à ce que la qualité de la vie dans les zones rurales bénéficie de niveaux plus élevés de modulation, bien qu'il n'ait pas été possible de quantifier cet impact. Prenant le PIB comme indicateur brut reflétant le bien-être matériel à travers l'Europe, tout accroissement du PIB peut signifier une amélioration potentielle de la qualité de la vie dans la mesure où il est lié à la croissance de l'ensemble de l'économie. Les modèles montrent que, dans le scénario Bilan de Santé, les taux plus élevés de modulation ont un impact positif, bien que très faible, sur la croissance du PIB (de 0.04% pour un taux de modulation à 13%). Ce résultat positif est entièrement dû à la plus grande disponibilité de fonds et aux cofinancements nationaux qui leur sont associés, dans le Pilier 2. L'effet est dû en grande partie aux mesures de l'Axe 3 qui ciblent principalement les investissements hors du secteur agricole, par exemple l'installation de nouvelles entreprises, l'amélioration des services en milieu rural et la promotion du tourisme.

Regardant au-delà du PIB, quand les taux de modulation sont faibles, les réductions du Pilier 1 ne semblent pas avoir un impact sur la qualité de la vie en zones rurales, car on n'observe aucun effet significatif sur la restructuration des exploitations et l'abandon des terres. Cependant, en s'appuyant sur les résultats des études de cas, les augmentations de dépenses du Pilier 2 ont un effet positif sur la qualité de la vie en augmentant les financements disponibles pour les mesures qui encouragent l'innovation, créent des possibilités d'emploi, améliorent l'accessibilité des services pour la population rurale ou offrent des financements pour des activités qui peuvent améliorer l'attractivité économique des zones rurales et donc y encouragent les investissements. Au-delà de l'Axe 3 et de l'approche Leader, ce sont les mesures agro-environnementales et celles en faveur des Zones Défavorisées qui ressortent comme ayant le potentiel d'améliorer la qualité de la vie en zones rurales, grâce à leurs rôles de maintien et d'amélioration de l'attractivité des zones rurale et donc peuvent entrainer une augmentation du tourisme. De plus, les études de cas ont montré l'importance de ces mesures pour garder les gens dans l'agriculture.

Environnement. Dans l'ensemble, les impacts de la modulation sur l'environnement sont positifs pour tous les paramètres environnementaux, dont la biodiversité, la qualité de l'eau, la qualité des sols, le paysage et le changement climatique. Ces impacts positifs résultent de la disponibilité de fonds supplémentaires dans le Pilier 2 et concernent toute une série de mesures dans l'ensemble des quatre Axes. L'importance de ces impacts est cependant difficile à quantifier au-delà du général.

Les réductions des paiements directs du Pilier 1 ne semblent pas avoir eu un impact significatif sur l'environnement. Ceci n'est pas surprenant, étant donné que l'impact sur les producteurs agricoles de la réduction des paiements du Pilier 1 (notamment pour influencer les facteurs de productivité, la structure des exploitations et le revenu) s'est avéré limité. Les modèles montrent qu'il se peut qu'il y ait une faible augmentation de l'abandon des terres agricoles en conséquence de la réduction des paiements du Pilier 1. Cependant, il semble que ceci est plus que compensé par les augmentations de fonds disponibles au sein du Pilier 2, en particulier pour les Zones Défavorisées et les mesures agro-environnementales. Ces impacts pourraient, bien entendu, devenir plus significatifs si les taux de modulation augmentent et si les niveaux de franchise sont modifiés.

Il est cependant probable que la disponibilité de fonds supplémentaires au sein du Pilier 2 ait un impact significatif sur l'environnement dans toute l'Europe des 15, et en particulier en Finlande et au Royaume-Uni (Angleterre) là où des financements complémentaires ont été particulièrement ciblés sur les mesures agro-environnementales. Dans tous les Etats membres, on peut voir que la modulation a un impact positif sur les tendances identifiées dans les indicateurs d'impact du CCSE qui ont trait aux zones de grande valeur pour la nature, l'index des oiseaux des champs, les surplus de nutriments et la production d'énergie renouvelable. En ce qui concerne les indicateurs du CCSE, dans le scénario de base, il est estimé que la modulation permettra à plus de 5 millions d'hectares d'être gérés selon des pratiques qui bénéficieront à la biodiversité, à 3 millions d'hectares d'être gérés pour contribuer à l'amélioration de la qualité de l'eau et des sols et à 1 million d'hectares d'être gérés de manière à contribuer à l'atténuation/adaptation au changement climatique.

Les résultats suggèrent également que la disponibilité de fonds supplémentaires, en particulier les mesures agro-environnementales et celles pour les Zones Défavorisées permette de retenir un peu plus de terres sous gestion agricole que cela ne serait le cas sans la modulation. Les modèles montrent que les terres concernées sont plutôt des prairies que des terres arables. Les indicateurs d'impact CCSE montrent également qu'une surface significative de terres pourrait ne pas être abandonnée lors de la période de programmation 2007-2013. Bien que les proportions de terres concernées indiquées par les modèles sont très faibles (moins de 1% de toutes les terres agricoles) en réalité, cet effet pourrait être beaucoup plus important. Cet impact ne serait certainement pas uniforme dans l'Europe des 15 et dépendra de manière cruciale de facteurs locaux tels que la succession, la propriété, l'éloignement des marchés, etc.

Limites / Enjeux pour la recherche et l'analyse qui requièrent un suivi

Cette étude avait pour objectif d'explorer les impacts de la modulation, grâce à l'utilisation de modèles économiques et d'études de cas nationales. Ce travail a révélé les défis considérables concernant la méthodologie et les données, défis qui sont

inhérents à ce type exercice complexe d'évaluation d'une politique. C'est particulièrement le cas lorsqu'on cherche à préciser et quantifier les impacts des politiques de développement rural du Pilier 2. Puisque ces mesures sont un élément croissant de la PAC, il est recommandé que des investissements supplémentaires soient une priorité, à la fois pour développer les outils d'analyse et collecter les données (à différentes échelles géographiques), aux niveaux des Etats membres et de l'Union Européenne.

La disponibilité de données concrètes de bonne qualité, précises et comparables qui montrent les impacts des mesures du Pilier 2 aux niveaux local, régional et des Etats membres est cruciale pour renseigner les futures évaluations de cette politique. Alors que les indicateurs CCSE sont une étape utile pour faciliter l'analyse des impacts et des estimations fournies par les Etats membres dans leurs Programmes de Développement Rural (?) sur leurs résultats anticipés, les impacts des différentes mesures au sein du Pilier 2, ces données doivent être complétées par des programmes de suivi détaillés au niveau des Etats membres.

A cet égard, une opportunité est offerte par les réseaux de développement rural et d'évaluation récemment créés. Ces réseaux pourraient être utilisés pour évaluer les programmes actuels de suivi et d'évaluation dans les Etas membres. Un travail entre réseaux nationaux permettrait de comparer les bonnes pratiques, améliorer les programmes de suivi pour veiller à ce que les bénéfices apportées par les mesures du Pilier 2 soient évaluées de manière plus précise et que l'information soit largement disséminée à travers tous les Etats membres.

Pour utiliser avec plus de confiance la modélisation comme outil de prédiction des impacts des différents scénarios politiques concernant les mesures du Pilier 2, la démonstration concrète de l'efficacité de ces mesures est cruciale. Par exemple, l'information concernant le taux de retour d'investissements des capitaux physiques et humains, le niveau des effets d'aubaine ('deadweight'), les coûts de transaction et l'impact des mesures environnementales sur les rendements, est nécessaire. Il est également nécessaire d'améliorer les modèles économiques à l'échelle de l'Europe pour les rendre capables de mieux refléter et différencier les impacts locaux, y compris par type d'exploitation, à partir des différentes façons dont ces mesures sont mises en œuvre dans différentes localités. Le travail actuellement entrepris dans le projet EUruralis 3.0 et le projet FP7 'CAPRI-RD' est à cet égard un bon commencement. Un autre grand domaine de recherche concerne la conceptualisation, la modélisation et la monétarisation des biens publics.

Pour interpréter les résultats de cette étude

Les résultats venant de la modélisation et d'autres formes d'analyse ne doivent pas être compris comme représentant les impacts d'un transfert de fonds du Pilier 1 au Pilier 2 de la PAC *per se*. Ils représentent plutôt l'impact potentiel d'un transfert de fonds entre les deux piliers en fonction d'une série d'hypothèses et de critères très spécifiques. L'analyse est basée sur plusieurs hypothèses nécessairement simplifiées sur comment ces critères pourraient changer sous différents scenarios. Si les critères et scenarios ayant un impact important sur les résultats étaient modifiés, les résultats de l'étude changeraient également. Les critères spécifiques utilisés dans cette étude sur la modulation sont précisés dans le Chapitre 1, les scenarios utilisés sont présentés dans le Chapitre 2.

Une autre note d'attention concerne les résultats des modèles économiques. La complexité des mesures du Pilier 2 et les diverses possibilités d'application dans l'Europe des 27 signifient qu'une série d'hypothèses ont dû être faites pour les impacts de mesures spécifiques du Pilier 2 sur les facteurs d'impulsion économique afin de calibrer les modèles. Celles-ci sont basées sur les meilleures informations disponibles dans la littérature, elles suivent la logique d'intervention pour chaque mesure, elles sont néanmoins d'ordre général. Les résultats des modèles sont donc fonction des hypothèses retenues ; les modèles ne peuvent prendre en compte les impacts contrastés que les mesures pourraient avoir dans différents Etats membres. Les résultats de cette étude doivent être étudiés avec ceci à l'esprit.

Malgré ces limites, l'équipe du projet estime que l'étude apporte plusieurs idées importantes et utiles sur la manière dont le secteur agricole, et les zones rurales plus généralement, sont affectés par le transfert de fonds des paiements directs du Pilier 1 vers les mécanismes de soutien plus ciblés du Pilier 2 au travers du mécanisme de la modulation et qu'elle constitue une base utile pour de futures recherches.

1 MODULATION AS POLICY MECHANISM AND THE LOGIC OF INTERVENTION

This chapter introduces modulation as a policy mechanism and sets out the intervention logic for this instrument, as it currently operates, outlining its rationale and purpose. It then further elaborates on the intervention logics of the individual rural development measures, considering both the policy targeting and the underlying economic mechanisms. A discussion on the conceptual basis for the analysis of modulation follows. The chapter ends with a presentation of the general macro-economic framework for the study. This chapter on intervention logic provides the background and basis for the methodological approach to assessing the economic, social and environmental impacts of compulsory modulation as set out in Chapter 2.

Considerations for interpreting the results of the study

The results of modelling and other forms of analysis should not be taken to represent the impacts of shifting funding from Pillar 1 to Pillar 2 of the CAP *per se*, rather they represent the potential impact of a shift in funding between the two Pillars subject to a very specific set of assumptions and criteria, and the analysis is based on a number of necessarily simplified assumptions about how these criteria might change under different scenarios. If these criteria and scenarios have an important impact on the results and if they were to change, then the results of the study would also change. The specific criteria assumed for the operation of modulation are set out in Chapter 1 and the scenarios used in the study are set out in Chapter 2.

A further note of caution should be raised specifically in relation to the results of the economic models. The complexity of Pillar 2 measures and the range of ways in which they can be implemented across the EU-27 means that a series of assumptions have had to be made about the impacts of specific Pillar 2 measures on economic drivers in order to calibrate the models. These are based on the best available evidence derived from the literature, and follow the logic of intervention for each measure, however they are nonetheless generalisations. The outputs of the models, therefore, are clearly to a considerable degree a function of the assumptions that are fed into them and have not been able to take into account the differing impacts that measures might have in different Member States. The conclusions of the study should be read with this in mind.

Despite these caveats, however, the study team feels that the study offers several important and useful insights into the way the agricultural sector, and rural areas more generally are affected by the shift of funding from direct payments under Pillar 1 to a more targeted support mechanism under Pillar 2 through the mechanism of modulation, and provides a useful basis for future research.

1.1 Background of modulation as a policy mechanism

The term 'modulation', was first used in relation to the Common Agricultural Policy (CAP) during the 1992 McSharry Reforms, and related to a proposal to impose a ceiling, or cap, on the amount of subsidy that an individual farmer could receive from the CAP. Member States with higher than average farm sizes (and hence subsidy receipts) lobbied against the proposal on the grounds that this would further distort the agricultural market by hindering rationalisation, and the proposals never became policy.

During the Agenda 2000 CAP reform, the meaning of modulation changed. The term was used to describe a policy mechanism for shifting funding from the part of the CAP budget dedicated to providing income support payments to farmers (Pillar 1) to the newly introduced rural development regulation[2], known as Pillar 2. At the time there was little support for such a mechanism being introduced on a compulsory, EU wide basis, and the final agreement resulted in 'voluntary modulation' being introduced, giving Member States the option to redirect up to a maximum of 20 per cent of Pillar 1 funds[3] to their rural development programme (RDP) budgets. All funds raised were able to be retained within the Member State and had to be match-funded by them. However, these modulated funds were restricted to certain measures: early retirement, agri-environment, Less Favoured Areas and afforestation.

Only three Member States took advantage of this opportunity – France, Germany and the UK – and all took different approaches and implemented modulation in differing ways (see Table 1.1).

The Mid Term Review of the CAP in 2003 initiated a shift away from support for agricultural production along with a greater emphasis on sustainability, the environment and rural development. Amongst a number of fundamental changes to the operation of Pillar 1 funds, an agreement was reached that made modulation a compulsory policy mechanism for all EU-15 Member States to implement, with later obligations for the new Member States.

The legal basis for this, current, form of modulation, was laid down in Article 10 of Council Regulation (EC) No 1782/2003 of 29 September 2003, which specified that all farms within the current EU-15 would be subject to compulsory modulation from 2005 at levels of 3% in 2005, 4% in 2006 and 5% for 2007-2012, and that these resources would be allocated between Member States according to a set of objective criteria to be spent on rural development measures. Compulsory modulation does not apply to the twelve new Member States that acceded to the EU in 2004 and 2007 until their Pillar 1 payments reach the same level as those for the EU-15. This will be 2013 for the EU-10, and in 2016 at earliest for Bulgaria and Romania. Compulsory modulation does not apply to the French overseas departments, Azores and Madeira, or the Canary or Aegean Islands.

[2] Council Regulation 1257/1999 of 17 May 1999 on support for rural development from the European Agricultural Guidance and Guarantee Fund (EAGGF) and amending and repealing certain Regulations.

[3] The legal basis for voluntary modulation was set out under Article 4 of Council Regulation 1259/99

Due to the fact that the compulsory modulation rates were lower than those that were being used by those Member States which were already operating voluntary modulation, these Member States were allowed to continue to apply voluntary modulation, alongside compulsory modulation, to cover the funding of measures being financed through this route until the end of the 2000-2006 programming period. Only the UK took advantage of this option.

On finalising the budget allocations for Pillar 2 for the 2007-13 programming period, it became apparent that certain Member States would face particular difficulties in financing their rural development programmes under Council Regulation 1698/2005, without being able to levy additional funds via voluntary modulation. The ability to continue to apply voluntary modulation in addition to compulsory modulation was agreed in March 2007 and is set out in Council Regulation 378/2007. This regulation, however, restricts the use of voluntary modulation to those Member States where voluntary modulation is already applied according to Commission Regulation (EC) No 1655/2004. As a result, voluntary modulation is currently operated in only two Member States, the UK and Portugal.

Table 1.1 Overview of compulsory and voluntary modulation rates in the EU Member States, 2000-2013

	Member States	**Period**	**Rate**	**Franchise**	**Focus**
Compulsory modulation	EU-15	2005-2013	3% in 2005 4% in 2006 5% in 2007-2013	euro 5,000 per farm	Allocated across measures as part of total EAFRD budget in the majority of Member States. Exceptions are: Finland & UK (England), with focus on Agri-Environment measure
Voluntary modulation	UK	2001-2013	2.5% in 2001-2004 See Table 1.2 for rates in 2005-2013	no franchise	2001-2006: focus on Agri-Environment measure 2007-13 – main focus continues to be agri-environment. Also required to allocate funds to Axis 1 and 3.
	France	2000-2002	3% Progressive element: maximum rate of 25% for holdings with a gross margin above euro150,000	euro 30,000 per farm with a gross margin of over euro50,000	Agri-Environment measure (the PHAE – extensive grassland premium)
	Germany	2003	2%	euro10,000 per farm	New agri-environment options
	Portugal	2008-2013	10%	euro5,000 per farm	Not known

The rates of voluntary modulation that have been set for the UK regions between 2005-2013 are set out in Table 1.2.

Table 1.2 Annual voluntary modulation rates for UK regions, 2005-2013 (%)

Region	2005	2006	2007	2008	2009	2010	2011	2012	2013
England	2	6	12	13	14	14	14	14	14
Wales	1.5	0.5	0	2.5	4.2	5.8	6.5	6.5	6.5
Scotland	3.5	4.5	5	8	8.5	9	9	9	9
N. Ireland	0	4.5	4.5	6	7	8	9	9	9

Source: Defra (2007), Communication to the European Commission by the United Kingdom Government concerning voluntary modulation. Accessed on 17/12/07 at http://www.defra.gov.uk/erdp/pdfs/rdp07_13/vmia.pdf.

In May 2008, as part of the legislative proposals for the CAP Health Check[4,5], the Commission proposed the introduction of an additional basic rate of modulation to be applied to all payments above the euro 5,000 franchise, combined with a progressive element which would be dependent on the size of direct payment received. The proposals suggest an increase of the basic rate by 2% annually from 2009 until it reaches 8% minimum additional modulation in 2012. The progressive element would be applied in 3% bands, as set out in Table 1.3. Under these proposals, New Member States (excluding Bulgaria and Romania) would become eligible for modulation in 2012 at a 3% rate. The current 5% rate of modulation would continue to operate as it does currently. It is proposed that the additional funds raised should be focused on the 'New Challenges' of climate change mitigation, renewable energy, water management and biodiversity through Member States' rural development programmes; also, the additional modulated funds would remain within each MS.

Table 1.3 Additional rates of modulation as set out in the Commission's Health Check Proposals

	2007	2008	2009	2010	2011	2012
DP < 5,000 euro	0 %	0 %	0 %	0 %	0 %	0 %
5,001 euro < DP < 100,000 euro	5 %	5 %	7 %	9 %	11 %	13 %
100,001 euro < DP < 200,000 euro	5 %	5 %	10 %	12 %	14 %	16 %
200,001 euro < DP < 300,000 euro	5 %	5 %	13 %	15 %	17 %	19 %
DP > 300,000 euro	5 %	5 %	16 %	18 %	20 %	22 %

NB: Modulation removes funds from Pillar 1 in one year (X) and transfer funds to Pillar 2 in the following year (X+1).

1.2 General logic of intervention

The rationale underpinning the introduction of compulsory modulation is 'to achieve a better balance between policy tools designed to promote sustainable agriculture and those designed to promote rural development'[6].

The operational objectives of compulsory modulation are therefore to:

- reduce direct payments to a proportion of farmers by a set percentage each year; and
- to add the funds levied to individual Member States' EAFRD allocation, requiring them to be co-financed in the same way as the core EAFRD budget.

4 Council Regulation establishing common rules for direct support schemes for farmers under the common agricultural policy and establishing certain support schemes for farmers, COM (2008) 306/4

5 Council Regulation amending Regulation (EC) No 1698/2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD), COM (2008) 306/4

6 Preamble to Council Regulation (EC) No 1782/2003

Without the application of compulsory modulation, for the EU-27 the proportion of the total CAP budget allocated to Pillar 1 in the 2007-13 programming period is 70%, compared to 30% allocated to Pillar 2. This percentage differs considerably when broken down for the EU-15 and the EU-12. For the EU-15, this proportion is 86:14 and for the EU-12 there is a much more even distribution between the two pillars with 52% of the budget allocated to Pillar 1 and 48% allocated to Pillar 2. By requiring EU-15 Member States to apply modulation, and by requiring the funds generated to be co-financed, this redresses the balance somewhat in favour of Pillar 2.

At the implementation level, the specific objectives of compulsory modulation are to:

- ensure that farms in receipt of low levels of direct payments are not disadvantaged;
- ensure there is a balanced distribution of resources between Member States; and
- to support increased rural development activity through redistributing the funds through Member States' Rural Development Programmes.

By reducing direct payments, there is a risk that this may disproportionately impact upon the income of small farms, thereby threatening their continued viability. Therefore, a 'franchise' limit of euro 5,000 of direct payments was put in place, below which payments are exempt from modulation.

In order to allow for some redistribution of these modulated funds across the EU-15 to areas where the rural development funds are deemed to be most needed, modulation receipts between Member States are calculated on the basis of three criteria: agricultural area, agricultural employment, and per capita Gross Domestic Product (GDP).

This key is intended to reflect the importance of agriculture within rural areas and to allow for some redistribution from intensive cereal and livestock producing countries to poorer and more extensive/mountainous countries, in order to achieve positive environmental and cohesion effects[7]. However, in order to ensure that Member States do not lose too significant a proportion of the funds levied from the reductions of their farmers' Pillar 1 payments, each Member State is guaranteed to receive back at least 80 per cent of these funds.

It is intended that the receipts from compulsory modulation are used by Member States to increase the amount of support available under their Rural Development Programmes. Unlike with voluntary modulation under Council Regulation 1259/1999, there are no restrictions on which measures the funds can be used to support. Not only are the modulated funds added to the core EAFRD allocation, but they must also be co-financed by the Member State at the rates set out in Article 70 of Council Regulation 1698/2005[8].

[7] Commission of the European Communities (2002), Mid-Term Review of the Common Agricultural Policy, Brussels, COM (2002) 394 final,

[8] For Axes 1 and 3, the maximum EAFRD contribution is 50% (or 75% in Convergence Regions) and for Axes 2 and 4 it is 55% (80% in Convergence Regions). The minimum EAFRD contribution rate is 20% for all axes.

The main objectives of the EAFRD[9] are:

- to improve the competitiveness of agriculture and forestry;
- to improve the environment and countryside by supporting land management;
- to improve the quality of life in rural areas and encourage diversification; and
- to build local capacity for employment and diversification.

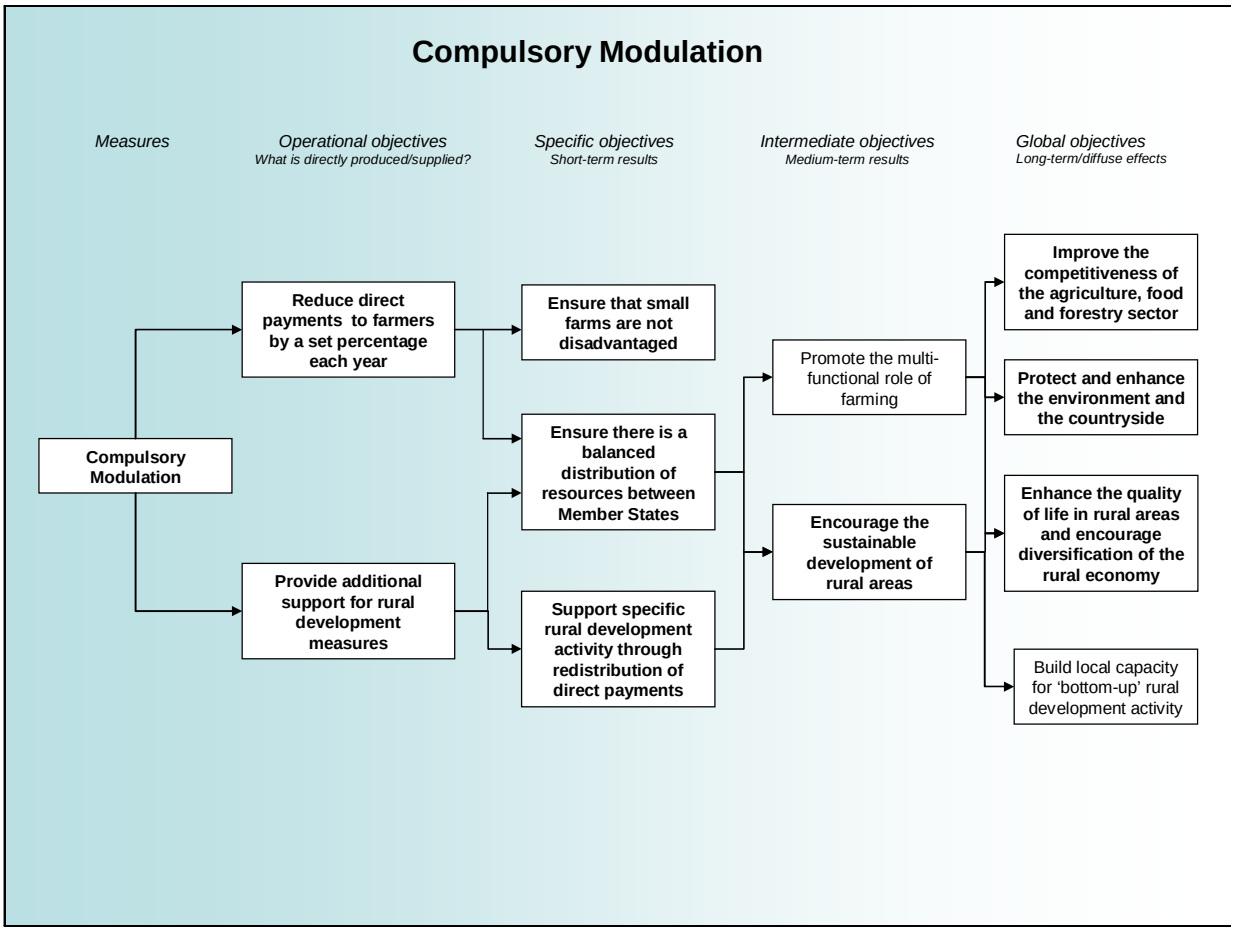
These objectives are reinforced by the 'Community Strategic Guidelines for Rural Development (programming period 2007 to 2013)' which seek to ensure that the rural development programmes developed by each Member State are closely aligned with overarching Community priorities. These priorities primarily relate to the Göteborg sustainability goals laid down in the EU Strategy for Sustainable Development and the objectives of the Lisbon strategy for growth and jobs. The Strategic Guidelines also seek to ensure that rural development is consistent with other EU policies, in particular cohesion and the environment, and provides a suitable fit with the reformed CAP.

As a general, overarching objective, therefore, compulsory modulation embodies a commitment to start to shift the spending of public resources on support for agricultural production towards supporting the 'multifunctionality' of European farming and sustainable rural development.

This intervention logic is set out in Figure 1.1.

[9] Council Regulation 1698/2005

Figure 1.1 Intervention Logic for Compulsory Modulation



From the schematic presentation of intervention logic for compulsory modulation, it becomes clear that several factors have to be considered in order to effectively assess its impacts. These include understanding the effects of reducing Pillar 1 direct payments and the effects of the availability of additional funding for Pillar 2 measures, not just on the agricultural sector, but also on the wider rural economy and the environment. To do this, an understanding of the different nature of Pillar 1 and Pillar 2 payments is necessary.

Pillar 1 direct payments, as set out within Council Regulation 1782/2003, are an income support payment aimed at ensuring a fair standard of living and stability of farm incomes. These payments have been progressively decoupled from production; however, Member States are still able to choose to pay a proportion of payments on a coupled basis for some sectors. In 2007, 18% of payments remained coupled and this is set to decrease to 10% by 2013. The level of direct payments is calculated, based on the amounts received during a historic reference period of 2000-2002. The basis for distributing these payments varies between Member States, but can be divided into three models:

- the historic model – based on payments received and the number of hectares farmed for individual holdings during the reference period;
- the regional model – where reference amounts are averaged across a region to provide a flat rate payment per hectare; and

- the hybrid model – where payments are calculated using a part historic and part regional flat rate approach.

Pillar 2 on the other hand, embodies a more targeted and programmed approach. The EAFRD has a clear set of objectives, beneath which sit a suite of more detailed measures, focused on achieving specific outcomes, with detailed criteria for their use. Based on the principle of subsidiarity, Member States are given the flexibility to use the measures, within the context of the overarching objectives, to meet the needs of their national or regional circumstances. Measures are grouped into Axes according to their overarching objectives which focus upon improving the competitiveness of the agricultural and forestry sectors (Axis 1), improving the environment and the countryside (Axis 2), improving the quality of life in rural areas (Axis 3), and the LEADER approach, enabling bottom up community initiatives (Axis 4). In order to ensure that all objectives are met, there is a requirement for a minimum proportion of the EAFRD budget to be allocated to each measure (10% for Axes 1 and 3; 25% for Axis 2; and 5% on Axis 4: the LEADER programme). Other key characteristics of the Pillar 2 programming approach are the requirement for European funds to be co-financed by the Member States, and for some measures to require a proportion of private funding. Detailed reporting and evaluation procedures are also required, and processes are set in place so that this information can then inform revisions to programme content, scheme design or implementation processes to improve the added value achieved through this form of public intervention.

Given the range of objectives of Pillar 2, and therefore the great variety of outputs and impacts that can be expected from the implementation of these measures, it is helpful to consider in more detail the intervention logics for individual measures, in order to inform the methodological framework and subsequent impacts of compulsory modulation.

1.3 Intervention logics for the Pillar 2 measures

To assess the effects of modulation in the second pillar arising from greater expenditure across a range of measures, it is necessary to develop the intervention logic, measure by measure. This demonstrates the intended causality from putting a measure in place, via stimulating changes at farm and individual business level, to achieving final outcomes on, for example farm structures, employment, quality of life and the environment. The intervention logic can be understood both in terms of economic mechanisms – the relationship between RD measures and explicit economic drivers – and in terms of non-market benefits.

The intervention logic for EAFRD as a whole is complex as measures have different types of relations with economic drivers and each driver has a specific impact. In addition, one of the key aims of many of these measures is to intervene in the provision of environmental and social benefits that are not provided by the market, and these also need to be reflected. Although measures can be grouped in relation to their broad overarching objectives, to understand the detailed objectives and intended outcomes of individual measures, the intervention logic for each measure needs to be examined separately. Therefore, we distinguish four steps in determining the intervention logic for each RD measure. Firstly, we set out the global, intermediate, specific and operational objectives for each measure, derived from Council Regulation 1698/2005 and supporting policy documents (for example the Community Strategic Guidelines and individual measure fiches linked to the Common Monitoring

and Evaluation Framework). In the second step, we examine the causality between individual RD measures and economic drivers, such as factor productivity, income payments, and human capital. We sub-divide these drivers with regard to the main production factors of land, labour, capital, as well as an overall factor index. These two steps are expressed in Table 1.6. In the third step we examine the impact of the economic drivers on key indicators used in the study as proxies for assessing the impacts of modulation on the study themes, as found in Table 1.7. Fourthly, going beyond the economic drivers, we consider the relationship between each RD measure and the provision of environmental and social non-market benefits.

Table 1.8 sets out the non-market environmental and social benefits that each measure within the EAFRD has the potential to deliver. For some measures, these non-market benefits are the primary rationale for the existence of the measure and therefore of the intervention logic underlying it. For example, the intervention logic for all Axis 2 measures, with the exception of the animal welfare measure, is to improve the environment and the countryside and to support the sustainable use of agricultural land, thereby leading to the maintenance or enhancement of biodiversity, landscape, water quality, soil quality and helping contribute to climate change adaptation and mitigation.

For other measures, while the environmental or social non-market benefits are not the primary rationale for the introduction of the measure, improving the sustainability of agriculture or enhancing natural capital are still included within their objectives, and intervention under such measures can still achieve significant environmental and social benefits. Examples of such measures in relation to the environment are the farm modernisation measure and the advisory measures under Axis 1, which are focused on improving the competitiveness of the farming and forestry sectors, but in doing so can improve the quality of the environment, for example by providing support for investments to modernise livestock housing, improve silage storage, improve equipment for the spreading of animal wastes and renewable energy infrastructure, with potential benefits for water quality and reductions in greenhouse gas emissions.

There is another subset of measures where the potential non-market benefits are more of an indirect nature, where possible environmental and/or social benefits are derived indirectly from the implementation of the measure. For example, measures focused on the development of new products or food quality schemes under Axis 1 or those targeted at diversification, setting up new businesses or promoting tourism under Axis 3. In these cases non-market benefits are only likely to arise where these are required to underpin the activity itself, or are a by-product of the activity undertaken.

The four steps together, brought together in Table 1.6, Table 1.7 and Table 1.8, provide the causality between RD measures and expected outcomes. For the purposes of this study, we have identified indicators in the field of competitiveness, farm structure, farm income and employment in Table 1.7, and the environment and quality of life as found in Table 1.8. The chain of analysis can be demonstrated by looking at two specific examples, relating to the vocational training measures under Axis 1 (Table 1.4) and the agri-environment measure within Axis 2 (Table 1.5).

Taking the vocational training measure (111) first, Table 1.4 sets out the objectives for this measure.

Table 1.4 Objectives for measure 111 for vocational training and information actions

Objective level	**Level of impact**	111 Vocational training and information actions
Operational Objectives	Beneficiary	To ensure an appropriate level of technical and economic training is available, beyond those already available as part of normal agricultural and forestry education programmes, for all those involved in agricultural, food and forestry activities. To include training to develop expertise in new information technologies; and awareness in the fields of: product quality, results of research sustainable management of natural resources
Specific Objectives	MS/Region	To improve the level of technical and economic expertise of those involved in agricultural, food and forestry activities
Intermediate Objectives		To enhance and adapt human potential
General/ Global Objectives	EU	To improve the competitiveness of the agriculture and forestry sectors To enhance the environment and the countryside

Source: 1) Rural Development policy 2007-2013 Common monitoring and evaluation framework (CMEF) – Guidance note E – Measure Fiches; 2) Council Regulation (EC) No 1698/2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD), 20 September 2005; 3) Council Decision 2006/144/EC on Community Strategic Guidelines for rural development programming period 2007-2013; 4) SEC (2005) 914 Annex to the Proposal for a Council Decision on Community Strategic Guidelines for Rural Development: Update to Impact Assessment Report SEC (2004) 931, Commission Staff Working Document

From Table 1.4, we can see that this measure aims to develop new skills for all people involved in agriculture and forestry. Table 1.6 then, links these objectives to economic drivers, demonstrating that higher levels of education are likely to directly increase labour productivity (++ = main correspondence between a measure and an economic driver), but also that it is likely to improve their skills to use the land and capital in a more efficient way. The training also leads to a higher stock of human capital in the economy. Table 1.7 illustrates the third step, linking the economic drivers to specific indicators. This suggests that an increase in labour productivity is likely to lead to an increase, for example, in GVA and output, but has a negative impact on employment in the short term. The latter is caused by the assumption that in agriculture the direct labour saving effect due to technological change is larger than the increased expansion effect due to more production, due to a lower price as costs have been reduced (inelastic demand); the long term effect is, however, to strengthen the resiliency of the remaining on-farm employment. The overall effect of measure 111 on employment is therefore not clear and depends on, *inter alia*, the elasticity of demand. The impact on output and farm income should be positive as all economic drivers work in the same direction. Although not captured within this table, it is clear from the objectives of this measure that it is also likely to provide benefits for the environment through, specifically, the improved management of natural resources, which is shown in Table 1.8

Taking the agri-environment measure (measure 214), as another example, the focus of this measure is the provision of payments to farmers for introducing or continuing agricultural production methods compatible with the protection or improvement of the environment or the landscape. The objectives for this measure are set out in Table 1.5.

Table 1.5 Objectives for the agri-environment measure (214)

Objective level	**Level of impact**	214 Agri-environment payments
Operational Objectives	Beneficiary	To encourage farmers and other land managers to introduce or maintain production methods compatible with the protection of the environment, the landscape and its features, natural resources, the soil and genetic diversity that go beyond mandatory standards To require beneficiaries to adhere to cross-compliance requirements
Specific Objectives	MS/Region	To support the sustainable development of rural areas To respond to society's increasing demand for environmental services
Intermediate Objectives		To support the sustainable use of agricultural land
General/Global Objectives	EU	To improve the environment and the countryside

Source: 1) Rural Development policy 2007-2013 Common monitoring and evaluation framework (CMEF) – Guidance note E – Measure Fiches; 2) Council Regulation (EC) No 1698/2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD), 20 September 2005; 3) Council Decision 2006/144/EC on Community Strategic Guidelines for rural development programming period 2007-2013; 4) SEC (2005) 914 Annex to the Proposal for a Council Decision on Community Strategic Guidelines for Rural Development: Update to Impact Assessment Report SEC (2004) 931, Commission Staff Working Document

These objectives may lead to lower yields due to extensification of farming practices, including fertiliser reduction and reductions in stocking densities, for example. Table 1.6 links these likely outcomes to the key economic drivers. This indicates that the implementation of the agri-environment measures may decrease labour productivity as more labour may be required to undertake the actions required, for example, more traditional forms of management such as hedgerow management or maintenance of other landscape features (stone walls, terraces etc) in good condition. Agri-environment payments are calculated mainly on the basis of compensation for income forgone due to the activities prescribed under the scheme. However, there is likely to be an element of deadweight associated with expenditure under the agri-environment measure, as some farmers may have continued with same management practices without the payments. In this case, these payments can be seen as contributing to the income of the farm. In the second step (Table 1.7), the lower productivity aspect has a neutral to negative impact on production, whereas the income payment aspect has a positive impact. Although not captured within economic related tables, as is clear from the objectives of the measure, and demonstrated in Table 1.8 the agri-environment measure is intended to have a significant positive impact on the environment, in relation to biodiversity, landscape, water quality, soil quality, and increasingly climate change.

These types of links between the objectives of the measures and the anticipated outcomes have been determined for all 40 measures within the EAFRD. They are sued to inform the development of hypotheses and assumptions relating to the impact of modulation on individual study themes as well as the assumptions for the Pillar 2 elements of the modelling in relation to LEITAP, CAPRI and FES. These are described in detail in Annex 1.

Table 1.6 Rural Development measures and corresponding economic drivers

	Economic drivers											
	Productivity				Factor payment				Supporting			
	Total factor	Labour	Capital	Land in agri-culture	General	Labour	Capital	Land	Product quality	Human capital	Fixed assets	Land available for agri-culture
Axis 1												
111 Vocational training and information actions	+	++	+	+		+			+	+		
112 Setting up of young farmers	++	+	+	+		+				+		
113 Early retirement of farmers and farm workers	+	++	+	+						-		
114 Use of advisory services by farmers and forest holders	++	+	+	+		+			+	+		
115 Setting up of farm management, farm relief and farm advisory services, as well as of forestry advisory services	++	+	+	+	+					+		
121 Farm modernisation	+		+				+				++	
122 Improvement of the economic value of forests	+	+	++	+					+			
123 Adding value to agriculture and forestry products	++	+	+		+				+			
124 Cooperation for development of new products, processes and technologies in the agriculture and food sector and in the forestry sector	++				+					+		
125 Improving and developing infrastructure related to the development and adaptation of agriculture and forestry	++		+									
126 Restoring agricultural production potential damaged by natural disasters and introducing appropriate prevention actions	++		+	+							+	+
131 Helping farmers to adapt to demanding standards based on Community legislation					++							
132 Supporting farmers who participate in food quality schemes					+				++			
133 Supporting producer groups for information and promotion activities for products under food quality schemes					+				++			
141 Supporting semi-subsistence agricultural holdings undergoing restructuring	+	+			+	++		+				
142 Supporting setting up of producer groups	+	+			++	+			+	+		
Axis 2												
211 Natural handicap payments to farmers in mountain areas				0 / -/+				++				+
212 Payments to farmers in areas with handicaps, other than mountain areas				0 / -/+				++				+
213 Natura 2000 payments and payments linked to WFD								++				+

214 Agri-environment payments		0/-		0/-		+		++				+
215 Animal welfare payments			-				++					
216 Support for non productive investments				0/-			++					
221 First afforestation of agricultural land				0/+				+				-
222 First establishment of agro-forestry systems on agricultural land				0/+				+				-
223 First afforestation of non-agricultural land								+				
224 Natura 2000 payment				-/0				++				
225 Forest environment payments				-/0				++				
226 Restoring forestry potential and introducing prevention actions	++			+								
227 Support for non-productive investments							++					
Axis 3												
311 Diversification into non-agricultural activities							+			++	+	
312 Support for business creation and development							+			++	+	
313 Encouragement of tourism activities							+			++	+	
321 Basic services for the economy and rural population							+			++	+	
322 Village renewal and development	++									+		
323 Conservation and upgrading of the rural heritage					++					+		
331 A training and information measure for economic actors operating in the fields covered by Axis 3	+	++								+		
341 A skills acquisition and animation measure with a view to preparing and implementing a local development strategy	+	++								+		
Axis 4												
41 Implementing local development strategies	++									+		
421 Implementing cooperation projects	++									+		
431 Running the local action group, acquiring skills and animating the territory	++									+		

Legend: *'++' = principal correspondence between a Rural Development measure and an economic driver; '+', '0' and '-' are additional relative weightings.*

Table 1.7 Economic drivers in relation to thematic indicators

	Indicators						
	Competitiveness		Farm structure		Farm income	Employment	
	GVA	Gross Output	No. of Farms	Avg. size* of farms	Farm income	Agri. labour force	Total employment
Total factor productivity	+	+	-	+	+	?	?
Labour productivity	+	+	-	+	+	-	?
Capital productivity	+	+	-	+	+	?	?
Land productivity in agriculture	+	+	-	+	+	?	?
Income payment, general	± /2	+ /1	+ /1	- /1	+	+ /1	?
Income payment, labour	± /2	+ /1	+ /1	- /1	+	+ /1	?
Income payment, capital	± /2	+ /1	+ /1	- /1	+	- /3	?
Income payment, land	± /2	+ /1	+ /1	- /1	+	- /3	?
Product quality	+	+	?	+	+	+	+
Human capital	+	+	?	+	+	-	?
Fixed assets	+	+	?	+	+	?	?
Land available for agriculture	+	+	+	+	+	?	?

General comments/remarks:
For this list of economic drivers the assumption is that they are increasing - apart from the last one (shift in preferences) which is not directional.
Based on the assumption of inelastic demand for agricultural products.
/1: depends on the objective of each measure and how it has been implemented
/2: if increased output has a negative price effect GVA might remain constant or even decline
/3:: if substitution effect is larger than expansion effect, which is often the case in agriculture as demand is inelastic 'size' in ESU*
Indicators criteria: 1) reflect goals, 2) quantifiable, 3) correspond to our models, 4) independent of one another

Table 1.8 Rural Development measures and their relationship to non-market indicators

	Bio-diversity	Water Quality	Soil Quality	Landscape	Climate Change	Quality Of Life and Rural Vitality
Axis 1						
111 Vocational training and information actions	+	+	+	+	+	+
112 Setting up of young farmers						+
113 Early retirement of farmers and farm workers						
114 Use of advisory services by farmers and forest holders	+	+	+	+	+	+
115 Setting up of farm management, farm relief and farm advisory services, as well as of forestry advisory services	+	+	+	+	+	+
121 Farm modernisation		+	+		+	+
122 Improvement of the economic value of forests	+	+	+	+	+	Indirect
123 Adding value to agriculture and forestry products	+	Potential indirect effect		+		+
124 Cooperation for development of new products, processes and technologies in the agriculture and food sector and in the forestry sector	Potential Indirect effect					Indirect
125 Improving and developing infrastructure related to the development and adaptation of agriculture and forestry	Very variable					+
126 Restoring agricultural production potential damaged by natural disasters and introducing appropriate prevention actions	Very variable					+
131 Helping farmers to adapt to demanding standards based on Community legislation		+	+		+	Indirect
132 Supporting farmers who participate in food quality schemes	Potential indirect effect					+
133 Supporting producer groups for information and promotion activities for products under food quality schemes	Potential indirect effect					+
141 Supporting semi-subsistence agricultural holdings undergoing restructuring	Potential indirect effect					+
142 Supporting setting up of producer groups	Potential indirect effect					+
Axis 2						
211 Natural handicap payments to farmers in mountain areas	+	+	+	+	+	+
212 Payments to farmers in areas with handicaps, other than mountain areas	+	+	+	+	+	+
213 Natura 2000 payments and payments linked to WFD	+	+	+	+	+	Indirect
214 Agri-environment payments	+	+	+	+	+	+
215 Animal welfare payments						
216 Support for non productive investments	+	+	+	+	+	+
221 First afforestation of agricultural land	+	+	+	+	+	Indirect
222 First establishment of agro-forestry systems on agricultural land	+	+	+	+	+	Indirect
223 First afforestation of non-agricultural land	+	+	+	+	+	Indirect
224 Natura 2000 payment	+	+	+	+	+	Indirect
225 Forest environment payments	+	+	+	+	+	+

226 Restoring forestry potential and introducing prevention actions	+	+	+	+	+	Indirect
227 Support for non-productive investments	+	+	+	+	+	+
Axis 3						
311 Diversification into non-agricultural activities	Potential indirect effect				+	+
312 Support for business creation and development	Potential indirect effect				+	+
313 Encouragement of tourism activities	Potential indirect effect					+
321 Basic services for the economy and rural population	Potential indirect effect					+
322 Village renewal and development	Potential indirect effect					+
323 Conservation and upgrading of the rural heritage	Potential indirect effect			+	Potential indirect effect	+
331 A training and information measure for economic actors operating in the fields covered by Axis 3	Potential indirect effect					+
341 A skills acquisition and animation measure with a view to preparing and implementing a local development strategy	Potential indirect effect					+
Axis 4						
41 Implementing local development strategies	Potential impact but very variable					+
421 Implementing cooperation projects						+
431 Running the local action group, acquiring skills and animating the territory						+

*Key: + - where measure has the **potential** to result in a non-market benefit. Whether these outcomes are achieved in practice will depend on the priorities attached to each measure within individual Rural Development Programmes, and the design and implementation of schemes in practice.*
Sources: Rural Development policy 2007-2013 Common monitoring and evaluation framework (CMEF) – Guidance note E – Measure Fiches - accessible at: http://ec.europa.eu/agriculture/rurdev/eval/guidance/note_e_en.pdf
Council Regulation (EC) No 1698/2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD), 20 September 2005
Council Decision 2006/144/EC on Community Strategic Guidelines for rural development programming period 2007-2013
SEC (2005) 914 Annex to the Proposal for a Council Decision on Community Strategic Guidelines for Rural Development: Update to Impact Assessment Report SEC (2004) 931, Commission Staff Working Document

1.4 Conceptual basis for the analysis of modulation

1.4.1 One region, fixed prices

Modulation implies transfer of funds from the first to the second pillar of the CAP. The present study intends to analyse the impact of such a transfer on agricultural production, income and on derived environmental indicators. Before plunging into a numerical analysis, it seems appropriate to approach the issue from a more abstract point of view, in order to identify critical points for the subsequent numerical analysis and to derive the principle directions of the expected impacts.

To keep the exposition simple, we start by assuming a highly simplified model of agriculture, where a single, profit maximising firm produces a single good by allocating land to the three agricultural activities “intensive agriculture”, “extensive agriculture” and “abandonment” with constant yields. Assume, furthermore, that the first pillar consists of a single payment of r euro per hectare that the firm receives for

intensive or extensive production alike, but not for "abandoned land". The second pillar consists of a payment *s* per hectare where the amount is higher for extensive agriculture than for intensive, but zero for land. The reform that is considered is to decrease *r* and increase *s*, and the question is what the effect will be on total production, land use and intensity. The payment *r* represents the single farm (or area) payment. The payment *s* is an abstract second pillar measure, where the payment is linked to the production of some common good, which is in turn assumed to be more strongly linked to the extensive than to the intensive production.

Building on the general logic of intervention as described in Section 1.2, modulation is viewed as consisting of two steps, where we first decrease *r* and then increase *s*. The immediate effect of reducing *r* is that (1) production, both intensive and extensive, decreases, and that (2) there is a shift toward intensive production.

One explanation for the two effects would be the following: (1) If the uniform subsidy *r* is decreased, land abandonment becomes relatively more attractive. (2) With the lower *r*, the firm depends more on market revenues and this affects the intensive production less than the extensive production. (1) is particularly interesting. It depends on the assumption that "abandoned land" is not eligible for support. IF *all* abandoned land were made eligible, and there were no other way for land to leave agriculture but by abandonment, reducing *r* would have *no effect* on production except for reducing land rents (this simple model contains no wealth or risk effects).

Next consider an increase of *s*. Increasing *s* favours production in general and extensive production in particular, counteracting the effect of decreasing *r*; it (1) reduces land abandonment, and (2) induces a shift towards extensive production (since by assumption support is higher for extensive production). Due to increased competition for shared resources, intensive production may be pushed back even though it receives some subsidy. Table 1.9 summarises the conclusions so far, and also shows the expected net effect of both steps (*a-priori* unknown).

Table 1.9 *A priori* effects of modulation

Effect – cause	Decreasing *r*	Increasing *s*	Net effect *r* + *s*
x_3: Land abandonment	↑	↓	?
x_1: Intensive production	↓	?	?
x_2: Extensive production	↓	↑	?
x_1/x_2: Intensity	↑	↓	?
$x_1 + x_2$: Total production	↓	?	?

1.4.2 Two regions, market feedback

Up to this point, only a single small (= price taking) producer was considered. In reality, modulation will be applied to the whole EU, and thus market feedback to changing quantities should also be considered. To exemplify this the world is assumed to consist of only two regions, each with a single producer defined as in the previous subsection. The good is perfectly homogeneous, and there is free trade and no trade costs. Demand is assumed to be such that if the price drops, demand increases, and vice versa. Each producer still operates as if the price were fixed.

Again, we consider modulation in two steps, where first *r* is decreased in both regions and then *s* is increased, potentially with different amounts in the regions. As before, decreasing *r* would lead to decreased production. However, with the market in place,

the decreased production would result in higher prices. Higher prices would favour both extensive and intensive production, but since the yield in the intensive technology is higher, revenues in intensive production would be less negatively affected by the reduced *r* and more positively affected by the rising price than would the extensive production. Market feedback would thus likely increase the tendency towards intensification resulting from decreased *r*.

One conclusion of the preceding analysis was that increasing *s* leads to an extensification of production, but that the direction of change of total production is ambiguous, because we cannot determine the effect on intensive production. This conclusion still holds. Even if we would consider the extreme case, where only extensive production is supported, no more definite conclusions are possible: Albeit one may safely conclude that *redirecting a fixed budget* from *r* to *s* would decrease total production (because *s requires* using a less productive technology), the national co-financing may be sufficiently large to compensate for the lower productivity of the extensive technology. If we for example consider a region where in the initial situation much land is fallow (not receiving any *r*-support), a significant increase in s_2 may cause extensive agriculture to increase by so much that some fallow land is taken into production and total production increases. Nevertheless, given that many second pillar measures (e.g. human capital investments) are directed toward activities not directly linked with production, the opposite, i.e. a production decrease compared with the initial situation, seems likely.

An interesting special case arises when only one of the two regions receives *s*-support (but both reduce *r*-support), and we assume that total production in the region receiving *s*-support decreases as a result of an extensification (as does production in the region that only loses *r*-support), then the market feedback will cause prices to rise *in both regions* and thus lead to intensification. The higher prices will, as previously argued, favour intensive production, thus reinforcing the tendency caused by the reduction of *r*, and we end up with a situation where one region is extensive and one is intensive.

Another interesting conclusion follows from the above assumed model together with Le Chatelier's principle, which (as applied in economics) roughly states that introducing a new constraint to a maximization problem decreases the value of the objective function. Applied to modulation, it means that since the producer is required to change his production pattern that he would not have chosen with decoupled payments, and the total compensation remains unchanged, his profit must be smaller; otherwise he would have chosen that production voluntarily at the outset.

In a situation where there are no external effects of agriculture, the shift from *r* to *s* would imply a loss of efficiency (and thus of welfare). However, since the *s*-support is intended as a compensation for the production of some common good, which would not be produced in sufficiently large amounts under pure *r*-support, the net effect under consideration of externalities should be a gain, given that the support level *s* is set appropriately. Valuation of external effects is beyond the scope of this text. Nevertheless, it is important to keep the existence of such effects in mind when evaluating the classical no-externalities welfare impacts of the reform; the potential loss in economic efficiency without regard to externalities is also the price to pay for the gained external benefits. Last but not least, part of the second pillar support is

directed towards human and physical capital investments, which is likely to boost productivity, thus offsetting the efficiency loss described above. This is not accounted for in the schematic analysis above, but turns out to be of crucial importance in the empirical application reported below.

The simple model discussed so far shows that the qualitative effects of modulation a-priori are ambiguous. Further progress in the analysis requires a numerical analysis based on empirical facts. In the absence of this empirical evidence, the modelling can go ahead as an *ex ante* analysis with clear assumptions based on the economic mechanisms of modulation. The actual implementation of modulation in the model framework is presented in Annex 1.

1.4.3 General macro-economic framework for the modulation study

The impacts of compulsory modulation on the study themes need to be set within the context of broader macro-economic drivers and trends (Table 1.10). A number of assumptions are made, therefore, with respect to variables which are exogenous to this analysis. Many of these are non-agricultural policy drivers, and assumptions are based on the Scenar 2020 project[10], but updated where necessary. Table 1.11 provides an overview of these assumptions. Figure 1.2 displays growth rates of population, GDP, and per capita GDP until 2013. These assumptions are factored into the models, and therefore all modelling results in relation to the impact of modulation, have already accounted for these underlying trends. Analysis relating to the results from other data sources, however, needs to take account of these trends.

Table 1.10 Exogenous drivers in the general framework, 2007-2013

Drivers	**Source of Assumptions**
Demographics	Main population trends as observed in the past
Macroeconomic growth	Moderate growth as seen in the trends
Consumer preferences	More demand for higher value added food products and increasing absolute spending for food production per capita
Agri-technology	Continuous trends in cost saving technological developments
World markets	Trends in agri-markets based on OECD/FAO World Agriculture Outlook 2008-2017.[11] Change from these trends due to different assumptions on exogenous and policy-related drivers, especially the demand for biofuels.
EU enlargement	No further EU enlargement until 2013 (i.e. EU = EU-27)

Growth of the world population will fall from 1.4% p.a. in the 1990-2003 period to about 1% p.a. in the coming ten years, which is due to declining birth rates. Almost all population growth will occur in low and middle income countries, whose population growth rates are much higher than those in high income countries. Due to low population growth in the EU (+0.3% p.a. for the EU-15 and -0.2% p.a. for the EU-10), the EU share in world population is expected to decline further.

With regard to economic growth, a moderate growth is expected over the coming period in almost all regions of the world in the general framework. Economic growth will be considerably higher for most of the transition and developing countries than for industrialised countries, e.g. the EU-15 and the United States. GDP in the EU is

[10] ec.europa.eu/agriculture/publi/reports/scenar2020/index_en.htm

[11] OECD-FAO (2008), Agricultural Outlook 2008-2017, OECD and FAO, Paris, France.

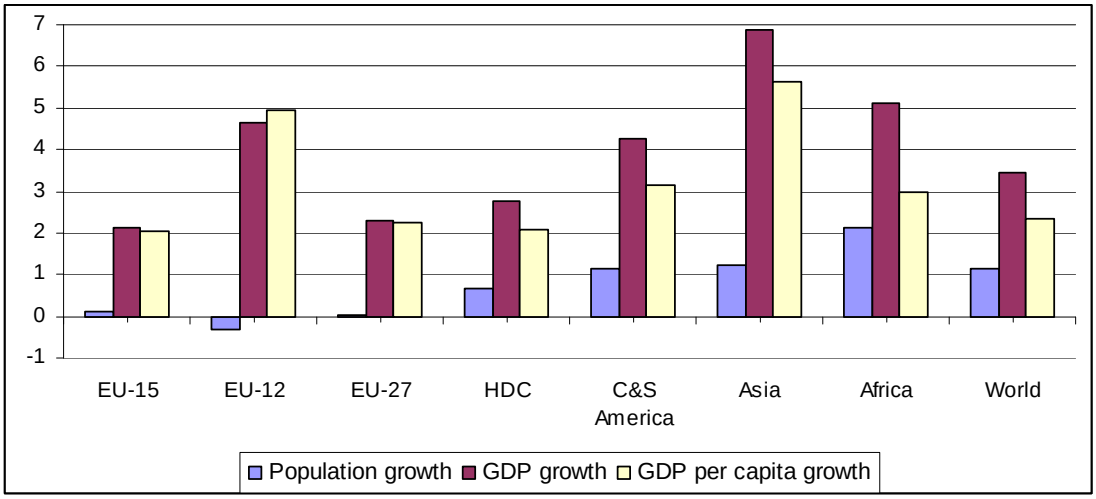
expected to increase over the coming years by 2% p.a. for the EU-15 and, due to economic transition, 3.8% p.a. for the EU-10.

Furthermore, a number of additional assumptions are made for the general framework with respect to the development of the CAP. They also reflect the assumptions of the Scenar 2020 study with some differences as a result of the more recent changing economic situation, for example in relation to commodity prices. These assumptions are depicted in Table 1.11.

Table 1.11 Assumptions for the baseline scenario in the general framework, 2007

Topic	Assumption
Market Policies	
Intervention	Continuation of current system of intervention prices Exclusion of maize from intervention in 2009 Adjustment of intervention prices to balance markets where necessary in order to comply with WTO restrictions on export subsidies Intervention price for butter decreases by 15% from 2012 onwards
Regulations for quota products (milk, sugar)	Reform of the sugar CMO Milk quota continues at 2007 level.
Biofuel policies	Biofuel policies such as mandatory blending implemented (2010, 5.75%; 2020, 10%)
Trade Policies	
Tariffs, export subsidies and TRQs	Continuation of current trade policies without an implementation of a potential WTO agreement
Direct Payments	
Development of direct payments	SAPS and SFP per ha payments constant in nominal terms (deflated by EU inflation rate)
Modulation rate in EU-15	5%
Distribution of funds from modulation in EU-15	80% within the MS within which the funds are generated (90% for Germany) 20% reallocation among MS
Decoupling of direct payments	MTR 2003
Application of the Single Farm Payment in EU-10	Prolongation of the SAPS system until 2013
Obligatory set aside rates	Mandatory set-aside rate at 0%

Figure 1.2 Population, GDP and GDP per Capita, Annual Growth Rates (%, 2007-2013)

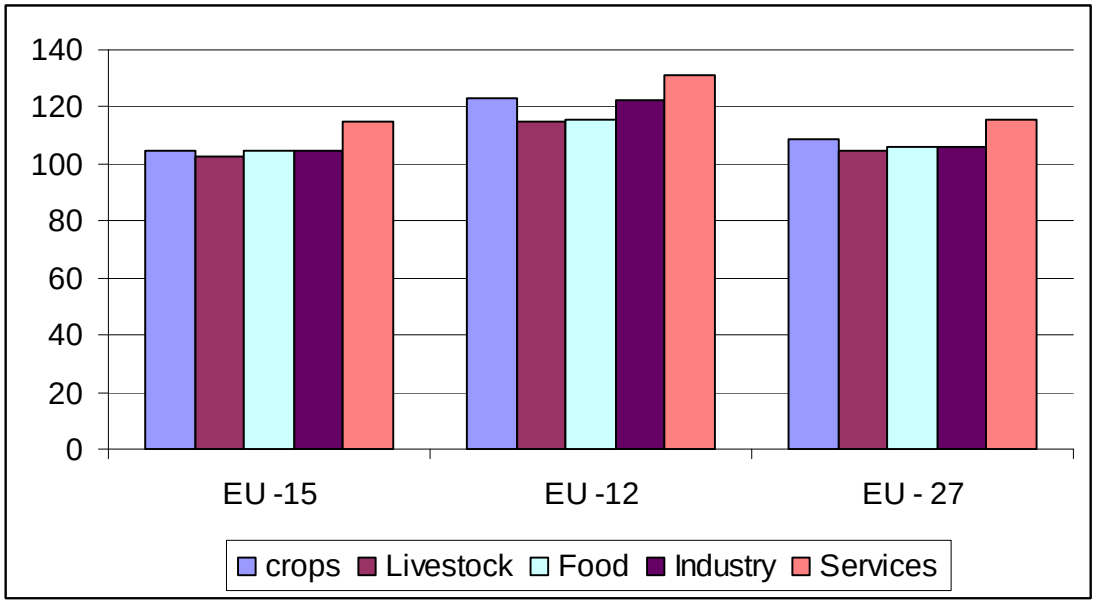


Source: USDA (2008), http://www.ers.usda.gov/Data/macroeconomics/
HDC (High developed countries) = US, Canada, Oceania and Japan; C&S America = Central and South America.

The development of the GDP per capita indicates the most important driver in the models applied for this study (see Figure 1.2). The differences in annual income growth rates per capita between 2.0% in the EU-15 and 5.6% in the Asian countries determine also the regional distribution of growth in demand for agricultural and food commodities.

Based on these assumptions, a consideration of the likely trends for growth within the different economic sectors. The service sector displays the strongest economic growth in the EU-15 and the EU-12 (see Figure 1.3). Within the EU-15, the crop, livestock, processed food, and industries sectors stay relatively stable within the 2007-2013 period. The biofuel directive has a positive impact on the crop production. Within the EU-12 all sector show a growth in real value added. The growth within the EU-27 is positive for all sectors. Next to the highest growth in services, the growth is relatively higher in crops and industries than in livestock and processed food.

Figure 1.3 Real Value Added in Different Sectors, 2013 (2007 = 100)

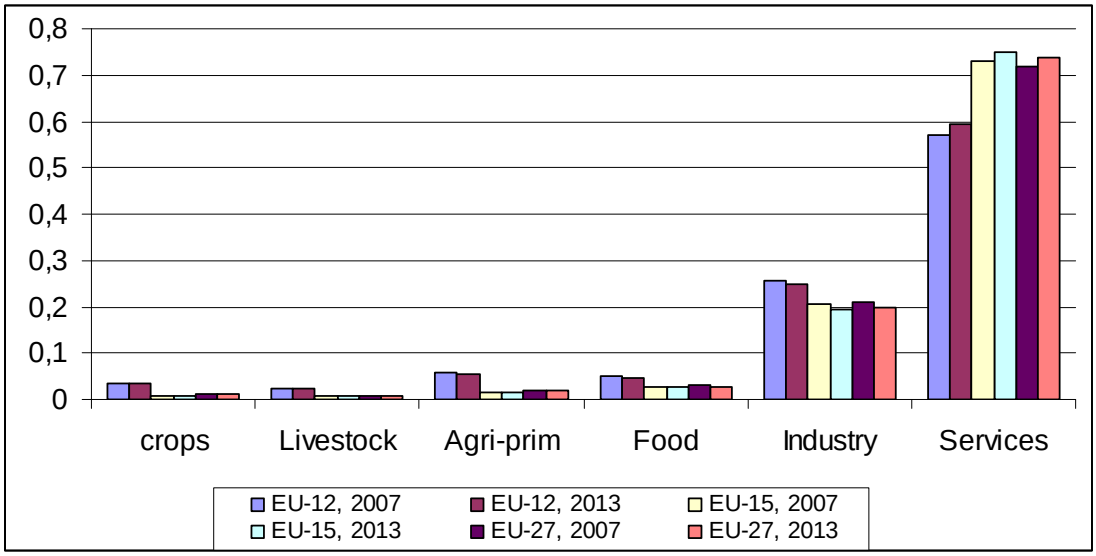


Source: Own calculations, based on LEITAP.

The general framework thus displays an ongoing trend of structural change between key economic sectors, with a declining share of agriculture and industry and an increasing share of services in the economy (Figure 1.4). The changes are relatively small as the period under consideration is the relatively short period 2007-2013.

This trend is most pronounced for the EU-12, for which industry and agriculture still accounted for more than 42% of the economy in 2007, but also holds for the EU-15. The declining share of agriculture in the economy reflects a global trend, which stems from the fact that the effect of supply shifters (technical productivity) dominates demand shifters (population growth, income). Especially due to typically decreasing income elasticities in the course of economic development the expenditure share for agricultural products declines with rising income.

Figure 1.4 Sectoral Structure of the EU in 2005 and 2013 (% of GDP)



Source: Own calculations, based on LEITAP.

It is against this background that the study of the impact of modulation takes place. It is likely that the effects of the modulation policy will cause a relatively small inflection in general, global trends that are driving the evolution of the agricultural economy. It is the direction and the degree of this inflection which the analysis within this study will isolate.

2 METHODOLOGY FOR THE IMPACT ANALYSIS

This chapter sets out the methodology proposed for analysing the core study themes of the project. It begins with an introduction to the study themes and basic hypotheses of the study, presents the analytical approach, and goes on to an in-depth discussion of issues regarding the methodology.

2.1 Introduction to the study themes and the basic hypotheses of the study

The objective of this study is 'to provide a quantitative and qualitative assessment of the impacts of modulation on rural areas, social and economic performance, environment, competitiveness, Community and national budgets…[taking] into account the re-distribution effects of modulation, within and between Member States, between economic sectors and types of holding.' Specifically, the study focuses on the following four study themes:

1. Distribution and budget effects
2. Effects on farm structure and agricultural sector
3. Socio-economic effects
    a. Competitiveness of the agricultural sector
    b. Farm and farm household income
    c. Employment
    d. Quality of life in rural areas
4. Environmental effects

The analysis, therefore, needs to focus on an assessment of the full range of social, economic and environmental impacts of compulsory modulation, both as a result of the effect of a reduction in Pillar 1 direct payments and the redistribution of these funds through Pillar 2. To do this, an understanding of the impact at both the farm level and the Member State/regional level is needed.

The impacts of modulation is considered for the EU-27 for two separate scenarios (with associated sensitivity analyses) in order to explore the potential difference in impacts of different overall rates of modulation, and any differences that might emerge from changes to rules relating to franchise levels, co-financing requirements, or allocation of funds within Pillar 2 to specific measures.

The impact of the redistribution of modulated funds through Pillar 2 is dependent on a wide range of variables including the way in which the modulated funds are used, how schemes are targeted and who is eligible. One of the key challenges for this study is to reflect the complexity of local impacts on the ground – social, economic and environmental – and to understand how these relate to the variety of ways in which Member States have implemented their Rural Development Programmes, and to disentangle the extent to which modulated funds have contributed to these impacts.

2.1.1 Scenarios

Two scenarios have been chosen for the Modulation study, each of which is subject to a number of sensitivity analyses. These are set out in Box 2.1.

The first scenario, the 'baseline scenario', is the current system of compulsory modulation, in which there is a 5% cut of Pillar 1 direct payments that applies to beneficiaries receiving more than euro 5,000 per year. The proportion of funds returned to the MS are calculated according to an allocation key (see Chapter 3 for details), and are allocated between the Pillar 2 measures for each Member States in the same way as the EAFRD budget .

The second scenario, the 'Health Check scenario', relates to the Commission's proposals for higher rates of modulation as set out in the Commission Communication of 20 May 2008 concerning the 'Health Check' of the CAP. This scenario consists of an additional 8% rate of modulation, introduced progressively between 2009 and 2012, and further increased according to the level of Pillar 1 direct payments received, as set out in Table 1.3 in Chapter 1. This additional modulation is then distributed to measures that can meet the 'New Challenges' indicated in the Commission's Proposal for a Council Regulation amending Regulation (EC) No 1968/2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD)[12] of 20 May 2008, specifically Annex II – Indicative types of operations related to priorities referred to in Article 16a. The project team has weighted this distribution pattern as shown in Table 2.1, and the same proportional allocation of the additional funds are made for each Member State.

There are five components of each scenario. The first is the level of the 'franchise', that is, the amount of Pillar 1 direct payments that serves as the threshold above which modulation is levied[13]. The second is the modulation rate itself. A third component relates to the proportion of modulated funds that is returned to an individual Member State for use within the EAFRD. Fourth is the manner in which the EAFRD budget – to which the modulated money contributes – is apportioned among the rural development measures. Last is the extent of Member State co-financing of the EAFRD, which is conditioned by the amount modulated from the Pillar 1 direct payments within the Member State.

[12] COM(2008) 306 Final.

[13] In practice, all direct payments are modulated, and then the amount corresponding to the deductions made on the first euro5,000 is refunded as so-called "additional aid".

Box 2.1: The two principle scenarios of the Modulation study, including the sensitivity analyses

Baseline Scenario
Compulsory modulation as agreed as part of the Mid-Term Review 2003 (Article 10 of Council Regulation 1782/2003)
Franchise: euro 5,000
Modulation rate: 5%
EC distribution key: current EAFRD (min 80% in MS, DE 90%)
RDP allocation: current EAFRD
MS co-financing: current EAFRD

Sensitivity Analysis (around the Baseline)
1) Modulation rate:
   (a) 0%
   (b) 20%
2) Franchise:
   (a) euro 0
   (b) euro 10,000

Health Check Scenario
With targeting to 'New Challenges'
Franchise: euro 5,000
Modulation rate = 13% (banded, or 'progressive', modulation)
EC distribution key:
- 1st 5% = current EAFRD (min 80% in MS, DE 90%)
- Additional CM stays within MS

RDP allocation: targeted to New Challenges
MS co-financing: current EAFRD

Sensitivity Analysis (around Health Check)
1) RDP allocation: proportional to current EAFRD
2) MS co-financing: 0%

Table 2.1 Weighting of additional compulsory modulation funds under the Health Check Scenario.

Rural Development Measure Groups	Health Check Priorities				
	Climate change mitigation	Renewable energies	Water management	Bio-diversity	Measure total
01 - Human Capital Investment					
111 Vocational training and information actions					
112 Setting up of young farmers					
113 Early retirement					
114 Use of advisory services					
115 Setting up of management, relief and advisory services					
02 - Physical Capital Investment					
121 Modernisation of agricultural holdings	0.06	0.06	0.03		0.16
122 Improvement of the economic value of forests					
123 Adding value to agricultural and forestry products		0.03			0.03
124 Cooperation for development of new products					
125 Infrastructure related to the development...			0.03		0.03
126 Restoring agricultural production potential					
03 - Improving Quality of Agricultural Production and Products					
131 Meeting standards based on Community legislation					
132 Participation of farmers in food quality schemes					
133 Information and promotion activities					
04 - EU-10 & EU-2 Transitional Measures					
141 Semi-subsistence farming					
142 Producer groups					
143 Direct Payment (BG + RO)					
05 - Sustainable Use of Agricultural Land					
211 Natural handicap payments to farmers in mountain areas					
212 Payments to farmers in areas with handicaps...					
213 Natura 2000 payments and payments...				0.03	0.03
214 Agri-environment payments	0.13		0.06	0.09	0.28
215 Animal welfare payments					
216 Non-productive investments			0.03	0.03	0.06
06 - Sustainable Use of Forestry Land					
221 First afforestation of agricultural land	0.03		0.03		0.06
222 First establishment of agro forestry systems on agricultural land					
223 First afforestation of non-agricultural land	0.03		0.03		0.06
224 Natura 2000 payments				0.03	0.03
225 Forest-environment payments				0.03	0.03
226 Restoring forestry potential and introducing ...	0.03				0.03
227 Non-productive investments					
07 - Diversification of the Rural Economy					
311 Diversification into non-agricultural activities		0.06			0.06
312 Business creation and development		0.03			0.03
313 Encouragement of tourism activities					
08 - Improving Quality of Life in Rural Areas					
321 Basic services for the economy and rural population		0.03			
322 Village renewal and development					
323 Conservation and upgrading of the rural heritage			0.03	0.03	0.06
09 - Training and Animation					
331 Training and information					
341 Skills acquisition. animation and implementation of ...					
10 - LEADER					
411 Implementing local development strategies. Competitiveness					
412 Implementing local development strategies. Environment/land					
413 Implementing local development strategies. QoL					
421 Implementing cooperation projects					
431 Running the local action group, acquiring skills and ...					
11 - Miscellaneous Assistance					
511 Technical Assistance					
611 BG RO Direct Payments					
Grand Total	0.28	0.22	0.25	0.25	1.00

NB: The numbers presented are rounded off to the second decimal, reflecting a weighting of 1/31 (0.032258), so row totals are not necessarily the same as the apparent sum of the individual cells.

2.2 Analytical Approach

Two separate, but interlinked methodological approaches – the modelling approach and non-modelling approach – have been used. This is set out in Figure 2.1. Within these two approaches, a range of methodological and analytical tools are used, as follows:

Non-modelling Approach

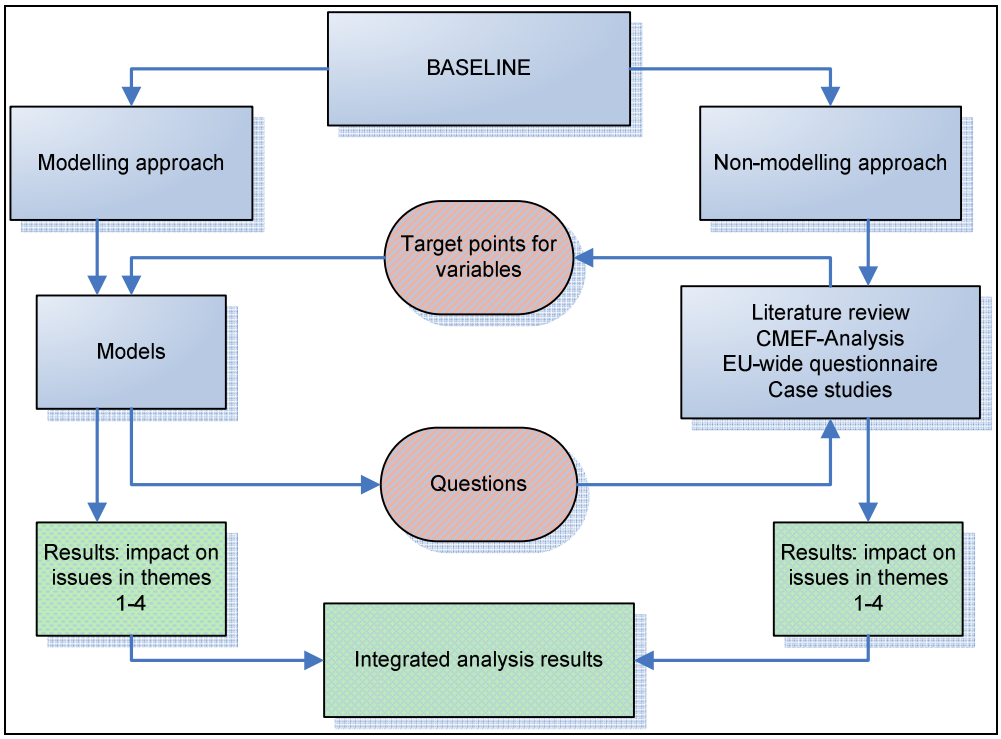
- Case Studies carried out in eight Member States (Finland, France, Germany, the Netherlands, Poland, Portugal, Slovenia, United Kingdom), gathering information from national literature, assessments of the 2007-2013 RDPs and semi-structured interviews with key officials and stakeholders;
- Questionnaires carried out by telephone interviews in the 19 Member States in which case studies were not conducted;
- CMEF Indicators – collation of information on output, result and impact indicators for the case study Member States

Modelling Approach:

- Budget model, tailor made for the project, provides much of the financial detail that is specific to the study,
- A suite of economic models (LEITAP, ESIM, CAPRI and FES) to assess the economic and sectoral impacts
- Dyna-CLUE, a land-use model, allows the results from the economic models to be disaggregated spatially

Some of these tools offer projections, others, such as the case studies, provide insights that are context-specific, whilst others provide information on impacts that can be compared across the EU-27. Individually they do not provide a comprehensive picture of the full range of impacts arising from different modulation scenarios. However, the methodology has been developed in such a way so that the data generated from these different approaches is complimentary and may be triangulated. This means that the results from different methodological tools can be cross-checked and validated. The integration of the two approaches is further described in Figure 2.1.

Figure 2.1 Schematic presentation of the methodology



Questions from modellers are incorporated in the non-modelling and in return comes target points and information to create sound assumptions in the models. The results of the two tracks are then integrated in the analysis.

2.2.1 Non-Modelling Approach

It is not possible to accurately assess the impacts of particular measures independently of the context within which they operate and the specific way in which the measures are implemented (i.e. eligibility criteria, targeting etc). For this reason, it is not possible for the models to capture the full complexity of the actual situation, particularly in relation to the redistributive effects of compulsory modulation through Pillar 2. The non-modelling element of the study is, therefore, essential to understand and fully take account of the variety of responses to modulation across the EU-27 Member States and to try and derive as full a picture as possible of what is happening on the ground, particularly in order to be able to evaluate the social and environmental impacts of the redistribution of money between farm types, regions and countries. The approach comprises both quantitative and qualitative tools as set out below.

1. A Literature Review: this looks at existing literature on the implementation of modulation and its impacts as well as the social, economic and environmental impacts of rural development measures. This allows assumptions regarding the impact of specific measures to be formulated and these assumptions are then qualified for the specific national/regional context through the case study interviews. It should be noted, however, that the most recent official evaluations on Pillar 2 expenditure remain the mid-term evaluation reports of the 2000-2006 RDPs as the *ex post* evaluations are not due to be completed until December 2008. The availability of quantified data on the impacts of particular measures is variable, and generally limited, within these evaluations, and this means that evidence on the impacts of specific measures is limited. Where new measures have been introduced in a Member State for the 2007-2013 programming period, or the targeting of a particular measure

has changed, this makes the assessment more difficult and in these situations, where it has been possible to access these, information from the 2007-13 RDP *ex ante* evaluations and Strategic Environmental Assessments has been reviewed.

2. A standardised telephone interview with non case study Member States: Because of the variations in policy response to modulation across Member States, particularly in relation to the design of their 2007-2013 Rural Development Programmes, and the importance of the link between the way in which EAFRD is implemented and impacts on the ground, it is important to obtain as full a picture as possible of the different policy responses across the EU-27. EU telephone interviews were, therefore, carried out with key officials responsible for the development of the current RDPs in 19 Member States (other than the case study countries, for which the questionnaires are integrated in the case study protocol), to collect information on the way in which increased funds within the Pillar 2 budget have influenced the structure and design of Rural Development Programmes, particularly in terms of the way in which the additional funds have been distributed between the different Axes and measures. Specifically, some of this information will feed into the budget model to help achieve more accurate projections of how additional compulsory modulation funds might be distributed within Axis 2 under higher compulsory modulation rates. The information gathered also allows us to compare different Member States' approaches to the use of compulsory modulation in a more qualitative way, and provides useful contextual information against which we can assess whether or not the case study information is representative of broader patterns of use, or very specific to a particular Member State.

3. Case Studies: Eight case studies (Finland, France, Germany, the Netherlands, Poland, Portugal, Slovenia and the UK) were undertaken to a much more in-depth analysis of the operation of compulsory modulation (and voluntary modulation in the cases of the UK and Portugal) to date, and the impacts that both the reductions in Pillar 1 payments and the increased availability of funds through Pillar 2 have had in relation to the full range of study themes. The case studies, through a detailed assessment of national literature, the Rural Development Programmes, and semi-structured interviews, are the main source of information for understanding the impacts and added value of redistributing compulsory modulation through Pillar 2 measures as these impacts are in large part dependent upon the way in which the EAFRD is implemented within a particular Member State, and as such are more difficult to model.

As far as possible, the case studies attempt to collate empirical data that can be fed through into the models and the indicator analysis. However, one of the key values of the case studies is the contextual information that they provide to enable a commentary to be made on the outputs of the models and the indicator analysis that is based on the detailed situation for eight different Member States. Providing this contextualised commentary on the impact of compulsory modulation in relation to all the study themes, both within the context of the two modulation scenarios being considered and the outputs of the sensitivity analysis, will be the main way in which the case study information will be used.

Part of the Case studies was also to investigate the redistribution between farm types to determine who will gain and who will not gain. In Figure 2.2, framework for this assessment is presented.

Figure 2.2 Analytical framework for assessing the redistributive effects of compulsory modulation between Pillar 1 and Pillar 2 at the level of the beneficiary

Unaffected • No P1 reduction • No P2 payment	Outright winners • No P1 reduction • P2 Payment
Losers • P1 reduction • (a) Ineligible for P2 • (b) Less P2 than P1 • (3) Already maximum	Net winners • P1 reduction • P2 payment o Neutral o Positive

4. Common Monitoring and Evaluation Framework (CMEF) indicator analysis. The CMEF indicators provide the main source of non-modelled quantitative information on the outcomes of the measures within Pillar 2. The collection of data on the input, output, result and impact indicators has been collected from the RDPs of the case study countries. While it had been hoped that it would be possible to compare data from all RDPS, this did not prove possible, within the timeframe of this study, as the way in which the indicators are reported within individual RDPs is very variable. The different types of CMEF indicators for which data is collected is set out in Table 2.2.

The information given is prospective, rather than actual. The data needs to be treated with some caution as the figures are estimates against which success of the programmes will be measured, and may have been influenced to some degree by political considerations.

In order to derive the impact of the use of modulation funds within the second pillar using the CMEF indicators, a series of calculations based on a number of assumptions are made. Firstly, the increase in the second pillar budget due to modulation funds is taken from the budget model for each Member State or region. Secondly, an assumption is made that each euro of input has the same output, and the total anticipated value of the CMEF output or result indicator attributed to modulation is therefore proportional to the contribution modulation makes to the RDP budget. Thirdly, in order to assess the magnitude of the anticipated output in the RDP, we express the total output and the supported units due to modulation as share of a benchmark value, for example, the number of supported farmers relative to the total number of farmers in the country, or number of supported hectares as a proportion of UAA.

Assessing the contribution of modulation to the values given for the impact indicators is less straightforward. As the impact indicators are overarching, the direct relation between the individual measures and impact is impossible to determine – it is the combined effects of the results over all measures that leads to changes in the impact indicators. This complicates the quantification of the contribution of the modulation funds to the impact indicators and it cannot be calculated in the same way as with the output and result indicators. Therefore, we give a qualitative assessment of the contribution of modulation funds to the impacts of the RDP, based on the findings in the previous steps.

Table 2.2 Overview of indicators for assessing the impact of the Rural Development Programmes

Indicator	Description	*Level*
Input	These refer to the budget or other resources allocated at each level of the assistance. *Example*: expenditure per measure declared to the Commission.	*Measure*
Output	These measure activities directly realized within programmes. *Example*: number of training sessions organized, number of farms receiving investment support, total volume of investment.	*Measure*
Result	These measure the direct and immediate effects of the intervention. They provide information on changes in, for example, the behaviour, capacity or performance of direct beneficiaries and are measured in physical or monetary terms. *Example*: gross number of jobs created, successful training outcomes.	*Axis*
Impact	These refer to the benefits of the programme beyond the immediate effects on its direct beneficiaries both at the level of the intervention but also more generally in the programme area. They are linked to the wider objectives of the programme. They are normally expressed in "net" terms, which means subtracting effects that cannot be attributed to the intervention (e.g. double counting, deadweight), and taking into account indirect effects (displacement and multipliers). *Example*: increase in employment in rural areas, increased productivity of agricultural sector, increased production of renewable energy.	Rural Development Programme

Source: European Commission (2006), Handbook on Common Monitoring and Evaluation Framework; EU Rural Development 2007-2013; Brussels, DG for Agriculture and Rural Development, Draft guidance document, Version 2.

2.2.2 Modelling Approach

The first tool in the Modelling Approach is the development of a budget model, which calculates the budgetary impacts of the modulation process by Member State, both in terms of the reductions in Pillar 1 direct payments, and the contribution of modulation to the EAFRD budget (Figure 2.3).

Figure 2.3 Budget model at the national level

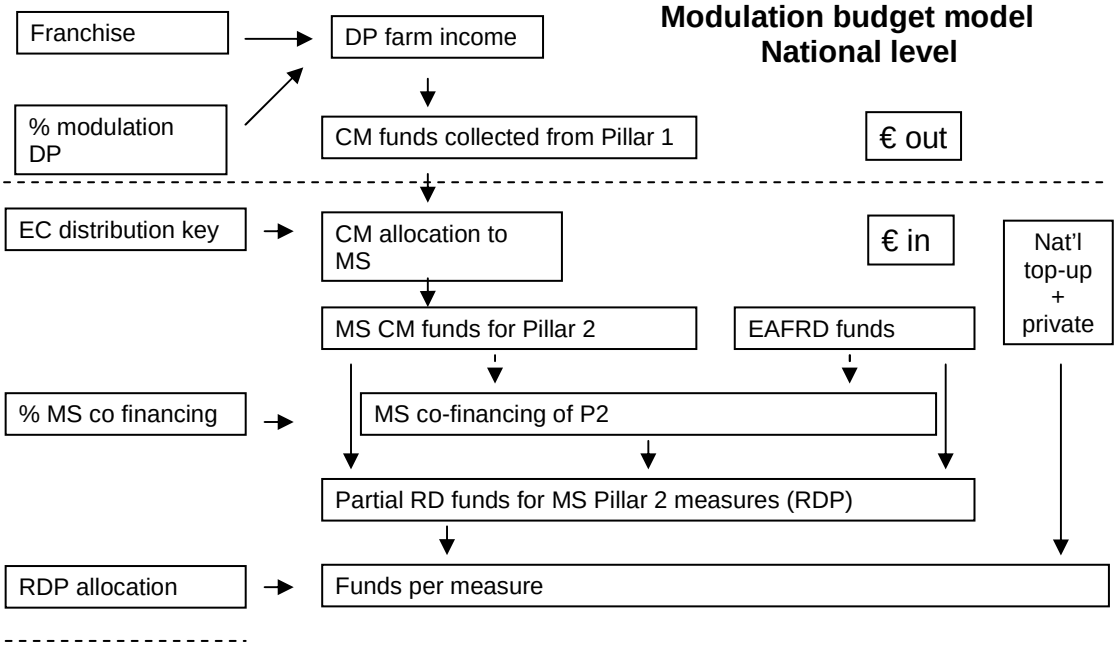
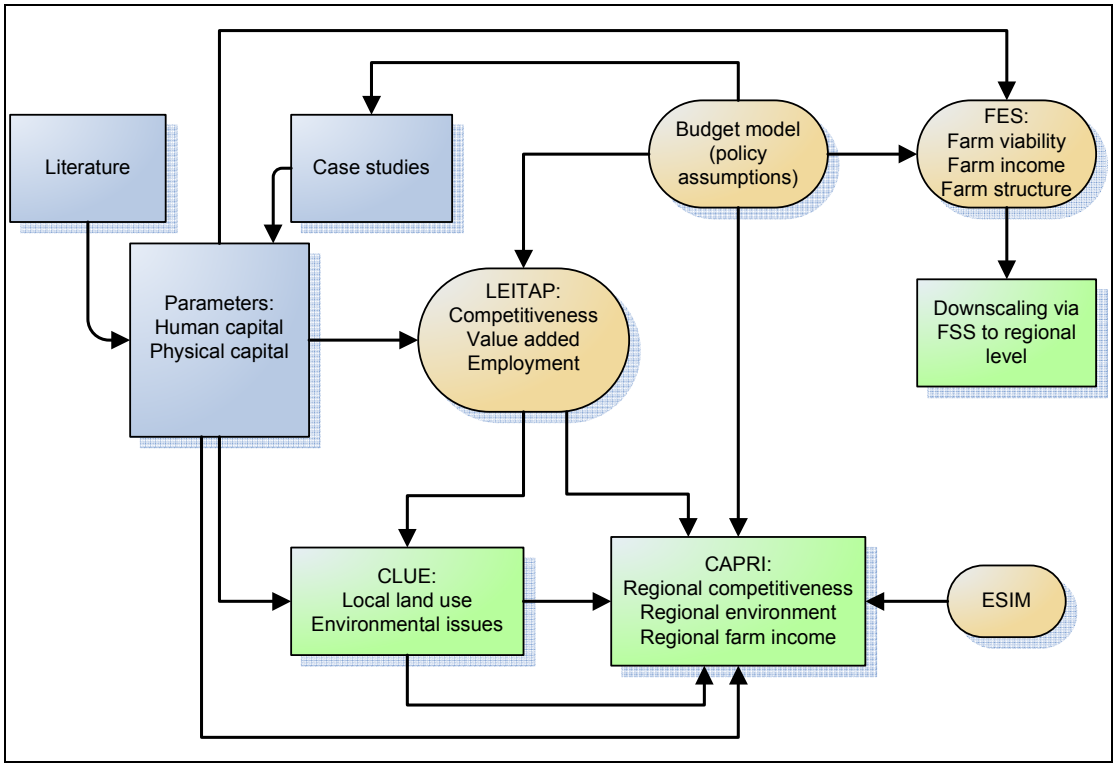


Figure 2.3 distinguishes between the operations (on the right-hand side) that determine the flow of money from the EAGF budget and monetary sources, and flows (from the top downwards) involved in the elaboration of the financial resources for the rural development measures in the second Pillar. It also highlights the fact that the calculations involved in generating the monetary flows from Pillar 1 to Pillar 2 are variable, as they depend on the level of the franchise, the percentage of modulation applied to direct payments, the EC distribution key, the percentage of MS co-financing, and the individual Member State allocation of resources between measures within their RDPs (on the left-hand side of Figure 2.3).

Once the budgetary effects of modulation have been established by the budget model, a range of economic models and a land use model are used to assess the economic and environmental impacts of modulation under the different scenarios. FES (a Financial Economic Simulation farm economic structure model), provides information on farm viability and farm structures, LEITAP provides information on competitiveness, value added and employment; ESIM gives projections of agricultural commodity markets; CAPRI is able to assess indicators on regional competition, regional environment and regional farm income; and Dyna-CLUE disaggregates this information spatially to help assess changes in land use and their potential environmental impact. The general structure of the Modelling Approach is given in Figure 2.4.

Figure 2.4 Quantitative impact analysis



Models are shown with their output contributions in this study. Rounded field indicate national levels and squared fields regional levels. The budget model provides basic information to all models and to the case-studies. Case studies together with literature provide the basis for the assumptions regarding the parameters human and physical capital that are used in the models.

Figure 2.4 demonstrates that the modelling approach is integrally associated not only with the budget model, but also with the case studies, and the modelling approach also draws on the literature review in order to investigate the exogenous parameters and

multiplier coefficients that are used in the modelling approach. Where such information is not available, assumptions with regard to parameters and multipliers have to be made by the modellers, on the basis of the best available expert knowledge. In order to model the economic and environmental impacts of modulation, it is necessary to find a means of linking agricultural commodity parameters with regional / territorial aspects. The global economy-wide dimension is covered by the economic model, LEITAP. ESIM provides more agricultural detail for the EU-25 countries, CAPRI distributes this impact to the regional (NUTS2) level, and FES to the farm level. Dyna-CLUE provides a detailed analysis of land cover change, thereby giving a spatial representation of the economic modelling outcomes.

In order to work coherently with agricultural commodity data, a common scheme for organising farm types (Table 2.3) and farm sizes is necessary. For this, the standard FADN classifications are used for the farm types ('TF8'), and seven categories are used farm size (in terms of ESU[14]); these categories are 0-4 ESU, 4-8 ESU, 8-16 ESU, 16-40 ESU, 40-100 ESU, 100-250 ESU and over 250 ESU.

Table 2.3 Agricultural specialisation on the basis of the codes for the types of farming (TF) in the Community typology (Reg. 85/377/EEC), using 8 standard classes.

Description of TF8	Grouping of TF on the basis of principal types of farming
Field Crops	13 specialist cereals, oilseeds and protein crops 14 general field cropping 60 mixed cropping
Horticulture	20 specialist horticulture
Wine	31 specialist vineyards
Permanent crops	32 specialist fruit and citrus fruit 33 specialist olives 34 various permanent crops combined
Milk	41 specialist dairying
Grazing livestock	42 specialist cattle – rearing and fattening 43 specialist cattle – dairying, rearing and fattening combined 44 sheep, goats and other grazing livestock
Pigs/poultry	50 specialist granivores
Mixed	71 Mixed livestock, mainly grazing livestock 72 Mixed livestock, mainly granivores 81 Field crops – grazing livestock combined 82 Various crops and livestock combined

An additional classification scheme is also used in this study, in order to group the rural development measures found in the EAFRD into groups of measures that behave similarly in terms of the economic mechanisms underlying the intervention logics for these measures. These groupings are set out in Table 2.5.

2.2.3 Analysis of modulation within the modelling framework

Modelling modulation has been made through a set of linked models. Linking models is an intricate task and that work is further described in Annex 1. The modelling was carried out in two steps: first Pillar 1 was reduced and second the money was introduced in the Pillar 2. The first step is usually quite straightforward (see Table

[14] ESU: The economic size of farms is expressed in terms of European Size Units (ESU). The value of one ESU is defined as a fixed number of EUR/ECU of Farm Gross Margin. Over time the number of EUR/ECU per ESU has changed to reflect inflation. The current situation is available at the web site indicated in the footnote, which also gives the current definition of "commercial farms" in terms of ESU (http://ec.europa.eu/agriculture/rica/methodology1_en.cfm).

2.4), with the main challenge being the modelling of decoupled payments (see Annex 1. The second step is more complicated since modelling the second pillar has never been done before; also this is further described in Annex 1. Introductory comments regarding the treatment of Rural Development measures are provided below. One important aspect of agriculture is its contribution to public goods. The models used in this study are not suited for analysing this aspect and the current literature in the field also do not allow for any consistent implementation in modelling policy interventions. An overview is given in Annex 2.

Table 2.4 Treatment of Direct Payments (Pillar 1) in models

Treated in Model	Implementation of direct payments
LEITAP	Farm payments are implemented as primary factor payments in the various agricultural sectors. Coupled payments are directly coupled to sectors. Decoupled payments are implemented as an equal payment rate to land in all eligible sectors and therefore do not provide an incentive to switch between eligible sectors and between production factors used within the eligible sectors.
FES	Farm payments are directly calculated and implemented at farm level.
CAPRI	Analyses the effects of changes in farm payments at the regional farm and sector level. CAPRI distinguishes between a large number of types of premiums. Decoupled premiums as, for example, milk and sugar premiums are distributed over the eligible crops of the regional farm. Coupled premiums are linked to agricultural activities at the regional level.

Following the elaboration of the economic mechanisms underlying the intervention logics for the rural development measures as developed in Chapter 1, Section 1.3, the economic models and the land use model employed in this study are able to perform a series of analyses in order to provide insight on the thematic issues in this study. These analyses can not reasonably be performed separately for each of the 46 rural development measures, and are thus grouped according to fundamental similarities in the economic mechanisms and how these are handled by each of the models. As an elaboration of this principle, Table 2.5 presents the groupings of rural development measures, the models that are used for their analysis, and what the relationship is between the models. Further elaboration of the information obtained for each of the groupings is presented in respective sub-sections in the text that follows (for a more elaborate description of the implementation of the various measures in the model see, Annex 1).

Table 2.5 Treatment of Rural Development measures* in quantitative models

	Treated in Model	How implemented (information needed from other models/case studies)
01 – Human Capital Investment [111-115, 131-133]	LEITAP	Payments influencing the total factor productivity in agriculture. Rate of return on investment is 40% (Evenson, 2001) Deadweight loss is assumed to be zero (sensitivity analyses is done with 25% deadweight loss)
	CAPRI	Via link with LEITAP
	FES	Payments on investment at farm level
02 – Physical Capital Investment [121-126]	LEITAP	Payments which influence the total factor productivity due to capital investments in all agricultural sectors. Rate of return on investment is 30% (Wolff (1996) and Gittleman, ten Raab and Wolff (2006)) Deadweight loss is assumed to be zero (sensitivity analyses is done with 25% deadweight loss)
	CAPRI	Via link with LEITAP
	FES	Payments on investment at farm level
03 – LFA Land Use Support [211, 212]	LEITAP	Income payment linked to land in agricultural sector. FADN data are used to distribute payments across sectors.
	CAPRI	Regional direct support. Distribution over sectors and regions based on FADN data and CLUE results.
	FES	Farms receive LFA or mountain area support when they are in these areas (income support)
	Dyna-CLUE	LFA support adds to the relative preference for the location for arable land or grassland (only for current agricultural land within LFA regions)
04 – Natura 2000 [213]	LEITAP	Income support linked to land in agricultural sector. FADN data are used to distribute payments across sectors.
	CAPRI	Regional direct support. Distribution over sectors and regions based on FADN data and CLUE results. Conditional on extensive technology being used.
	Dyna-CLUE	Agricultural land in Natura 2000 areas receives a higher relative preference (as compared to no support) for agriculture (only for current HNV agricultural land within LFA regions)
05 – Agri-Environment measures [214-216]	LEITAP	On the one hand, income support linked to land in agricultural sector and on the other hand a yield and labour productivity loss. FADN data are used to distribute payments across sectors.
	CAPRI	Regional direct support. Distribution over sectors and regions based on FADN data. 50% of the support directed towards TF8 farm types 1, 2, 3, 4 and 8 is conditional on extensive technology being used, for remaining amounts extensive as well as intensive technology is eligible.
	FES	Payment linked to land
06 – Forestry [221-227] 07 – Diversification [311-313] 08 – General rural development [321-323, 331, 341] 09 – LEADER [411-413, 421, 431] 10 – Technical assistance [511, 611]	LEITAP	Investment support for non-agricultural activities that increase productivity. Rate of return on investment is 30%. Deadweight loss is assumed to be zero (sensitivity analyses is done with 25% deadweight loss)
	CAPRI	Via link with LEITAP
	Dyna-CLUE	For forestry: conversion of arable land to forestry or grassland in erosion sensitive areas is stimulated by lowering the relative preference of current arable land in erosion sensitive areas.

** The RD measure numbers are indicated between square brackets [#].*

2.3 Issues regarding the methodology

As a result of the issues discussed above, it would seem that the main methodological issues continue to centre around the accuracy with which it is possible to assess the impacts of compulsory modulation as a result of the additional funds in Pillar 2.

General conclusions about the analysis of the impacts of a reduction of Pillar 1 direct payments are feasible across EU-27. However, generalised assessment of impacts across Member States in relation to the impact of additional funds being available through Pillar 2 is far more problematic as so many of the impacts are dependent on the way in which Member States have chosen to use the CM funds, the structure of the RDP more generally, and how they have designed and implemented the specific measures. Problems with the quantification of indicators at the national level and the lack of detailed information to feed into the economic models in relation to Pillar 2 regional (NUTS2) impacts, means that there is a need for additional reliance upon the qualitative approach for the analysis of this aspect of the study.

Another consideration is that the impacts of modulation are conditioned by global trends that are driving the evolution of the agricultural economy. In contrast to these macro-trends, the direction and the degree of the inflection caused by modulation – that is the focus for the analysis within this study – are not straightforward to distinguish.

A last consideration is that because of the short time span between the implementation of the current system of compulsory (and voluntary) modulation and the present time, there is relatively little data available with which to inform an *ex post* study of the impacts of modulation. This therefore requires an *ex ante* approach, with which the little evidence that has been collected can be contrasted. The *ex ante* approach relies heavily on the consistent data handling and data generation structure that models can give to what has become, in fact, a scenario based examination of the possible effects of modulation. For this reason, the importance of the modelling exercise, including the critical assumptions behind this work, requires a comprehensive explanation in order for the output to be credible, as this is an entirely novel manner by which to investigate the effects of modulation.

Issues of data collection in relation to the case studies

Modulation and the rules surrounding its implementation was the subject of quite some debate at the time when the case studies were undertaken, in the run up to the publication of the Commission's Health Check legislative proposals on May 20th. While the case study experts sought to separate these policy considerations from the actual empirical effects of reducing Pillar 1 payments and increasing available funding in Pillar 2, it is apparent from the case study reports that the on-going policy debate has affected the data collection to some extent, particularly in relation to the prospective element of the study. This is either because Member States were not prepared to divulge what they think the potential impacts of increased rates of compulsory modulation might be before they made official statements on their position, or because insufficient thought had as yet been given to what the implications of an increase in funding for Pillar 2 might be. This means that the prospective dimension of the case study reports has not been as elucidating as it might otherwise have been.

One of the aims of the case studies was to collect detailed empirical data to feed into the economic models. This has proved problematic, as the level of detail required in relation to the key variables for a particular measure were not readily available within the majority of Member States. This means that assumptions for the models have had to be made on an aggregate scale based on expert judgement and the meagre information available through the literature.

In addition, each case study expert was asked to provide information on the impact of compulsory modulation on a range of indicators under each study theme, indicating the direction of change of each indicator. Some case study experts found it difficult to assess these indicators and we therefore have some gaps in relation to indicator information for Germany, Portugal and Poland, and the Netherlands.

Limitations of information on quantified impacts of RDPs

In addition, the fact that the 2007-13 RDPs have only recently been approved means that it is difficult to assess the impacts of modulation on these programmes, beyond making assumptions based on the implementation and evaluation of similar measures in the previous programming period and/or assessing the predicted effects of these measures using the CMEF indicators. It should be noted, however, that the most recent official evaluations on Pillar 2 expenditure remain the mid-term evaluation reports of the 2000-2006 RDPs as the *ex post* evaluations are not due to be completed until December 2008. The availability of quantified data on the impacts of particular measures is variable, and generally limited, within these evaluations, and this means that – unless additional, specific evaluations have been undertaken on particular measures within Member States – the evidence on the impacts of specific measures is limited. Where new measures have been introduced in a Member State for the 2007-2013 programming period, or the targeting of a particular measure has changed, this makes the assessment more complex/problematic and in these situations the *ex ante* evaluations, the Strategic Environmental Assessments and the CMEF indicators are more heavily relied upon, together with the expert judgement derived from interviews with case study respondents. In light of this, the case studies have only been able to provide limited information on quantifying the additional impacts of compulsory modulation on RDP measures, and they have had to rely instead on more qualitative judgements.

The lack of readily available data on the distribution of Pillar 2 measures by farm type or size in many Member States makes any detailed analysis of the financial winners and losers from compulsory modulation difficult. An attempt was made to do this in some details in France and England, but in other Member States only the use of expert judgement was possible.

Monetisation of Public Goods

Although monetisation of public goods is not possible with the tools available for this study, it is the object of research and should enhance the appreciation of public goods as an objective of public policy, and as having economic as well as environmental value in the pursuit of regional development objectives.

Specific issue relating to the UK

In the UK in particular, it is difficult to disentangle the impacts of compulsory modulation from the impacts of voluntary modulation, beyond a consideration of their

relative weight in financial terms, particularly as modulation in one form or another has been in operation since 2000. However, there are also benefits associated with this situation, as the use of voluntary modulation is accompanied by clear reporting requirements, which require Member States to set out what the funds are to be used for and to assess the impacts of the use of additional Pillar 2 funds. For this reason, alongside the fact that this policy mechanism has been in use for seven years, more analysis has been undertaken in the UK on the impacts of modulation that in any other Member State.

One of the key issues relating to the use of indicators within the study is the accuracy with which we can attribute values to the indicators in different years and under different scenarios and the implications that this then has for any analysis based on these figures.

The main source of published data is in relation to the Baseline Scenario. These data comprises the values attributed by Member States to the output, result and impact indicators as part of the Common Monitoring and Evaluation Framework (CMEF), although they will not provide information on all indicators proposed. These data, by their very nature, are projections, rather than actual values, and given the fact that they will be used as a means of evaluating the RDPs, are likely to have been developed with this in mind. As such, they are likely to have some margin of error associated with them, and should probably be treated as a slight underestimate of the likely actual situation in 2013.

The other indicator values, however – for the counterfactual situation and for the Health Check Scenario – have to be derived, either through models or expert judgement from the indicator values established for the Baseline Scenario. This adds an additional margin of error to these calculations and will limit the accuracy with which any impacts of compulsory modulation can be assessed. The process was made transparent in order to make sure that the results highlight the margin of error associated with them and hence the degree of accuracy of any subsequent analysis.

In relation to the impacts of the modulated funds through Pillar 2, for many Member States it is difficult to disaggregate the impact of the modulated funds from the impact of the measures more generally, beyond making broad judgements in relation to the proportion of modulated funds allocated to a particular measure. In some cases, it is possible to see what would or would not have happened in the absence of the modulated funds, but this has not been possible in all cases.

In addition, the fact that the 2007-13 RDPs have only recently been approved means that it is difficult to assess the impacts of modulation on these programmes, beyond making assumptions based on the implementation and evaluation of similar measures in the previous programming period.

The lack of availability of data on the distribution of Pillar 2 measures by farm type or size makes any detailed analysis of the financial winners and losers from compulsory modulation difficult. An was made to do this in some detail in France and England through the case studies, but in other Member States only the use of expert judgement was possible.

Box 2.2 Overview and limitations to the modelling methodology

1. Empirical information about the impact of modulation and especially the impact of second pillar measures is very scarce. Therefore, *ex post* information hardly exists.
2. Public goods are not included in the modelling, although they are an important part of the second pillar.
3. Environmental impacts are difficult to generalize as the impacts vary locally.
4. Pillar 2 is a complex measures with different impacts, depending on how they are implemented. Therefore, only a stylized approach for each measure can be implemented, and the approach taken includes grouping the measures. This approach is summarized in Table 2.14, which also serves as an overview of the use of the modelling within the methodology.
5. Lack of empirical information about deadweight.
6. Transaction costs have not been addressed

3 ANALYSIS OF DISTRIBUTION AND BUDGET EFFECTS

3.1 Issues

In this chapter, the redistribution effects of modulation are examined in relation to both the reductions of direct payments in the first pillar and the redistribution of the modulation funds to rural development measures in the second pillar. In particular, the chapter focuses on the extent to which the redistribution of funds through modulation changes the distribution of support between Member States and affects national budgets due to the co-financing requirements of Pillar 2 budgets.

The nature of the redistribution of support that is brought about by modulation is fundamental to the analysis of all subsequent study themes. To enable a detailed understanding of these redistribution effects, the Budget Model has been developed, which consists of budget data relating to Direct Payments (DP) and the European Agricultural Fund for Rural Development (EAFRD) 2007-2013 for the EU-27 accompanied by a set of calculation rules for the transfer of funds between the two funds. By using the Budget Model, detailed breakdowns of budgets and changes in the budget due to modulation in the Baseline and the Health Check Scenario can be presented. Specifically, the Budget Model can provide information on:

- the re-distribution of support between Member States; and
- the effect of modulation on national budgets due to the requirement of co-financing.

In conjunction with information derived from the FES model, the case study reports, and the telephone questionnaires, the Budget Model can also help to answer questions on the:

- re-distribution of support between farms;
- re-distribution of support between regions;
- co-financing capacities of Member States.

Plan of this chapter

The plan of this chapter is as follows. In Section 3.2 a summary of the chapter is given. In Section 3.3 the initial situation of the Direct Payments (DP) and EAFRD budget for the period 2007-2013 is discussed. In Section 3.4 the focus is on changes in the DP and EAFRD budget due to compulsory modulation in the Baseline Scenario, followed by a sensitivity analysis of the Baseline Scenario in Section 3.5. Then, in Section 3.6 changes in the DP and EAFRD budget due to modulation in the Health Check Scenario are presented, followed by a sensitivity analysis of the Health Check Scenario in Section 3.7.

3.2 Summary

In the Baseline Scenario, compulsory modulation (CM) of 5% in the period 2007-2013 results in a reduction of 8.2 billion euro of the Direct Payments (DP) budget for the EU-15 as a whole (Table 3.1). For the individual EU-15 Member States, this implies a reduction of the overall DP budget of between 1-4%. The addition of the modulation funds to the EAFRD budget for the EU-15 increases this budget by nearly 20%. However, the increase in the EAFRD budget varies significantly between individual EU-15 Member States, mainly depending on the relative shares of DP and

EAFRD in the total budget, which is in turn affected by the allocation criteria[15] determining the proportion of the total EU core EAFRD budget received by individual Member States. As a result, countries where EAFRD constitutes a relatively small proportion of the total budget, like Denmark, the UK and the Netherlands, face an increase in their EAFRD budget of 56-94%, whereas countries where the EAFRD constitutes a high share of the total budget, like Austria and Finland, show only an increase of about 6%. In addition, as a result of the 'return key', some countries lose from the redistribution of modulation funds: these Member States are mainly located in North Western Europe, Finland being the exception. Countries that benefit from the redistribution are located in S. Europe. It is important to note that the addition of 8.2 billion euro of modulation funds to the EAFRD budget also results in an increase of 7.2 billion euro of national co-financing as well as 7.2 billion euro of private funding. This means that, overall, the total budget available for P2 in the EU-15 increases by 14%.

Table 3.1 DP, EAFRD and P2 budget in the Baseline and Health Check Scenario in the EU-15, 2007-2013

	Baseline scenario		Health Check scenario	*Health Check Scenario relative to Baseline Scenario*	
	billion euro	%	billion euro	billion euro	%
DP budget before modulation	254.4		254.4		
modulation P1	8.2		13.3	5.1	63
DP budget	246.2		241.1	-5.1	-2
decrease DP budget due to modulation		3			
EAFRD budget before modulation	42.8		42.8		
modulation available for P2	8.2		13.3	5.1	63
EAFRD budget	50.9		56.1	5.1	10
increase EAFRD budget due to modulation		19			
P2 budget	*166.5*		*179.8*	*13.3*	*8*

Source: Budget Model (LEI).

In the Health Check Scenario, modulation in the period 2009-2012 results in an additional reduction of 5.1 billion euro of the DP budget for the EU-15 as a whole (Table 3.1). As a consequence, the EAFRD budget 2007-2013 for the EU-15 increases by 5.1 billion euro relative to the Baseline Scenario (+10%). If Voluntary Modulation (VM) funds in the UK and Portugal are deducted, the net increase of the EAFRD budget 2007-2013 amounts to 4.4 billion euro. As in the Baseline Scenario, the increase in the EAFRD budget for the individual EU-15 Member States largely varies, mainly depending on the shares of DP and EAFRD in the total budget. The addition of an additional 4.4 billion euro of modulation funds in the Health Check Scenario to the EAFRD budget results in an increase of 3.7 billion euro of national co-financing and 5.2 billion euro of private funding. On the whole, the total budget available for P2 in the EU-15 increases by 8%.

[15] Article 69 of Council Regulation 1698/2005 sets out the allocation criteria for the EAFRD budget between Member States, which consider: past performance (allocations under the 2000-2006 programming period), amounts reserved for Convergence regions; and additional amounts relating to specific situations and needs based on objective criteria (not defined).

3.3 Initial situation DP and EAFRD budget 2007-2013

The total EU budget for direct payments (DP) of the first pillar and the EAFRD budget for the second pillar of the CAP in the EU-27 for the period 2007-2013 amounts to 375 billion euro (Table 3.2). From this total budget, three quarters (286 billion euro) are allocated to DP and one quarter (88 billion euro) for EAFRD. Quite a large difference in the share of DP and the EAFRD in the total budget can be observed between the 'old' and 'new' Member States; In the EU-15 less than one fifth of the total budget is allocated to the second pillar, in the NMS12 the second pillar budget amounts to almost 50%. Individual Member States, however, deviate quite significantly from this average picture. Within the EU-15 Member States, the share of the EAFRD budget of the second pillar in the total budget is about 6-10% in Denmark, the UK, the Netherlands, Belgium and France; it is about one quarter in Italy, Sweden and Luxembourg, one third in Finland and nearly 50% in Austria and Portugal. Within the NMS12 Member States, the share of EAFRD in the total budget varies from 37% in Hungary to 79% in Malta. This share of EAFRD within the total budget is in fact the main indicator of the magnitude of the impact of modulation on Pillar 2.

In the case study report of Germany reference is made to a substitution effect of funds. The national public budget for the RDPs of the *Länder* in the period 2007-2013 is considerably lower than the budget available for the period 2000-2006. This cut in the national public budget has partly been compensated by CM funds.

3.4 Baseline Scenario

3.4.1 Changes in the DP budget 2007-2013 as a result of compulsory modulation

Under current legislation, compulsory modulation amounts to 5% of the DP in the years 2007-2013, with a franchise of 5000 euro per farm. In this period, compulsory modulation is only applied in the EU-15 Member States. As a result of the phasing in of the direct payments in the NMS12, the EU-10 Member States are only subject to compulsory modulation at the end of the period 2007-2013, and BG and RO only as of 2016 at earliest. Therefore, in our analysis of the redistribution effects of modulation we only focus on the EU-15.

In the DP budget 2007-2013, funds raised due to compulsory modulation (CM) have already been deducted. The total decrease in the DP budget due to compulsory modulation amounts to nearly 8.2 billion euro in the EU-15 in the period 2007-2013 (Table 3.3). Although the absolute reduction of the DP in the individual Member States varies from 10 million euro in Luxembourg to 2.3 billion euro in France, the relative reduction of the DP is rather small and quite similar in the EU-15 Member States: it ranges from 1% in Greece to 4% in Denmark, France, Germany, Luxembourg and the UK. If, however, VM in the UK and Portugal is taken into account, the effect is significantly larger. For example in the period 2007-2013 VM funds amount to about 2.5 billion euro in the UK, which reduces the DP budget by a further 10% , while VM rates in Portugal in 2008-2012 raise a further 205 million euro, equivalent to an additional 5% of the Portuguese DP budget.

Table 3.2 Share of the budget for Direct Payments (DP) of the first pillar and the EAFRD budget for the second pillar in the total budget (EU-27), 2007-2013 (million euro)

	Total budget: DP and EAFRD, 2007-2013 (mio euro)	Budget DP, 2007-2013 (mio euro) 1)	DP as % of total (DP plus EAFRD) budget (%)	Budget EAFRD, 2007-2013 (mio euro)	EAFRD as share of total (DP plus EAFRD) budget (%)
Denmark	7646	7201	94	445	6
United Kingdom 2)	29737	27827	94	1910	6
Netherlands	6433	5946	92	487	8
Belgium	4681	4262	91	419	9
France	64865	58423	90	6442	10
Germany	48340	40307	83	8033	17
Spain	39768	32680	82	7088	18
Ireland	11723	9383	80	2340	20
Greece	18187	14480	80	3707	20
Italy	35224	26973	77	8251	23
Sweden	7157	5331	74	1826	26
Luxembourg	349	259	74	90	26
Finland	6038	3958	66	2080	34
Austria	9116	5205	57	3911	43
Portugal 3)	7925	4007	51	3918	49
EU-15	**297188**	**246242**	**83**	**50946**	**17**
Hungary	10298	6493	63	3806	37
Czech Republic	7316	4500	62	2816	38
Cyprus	379	217	57	163	43
Poland	28269	15039	53	13230	47
Lithuania	3611	1868	52	1743	48
Slovak Republic	3892	1923	49	1969	51
Bulgaria	5098	2489	49	2609	51
Slovenia	1612	712	44	900	56
Latvia	1767	725	41	1041	59
Estonia	1209	494	41	715	59
Romania	13524	5502	41	8023	59
Malta	97	20	21	77	79
EU-12	**77072**	**39982**	**52**	**37092**	**48**
EU-27	**374260**	**286224**	**76**	**88038**	**24**

1)The total budget for DP is less than the total budget for the first pillar as it excludes expenditure for export subsidies and market interventions.2)The EAFRD budget for the UK is exclusive VM funds. These funds amount to 2532 mio euro in the period 2007-2013.3). We do not know yet whether the EAFRD budget given here for Portugal includes VM.

Source: Budget DP from Council Regulation 1782/2003 (consolidated version - August 5, 2006) and Agra Europe (2007), 'Threat of DP cuts rises as NMS accede', Agra Europe Weekly, January 12; Budget second pillar from EC (2007), EU support for rural development 2007-2013; Pre-allocated funding under Heading 2 'Natural Resources' of the Financial Framework, Brussels: European Commission; adaptation LEI.

Table 3.3 Changes in the DP and EAFRD budget due to compulsory modulation in the EU-15, 2007-2013

	Budget DP and EAFRD, 2007-2013 (million euro)	Modulation first pillar 2007-2013 (million euro)	Budget DP before modulation, 2007-2013 (million euro)	Decrease budget DP due to modulation, 2007-2013 (%)	Budget EAFRD before modulation, 2007-2013 (million euro)	Total modulation available for second pillar, 2007-2013 (million euro)	Increase budget EAFRD due to modulation, 2007-2013 (%)	Benefit / loss (million euro)	As % total budget DP and EAFRD, 2007-2013
France	64865	2275	60698	4	4622	1820	39	-455	-0.7
United Kingdom	29737	1156	28983	4	985	925	94	-231	-0.8
Germany	48340	1478	41785	4	6703	1330	20	-148	-0.3
Ireland	11723	283	9666	3	2114	226	11	-57	-0.5
Denmark	7646	265	7466	4	233	212	91	-53	-0.7
Netherlands	6433	204	6150	3	312	175	56	-30	-0.5
Belgium	4681	132	4394	3	313	105	34	-26	-0.6
Sweden	7157	181	5512	3	1669	156	9	-25	-0.3
Luxem-bourg	349	10	269	4	82	8	10	-2	-0.6
Finland	6038	100	4058	2	1959	121	6	21	0.3
Italy	35224	705	27678	3	7411	840	11	135	0.4
Greece	18187	207	14687	1	3350	358	11	151	0.8
Austria	9116	103	5308	2	3650	262	7	159	1.7
Portugal	7925	83	4090	2	3610	308	9	225	2.8
Spain	39768	981	33661	3	5772	1316	23	335	0.8
EU-15	297188	8161	254403	3	42785	8161	19	0	0.0

Source: Budget DP from Council Regulation 1782/2003 (consolidated version - August 5, 2006) and Agra Europe (2007), 'Threat of SFP cuts rises as NMS accede', Agra Europe Weekly, January 12; Modulation from Agra Informa Ltd (2007), CAP Monitor 23.02.2007; Budget second pillar from EC (2007), EU support for rural development 2007-2013; Pre-allocated funding under Heading 2 'Natural Resources' of the Financial Framework, Brussels: European Commission; Modulation and % return from Agra Informa Ltd (2007), CAP Monitor 23.02.2007; adaption LEI.

Table 3.4 5% compulsory modulation and increase EAFRD budget second pillar in the EU-15 Member States, 2007-2013

	Modulation DP p.a. (million euro)	% 'return'	Modulation available for second pillar, p.a. (million euro)	Total modulation available for second pillar, 2007-2013 (million euro)	EAFRD budget second pillar including modulation, 2007-2013 (million euro)	As % of national budget DP and second pillar, 2007-2013	EAFRD budget second pillar without modulation, 2007-2013 (million euro)	Increase EAFRD budget second pillar due to modulation, 2007-2013 (%)
United Kingdom 1)	165	80	132	925	1910	6	985	94
Denmark	38	80	30	212	445	6	233	91
Netherlands	29	86	25	175	487	8	312	56
France	325	80	260	1820	6442	10	4622	39
Belgium	19	80	15	105	419	9	313	34
Spain	140	134	188	1316	7088	18	5772	23
Germany	211	90	190	1330	8033	17	6703	20
Italy	101	119	120	840	8251	24	7411	11
Ireland	40	80	32	226	2340	20	2114	11
Greece	30	173	51	358	3707	20	3350	11
Luxembourg	1	80	1	8	90	26	82	10
Sweden	26	86	22	156	1826	26	1669	9
Portugal	12	372	44	308	3918	50	3610	9
Austria	15	255	37	262	3911	43	3650	7
Finland	14	121	17	121	2080	34	1959	6
EU-15	1166		1166	8161	50946		42785	19

1) The EAFRD budget for the UK is exclusive of voluntary modulation (VM) funds. These funds amount to 2532 mio euro in the period 2007-2013.
Source: Budget second pillar from EC (2007), EU support for rural development 2007-2013; Pre-allocated funding under Heading 2 'Natural Resources' of the Financial Framework, Brussels: European Commission; Modulation and % return from Agra Informa Ltd (2007), CAP Monitor 23.02.2007; adaptation LEI.

3.4.2 Changes in the EAFRD budget 2007-2013 as a result of compulsory modulation

Each Member State receives at least 80% of the modulation funds they generate (90% for Germany). The distribution of the remaining modulation funds is calculated by using a 'return key' depending on agricultural area, agricultural employment and GDP/capita. On the whole, Member States in North-West Europe (Belgium, Denmark, Germany, France, Ireland, Luxembourg, the Netherlands, Sweden and the UK) have a return key of 80-90%, so they do not get back all the modulation funds deducted from the first pillar (Table 3.4). The southern Member States, as well as Austria and Finland have a return key of more than 100%. Portugal (375%) and Austria (253%) benefit from the highest return keys. CM funds were automatically added to the EAFRD budget 2007-2013. Due to these funds, the EAFRD budget for the EU-15 for the period 2007-2013 increased by nearly one fifth from 43 billion euro to the current 51 billion euro. However, the increases in the budgets for individual Member States varies considerably, mainly depending on the return key and the initial distribution of the budget over the DP and EAFRD. As a result of this, Member States with a relatively small share of the EAFRD in the total budget tend to experience the highest increases, whereas Member States with a relatively high share of EAFRD in the budget tend to have a more moderate increase. The UK, Denmark, the Netherlands, France and Belgium, which have a share of 6-10% of EAFRD in the total budget, therefore, face an increase in the EAFRD budget of 34-94%. Spain and Germany, with a share of about 18% of EAFRD in the total budget, have about the same increase as the EU-15 average. All other Member States, with a share of one fifth or more of EAFRD in the total budget, show an increase of 11% or less in the EAFRD budget due to compulsory modulation.

For the UK, the addition of 2.5 billion euro of VM funds to the EAFRD budget 2007-2013 results in an increase of the core EAFRD budget (excluding compulsory modulation funds – 1 billion euro – of 250%, which is considerably above the 94% increase due to CM funds).

3.4.3 'Winners' and 'losers' due to compulsory modulation

The level of the return key determines whether a Member States gains or loses from compulsory modulation: a key above 100% implies that a Member States receives more funds for the EAFRD budget than its modulated funds from the DP, whereas the opposite applies for a return key below 100%. France (455 million euro), the UK (231 million euro) and Germany (148 million euro) suffer from the largest losses; Italy (135 million euro), Greece (151 million euro), Austria (159 million euro), Portugal (225 million euro) and Spain (335 million euro) benefit most from modulation (Table 3.3). Nevertheless, the redistribution of the modulated funds of the DP hardly affects Member States' total budget for DP and EAFRD for the period 2007-2013: increases or decreases are less than 1% (except for Austria (+1.7%) and Portugal (+2.8%).

Calculation of the increase in the second pillar budget due to modulation funds
The total budget of the second pillar consists of five components (Figure3.1):

(1) a contribution of the European Agricultural Fund for Rural Development (EAFRD);
(2) modulation funds;
(3) national co-financing from national public funds;
(4) national top-up;
(5) private funds.

The total public budget consists of the first four components. EU-co-financing rates vary per axis from the second pillar and per convergence status (Table 3.5).

Modulation funds have to be co-financed by national public funds from the Member States. In addition, modulation funds generate also private funds, as for some rural development measures a maximum share of subsidies is used. As co-financing rates and the maximum shares of subsidies may vary per rural development measure, a calculation of the generation of national public funds and private funds due to modulation is made per measure (Table 3.6). It could be said that the higher the national co-financing rate, the higher the increase in the public budget for the second pillar due to modulation. Moreover, the higher the share of the private funds in the total budget, the higher the increase in the total budget for the second pillar due to modulation.

Assumptions on the distribution of the CM funds over rural development measures are specified in Table 3.7.

Figure 3.1 Composition of the second pillar budget

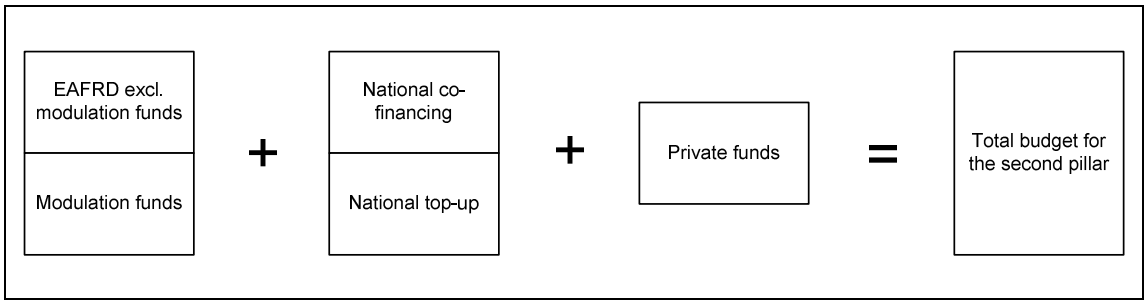


Table 3.5 Maximum EU co-financing rates of the second pillar, 2007-2013 (%)

	Regions eligible under the Convergence Objective	*Other regions*
Axis 1 Competitiveness	*75*	*50*
Axis 2 Land management	*80*	*55*
Axis 3 Wider rural development	*75*	*50*
LEADER Axis	*80*	*55*

Source: European Commission (2006), The EU Rural Development Policy 2007-2013; Brussels, DG for Agriculture and Rural Development, Fact Sheet.

Table 3.6 Example of the calculation of the increase in the total budget for the second pillar due to compulsory modulation per measure

	Formula	Increase in euro
Increase in EARDF budget due to compulsory modulation	1 euro CM	1
Increase in national public budget	(co-financing rate national Member State[1)] / co-financing rate EU) * 1 euro CM	1
Increase in total public budget second pillar	(100 / co-financing rate EU) * 1 euro CM	2
Increase in private budget	(PR/PU[2)]) * (100 / co-financing rate EU) * 1 euro CM	0.66
Increase in total budget per measure	(1 + PR/PU) * (100 / co-financing rate EU) * 1 euro CM	2.66

1) In this example the co-financing rate EU Member State is 50%; 2) the ratio of private and public expenditure PR/PU in this example is 1/3.

Table 3.7 Assumptions for the distribution of modulation funds over the EAFRD budget

Baseline Scenario	**Health Check Scenario**	**Health Check Scenario, sensitivity analysis**	
Compulsory modulation 5%	*Additional modulation funds raised under the Health Check Scenario*	*Additional modulation funds raised under the Health Check Scenario*	*Voluntary modulation*
Finland and England (UK): All funds are spent on measure 214	*All countries:* targeted at New Challenges: Measures 123, 125, 213, 224, 225, 226, 312, 322: each 3%; Measures: 216, 221, 223, 311, 323: each 6%; Measure 121: 16%; Measure 214: 28%	*Finland and England (UK):* All funds are spent on measure 214	*Portugal:* 50% is spent on Axis 1 (70% on measures 111, 121 and 123; 30% on measure 125); 50% is spent on Axis 2 (proportionally to EAFRD budget 2007-2013)
All other countries: Modulation funds are spent proportionally to EAFRD budget 2007-2013		*All other countries:* Modulation funds are spent proportionally to EAFRD budget 2007-2013	*Northern Ireland (UK) and Scotland (UK):* Voluntary modulation funds are spent proportionally to EAFRD budget 2007-201*3*
			England (UK): 10% is spent on Axis 1 (measures 111, 121, 123 and 124) [1]; 80% is spent on measure 214[2]; 10% is spent on Axis 3 (proportionally to EAFRD budget 2007-2013)[3]
			Wales (UK): 80% is spent on Axis 2 (proportionally to EAFRD budget 2007-2013) 20% is spent on Axis 1, 3 and 4 (proportionally to EAFRD budget 2007-2013)

1) No national co-financing, 2) With national co-financing, 3) No national co-financing

3.4.4 Increase in the second pillar budget due to modulation funds

The addition of 8 billion euro of CM funds to the EAFRD budget 2007-2013 in the EU-15 implies an increase of 7 billion euro of national co-financing and also 7 billion euro of private funding (Table 3.8). For the EU-15 as a whole, the P2 budget 2007-

2013 increased by 14% relative to the P2 budget without CM funds. This increase is smaller than the increase of 19% in the EAFRD budget, as national co-financing for the EU-15 as a whole is less than 50%.

When we look at the increase in the P2 budget for the individual Member States, then we see the same picture as with regard to the increase in EAFRD due to CM funds. The increase in the P2 budget is highest in Denmark, Belgium, The Netherlands, the UK and France, and lowest in Portugal, Austria and Finland. Due to the inclusion of VM funds in the P2 budget for the UK, the share of the P2 budget induced by CM funds is underestimated in Table 3.8. If the VM funds and their associated national co-financing and private funds were to be excluded, then the increase in the P2 budget due to CM funds would have been about 50%.

3.5 Sensitivity Analysis in the Baseline Scenario

3.5.1 Budget changes 2007-2013 with 20% compulsory modulation

Application of 20% CM (i.e. 3% in 2006 and 20% in the years 2007-2012) generates over 29 billion euro of CM funds in the period 2007-2013 in the EU-15, which results in a decrease in the DP budget 2007-2013 by about 8%. Greece (-4%) and Finland (-6%) are affected the least and the UK, France, Germany and Belgium (all -10%) the most.

The addition of 20% CM funds to the EAFRD budget 2007-2013 for the EU-15 means an increase of over 40% relative to the current EAFRD budget. Again, the effect varies among Member States. In the UK, Denmark, the Netherlands, Belgium and France the EAFRD budget doubles, in Spain and Germany the increase amounts to one third to one half, whereas the increase in the remaining countries is one quarter or less.

Table 3.8 Increase P2 budget due to 5% compulsory modulation in EU-15 Member States, 2007-2013 (million euro)

	Total input (P2 budget) (mio euro)	EAFRD increase due to modulation funds (mio euro)	National co-financing increase due to modulation funds (mio euro)	Private financing increase due to modulation funds (mio euro)	Total increase due to modulation funds (mio euro)	P2 budget induced by modulation funds (%)
Denmark	1250	212	184	200	595	48
Belgium	3561	105	183	598	885	25
France	19315	1820	1554	1224	4598	24
Netherlands	2411	175	175	223	573	24
United Kingdom 1)	10607	925	1001	246	2171	20
Spain	30784	1316	1236	1993	4545	15
Germany	26211	1330	854	1331	3515	13
Greece	6574	358	132	144	634	10
Italy	25193	840	850	714	2405	10
Sweden	5447	156	179	129	465	9
Luxembourg	663	8	24	20	52	8
Ireland	6050	226	189	21	437	7
Portugal	8977	308	83	163	554	6
Austria	11659	262	262	193	717	6
Finland	7790	121	311	0	432	6
EU-15	166494	8161	7218	7199	22578	14

1) Including Voluntary Modulation Funds. Source: Budget Model (LEI).

3.5.2 Franchise of 0 and 10,000 euro

A franchise of 0 euro implies that all farms that receive DP having their payment reduced by 5%. For the EU-15, the DP budget 2007-2013 would be 1% smaller than the DP budget with a franchise of 5,000 euro. On the other hand, when using a franchise of 10,000 euro, the DP budget 2007-2013 would be 1% larger than the DP budget with a franchise of 5000 euro. Application of the 0 euro franchise results in an increase in the EAFRD budget 2007-2013 of a further 6% for the EU-15 as a whole. In Denmark, the Netherlands, Belgium and Greece, the EAFRD budget 2007-2013 would increase by a further 11-13%, whereas it would increase by only a few percentage points in Finland and Portugal. The application of a 10,000 euro franchise would result in a decrease in the EAFRD budget 2007-2013 by 3% in the EU-15. The decrease varies from 10% in Denmark, the Netherlands and Belgium to 1% in Finland and Portugal.

3.5.3 Consequences of sensitivity analyses for levels of national co-financing

Changes in the EARFD budget 2007-2013 have consequences for the required amounts of national co-financing. As with the core EAFRD budget 2007-2013 for the EU-15, the amount of national co-financing would increase by 40% with a CM rate of 20% (Table 3.9). In particular, Denmark, the Netherlands, Belgium and France would be faced with a doubling of the amount of national co-financing. Application of a 0 euro franchise would result in a rise by 6% of the overall amount of national co-financing required in the EU-15, whereas an application of a 10,000 euro franchise would result in a decrease by 3%.

Table 3.9 Sensitivity analysis of national co-financing of the EAFRD budget (EU-15) 2007-2013

	Average national co-financing rate (%)	National co-financing (mio euro)				*National co-financing as share of national co-financing at 5% CM (%)*		
		5% CM	20% CM	Franchise 0 euro	Franchise 10000 euro	20%	Franchise 0 euro	Franchise 10,000 euro
Denmark	46	386	962	435	347	250	113	90
Netherlands	50	487	993	552	437	204	113	90
Belgium	63	726	1451	809	654	200	111	90
France	46	5502	10441	5871	5164	190	107	94
United Kingdom	50	4389	7482	4548	4239	170	104	97
Germany	39	5160	7679	5387	4983	149	104	97
Spain	48	6657	8890	7213	6386	134	108	96
Ireland	46	1959	2491	2084	1884	127	106	96
Sweden	53	2092	2624	2146	2046	125	103	98
Luxembourg	76	278	345	286	272	124	103	98
Italy	50	8354	10289	8856	8175	123	106	98
Greece	27	1371	1562	1527	1329	114	111	97
Finland	69	4603	5215	4709	4525	113	102	98
Austria	50	3911	4266	4024	3845	109	103	98
Portugal	21	1055	1126	1074	1048	107	102	99
EU-15	*47*	*46928*	*65815*	*49522*	*45332*	*140*	*106*	*97*

Source: Budget Model (LEI).

3.6 Health Check Scenario

Changes in the DP budget 2007-2013 under the Health Check Scenario

Under the Health Check scenario, the modulation funds raised consist of two elements. Firstly, the CM funds 2007-2013 as described under the baseline scenario, and secondly an additional element according to the higher modulation rates in the years 2009-2012, a proportion of which are linked to the level of DP received. In the EU-15, modulation funds under the Health Check Scenario amount to over 13 billion euros in the period 2007-2013, which means an increase of more than 5 billion euro over and above those raised through CM (Table 3.10). For the EU-15, the Health Check Scenario results in an additional decrease of the DP budget 2007-2013 of 2%. The DP budget in Germany shows the highest decrease (3%). Those Member States with a large proportion of farms receiving high levels of DPs (such as Germany and the UK, are affected to a greater extent.

Table 3.10 Budget Direct Payments and modulation in the Health Check Scenario (EU-15), 2007-2013

	Total budget DP, 2007-2013 (million euro)	Compulsory modulation DP (5%) 2007-2013 (million euro)	Modulation of DP in Health Check 2007-2013 (million euro)	Increase modulation funds in Health Check 2007-2013 (million euro)	Decrease budget DP in Health Check, 2007-2013 (%)
Germany	40307	1478	2639	1161	2.9
United Kingdom 1)	27827	1156	1863	707	2.5 (0)
France	58423	2275	3576	1301	2.2
Belgium	4262	132	225	93	2.2
Denmark	7201	265	419	155	2.1
Sweden	5331	181	288	107	2.0
Italy	26973	705	1218	514	1.9
Netherlands	5946	204	317	113	1.9
Luxembourg	259	10	15	5	1.9
Spain	32680	981	1513	532	1.6
Portugal 1)	4007	83	145	62	1.5 (0)
Austria	5205	103	182	79	1.5
Ireland	9383	283	424	141	1.5
Finland	3958	100	154	53	1.3
Greece	14480	207	321	115	0.8
EU-15	246242	8161	13299	5138	2.1

1) Changes in the DP budget are given here to compare the decrease in the DP budget due to modulation in Health Check Scenario among Member States. However, as the decrease in DP in Health Check will be compensated by a deduction in VM funds from the DP budget, the DP budget 2007-2013 in the UK and Portugal is the same in Baseline Scenario and in Health Check Scenario
Source: Budget Model (LEI).

3.6.1 Changes in the EAFRD budget 2007-2013 under Health Check Scenario

The additional part of modulation funds raised in 2009-2012 is not subject to a 'return' key. This implies that the 'return' key increases for Member States with a 'return' key at 5% CM of less that 100, and that the 'return' key decreases for Member States with a 'return' key at 5% CM of over 100 (Table 3.11). The Health Check Scenario results in an increase in the EAFRD budget 2007-2013 by 10% for the EU-15. This increase varies among Member States: in the UK and Denmark the EAFRD budget increases by about one third, whereas in Greece, Finland, Austria and Portugal the increase is limited to a few percents.

Table 3.11 Increase of EAFRD budget in the second pillar in the Health Check Scenario (EU-15), 2007-2013

	Additional modulation in the Health Check Scenario DP 2007-2013 (million euro)	Modulation available for EAFRD budget second pillar, 2007-2013 (million euro)	% 'return' compulsory modulation	% 'return' additional modulation in Health Check Scenario	EAFRD budget second pillar incl. compulsory modulation, 2007-2013 (million euro)	As % of national budget DP and second pillar, 2007-2013	EAFRD budget second pillar in Health Check Scenario 2007-2013 (million euro)	Increase EAFRD budget second pillar in Health Check Scenario, 2007-2013 (%)
United Kingdom 1)	1863	1632	80	88	1910	6	2617 (1910)	37 (0)
Denmark	419	366	80	87	445	6	599	35
Netherlands	317	288	86	91	487	8	599	23
Belgium	225	198	80	88	419	9	512	22
France	3576	3121	80	87	6442	10	7743	20
Germany	2639	2491	90	94	8033	17	9194	14
Spain	1513	1848	134	122	7088	18	7621	8
Italy	1218	1354	119	111	8251	23	8764	6
Ireland	424	368	80	87	2340	20	2481	6
Sweden	288	263	86	91	1826	26	1932	6
Luxem-bourg	15	13	80	87	90	26	95	5
Greece	321	473	173	147	3707	20	3822	3
Finland	154	174	121	114	2080	34	2133	3
Austria	182	341	255	187	3911	43	3990	2
Portugal 1)	145	370	372	256	3918	49	3980 (3918)	2
EU-15	13299	13299			50946		56084	10

1) Changes in the EAFRD budget are given here to compare the increase in the EAFRD budget due to modulation in Health Check Scenario among Member States. However, as the increase in EAFRD due to modulation in Health Check Scenario will be compensated by a deduction in VM funds from the EAFRD budget, the EAFRD budget 2007-2013 in the UK and Portugal is the same in the Baseline Scenario and Health Check Scenario Source: Budget Model (LEI).

3.6.2 Increase in the second pillar budget in the Health Check Scenario

The addition of 4.4 billion euro (excluding UK and Portuguese additional modulation funds) of additional modulation funds to the EAFRD budget 2007-2013 in the EU-15 implies an increase of 3.7 billion euro of national co-financing and 5.2 billion euro of private funding (Table 3.12). For the EU-15 as a whole, the P2 budget 2007-2013 increases by 7% relative to the P2 budget with CM funds. This increase is smaller than the increase by 10% in the EAFRD budget, as national co-financing for the EU-15 as a whole is less than 50%.

Table 3.12 Increase P2 budget in the Health Check Scenario (EU-15), 2007-2013 (million euro)

	total input (P2 budget) (mio euro)	EAFRD increase due to additional modulation funds (mio euro)	National co-financing increase due to additional modulation funds (mio euro)	Private financing increase due to additional modulation funds (mio euro)	Total increase due to additional modulation funds (mio euro)	P2 budget induced by additional modulation funds (%)
Denmark	1725	155	138	182	475	28
France	22957	1301	1095	1245	3641	16
Netherlands	2817	113	113	180	406	14
Belgium	4117	93	133	330	555	13
Germany	29851	1161	736	1743	3640	12
Sweden	5828	107	120	155	382	7
Italy	26642	514	514	421	1449	5
Luxembourg	695	5	14	13	32	5
Spain	32260	532	465	479	1476	5
Ireland	6337	141	73	72	286	5
Greece	6786	115	41	56	211	3
Finland	7987	53	108	35	197	2
Austria	11953	79	79	136	293	2
United Kingdom	10869	0	75	187	263	2
Portugal	8960	0	-1	-17	-17	0
EU-15	179783	4369	3703	5218	13290	7

Source: Budget Model (LEI).

When we look at the increase in the P2 budget for the individual Member States, then we see by and large the same picture as with regard to the increase in EAFRD. The increase in the P2 budget is highest in Denmark, Belgium, The Netherlands and France, and lowest in Austria, Greece and Finland. Due to the fact that any increase in CM funds has to be offset by an equivalent decrease in VM funds, the P2 budget for Portugal more or less remains unchanged, whereas the P2 budget for the UK rises by 2%. This is due to the fact that under the Health Check scenario, the additional PM funds have not been allocated to the same RDP measures as current VM funds, and some of the funds to which these additional funds have been allocated receive different rates of co-financing and potentially require the contribution of private funds (for example, in the UK (England), VM funds are currently focused predominantly on the agri-environment measure, whereas under the Health Check scenario for this study, the additional funds have been allocated in a standard way across a range of measures across the axes).

3.7 Sensitivity Analysis in the Health Check Scenario

A proportional distribution of the additional PM funds over the RDP measures rather than a targeted use towards New Challenges results in some minor changes in the P2 budget 2007-2013 for the EU. The amount of national co-financing increases by about 270 million euro and that of private funds decreases by 1 billion euro (Table 3.13). However, the total increase in the P2 budget 2007-2013 in the EU-15 of 7% relative to the P2 budget with CM funds is more or less the same as in the Health Check scenario.

3.7.1 Changes in national co-financing

The increase in the required budget of national co-financing ranges from 30% in Austria to 86% in Denmark if the additional funds are targeted at the New Challenges (Table 3.13). Due to the requirement for VM rates to be reduced as CM rates increase, the additional national co-financing in the UK increases only by 8% and that in Portugal decreases by 1%. In the case of a proportional distribution of the additional funds over RDP measures, in most Member States the required national co-financing is more or less similar or slightly above that in the case of targeting at New Challenges. However, for Ireland, Belgium and Finland the requested national co-financing is considerably higher. Obviously, in these countries the national co-financing rates of the New Challenges measures are below those of the current RDP measures.

Table 3.13 Sensitivity analysis of national co-financing of the EAFRD budget and the Health Check Scenario (EU-15), 2007-2013

		National co-financing (mio euro)			National co-financing as share of national co-financing at 5% CM (%)	
	Average national co-finan-cing rate (%)	5% CM	Additional modulation with targeted use at New Challenges	Additional modulation with proportional distribution over RDP measures challenges	Additional modulation with targeted use at New Challenges	Additional modulation with proportional distribution over RDP measures challenges
Germany	39	854	736	746	86	87
Denmark	46	184	138	134	75	73
Belgium	63	183	133	161	73	88
France	46	1554	1095	1111	70	71
Sweden	53	179	120	122	67	68
Netherlands	50	175	113	113	65	65
Italy	50	850	514	520	60	61
Luxembourg	76	24	14	15	58	61
Ireland	46	189	73	118	39	63
Spain	48	1236	465	500	38	40
Finland	69	311	108	137	35	44
Greece	27	132	41	42	31	32
Austria	50	262	79	79	30	30
United Kingdom	50	1001	75	176	8	18
Portugal	21	83	-1	0	-1	0
EU-15	47	7218	3703	3976	51	55

Source: Budget Model (LEI).

From the case studies we have some information whether Member States are prepared to provide additional national co-financing for the RDP in the case of additional modulation. It seems that France, Germany and the Netherlands are against the proposal and that they are in favour of a revised article 69. By using article 69 no national co-financing is needed. On the other hand, the UK and Portugal, who apply VM, welcome the proposals for additional modulation. The position of Finland is yet unclear. In the German case study report, it is suggested that the current national top ups could be used as national co-financing for additional modulation. This would

imply that additional modulation only increases the EAFRD budget without induced increases in national co-financing and private funding.

3.7.2 No national co-financing of additional modulation funds

When no national co-financing of additional modulation funds is given, the P2 budget 2007-2013 for the EU-15 increases by 3% (Table 3.14).

Table 3.14 Sensitivity analysis increase P2 budget in Health Check Scenario and no national co-financing (EU-15), 2007-2013 (million euro)

	Total input (P2 budget) (mio euro)	EAFRD increase (mio euro)	National co-financing increase (mio euro)	Private financing increase (mio euro)	Total increase (mio euro)	P2 budget increase (%)
Belgium	3759	93	0	105	198	5
Denmark	1497	155	0	92	247	16
Germany	28356	1161	0	984	2145	8
Greece	6729	115	0	40	155	2
Spain	31559	532	0	243	775	2
France	21252	1301	0	636	1937	9
Ireland	6228	141	0	36	177	3
Italy	25906	514	0	199	713	3
Luxembourg	671	5	0	4	8	1
Netherlands	2614	113	0	90	203	8
Austria	11806	79	0	68	147	1
Portugal	8895	0	-17	-66	-83	-1
Finland	7859	53	0	16	69	1
Sweden	5628	107	0	75	181	3
United Kingdom	9764	0	-590	-253	-842	-9
EU-15	172524	4369	-606	2267	6030	3

Source: Budget Model (LEI).

4 EFFECTS ON FARM STRUCTURE AND THE AGRICULTURAL SECTOR

4.1 Issues

This chapter considers the effects of reducing Pillar 1 direct payments, and the redistribution of the modulation funds to rural development measures in the second pillar, on farm structures and the agricultural sector. The focus of this study theme includes an analysis of how modulation affects farm structures, the size distribution of farms across regions, Member States and the EU-27 as a whole and any changes in farm specialisation that occur. In addition, the study explores the effects of modulation on the agricultural sector including the growth and/or decline of agricultural and non-agricultural activities as well as the effects along the production and market chain and possible effects on consumers.

4.2 Summary

According to the FES model the net change in the number of farms in the EU-15 Member States under both the Baseline Scenario and the Health Check Scenario is negligible. This finding is backed up by information from the case studies, where experts indicated that they anticipated very few changes in the farm structure indicators to result from compulsory modulation under the levels considered in this study. They did, however, suggest that there might be some small changes in farm structure at the local level.

The overall production effect due to modulation under the Health Check Scenario is positive for primary agriculture in the EU-15 (0.45%) and EU-27 (0.4%). The impact for EU-15 is larger than for the EU-27 as modulation only applies to the NMS for the last year of the 2007-2013 financial programming period in the EU-10 and afterwards for BG and RO.

Reducing the first pillar has a slightly negative impact on production due to the fact that part of the payments are still coupled in some countries in the baseline scenario and due to the fact that decoupled payments have minor production effects. The pillar 2 measures, especially physical capital investments in Axis 1, have a larger and positive effects so the net effect on production is positive. When broken down by product type, it can be seen that the net production effect is slightly positive for all broad groups of products except for cereals, where there is an overall small decline in production experienced. This effect, however, is largely due a few specific cereals (e.g. Durum wheat) which continue to receive an element of coupled support.

The models indicate that, under the Health Check Scenario, compulsory modulation leads to slightly lower consumer prices for primary agricultural products. The main group of measures that causes this result is the physical capital investments as these are likely to increase productivity and thereby lower costs.

4.3 Impact on farm structure

Any analysis of the effects of modulation on farms structures has to be set within the context of significant trends in structural change that are brought about by non-policy drivers. For example, the past twenty years has witnessed a decline in the overall number of farms accompanied by an increase in the overall size of farm holdings.

These trends are fairly consistent between different Member States, with most of the case study countries identifying average annual decreases in farm numbers of between 2-3%. This trend is predicted to continue, with a 25% decrease in the number of farms anticipated between 2003 and 2020, with a rate of decrease of around 2.5% per year in the EU-15 and 4 % per year in the EU-10 (as developed in the Scenar 2020 project[16]). Key drivers affecting these trends include market drivers, such as the level of commodity prices, or changes in policy support, such as the decoupling of support payments from production.

Amidst these drivers of structural change, compulsory modulation, especially at relatively low levels, is unlikely to have a significant impact upon farm structural change. However, as modulation rates increase, its role in driving structural change may increase, particularly for those holdings experiencing an overall decline in their Pillar 1 payments, and as a result of increased funding availability for Pillar 2 measures, such as early retirement, or support for young farmers which are focused at facilitating structural change and the improved efficiency of farm holdings. On the other hand, increased levels of investment in Axis 2 measures, such as the LFA and the agri-environment measures, may serve to slow down structural change as these measures may help to keep a proportion of smaller holdings, particularly extensive livestock holdings, in business which might otherwise have been abandoned or amalgamated into larger, more profitable holdings.

From the budget model it is possible to derive the proportion of modulated funds that might be allocated to different rural development measures, which gives some indication of the proportional impact that modulation is likely to have. In relation to Axis 1 measures, within which the early retirement, farm modernisation and infrastructure measures sit, the contribution of modulated funds ranges from up to 10% of the total Axis 1 budget in GR, IT, LU, AT, PT, SW and IE, between 10-20% of the budget in DE, ES, and EI, and over 20% in BE, DK, FR, NL.

The FES model is designed to analyse the potential changes in the number of farms over time (Table 4.1). According to the FES model, changes in number of farms in the EU-15 Member States as a result of reductions in Pillar 1 direct payments under both the Baseline Scenario and the Health Check Scenario are negligible. The highest decreases are in Denmark (-0.6%), Germany and Sweden (both -0.1%). The very few farm businesses that are terminated altogether do so for financial reasons. It has not been possible to model the impact that the increased funding available for Pillar 2 measures might have on farm structures and the model can also not account for what happens to the land of the farms that have stopped.

Given these negligible changes in the number of farms in both scenarios, we do not present changes in the other farm structure indicators based on the FES model, as these show the same negligible changes as the number of farms.

[16] ec.europa.eu/agriculture/publi/reports/scenar2020/index_en.htm

Table 4.1 Number of farms as a result of reductions in Pillar 1 direct payments under the Baseline and Health Check Scenario in the EU-15 Member States, 2013

	Number of farms, 2013	Change in the number of farms in 2013 relative to the Baseline Scenario			
	Baseline Scenario	No modulation	BL+ 10keuro franchise	BL + 20% modulation	Health Check Scenario
EU-15, change to Baseline Scenario (%)	3,032,485	0.02	0.01	-0.06	-0.02

Source: FES model, based on FADN data.

These results are backed up by the findings from the case studies. Table 4.2 sets out a synthesis of the answers given of the impact of modulation of P1 and P2 on a number of farm structure indicators in the EU-15 case study countries. For five out of the nine indicators, it was thought that these would not change due to modulation in P1 and P2. For the remaining four indicators, minor decreases or increases are expected. It should be noted, however, that it is not straightforward to isolate the impact of direct payments or individual RDP measures on farm structure indicators from the impacts of other drivers, let alone assess the impact of a small change in the budget for direct payments or the RDP measures on farm structure. In addition, some case study experts indicated that modulation might lead to changes in farm structures at the local level, but that these were unlikely to be perceived at national level.

Table 4.2 Synthesis of the possible impact of compulsory modulation of P1 and P2 on farm structure indicators in the EU-15 case study countries (FI, FR, PT UK)

Indicator	Impact P1	Impact P2	P1+P2
Utilized agricultural area (UAA) (ha)	0	0	0
Share of arable area, permanent grass and permanent crops in UAA (%)	0	0	0
Number of farms	minor (-)	0	0
Average farm size (ha)	minor plus	0	minor plus
Average farm size (ESU)	0 – minor plus	0 – minor plus	0 – minor plus
Agricultural labour force (AWU)	minor (-)	minor plus	0
Composition of farming types (% of total)	0	0	0
Organic land as % of UAA	0	0	0
Organic production as % of total agricultural production	0	0	0

Source: Case study reports, adaptation LEI.

In certain situations, however, especially where the reductions in Pillar 1 payments affect farming sectors that are struggling in terms of financial viability, it may be that compulsory modulation exacerbates existing impacts of market forces which drive structural change. For example, the Finnish, French and UK case studies suggest that the reduction of Pillar 1 payments could reduce the proportion of agricultural land under extensive arable cropping, although the extent to which this is actually due to compulsory modulation or higher commodity prices is unclear. The case study expert in Portugal also highlights this issue, indicating that reductions on Pillar 1 payments as a result of compulsory modulation predominantly affect those medium sized, extensive farms that are becoming increasingly financially unviable, and as such may exacerbate the parallel trends being experienced in certain regions of Portugal of land abandonment on the one hand and farm expansion on the other. The potential for modulation to accelerate these twin trends of increases in farm size on the one hand, and land abandonment on the other, is an issue which is also highlighted in the case

study reports for Poland and Slovenia. This may also be the case within the beef and sheep sectors in the UK, sectors which derive a relatively high proportion of their incomes from direct payments and are sectors that are facing significant economic difficulties currently.

The impact of the increased funding available within Pillar 2 as a result of modulation is less straightforward to determine. The early retirement measure is the sole measure with an explicit objective of achieving significant structural change of the transferred holding. However, this measure, used in 9 of the EU-15 Member States, only accounts for 1.5% of total public funds allocated to the 2007-13 RDPs, ranging from under 0.5% in DK, DE, FR and IT to 5.2% in GR and 7.7% in IE. Other measures that aim to improve the efficiency or factor productivity of farms, such as the farm modernisation measure and the measure to improve farm infrastructure, can also indirectly influence restructuring. Conversely, measures within Axis 2, such as the LFA and the agri-environment measure, may slow down structural change by providing payments for extensive land management practices, which may serve to allow farm businesses to continue, which might otherwise have ceased to operate, with the land either being abandoned or amalgamated into larger holdings.

The literature review showed that there is little information about the effects of Pillar 2 measures on restructuring *per se*. In relation to the early retirement measure, under the 2000-2006 programming period, the highest levels of adoption of this measure were 'in areas of least need' and that the structural effect arising from the measure were similar to those which would have occurred anyway. The literature review also shows that the early retirement measure led to an increase in farm size, notably in ES, GR, PT and DE.

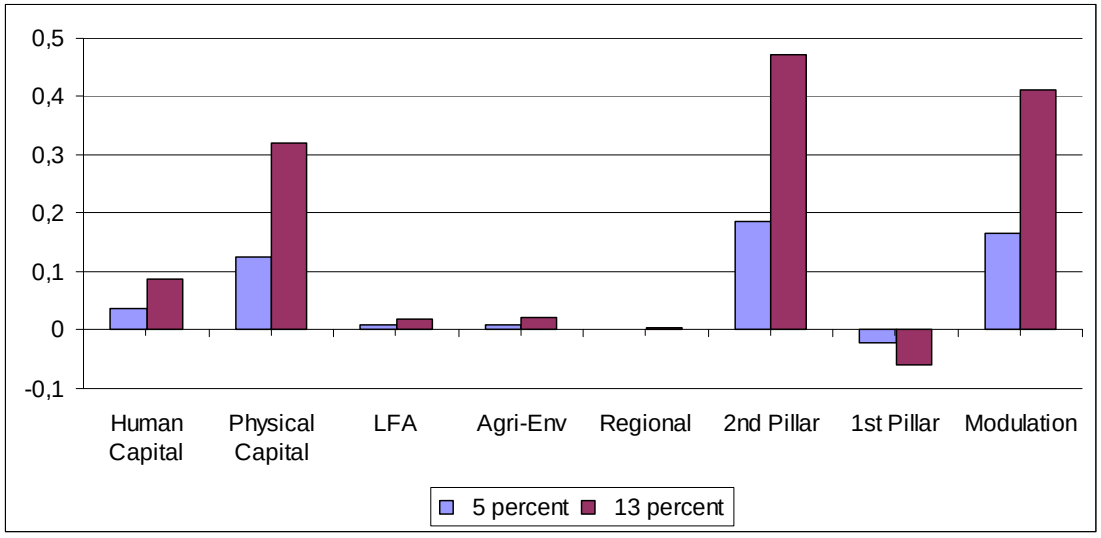
Interestingly, the majority of the case studies suggest that, in relation to Pillar 2 measures, it is the farm modernisation and the infrastructure measures that are likely to have the greatest impact on farms structures, possibly due to the fact that there is a significant proportion of the RDP budget allocated towards these measures (9% and 7% respectively). The Slovenian case study also refers to the role that training could play in shifting more traditional management practices to more market-oriented production. The budget model showed a slight emphasis on the measures in Axis 1, despite this, the case studies have shown that the additional modulation funds for these measures will not have any real net effect on farm structures.

Under the Health Check Scenario, although the early retirement measure will not be the focus of additional funds, it is unlikely that any significantly different impacts will be noted, given the minimal effect of this measure under the baseline scenario. Additional funding focused on Axis 2 measures – such as the LFA and agri-environment measures – could serve to further slow down structural changes amongst smaller extensive grassland farms. However, if funds are focused on the farm modernisation measure, then – depending on what these are used for – they may facilitate further re-structuring. It was not possible to ascertain the extent to which these effects would be likely to take place within this study.

4.4 Impact on the agricultural sector

Both the economic models (LEITAP and CAPRI) show that modulation, under the baseline scenario, has an overall positive, albeit small, production effect, although there are some differences between regions and products. This effect increases under the Health Check scenario. LEITAP suggests that the overall production effect under the Health Check scenario is positive for primary agriculture, with an overall increase in production of almost 0.4% compared to no modulation (see Figure 4.1). In addition to the overall impact of modulation under the Health Check scenario, both Figures 4.1 and 4.2 also distinguish the impact of various groups of second pillar measures, the impact of the whole second pillar and the impact of reducing the first pillar. The impact of the second pillar on production is positive (0.47%) while reducing first pillar payments as a small negative production effect (-0.06%). The negative production effect of reducing first pillar payments is limited as payments are decoupled. Second pillar payments, especially Axis 1 measures, increase production due to a higher productivity growth and due to co-financing that increases the total subsidy budget available strongly. The positive production effect of modulation is primarily due to the impact of physical capital investments, which aim to increase productivity, thereby lowering costs and prices. Lower prices, in turn, slightly increase demand and competitiveness, both of which lead to increased production. Part of the explanation for the large impact of these measures is that a large share of the second pillar money (~25%) is spent on these measures, and hence a greater proportion of modulation funds will also be allocated to them. The same productivity impact can be expected as a result of investment in the human capital investments; however, the impact is lower as less money is distributed to these measures (~8%). The production impact of the LFA and agri-environment measures is slightly positive due to the fact that these payments keep some areas in production.

Figure 4.1 EU-27 production volume of primary agriculture – 5% / 13% modulation (% change relative to no modulation in 2013)

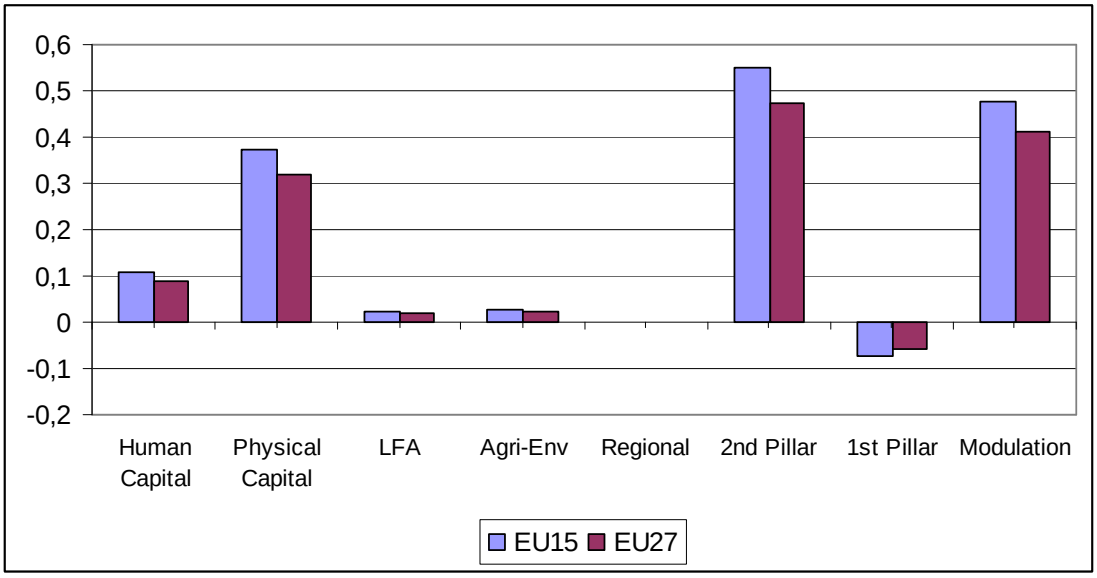


Source: LEITAP

Looking at the increased rates of modulation under the Health Check scenario compared to the no modulation scenario, Figure 4.2 shows that the impact for EU-15 is larger (0.45 % increase) than for the EU-27 (0.4% increase) as modulation only

applies to the NMS (excluding Romania and Bulgaria) from 2012, while it is in place for the EU-15 for the whole 2007-13 period.

Figure 4.2 Production volume of primary agriculture – EU-15 / EU-27 (% change of the Health Check scenario relative to no modulation in 2013)

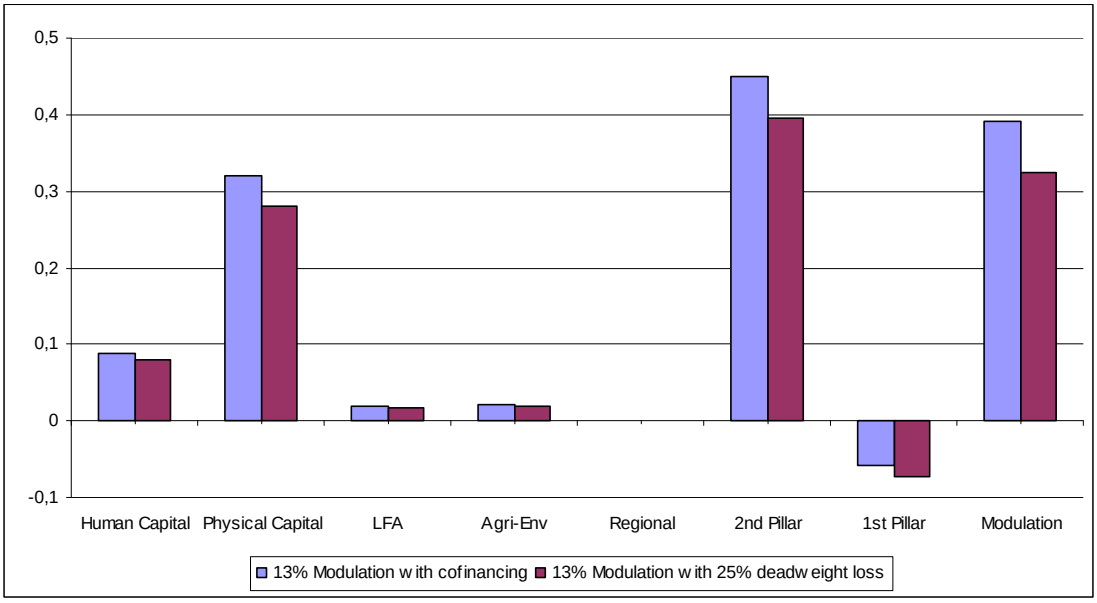


Source: LEITAP

The impact is measured in 2013, assuming the application of modulation over the 2007-2013 period. If one extends the period, the dynamic effects with regard to physical and human capital will mean that the impact, relative to the baseline scenario, becomes larger over time. This is because the effects are cumulative, in other words productivity gains in one year remain more or less constant over time[17], and every year adds a new productivity gain. The effect of reducing Pillar 1 direct payments and, for example, LFA payments remains more or less the same as they are income payments.

[17] It declines over time due to depreciation.

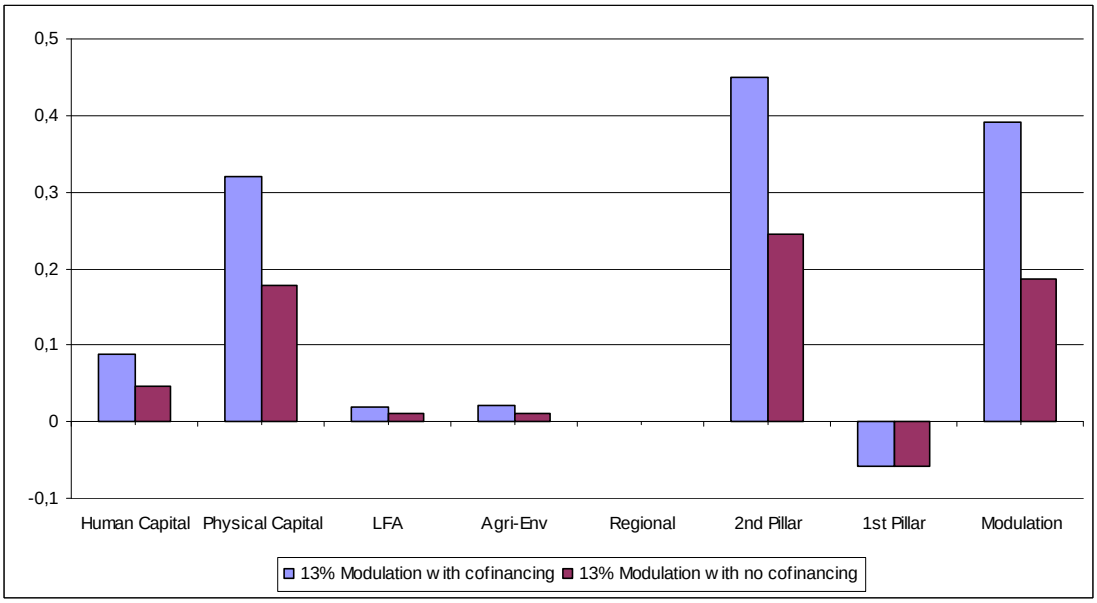
Figure 4.3 Impact of deadweight loss on EU-27 production volume of primary agriculture (% change relative to no modulation in 2013)



Source: LEITAP

The deadweight loss or crowding out effect reduces impact of pillar 2 measures on production more or less proportionally (see Figure 4.3).

Figure 4.4 Impact of co-financing on estimated EU-27 production volume of primary agriculture (% change relative to no modulation in 2013)



Source: LEITAP

The co-financing requirements have a relatively large impact on the impact of pillar 2 measures on production (see Figure 4.4). The overall impact of modulation reduces from 0.4% to about 0.2%

Using the CAPRI model, the impacts on production can be computed on a more disaggregated level for regions and products. This section presents and discusses the results of the "Health Check" scenario (Health Check) with 13% tiered modulation (additional second pillar funds allocated to "New Challenges") against a baseline with zero modulation. In addition, several partial implementations of the Health Check scenario are presented, with the purpose to decompose the total effects and better illustrate how the results arise.

Table 4.3 shows the difference (%) in production of important primary product groupings for the EU-27 in the scenarios compared with the baseline. A first conclusion is that agricultural production generally is higher in the Health Check scenario (last column) than in the baseline, but that the effects are rather small and different across products and regions. The right-hand column shows the total effect of reducing the first pillar and introducing all second pillar measures, compared with the baseline scenario. The other columns show simulations including only the reduction of the first pillar in conjunction with the introduction of a single group of second pillar measures.

The first column (from left) of Table 4.3 shows the effect of reducing Pillar 1 payments, but not changing any Pillar 2 payments. As expected, reducing first pillar support generally reduces production, but the effect is mostly minor. The reduction is partly due to the continued existence of a few coupled direct payments (e.g. durum wheat and pulses), and partly due to the weak production effect of Single Farm Payments in CAPRI (analysed in detail elsewhere). Potatoes form another exception. In the baseline, potatoes were not included in the single payment scheme, and were therefore becoming more profitable relative to other crops following modulation. Of the animal sectors, only beef and sheep and goats are negatively affected

The second and third columns show the combined effect (also relative to the baseline scenario) of reducing Pillar 1 direct payments and introducing Pillar 2 human (second column) and physical capital (third column) investment measures (groups 01 and 02), which enter CAPRI via LEITAP. These measures increase productivity, as described above, and are an important driver of model results. The simulations suggest that the effect of both measures are to increase production, but that the physical capital investments have a stronger effect, more than sufficient to counteract the effect of reducing P1 for all products except for durum wheat and pulses, and for fodder. The particular reverse reaction of fodder to productivity growth is due to increased efficiency in animal feeding as a consequence of the technical progress, so that less roughage is required albeit beef production increases.

The fourth and fifth columns show the production effects of reducing the first pillar and increasing the LFA and Natura 2000 measures. The LFA measures are fairly decoupled, and only a very weak production effect can be seen at the aggregate level of EU-27. The Natura 2000 measure is modelled as requiring extensive management practices, and this also shows in the results, where production decreases. However, the amount of money allocated to the measure is small, and thus the effect on production is small.

The sixth column shows the result of reducing P1 and introducing the Pillar 2 agri-environment measure (AEM, group 05). The implementation of this measure involves

a range of management requirements, many of which require the use of more extensive production techniques, especially for the cropping sectors. The AEM payments for beef producing farms was, based on the case study results, modelled as partly directed towards support for grazing animals as suckler cows and sheep and goats, where it contributes to maintaining production in some areas. Therefore, that measure causes a *reduction* of production for crops, but has a small *positive effect* (compare third to first column) on the production of beef.

The seventh column shows the effect of first pillar reductions and other groups of second pillar measures not elsewhere accounted for. They were included for completeness, but the reader may verify that their influence in general is smaller than that of other groups of measures.

Table 4.3 Production results for EU-27 (% difference to baseline scenario) in selected simulations.

Product	P1 only	P1+lab	P1+cap	P1+lfa	P1+n2k	P1+age	P1+reg	P1+all
Cereals	*-0,11*	*-0,03*	*0,19*	*-0,10*	*-0,16*	*-0,17*	*-0,10*	*0,17*
- Soft wheat	-0,07	0,01	0,24	-0,06	-0,10	-0,10	-0,05	0,26
- Durum wheat	-1,22	-1,03	-0,69	-1,21	-1,53	-1,64	-1,21	-1,20
- Rye and meslin	-0,12	-0,08	0,08	-0,11	-0,17	-0,18	-0,12	0,03
- Barley	-0,13	-0,04	0,16	-0,11	-0,20	-0,16	-0,12	0,17
- Oats	-0,09	0,00	0,11	-0,08	-0,15	-0,26	-0,09	-0,02
- Grain maize	-0,07	-0,01	0,20	-0,07	-0,09	-0,13	-0,07	0,18
- Other cereals	-0,11	0,00	0,43	-0,09	-0,23	-0,24	-0,10	0,35
- Paddy rice	-0,03	0,02	0,14	-0,04	-0,03	-0,04	-0,03	0,19
Oilseeds	*-0,25*	*-0,13*	*0,19*	*-0,24*	*-0,32*	*-0,35*	*-0,25*	*0,17*
- Rape seed	-0,28	-0,17	0,19	-0,27	-0,34	-0,42	-0,27	0,11
- Sunflower seed	-0,22	-0,11	0,16	-0,20	-0,28	-0,26	-0,22	0,20
- Soya seed	-0,16	0,02	0,34	-0,13	-0,21	-0,19	-0,15	0,47
Other arable field crops	*0,02*	*0,08*	*0,27*	*0,02*	*0,01*	*-0,04*	*0,03*	*0,25*
- Pulses	-1,15	-1,23	-1,43	-1,10	-1,25	-1,26	-1,14	-1,80
- Potatoes	0,14	0,14	0,16	0,14	0,14	0,10	0,14	0,12
- Sugar beet	0,00	0,11	0,41	0,00	-0,01	-0,08	0,01	0,43
Veg. and Perm. crops	*0,00*	*0,06*	*0,20*	*0,00*	*-0,01*	*-0,03*	*0,01*	*0,21*
Fodder	*0,00*	*-0,04*	*-0,13*	*0,01*	*-0,02*	*-0,05*	*-0,01*	*-0,25*
Meat	*-0,01*	*0,08*	*0,32*	*-0,01*	*-0,02*	*0,01*	*0,00*	*0,42*
- Beef	-0,10	0,02	0,22	-0,10	-0,10	0,01	-0,08	0,43
- Pork meat	0,01	0,10	0,38	0,01	0,00	0,02	0,02	0,47
- Sheep and goat meat	-0,07	0,01	0,16	-0,07	-0,08	-0,02	-0,06	0,32
- Poultry meat	0,01	0,08	0,28	0,01	0,01	-0,01	0,02	0,32
Other Animal products	*-0,02*	*-0,01*	*0,00*	*-0,02*	*-0,02*	*-0,01*	*-0,02*	*0,02*
- Cow and buffalo milk	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
- Sheep and goat milk	-0,16	-0,05	0,17	-0,16	-0,17	-0,11	-0,15	0,34
- Eggs	0,00	0,04	0,16	0,00	-0,01	-0,01	0,01	0,19

P1 = reduction of the first pillar, lab = labour investments, cap = physical capital investments, lfa = Less Favoured Area support, n2k = Natura 2000, age = agri-environment schemes, reg = regional support, P2 = all second pillar measures. Source: CAPRI

The change in cereals production may be further divided into a change in area under production and a change in yield. This is set out in Table 4.4, where also the effects of the two most important groups of measures are shown separately. The table shows that the area of some cereals decreases whereas others increase. As mentioned above, a part of the explanation for a reduced area under cereal production is that some P1 payments, especially for durum wheat, are more strongly linked to production, and therefore modulation has a stronger effect on those cereals.

Table 4.4 Decomposition of cereals production into yield and acreages for EU-27 (percent change relative to baseline scenario)

	P1 only		P1+cap		P1+age		P1+P2	
Product	Hectares	Yield	Hectares	Yield	Hectares	Yield	Hectares	Yield
Cereals	*-0,11*	*0,00*	*-0,08*	*0,26*	*0,10*	*-0,26*	*0,17*	*0,01*
- Soft wheat	-0,07	0,00	-0,04	0,28	0,10	-0,20	0,16	0,10
- Durum wheat	-1,23	0,01	-0,93	0,24	-0,90	-0,74	-0,49	-0,72
- Rye and Meslin	-0,10	-0,02	-0,15	0,23	0,03	-0,21	0,04	-0,01
- Barley	-0,08	-0,05	-0,07	0,23	0,30	-0,46	0,35	-0,18
- Oats	-0,04	-0,05	-0,02	0,13	0,31	-0,57	0,34	-0,36
- Grain Maize	-0,06	-0,01	-0,04	0,24	-0,02	-0,12	0,03	0,15
- Other cereals	-0,11	0,00	0,09	0,34	-0,01	-0,23	0,23	0,11
- Paddy rice	-0,11	0,08	-0,10	0,25	-0,17	0,13	-0,17	0,37

P1 = first pillar, cap = physical capital investments, age = agri-environment schemes, P2 = second pillar. Source: CAPRI

The mechanism behind the change in yields is more complex. Table 4.3 shows only average yields for EU-27. Behind the change in average yield a range of factors are at play. Most important are:

a) technical progress, i.e. via investments in human and physical capital: productivity increases for a given input use;

b) extensive land use, i.e. in order to receive support under certain P2 measures: producers are required to adhere to certain management prescriptions, which may constrain production, for example introducing non-productive buffer strips, reducing levels of inputs, or reducing stocking levels; and

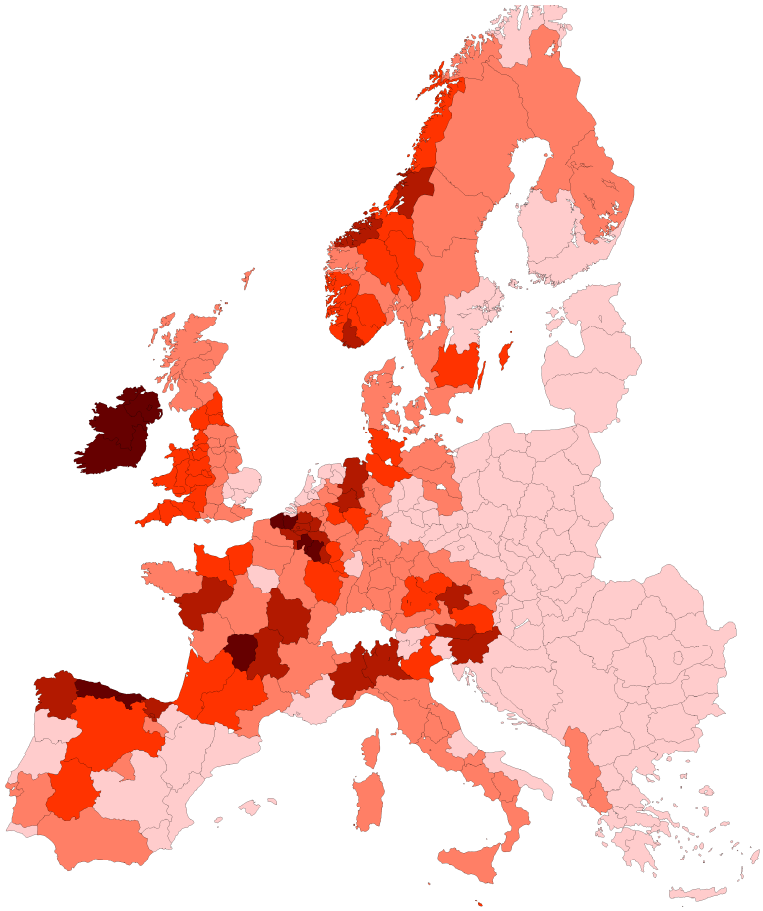
c) changes in regional weights, i.e. even if yields change in no single region: it may be that some regions with low yields expand production whereas some regions with high yields decrease production, and thus their weights in the average change.

In all cases, a combination of those three effects are present, and it is not possible, within the scope of this study, to pursue each of them – for each cereal – across all regions. Nevertheless, one can say that, in general, capital investments support an increase in yields, whereas requirements to extensify cause them to decrease.

Of all broad agricultural sectors, the meat sectors are the most strongly influenced by modulation in terms of production, with an increase of 0.42 % versus the baseline. Of particular interest is the production of beef meat, because of its importance for the environment, both in positive ways in terms of provision of e.g. grazed landscapes and biotopes and negative externalities as potential ammonia emissions and nitrate pressures.

Figure 4.5 shows the concentration of beef production, indexed by kg beef / utilizable agricultural area, in the EU. One can see that important beef producing areas are located in Germany, northern Italy, Belgium, France, UK, Ireland, Spain, Austria and Slovenia, whereas by the selected measure, beef production is less intensive in the eastern members of the union with Sweden, Finland, the Baltic states, Poland, Bulgaria, Romania, Hungary and Slovakia.

Figure 4.5 Beef meat production intensity in the baseline, measured as kg beef/ha UAA. Darker regions mean greater production.

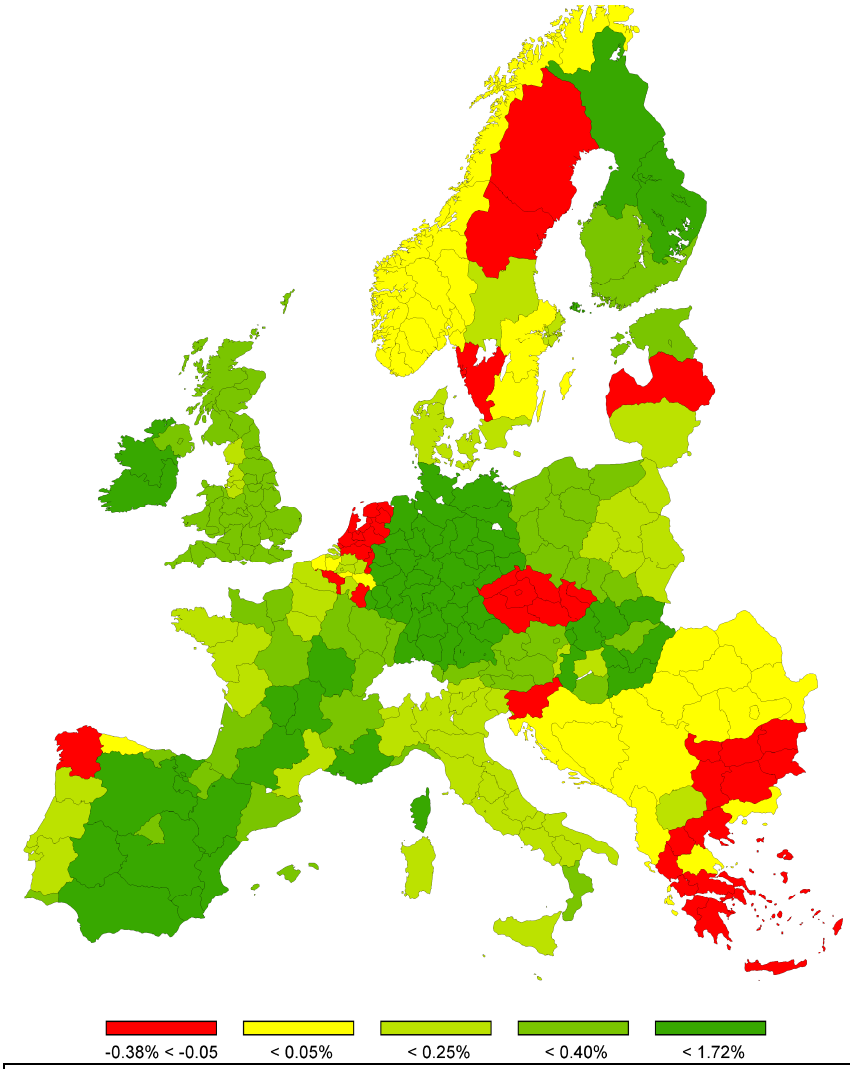


Source: Simulations with CAPRI

The effect of modulation on beef production depends on several factors, of which the most important ones are:

- Is beef production based on suckler cows or bull fattening?
- Are there coupled direct payments (to suckler cows, special premiums, and slaughter premiums) that get reduced with modulation?
- How is the second pillar budget spent, e.g. is it explicitly supporting suckler cows?

Figure 4.6 Change in beef production in Health Check scenario compared with the baseline.



Simulation results from the partial equilibrium model CAPRI. The map shows the relative difference in beef production between the Health Check and the baseline scenarios for 2013.

Figure 4.6 shows the relative change in beef production in the Health Check scenario versus baseline. Green colours indicate an increase and red a decrease, whereas yellow denotes an approximate status quo. If we look at some of the most intensive beef producing regions mentioned above, we see for example that production increases in all of Germany, France, Italy, Ireland and most of Spain, whereas it decreases in some parts of Belgium, in the Netherlands, Slovenia and Sweden. The regional changes in beef production depend on several interacting forces: Technical progress resulting from increased second pillar spending tend to increase production (in particular in Germany, but to some extent everywhere), and the combination of somewhat increased *total* EU production and inelastic demand results in lower beef prices (everywhere), causing some reallocation of production among regions.

The direct payments of the first pillar and the allocation of second pillar budget interact with the production structure to determine the result of each region. Key drivers are coupled payments (slaughter premia and suckler cow payments) and young animal prices and feed. A few examples are helpful. In the Netherlands, there are no coupled suckler cow payments in the baseline whereas there are slaughter

premia. Modulation in combination with lower beef prices thus causes slaughtering to decrease a bit, whereas suckler cows are not directly affected (lower meat output per animal). In a second round of effects, suckler cows decrease in other countries with coupled payments, like Spain, which tend to make fodder, young cows, heifers and young bulls cheaper. The net effect turns out to be an increase in the suckler cow herd. Since suckler cows generally produce less meat than animals in an intensive fattening system, total meat production decreases. The opposite mechanism is at play in Spain and Germany.

France is a special case. The many coupled payments would suggest that production would be negatively affected by modulation, especially as a large proportion of meat comes from suckler cows. Nevertheless, the RD programme seems to be designed in such a way that it benefits both suckler cows (via support for grazing animals) and bulls (via support to mixed farms, some of which have bulls). On the balance it seems that the net result considering modulation, second pillar, lower beef prices and extra technical progress is a slight production increase, albeit smaller than that in Spain or Germany.

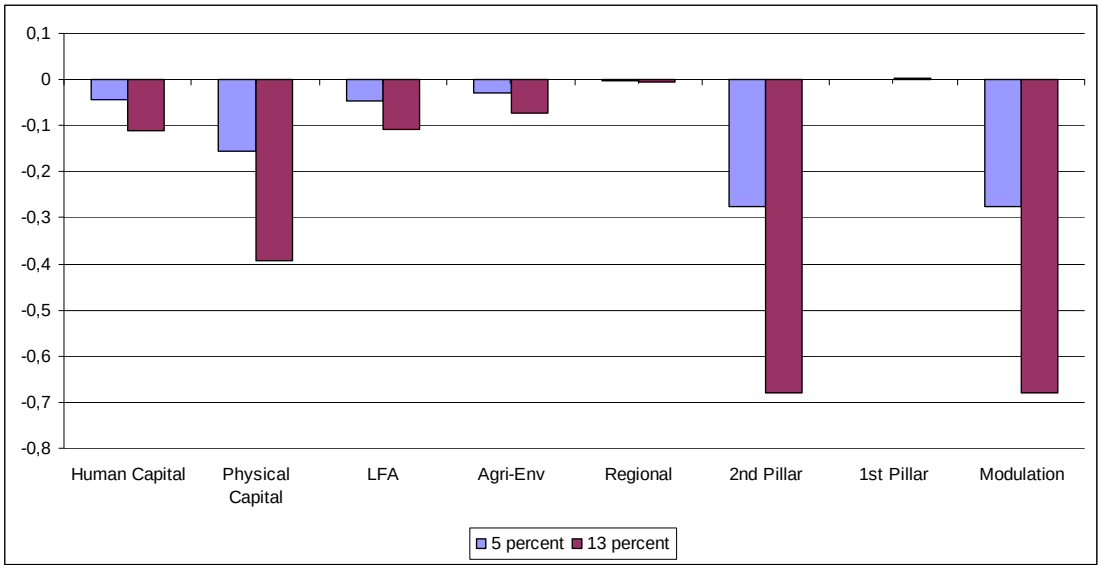
Note that in the Health Check scenario with "New Challenges", the French RD programme (presumably) directs much of the additional modulation funds towards agri-environment payments and in particular towards suckler cows. In a sensitivity analysis ("Spend additional funds proportional to existing programmes") the largest share was instead directed to LFA measures, which have a rather weak production effect. In that simulation (not shown), the suckler cow herd in many French regions decreased more strongly.

The example of beef production shows the range of factors in play when attempting to assess the impact of modulation on a particular sector, the sensitivity of certain assumptions (for example, the productivity response to support under Axis 1 of the EAFRD), and the significant variations that may occur between Member States and regions.

4.5 Consumer prices

Also the consumers will be affected by any changes in farm structures, since it (normally) should show through changes in consumer prices. In comparison with the baseline scenario, LEITAP shows that modulation under the Health Check scenario leads to lower consumer prices for primary agricultural products by almost 0.7% for the EU-15 and slightly less for the EU-27 for the period 2007-2013 (see Figure 4.7). It is the physical capital investment measures under Pillar 2 that are the main cause of this result, as they increase productivity and lower costs over the period. The impact of income payments for LFA and agri-environment measures have a slightly negative impact on prices as, in a competitive environment, part of the income payments leak away to consumers and other sectors. The impact of LFA is larger than for the agri-environment measure, as the latter provides compensation payments for additional costs, whereas in the case of LFA these are primarily income payments. Reducing first pillar money has the opposite impact.

Figure 4.7 Consumer price of primary agriculture at 5% and 13% modulation rates (% change relative to no modulation in 2013)



Source: LEITAP

5 SOCIO-ECONOMIC EFFECTS OF MODULATION

5.1 Competitiveness of the Agricultural Sector

5.1.1 Issues

The specific issues associated with the impact of modulation on the competitiveness of the agricultural sector are the extent to which modulation affects the competitiveness and value added of the EU agri-food sectors at national and regional levels. In particular, this theme considers the degree to which the additional funds available for investments in physical capital or human capital under Pillar 2 measures will impact upon competitiveness, but also how the reduction of Pillar 1 might influence competitiveness.

5.1.2 Summary

Outputs from the economic models suggest that increased rates of modulation under the Health Check scenario have a small overall net positive impact on the competitiveness of both the agricultural sector, and of rural areas, compared with the baseline scenario. The impact on agricultural value added is also very slightly positive. This is the case even without taking into account the contribution that the anticipated positive impacts on public goods and environment might make, which it has not possible to quantify as part of this analysis. The growth of value added as a result of modulation is highest in the primary agriculture, services and processed food sectors. Conversely, the impact on the energy and industry sectors is much more limited.

The positive impact is mainly caused by the impacts of the availability of additional funds for Pillar 2 measures, particularly the dynamic impact of measures that increase productivity of production factors, such as human and physical capital measures in Axis 1. The economic modelling results are backed up by the case studies, and the figures for the agricultural sector are similar to those estimated by the Member States in relation to the GVA CMEF Impact Indicator. Measures within Axis 3 also contribute to this positive effect; however, due to the fact that these measures are implemented mainly outside the agricultural sector, they increase productivity in other sectors.

Under the Health Check scenario, net exports also increase for all products except for dairy products. In essence the entire net trade effect comes from the availability of additional funds for the human and physical capital measures, mainly within Axis 1, since these are assumed to increase productivity. All other Pillar 2 measures show the opposite effect, however the overall net effect is positive.

As a result partly of the additional technical change facilitated through Axis 1, but also through additional funds becoming available for other sectors than agriculture, the models show that increased rates of compulsory modulation lead to less distortion in the economy, and a concomitant welfare gain.

5.1.3 Measuring Competitiveness

The term “competitiveness” has no single generally accepted definition, and is laden with potentially different connotations. One possible definition is “being able to

compete". With that definition, the analysis of production (showing a slight overall increase) is a good measure of competitiveness. However, production may increase for many reasons, which may or may not relate to internal properties of the sector studied. In order to see if the sector itself has undergone some change that puts it in a better competitive position on the market, a more refined measure is required.

At the national or European level, the main factors influencing the competitiveness of agriculture and of agro-food firms are as follows: the natural resources (land, climate, water) and the human resources (training of farmers); technological progress (in relation with the level of investment in research and development); the productivity of production factors (labour, land, livestock); the characteristics of the final product; the fiscal and monetary regulations (interest rates, taxation of income, controlling inflation); the strategies of investments; the trade policies (tariffs, quotas, etc.); the agricultural policies (subsidies and market regulation).

At international level, competitiveness depends on a variety of factors, including the exchange rate, the cost of international transport and trade preferences between states. In some cases, the exchange rate is influenced by the measures adopted by governments. Thus, the devaluation of the currency of a country relative to its competitors (as is currently the case of the U.S. dollar against the euro) results in an improvement of the competitiveness of products exported. Imported products are, however, more expensive. Therefore, and all things being equal, local producers of these goods become more competitive. Local consumers on the other hand will not be able to afford imported goods.

The case studies show that for the most part key factors affecting competitiveness are of general socio-economic character: skilled labour, farm debts, labour cost, land price, specialisation, research support, infrastructure, proximity to markets, exchange rates, increasing scales of production (agrarian structure). Also agricultural policy is mentioned as a key factor as is production limits (quotas), albeit in just one case each. Modulation is assumed to influence these factors to a rather small extent, even though especially some measures in pillar 2 are expected to positively influence some of them (labour skills).

Most of these are not possible to quantify with the models used in this study. One possible measure is Gross Value Added (GVA) at market prices. This would reflect the sector's possibility to attract capital, land and labour by its own virtue, based on market returns, without relying on subsidies or protection. Competitiveness defined in this way has certain drawbacks. It considers a substitution of fixed for variable inputs as a gain. Unfortunately, CAPRI only maintains a single set of producer prices, which includes the effect of all market and border protection measures, albeit the revenues stemming from direct subsidies can be isolated and subtracted. Furthermore, it is strongly influenced by price changes. In fact, defined this way, competitiveness becomes nothing more than agricultural income (Modified Gross Value Added - MGVA) minus transfers (subsidies). Nevertheless, GVA is the measure of competitiveness that is most readily able to be computed within this study. Sectoral GVA is an output from LEITAP and shows the impact on all sectors, whereas CAPRI gives detail on GVA changes for agricultural products.

The case studies use no specific definition of competitiveness but a number of issues related to competitiveness are put forward: economic efficiency, economic

performance, production capacity, development of new markets, diversification activities and human capital. A related issue that is put forward concerns the effects on commodity prices.

Another aspect of competitiveness is the capability of the EU to compete on world markets. A simple measure of this, similar to production, is net trade. Net trade is, in contrast to gross value added, strongly correlated with coupled support, and it also depends on demand inside the EU, which is arguably not an important aspect of the agricultural sector *per se*. Nevertheless, net trade can contribute to a fuller picture of the competitiveness of the agricultural sectors. From LEITAP we retrieve the volumes of export and import, and CAPRI gives net trade of certain commodities.

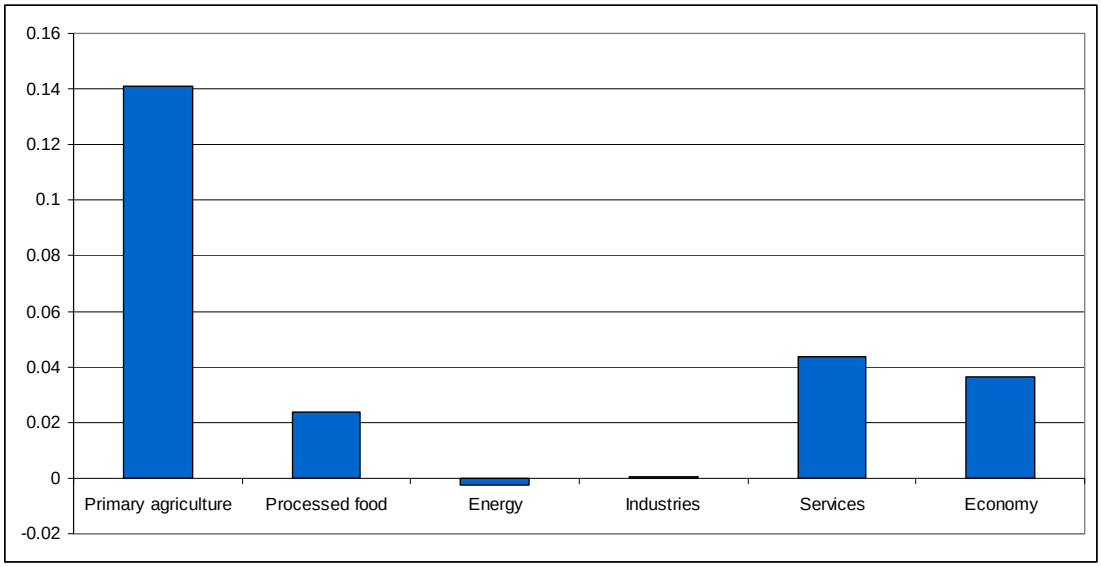
In relation to Pillar 2, the measures that are most likely to improve the competitiveness of the agricultural and forestry sectors are those that sit within Axis 1, particularly those that enable investments in new technologies and physical infrastructure to be made, as well as those that focus on improving human capital, thereby helping to rationalise production processes, investigate new and sustainable market opportunities and to improve the quality of products. This view is supported by the result of the case studies.

The analysis within this chapter is derived primarily from the economic models, with some information provided from the CMEF indicators for the case study countries, which serves to reinforce the outputs from the models. Also the result of the case studies has been incorporated in this chapter.

5.1.4 Gross Value Added

The growth of value added under the Health Check scenario is limited, but positive. The growth is highest for primary agriculture (0.14%), the focus of the majority of expenditure under both Axis 1 and Axis 2 within Pillar 2 (see Figure 5.1). The food processing sector gains from lower primary agricultural input prices and some Axis 3 money focused, for example, at diversification and improving rural infrastructure. The growth in valued added of services is also noticeable. This is caused by a productivity increase due to Axis 3 spending, particularly the impact that these can have in stimulating tourism, but support for broader farm diversification activities may also give positive effects, as highlighted in the French and UK case studies The impact on the energy and industry sectors is limited. Only the energy sector would experience a negative effect since the investments in physical and human capital will save energy.

Figure 5.1 Sectoral value added growth (% change Health Check scenario relative to no modulation in 2013)



Source: LEITAP

Table 5.1 shows the net impact of modulation under the Health Check scenario for GVA (excluding direct payments) per broad production sector, taking average values per hectare or head in EU-27, computed as market revenues minus variable costs. The left-hand column shows GVA in the baseline, and the remaining columns show the difference under different simulations

Table 5.1 Gross value added per hectare or head for different agricultural sectors for EU-27. Value in baseline and change (Δ euro/ha or head) in simulations under Health Check scenario vs. baseline.

Sector	GVA in baseline	P1 only	P1+cap	P1+age	P1+P2
Cereals	178,24	0,50	0,06	1,54	1,20
Oilseeds	273,87	0,42	1,11	0,97	1,95
Other arable crops	836,20	0,99	1,49	2,11	2,99
Vegetables and Permanent crops	5182,54	0,39	-4,55	-0,85	-5,20
Fodder activities	15,85	0,11	-0,80	0,55	-0,47
All cattle activities	279,19	1,76	1,72	-0,22	-0,38
Beef meat activities	-15,40	2,60	2,29	0,27	-0,08
Other animals	54,37	0,02	-0,16	-0,11	-0,30

The first data column from the left shows baseline value. The remaining columns show the percentage difference to the baseline in simulations implying "only decreasing P1 payments", "decreasing P1 and increasing Physical Capital Investments", "decreasing P1 and increasing agri-environment payments" and "decreasing P1 and increasing the full set of P2 measures". Source: Simulations with CAPRI.

Under the Health Check scenario, the changes in GVA per hectare or head in most cases are small compared to the GVA in the baseline. For "Beef meat activities", GVA in the baseline is negative. The two main reasons for the negative GVA are that (1) this group of activities includes suckler cows, which in most instances are not profitable without direct support, and also that (2) the raising of suckler cow calves for input use in meat and milk production are not included in "Beef meat activities" and thus only a part of the production chain is captured. The line labelled "All cattle activities" includes the raising of calves and intermediate (recruitment) heifers, as well as dairy cows, which results in a positive GVA. One must keep in mind that

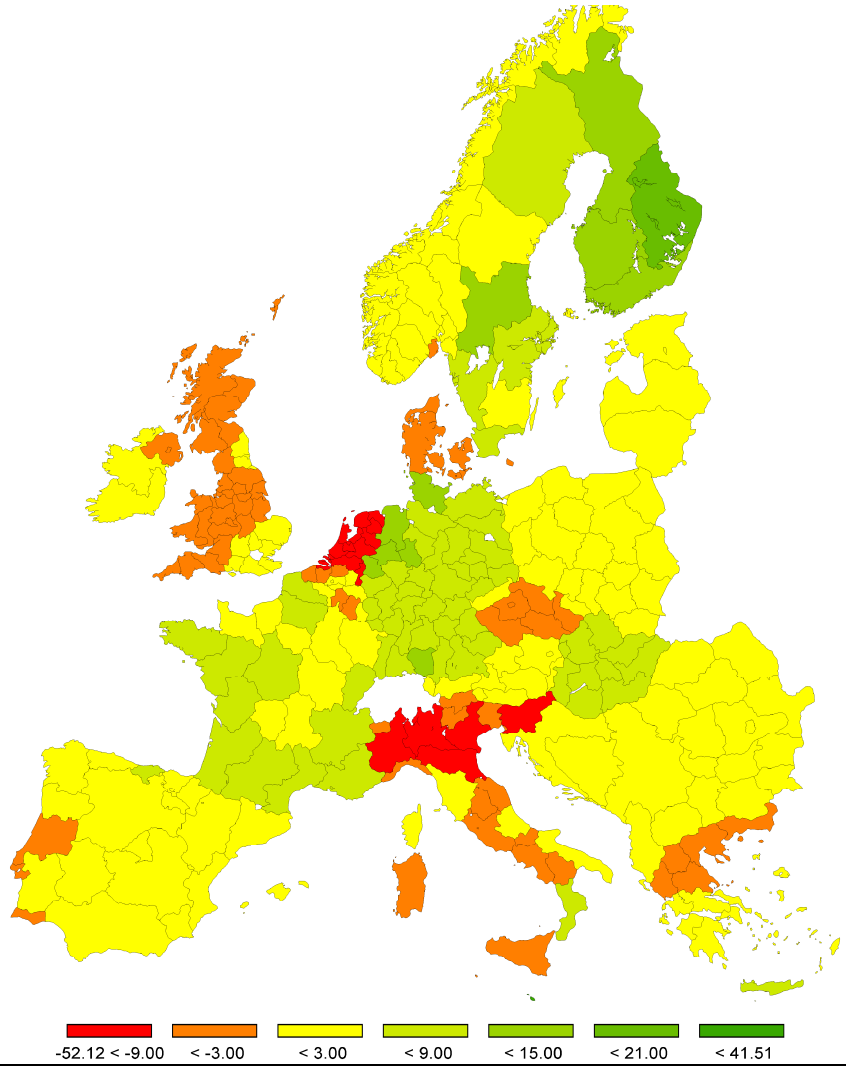
GVA is the difference between the two large positions sales revenues and variable costs, and it can be a small share of total revenues.

The column labelled “P1 only” shows the effect of reducing first pillar direct payments. For almost all activities this effect implies a higher GVA, due to reduced production and thus higher prices. The case studies show that the reduction of Pillar 1 is likely to have only limited effects on the production and prices of commodities. The French case study emphasises that other factors are of greater importance for the development of the commodity prices: increased food demand and purchasing power in emerging markets, low world production (specially Oceania), low global stocks, decline in production for some commodities, increased production of biofuels and scarcity of supply which encourages speculation on commodity markets. If the degree of uncertainty regarding such broad factors that also influence agricultural prices, GVA and competitiveness, then the comparative static results of the simulations with CAPRI are arguably relatively insignificant.

The column labelled “P1+cap” shows the effect of the introduction of additional funding for the physical investment measure. In all sectors yields increase and input requirements decrease (although this is not visible in the table). As a consequence, production tends to increase, and thus prices drop. As a net effect, GVA increases compared to “P1 only” for most sectors and decreases for vegetables and permanent crops and fodder. For cereals, the price and technical progress effects cancel out. The introduction of additional money for the agri-environment measure in “P1+age” has generally the opposite effect, due to the fact that the outcome of this measure is generally either to maintain or decrease production. Extensified production implies less input costs and higher price on the market. The generalised way of treating environmental payments in the CAPRI model obscures some faces of reality. A detailed overview of the implementation of all measures, including the AEM is available in Annex 1, but the basic assumption is that some of the AEM leads to extensification.

The last column “P1+P2” shows the effect of all first and second pillar measures. The net effect is a small gain in GVA for cereals, oilseeds and other arable crops, and a decrease for animal husbandry, fodder and permanent crops. It is interesting to note that GVA decreases in more protected sectors as meat and permanent crops whereas it increases for less protected sectors. This is (mainly) due to the balance between lower costs (due to technical progress) and lower prices (due to expansion on a limited market). Market prices react (fall) less in sectors that can easily expand exports or where imports are important in the baseline, i.e. where total demand is more elastic.

Figure 5.2 Difference in GVA per hectare under the Health Check scenario relative to baseline (EUR/ha UAA)



Simulation results from the partial equilibrium model CAPRI. The map shows the difference in Gross Value Added per UAA between the Health Check and the baseline scenarios for 2013.

Figure 5.2 shows the difference in GVA per hectare across all sectors in each region and in Health Check relative to the baseline. In the map, the yellow class contains regions where GVA remains close to the baseline value. In red regions GVA decreases, whereas it increases in the green regions. The change in modified gross value added (MGVA) depends mainly upon the following factors:

- Increased productivity due to the investment subsidies
- Reduced cost due to increased productivity
- Decreased product prices due to increased production

The figure shows that for most regions, GVA increases or remains constant. The most negative impact is found in the Netherlands. It is due to less technical progress in that region (communicated from LEITAP to CAPRI via the model link). A comparison with, for example, Germany reveals that technical change due to the investments in human and physical capital in NL is only about 1/10 of that in DE, and this is the major explanation for the difference between those countries. The indirect effects of technical progress in terms of lower product prices spread easily across borders, so

that improved productivity in DE lowers the beef prices also in NL, whereas technical progress *per se* does not spread as easily – for example, NL does not benefit from more modern farm machinery or skilled labour than DE.

Some Member States, notably Italy, contain some regions with increased GVA (southern Italy) and some with decreased GVA (northern Italy). The regional differences in this case, as well as in the cases of UK, Ireland and Slovenia, is due to the relative specialization meat production, indicated by Figure 4.5 showing beef meat production per ha UAA. The EU meat markets are more isolated from the rest of the world, and thus the price formation depends strongly on European supply and demand. The increase in supply following the productivity gains therefore results in a stronger price drop for meat products than for less protected arable crops. Consequently, animal sectors suffer from a "price scissor" when output prices drop more than input prices, and thus regions specialized in meat production in Member States with less strong technical progress may see GVA decrease. In practice, of course, in the regions with potentially falling GVA/hectare, where the maintenance of grazing by livestock is a priority, authorities may choose to increase incentives under the LFA or other measures in order to maintain livestock numbers utilising additional funds available as a result of modulation

For the new Member States, the lack of change depends on the combination of (1) lower first pillar payments to start with (2) lower modulation rates, (3) lower public and private co-financing, and (4) a different distribution of spending across the axes of P2.

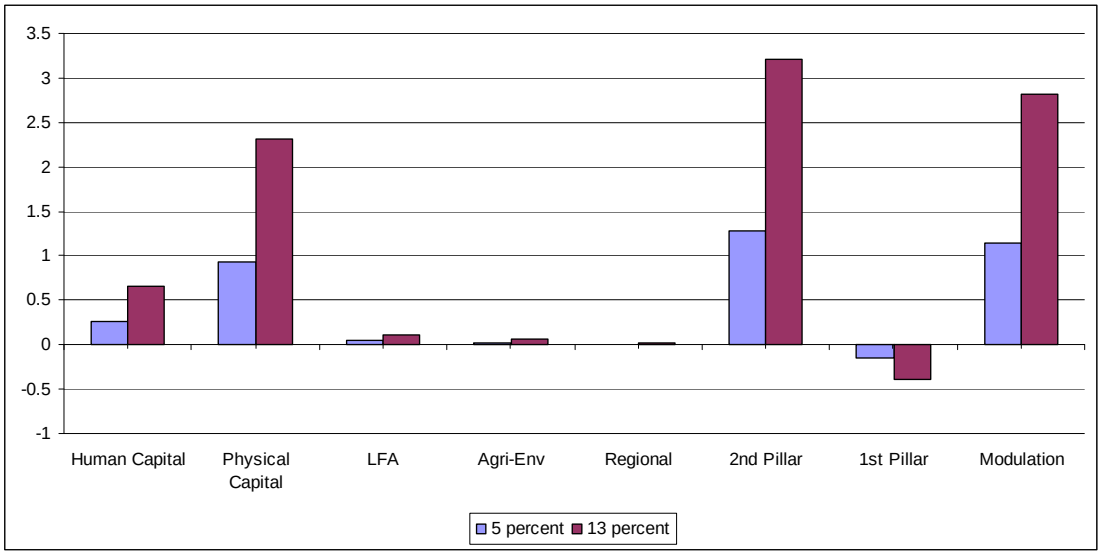
The CMEF indicators also indicate that Pillar 2 measures as a whole will contribute to an increase in GVA. The result indicator measuring the increase in gross value added in supported holdings/enterprises in agriculture/forestry, and the economic impact indicators on economic growth (measured as net additional value added expressed in PPS) and labour productivity (measured as change in gross value added per full-time equivalent), could be used to explore whether the use of compulsory modulation (CM) funds in the second pillar, under the baseline scenario, is anticipated to affect the competitiveness of the agricultural sector.

On the whole, according to the RDPs in the case study countries, it is expected that support for Pillar 2 measures will increase GVA in supported holdings in agriculture/forestry by 0.05-3% p.a. The anticipated contribution of CM funds to this increase varies from 5% in Portugal to 31% in the Netherlands.

5.1.5 Effects on trade

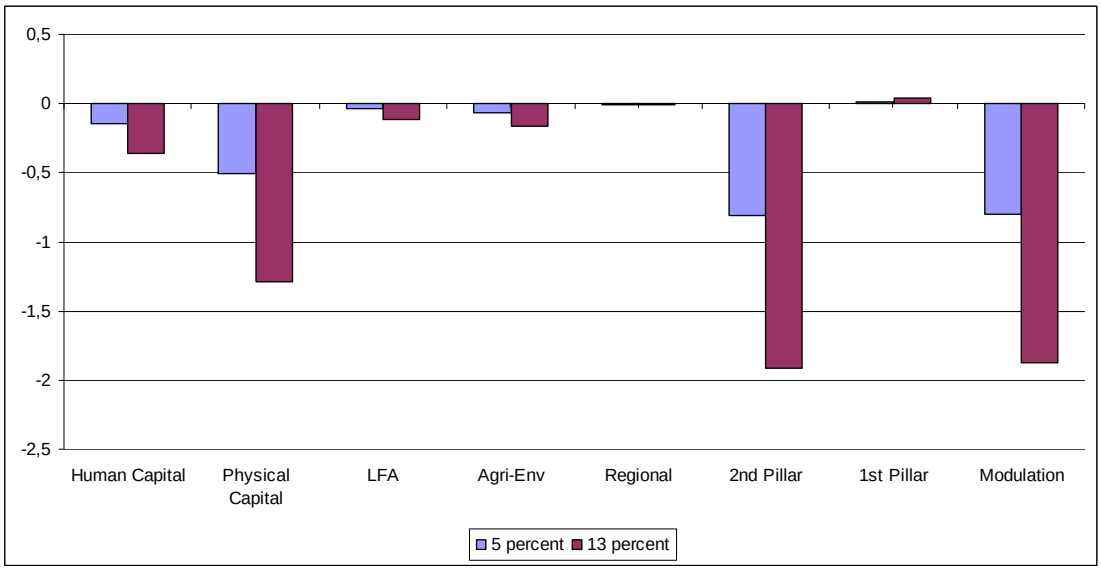
Due to the enhanced funding available for physical and human capital investments within Pillar 2, the quantity of exports will increase with between 2,5% and 3% in the Health Check Scenario (Figures 5.3). The impact of physical capital investments is larger as a larger part of the money is spent on this measure (~25%). The main underlying reason is that the investments increases productivity and thus lower prices relative to the prices of foreign producers. Reducing Pillar 1 payments has a small negative effect. Lower prices of EU products relative to foreign products lead also to a decrease in the quantity of imports. (Figures 5.3 and 5.4).

Figure 5.3 EU-27 quantity of exports in primary agriculture – 5% / 13% modulation (% change relative to no modulation in 2013)



Source: LEITAP

Figure 5.4 EU-27 quantity of imports in primary agriculture – 5% / 13% modulation (% change relative to no modulation in 2013)



Source: LEITAP

Table 5.2. shows the impact of modulation on net trade for a range of different primary and processed commodities under the Health Check scenario, compared with the baseline, and shows the percentage change under different simulations.

Table 5.2 Net trade in different primary and processed commodities. Baseline value in 1000 t and other simulations as percent difference to baseline.

Product group	Baseline	P1 only	P2+cap	P2+age	P1+P2
Cereals	18 134	-0,50	2,41	-1,38	2,18
Oilseeds	-19 488	0,01	0,40	-0,20	0,27
Other arable field crops	-1 879	0,41	0,88	-0,09	0,60
Vegetables and Permanent crops	-14 310	-0,01	0,50	-0,07	0,56
Meat	748	-0,12	7,69	0,40	10,05
Other Animal products	540	-0,01	0,69	-0,06	0,81
Dairy products	-255	-0,13	-1,60	-0,09	-1,97
Oils	-5 273	-0,13	0,12	-0,22	0,07
Oil cakes	-25 513	0,12	1,09	-0,41	0,84
Secondary products	-6 672	0,00	0,53	-0,15	0,46

P1 = first pillar, cap = Physical capital investments, age = agri-environment schemes, P2 = second pillar.
Source: CAPRI

Net exports increase for all products except for dairy products. Note that with conventional computations, a negative percentage change of a negative net trade position implies a less negative net trade in the simulation, as this is equivalent to a net import. Since net trade is the difference of two large terms (supply and demand in the EU), small production and demand changes result in relatively large net trade effects, sometimes in the range of several percentage points.

Since the agricultural sector itself is a major user of agricultural products, technical progress impacts on the market balance by reducing demand as well as increasing supply. For cereals, we saw in Chapter 4 that gross production increased slightly under the Health Check scenario. Feed demand within the EU decreases even more (as a result of technical progress), and thus a clearly positive net trade effect results. The only situation where net exports do not increase is with regard to dairy products (a decrease by 1.41 percent). A closer look at the underlying data reveals that production actually increases slightly, but that human demand also increases, and since net trade is a very small share of total production on average across all products, this is sufficient to result in a 1.27% improvement in net exports. The tiny change in human demand is difficult to track. It may be due to the increased purchasing power of the consumers connected to the increased GDP following the 2003 CAP reform, communicated from LEITAP to CAPRI and applied as a shock to the consumer budget constraint.

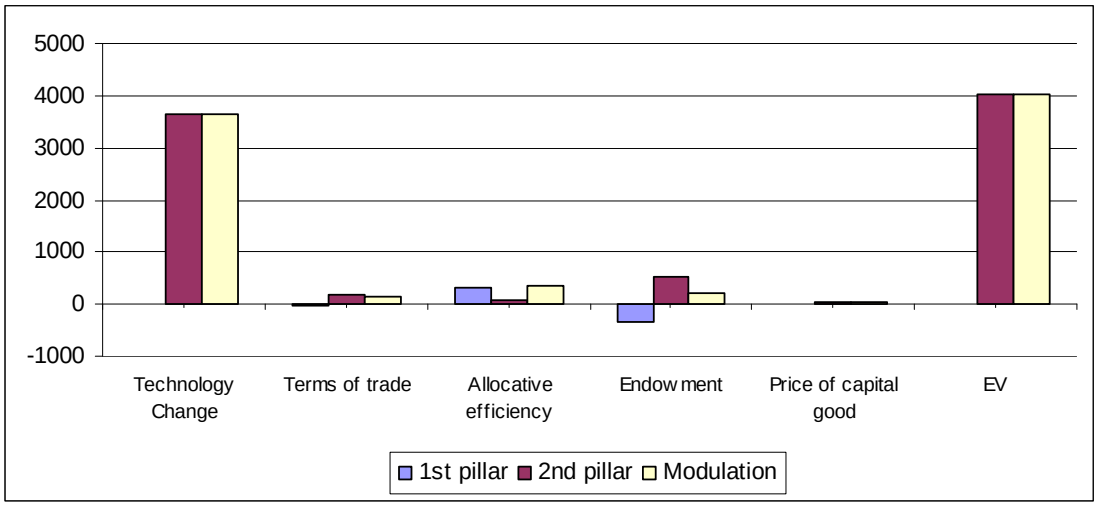
The columns of the table contain the effects in different simulation experiments. In essence the entire net trade effect comes from technical progress (due to human and physical capital investments). More specifically, the decomposition in the table shows that reducing the first pillar payments has a small negative effect on net trade, capital investments have clear positive effects, and agri-environment payments have a small negative effect except for meat (grazing by animals is supported).

5.1.6 Welfare effects

The Health Check Scenario leads to a welfare gain measured by equivalent variation (EV) of 4 billion USD for the EU-15 without taking into account the welfare contribution due to the provision of public goods. 80% of this is caused by the increased level of technological change due to the increased availability of funding for

Pillar 2 measures that encourage investments in physical and human capital within the agricultural sector (Axis 1) and regional investments outside the agricultural sector (Figure 5.5). The allocative efficiency effect is positive in relation to reductions of first pillar direct payments, due to the fact that production factors move out of the distorted agricultural sector to less distorted sectors. It is also positive as a result of increasing the budget for the second pillar, as certain measures enhance structural change: factors leave the agricultural sector, due to technological progress, and move into the services sector, which is less distorted. The endowment effect (inflow or outflow of endowments) is determined by the inflow and outflow of agricultural land. It is negative in the case of reducing Pillar 1 as land is taken out of production in marginal areas. It is positive in relation to the increase in second pillar payments, as some measures – most notably LFA and agri-environment measures – can maintain land in production that might otherwise be abandoned.

Figure 5.5 Welfare (Equivalent Variation, EU-15, million USD, change Health Check scenario relative to baseline in 2013)



Source: LEITAP

5.2 Effects on Farm Income and Farm Household Income

5.2.1 Issues

This section focuses on the impact of modulation on farm income and farm household income under both the baseline and the Health Check scenarios. Assessing the impacts of modulation on farm income and farm household income is not straightforward. While Pillar 1 direct payments have a direct income effect, this is not the case for the majority of Pillar 2 measures, and so the degree to which Pillar 2 measures – those focused at the agricultural sector – are considered to have an income effect first needs to be established. Within this study, it has been assumed that expenditure under the LFA measures are pure income payments, that expenditure under human and physical capital measures has an income effect according to assumptions on investment rate returns, and that expenditure under the agri-environment measure are considered to be income neutral.

In general, we assume that those farm types where Pillar 1 direct payments make up a high proportion of income are likely to experience a greater negative impact on overall farm incomes from reductions in Pillar 1 payments, and that this impact is likely to increase under the Health Check scenario as modulation rates increase. However, this impact should be mitigated to a certain extent by the additional availability of funds available through Pillar 2, which are augmented by additional national co-financing and private funds. The extent to which this takes place will depend on the ability of different farms to access funding from Pillar 2. It should also be noted that a proportion of funds will be redistributed away from the farming sector to non-farming beneficiaries.

Data on the impacts on modulation on farm incomes and farm household income has been calculated based on both the FES (using FADN data), CAPRI and LEITAP models, and on information provided within the case study reports.

5.2.2 Summary

The impact of modulation on farm family income is unclear, with different economic models giving slightly differing results. According to FES, at the Member State level it would appear that aggregate farm household income declines very slightly as a result of modulation. Conversely, CAPRI and LEITAP indicate a slightly positive income effect. These overall results are likely to mask potentially more significant local and regional differences, particularly between farm types, whereby some type of farms/businesses are likely to benefit and some will lose out in terms of income.

FES calculations indicate that, under the Health Check Scenario, the decrease in DP per farm in 2013 relative to the Baseline Scenario ranges from about 90 euro in Greece to about 2,000 euro in Denmark. Due to additional reductions in direct payments from Pillar 1 under the Health Check Scenario, Farm Income decreases in 2013 by 0.7% per farm in Greece to over 6% in Denmark. When considering the redistribution of the additional modulation funds within Pillar 2, FES only takes account of the impact of human and physical investments, LFA and agri-environment schemes on Farm Income. Taking the situation in 2013, it appears that the additional input of money to the budget to these measures, even with associated national co-financing, is on the whole insufficient to compensate for the income loss resulting from reductions in direct payments, except for Luxembourg. This result, however, is largely due to the fact that LFA measures are the only Pillar 2 measures modelled as pure income payments, and Luxembourg is unusual in having designated a large proportion of its UAA as LFA.

A look at the income effects per farm type reveals that field cropping, grazing, milk and mixed farms are most affected: within these farm types there is both a large proportion of farms that experience an income loss and a large proportion that faces an income increase. Across the EU-15, grazing farms show the largest proportion of net winners from modulation, with 36% of farms experiencing an increase in farm income of over 0.5% – although this figure masks much higher proportions of grazing farms gaining in France (69%) and the UK (96%). Mixed and diary farms, on the other hand, tend to have the largest proportion of net losers, with 45% of farms experiencing a net decrease in farm income of more than 0.5% – again the figures are as high as 90% in Denmark and 88% in Ireland.

5.2.3 Findings from FES

Changes in Direct Payments in Pillar 1

In the EU-15, Direct Payments (DP) vary from about 3,200 euro per farm in Portugal to over 29,000 euro per farm in the UK in 2013 in the Baseline Scenario (Table 5.3). Without the rate of 5% compulsory modulation, DP per farm in 2013 would be higher, ranging on average from about 60 euro in Greece to about 1,500 euro in the UK. Under the Health Check Scenario, the decrease in DP per farm in 2013 relative to the Baseline Scenario ranges from about 90 euro in Greece to about 2,000 euro in Denmark. For Portugal and the UK it is assumed that voluntary modulation will be substituted by the additional modulation, and therefore DP per farm is hardly affected under the Health Check Scenario. The small increase in DP in the UK arises due to the franchise, which applies in the Health Check Scenario whereas it is not applicable in voluntary modulation.

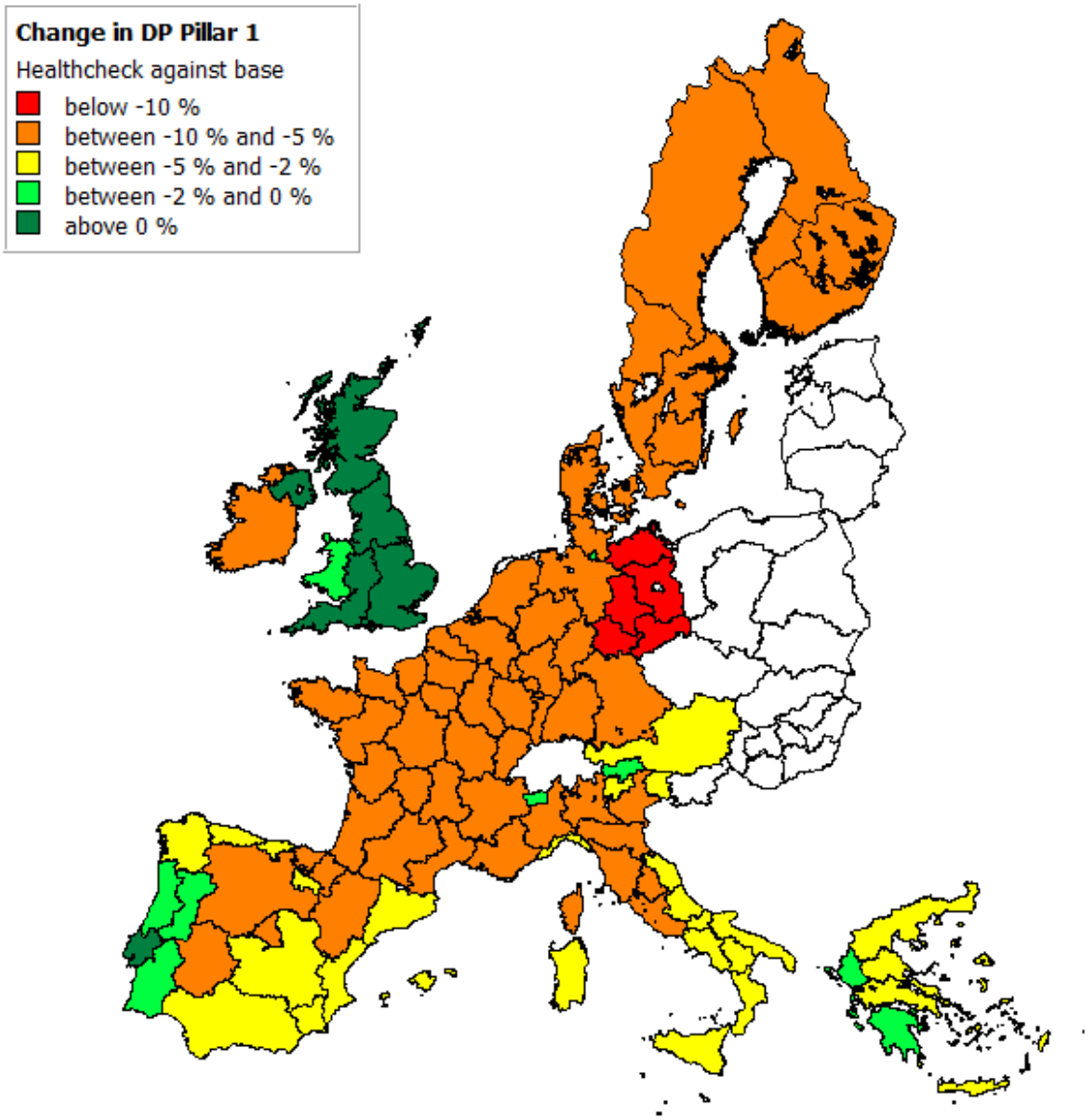
Table 5.3 Direct Payments of Pillar 1 per farm in the different scenarios in the EU-15 Member States, 2013 (euro)

	Baseline (5% modulation)	Change in Direct Payments relative to the Baseline			
		No modulation	Franchise of 10k euro	20% modulation	Health Check Scenario
Austria	9490	268	128	-803	-428
Belgium	16675	663	176	-1989	-1062
Denmark	27439	1261	240	-3696	-2041
Finland	14413	518	172	-1555	-835
France	24154	1055	187	-3177	-1702
Germany	21292	908	180	-2811	-1786
Greece	3493	57	33	-171	-91
Ireland	11103	356	132	-1069	-570
Italy	4851	149	36	-446	-268
Luxembourg	19420	788	203	-2377	-1260
Netherlands	13204	525	130	-1588	-832
Portugal	3201	118	30	-293	-6
Spain	5567	174	58	-515	-275
Sweden	22029	1092	171	-2844	-1616
UK	29246	1497	223	-4675	195

Source: FES model, based on FADN data.

In most EU-15 regions, the decrease in direct payments in Pillar 1 under the Health Check Scenario relative to the Baseline Scenario varies between 5 and 10% (Figure 5.6). However, the decrease is higher in regions with relatively large farms in Eastern Germany (about 11-13%) and lower in regions in Austria and Greece and several Spanish and Italian regions. As a result of the fact that under the Health Check Scenario voluntary modulation decreases with almost the same amount as compulsory modulation increases, hardly any change in amount of direct payments is experienced in most of the UK and Portuguese regions. The only change that can be experienced is due to the fact that under compulsory modulation the franchise is applicable.

Figure 5.6 Direct Payments of Pillar 1 per farm under the Health Check Scenario in the EU-15 regions, 2013 (change in % relative to Baseline Scenario)



Source: FES model, based on FADN data.

Large variations in proportion DP in Farm Income among farm types and Member States

A look at the proportion of DP in Farm Income under the Baseline Scenario reveals two striking issues (Table 5.4):

1. the average proportion ranges from 16% per farm in Italy and the Netherlands to about 80% per farm in Sweden and Denmark;
2. the proportion is considerably higher in field crops, grazing, milk and mixed farms than on pigs and poultry, permanent crops, wine and horticultural farms.

It could be argued that the higher the proportion of DP in Farm Income, the greater the decrease in Farm Income under increasing rates of modulation. From this, it

results that the impact of changes in the rate of compulsory modulation on farms in some Member States (Denmark, Sweden, UK, France, Ireland and Germany) and some farming types (field crops, grazing, milk and mixed farms) tends to be greater than others.

Table 5.4 Proportion of Direct Payments of Pillar 1 in Farm Income per farm type under the Baseline Scenario in the EU-15 Member States, 2013 (%)

	Field crops	Grazing	Milk	Mixed	Pigs/ poultry	Permanent crops	Wine	Horti-culture	Total
Denmark	193	-	62	106	33	12	-	2	82
Sweden	144	92	48	132	37	-	-	1	80
UK	112	106	40	87	3	3	-	3	67
France	92	80	54	77	20	7	3	1	58
Ireland	80	77	29	64	-	-	-	-	57
Germany	92	86	43	80	26	2	3	2	56
Finland	66	136	31	57	15	-	-	1	46
Luxembourg	-	67	36	62	-	-	2	-	42
Portugal	46	54	41	61	0	18	7	2	37
Austria	44	38	22	39	18	2	14	-	28
Greece	40	29	-	33	-	21	6	3	27
Belgium	37	53	26	32	5	1	-	1	26
Spain	40	39	26	35	4	17	3	0	23
Italy	28	17	18	21	5	11	3	0	16
Netherlands	34	77	34	34	3	0	-	0	16

Source: FES model, based on FADN data.

Changes in funds for Pillar 2

FES only takes account of the impact of human and physical capital investments (measures 111, 112 and 121), LFA (measures 211 and 212) and agri-environment schemes (measure 214) on Farm Income. Additional modulation funds in the Health Check Scenario are spent on these measures in the same proportion as the EAFRD budget 2007-2013[18]. Additional modulation funds spent on other rural development measures are not taken into account by FES, as it is assumed that these only have indirect effects on farm income or that these affect non-farm income in the rural economy. Funds spent on LFA are considered as direct income support; funds spent on agri-environment schemes are considered to be income neutral, whereas funds spent on investment subsidies result in an income increase according to assumptions on investment rate returns (see Chapter 2).

Under the Health Check Scenario, the highest amounts of additional modulation funds for Pillar 2 are available per farm in Denmark, Germany, France and Sweden (about 1,600 to 2,000 euro) in 2013 and the lowest in Greece (about 90 euro) (Table 5.5). In FES, these are spent on LFA measures, agri-environment schemes and investment measures in Axis 1. By doing so, in most countries a substantial part of the additional modulation funds are absorbed. Due to national co-financing and private funding, additional modulation funds for these measures increase, varying from about 60% in Greece to over 700% in Belgium. This high increase is the result of a relatively strong emphasis on investment subsidies in Pillar 2 in Belgium, which induce a high amount of private funding.

[18] By doing so, FES slightly differs from the application of the Health Check scenario by the other models, which spent additional modulation funds on the new challenges.

Table 5.5 Additional modulation funds for Pillar 2 measures in the Health Check Scenario per farm in the EU-15 Member States, 2013

	Additional modulation funds available for P2 (euro)	Share in EAFRD budget 2007-2013 (%)				Total P2 funds induced by additional modulation (euro)			Increase total P2 budget LFA, AE and investment (% to modulation funds)
		LFA (measure 211 and 212)	Agri-environ-mental measures (measure 214)	Investment in farms (measure 111, 112 and 121)	Total share	LFA	Agri-environment measures	Investment	
Austria	428	24	46	9	79	207	394	252	151
Belgium	1062	4	30	39	73	91	627	5982	764
Denmark	2041	1	46	9	56	40	1708	772	117
Finland	835	40	32	7	79	334	944	58	104
France	1702	31	15	22	67	940	450	1300	134
Germany	1786	10	25	11	46	325	755	1247	184
Greece	91	9	18	15	42	10	22	30	64
Ireland	570	21	49	3	73	218	509	49	87
Italy	268	6	23	19	49	35	120	202	174
Luxembourg	1260	29	30	24	82	1447	1501	3691	542
Netherlands	832	4	22	10	36	60	371	529	206
Portugal	6	18	10	11	39	-	-	-	-
Spain	275	6	14	14	34	34	75	167	193
Sweden	1616	14	54	12	81	497	1865	1162	170
UK	2618	9	54	4	67	734	2587	592	90
EU-15	566	15	25	14	54	196	319	449	175

Source: FES model, based on FADN data.

Changes in farm income

Due to additional modulation of direct payments in Pillar 1 in the Health Check Scenario, Farm Income decreases in 2013 by 0.7% per farm in Greece to over 6% in Denmark relative to the Baseline Scenario (Table 5.6). It appears that the additional input of money to the budget for LFA measures, agri-environment schemes and investment subsidies is on the whole insufficient to compensate for the income loss per farm in 2013 due to modulation of direct payments under the Health Check Scenario, except for Luxembourg. In the UK also a positive effect can be perceived, resulting from the removal of the franchise and additional funds for LFA payments. The income loss per farm ranges from 0.3% in Austria to 3-4% in Denmark, Germany and Sweden. A number of reflections could be put forward for the interpretation of these findings:

a. The reduction of direct payments due to modulation of Pillar 1 is considered as a direct income loss, whereas rural development measures in Pillar 2 are usually not given as direct income support, with the main exception of the LFA measure. The amount of received investment subsidies (measures 111, 112 and 121) does not directly increase the Farm Income, since its nature is not an income payment. Moreover, the income effect of additional investments, due to the subsidies, is distributed over the time span of the investment. Table 5.6 only shows the income effect in 2013. The total effect of the investment subsidies on farm income is much higher (i.e. present net value). Furthermore the agri-environment measures are considered in FES to be income neutral.
b. Modulation of Pillar 1 only effects farm income, whereas Pillar 2 is directed at both farming and non-farming activities in the rural economy. So part of the modulated funds from farms leaks away to non-farming activities in the rural economy.
c. In Table 5.6, the focus is on the average farm in a country. Within countries, there is a variation around this average, so some farms will lose more than the average, while especially LFA farms are likely to win as the increase in LFA payments could be higher than the reduction of Pillar 1 funds made on these farms.
d. The results for Luxembourg could be explained by the fact that the whole country is eligible for LFA payments, along with the high national co-financing rate for this measure in this country (75%). In addition, there is a rather high rate of private funding for investment subsidies in this country.

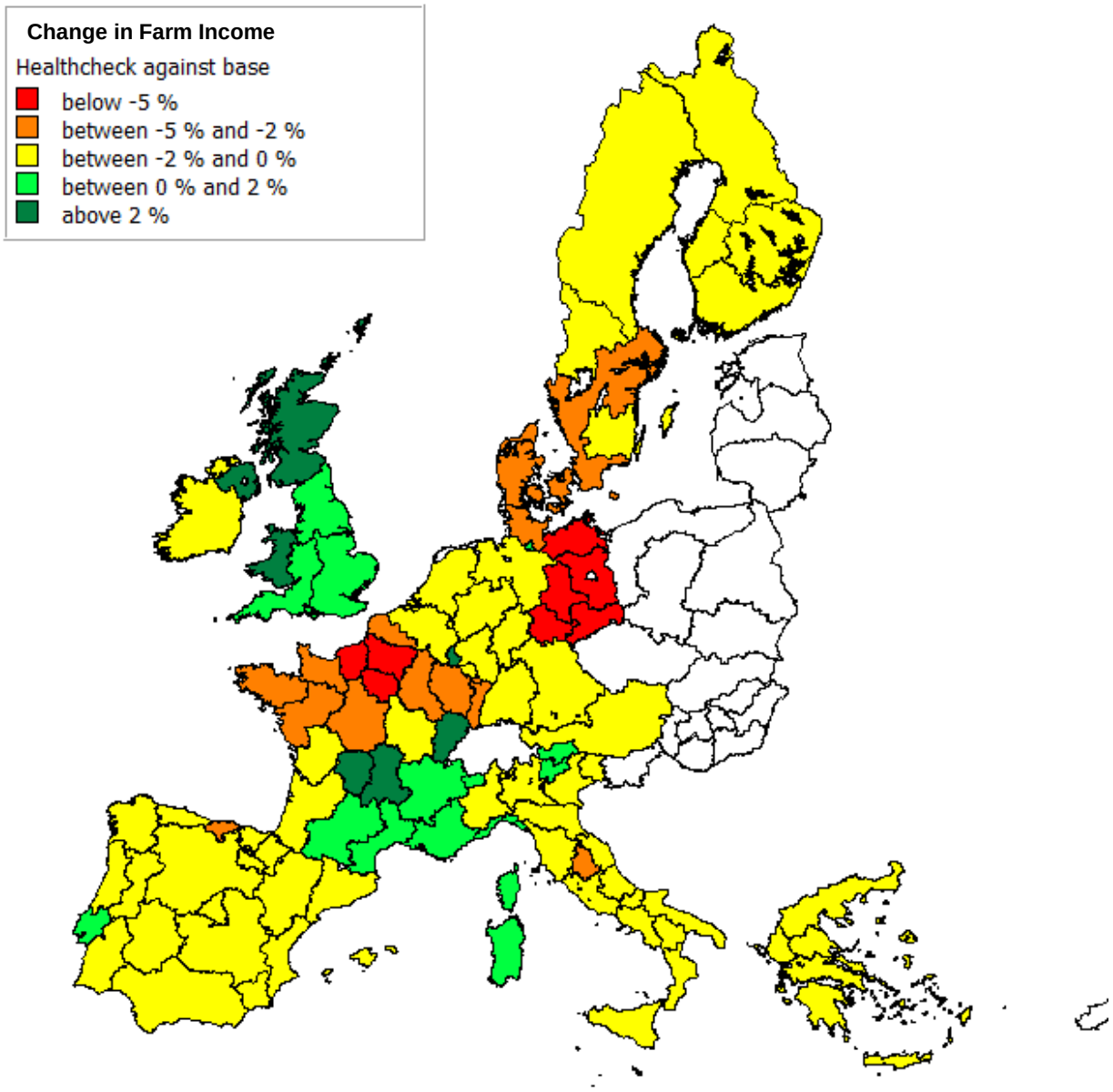
When we look at changes in farm income per farm in 2013 under the Health Check Scenario in the EU regions, then it appears that regions within countries are usually affected in a more or less similar way, except for France, Germany, Sweden and the UK (Figure 5.7). Regions in the N-W France lose relatively, whereas those in S-E France tend to benefit. In Germany, regions with large farms in the eastern part of the country lose. In Sweden, losing regions are located in the south. In the UK, Scotland, Wales and North-Ireland are the regions that experience the highest income gains.

Table 5.6 Changes in Farm Income in the Health Check Scenario per farm (EU-15), 2013

	Baseline income 2013 (mio euro)	Change due to (mio euro)			Change due to (%)		
		Additional Modulation P1	LFA	Investment, 2013	Additional Modulation P1	LFA	Invest-ment, 2013
Austria	33442	-393	206	86	-1.2	0.6	0.3
Belgium	64541	-1063	91	888	-1.6	0.1	1.4
Denmark	33554	-1554	42	85	-4.6	0.1	0.3
Finland	31480	-849	335	21	-2.7	1.1	0.1
France	41929	-1692	940	146	-4.0	2.2	0.3
Germany	38125	-1627	324	186	-4.3	0.9	0.5
Greece	12829	-91	10	3	-0.7	0.1	0.0
Ireland	19334	-580	218	6	-3.0	1.1	0.0
Italy	30978	-268	35	32	-0.9	0.1	0.1
Luxembourg	46041	-1282	1523	751	-2.8	3.3	1.6
Netherlands	83195	-872	56	108	-1.0	0.1	0.1
Portugal	8572	-7	0	0	-0.1	0.0	0.0
Spain	24038	-273	34	28	-1.1	0.1	0.1
Sweden	27577	-1394	495	24	-5.1	1.8	0.1
UK	43780	199	701	23	0.5	1.6	0.1

Source: FES model, based on FADN data.

Figure 5.7 Changes in Farm Income per farm under the Health Check Scenario in the EU-15 regions, 2013 (%)



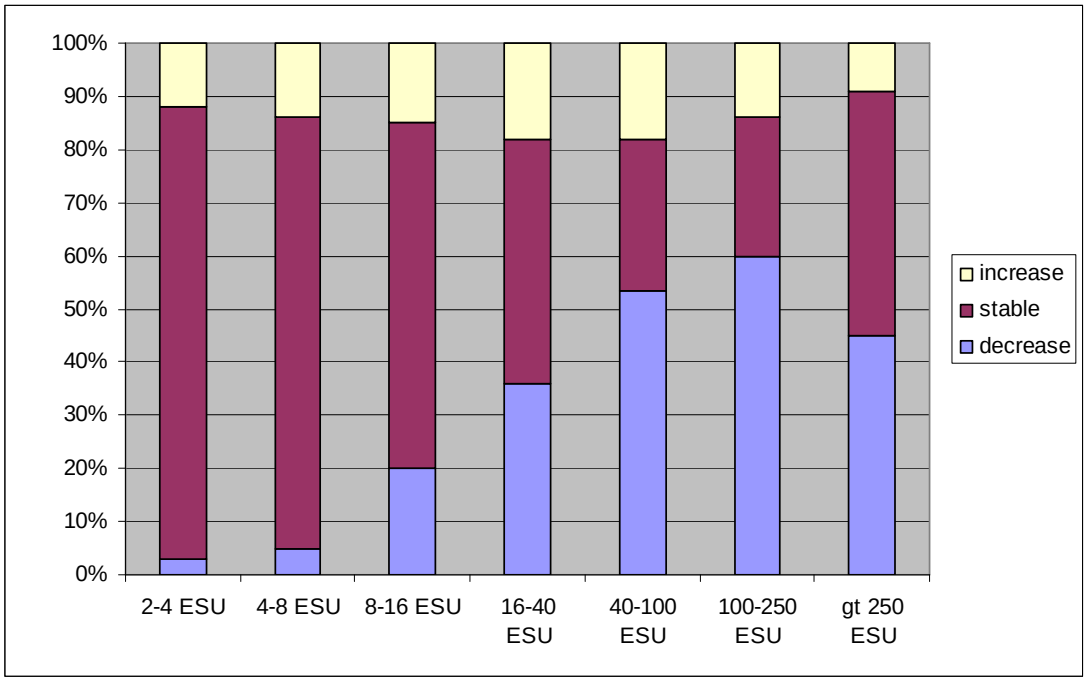
Source: FES model, based on FADN data.

Changes in Farm Income according to farm size

For analysing which farms benefit and which farms lose from modulation, we grouped farms according to changes in Farm Income under the Health Check Scenario into three types: farms with an increase in income above 0.5%, farms where income remained rather stable (change between -0.5 and +0.5%) and farms with an income decline above 0.5% in 2013. For the EU-15 as a whole, it appears that there is a tendency that the larger the farm size, the larger the proportion of farms that face an income loss (Figure 5.8). However, this trend does not apply to the group with the largest farm size, likely as a result of banded modulation. The proportion of farms that benefit from modulation is remarkably the same for all size groups, and fluctuates in a small range between 9 and 18%. When we look at the individual Member States, the

same trend can be perceived for the proportion of farms that face an income decline, although the absolute levels of the proportion rather differs among countries (Table 5.8). The proportion of farms according to farm size that benefits from modulation rather varies among Member States (Table 5.7). It is moderate in Germany, Greece, Italy, the Netherlands, Portugal, and Spain and relatively high in the UK. In the last country, many medium-sized farms are likely to benefit from the application of the franchise in the Health Check Scenario. In most countries, except for Belgium, Denmark and Portugal, the proportion of smaller sized farms that experience an income increase exceeds that of the larger sized farms.

Figure 5.8 Changes in Farm Income under the Health Check Scenario according to farm size in the EU-15, 2013 (%)



Increase: change in FFI>0.5%; stable: change in FFI between -0.5% and + 0.5%; decrease: change in FFI>-0.5%.
Source: FES model, based on FADN data.

Table 5.7 Proportion of farms with an increase of over 0.5% in Farm Income under the Health Check Scenario according to farm size in the EU-15 Member States, 2013 (%)

	2-4 ESU	4-8 ESU	8-16 ESU	16-40 ESU	40-100 ESU	100-250 ESU	>250 ESU
Austria			44	20	9	9	
Belgium				24	20	20	32
Denmark			3	3	6	5	4
Finland			58	9	4	1	
France			50	50	31	15	7
Germany			22	17	6	4	6
Greece	8	7	4	2	1		
Ireland	70	61	21	14	6	2	
Italy		18	15	9	6	3	1
Luxembourg				62	59	35	
Netherlands				14	2	2	2
Portugal		0	0	0	1	3	
Spain	14	10	6	3	3	3	5
Sweden			24	24	9	5	
UK			100	93	89	72	28
EU-15	12	14	15	18	18	14	9

Source: FES model, based on FADN data.

Table 5.8 Proportion of farms with a decrease of over 0.5% in Farm Income under the Health Check Scenario according to farm size in the EU-15 Member States, 2013 (%)

	2-4 ESU	4-8 ESU	8-16 ESU	16-40 ESU	40-100 ESU	100-250 ESU	>250 ESU
Austria			21	41	62	42	
Belgium				45	58	51	30
Denmark			75	91	88	90	85
Finland			17	56	69	79	
France			24	28	51	61	42
Germany			9	44	72	82	78
Greece	3	8	27	49	58		
Ireland	7	19	62	71	79	87	
Italy		2	9	25	41	53	47
Luxembourg				13	9	13	
Netherlands				32	58	67	24
Portugal					0	18	
Spain	3	5	21	41	60	60	31
Sweden			67	60	82	85	94
UK				1	1	1	25
EU-15	3	5	20	36	53	60	45

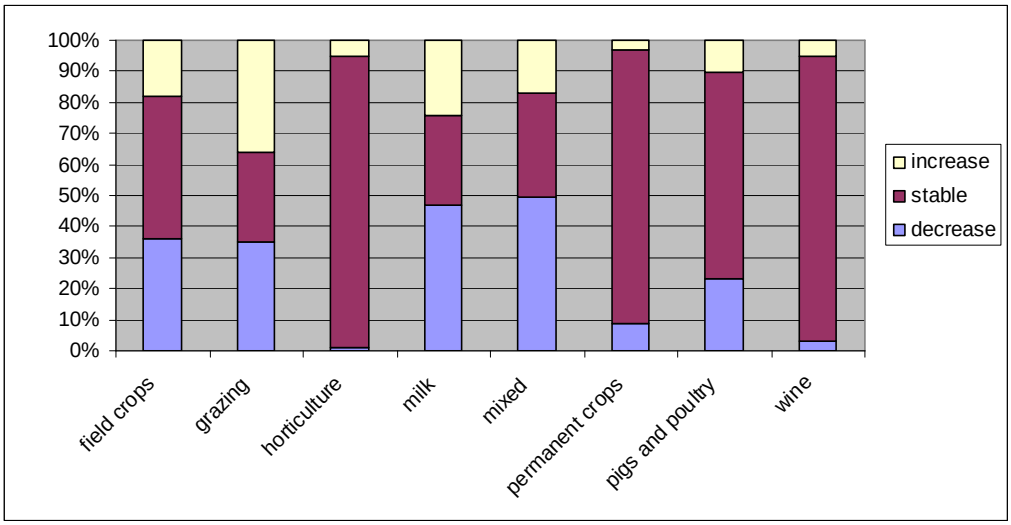
Source: FES model, based on FADN data.

Changes in Farm Income according to farm type

An analysis of which farm types benefit and lose under the Health Check Scenario in the EU-15 in 2013, shows that Farm Income on horticultural, permanent cropping, pigs and poultry, and wine farms are hardly affected (Figure 5.9). We already noted before that the proportion of DP in Farm Income was rather small on these farm types (Table 5.4). Grazing and milk farms have the highest proportion of benefiting farms (25-35%), mainly due to increased LFA payments. About one fifth of mixed and field

cropping farms also experience an income increase. On the other hand, there is also a considerable proportion of field crops, grazing, milk and mixed farms that face an income decrease, varying from about one third for field crops and grazing farms to nearly 50% for milk and mixed farms. This average EU-15 picture can by and large also be perceived in the individual Member States (Table 5.9 and Table 5.10). The Health Check Scenario evidently results in a redistribution of funds within farm types rather than among farm types.

Figure 5.9 Changes in Farm Income under the Health Check Scenario according to farm type in the EU-15, 2013 (%)



Increase: change in FFI>0.5%; stable: change in FFI between -0.5% and + 0.5%; decrease: change in FFI>-0.5%.
Source: FES model, based on FADN data.

Table 5.9 Proportion of farms with an increase of over 0.5% in Farm Income under the Health Check Scenario according to farm type in the EU-15 Member States, 2013 (%)

	Field crops	Grazing	Horti-culture	Milk	Mixed	Permanent crops	Pigs/ poultry	Wine
Austria	11	25		38	21	13	21	10
Belgium	21	15	31	29	14	35	21	
Denmark	4		5	4	5	4	2	
Finland	33	3	6	7	19		10	
France	23	69	8	42	30	21	18	10
Germany	6	11	7	16	13	5	11	5
Greece	13	3			4	0		
Ireland	2	41		21	2			
Italy	20	38	4	12	22	4	3	4
Luxembourg		53		69	70			10
Netherlands	5	15	1	3	6	1	4	
Portugal	0							
Spain	17	11	3	4	7	3	5	2
Sweden	19	12	18	18	18		24	
UK	81	96	28	83	83	32	26	
EU-15	18	36	5	24	17	3	10	5

Source: FES model, based on FADN data.

Table 5.10 Proportion of farms with a decrease of over 0.5% in Farm Income under the Health Check Scenario according to farm type in the EU-15 Member States, 2013 (%)

	Field crops	Grazing	Horti-culture	Milk	Mixed	Permanent crops	Pigs/ poultry	Wine
Austria	74	48		21	56		27	18
Belgium	65	74	4	57	66	2	11	
Denmark	88		12	96	90	22	70	
Finland	49	97		55	60		23	
France	67	23	3	54	63	8	39	8
Germany	75	79	2	49	77	3	58	8
Greece	21	33	2		30	10		
Ireland	77	43		52	88			
Italy	23	22	1	37	27	7	13	1
Luxembourg		20		5	12			
Netherlands	65	39	1	93	64	1	9	
Portugal	0	1			0	0		
Spain	38	53	1	54	54	12	12	2
Sweden	77	74		63	75		39	
UK	6	1	4	1	3	5	1	
EU-15	36	35	1	47	49	9	23	3

Source: FES model, based on FADN data.

5.2.4 Findings from CAPRI

Section 5.1 analysed gross value added at producer prices. Adding the effect of changing premium payments results in the indicator of Modified Gross Value Added (MGVA), which reflects the return to the fixed costs capital, land and labour. CAPRI does not explicitly feature capital and labour, and the cost of land is accounted for by the dual value of the land constraint. Thus, MGVA is the best available basis for an income measure in CAPRI.

Table 5.11 shows agricultural income on sector level (EU-27), and disaggregates the net results into different revenues and costs. The left-hand column of the table shows MGVA in million euro in the baseline, and the remaining columns the percent difference in four different scenarios to that baseline. The bottom row shows the net result, which turns out to be a small loss. The other rows of the table reveal how the result arises from Production value, Inputs and Premiums. In fact, all three positions decrease, but the decrease in revenue is such that the net result is an income loss. Given the discussion of the impact on production in Section 5.1, the result for income is not surprising. We have already seen that production increases for most products, with a general depression of prices as a result. For cereals, the price reduction (not shown) results from reduced feed demand due to technical progress in feeding. The production increase, which is partly due to technical progress, also manifests as an input and thus as variable cost saving.

Table 5.11 Modified gross value added at producer prices plus premiums in EU-27 in different simulations compared with the baseline (% difference)

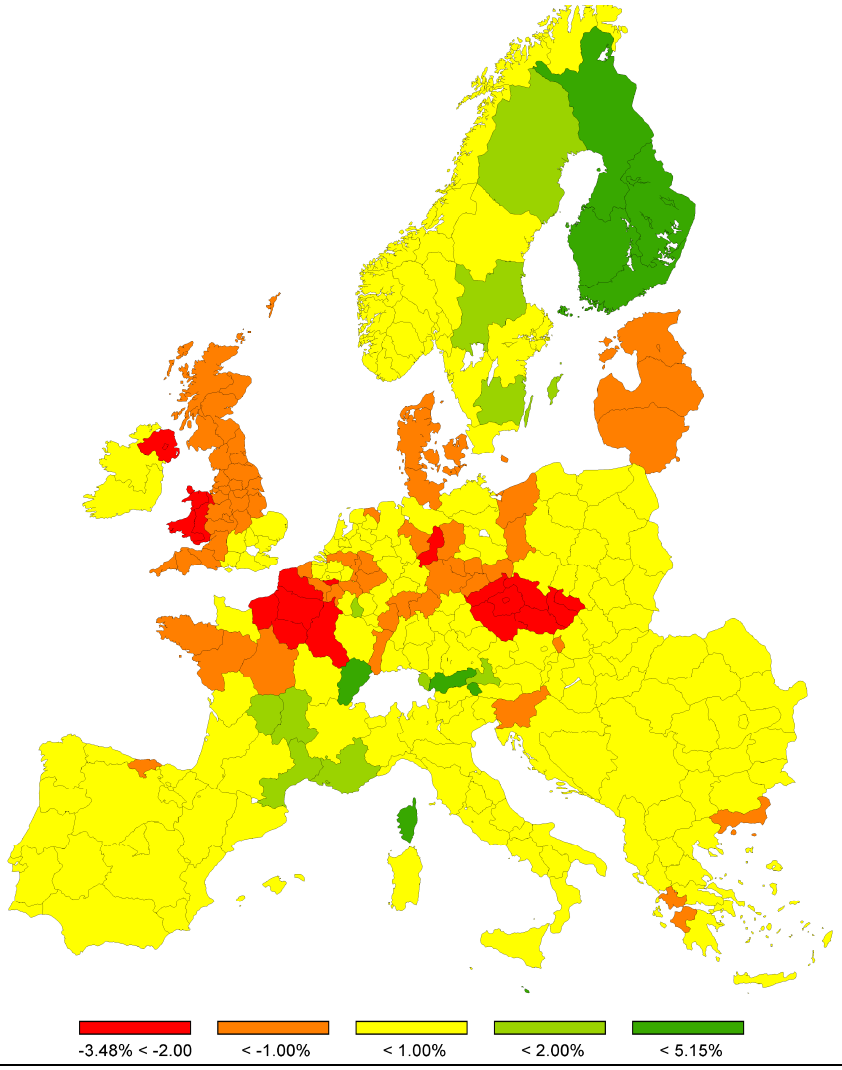
Position	Baseline (mio EUR)	P1 only (%)	P1 + cap (%)	P1 + age (%)	P1 + P2 (%)
Production value	*393 163*	*0,05*	*-0,28*	*0,02*	*-0,42*
Cereals	37 555	-0,04	-0,24	0,03	-0,23
Oilseeds	5 552	-0,15	-0,06	-0,16	-0,06
Other arable field crops	9 591	-0,05	-0,04	-0,02	-0,03
Vegetables and Permanent crops	84 268	0,02	-0,17	0,06	-0,16
All other crops	33 759	0,00	0,12	0,00	0,16
Fodder	21 506	0,06	-0,44	0,08	-0,58
Meat	74 425	0,11	-0,51	-0,01	-0,83
Other Animal products	57 642	0,00	0,00	0,02	0,03
Young animals	31 331	0,35	-1,38	-0,01	-2,50
All other income (EAA Output rest)	23 237	0,00	0,00	0,00	0,00
Manure output	14 297	-0,07	-0,02	0,12	0,21
Inputs	*239 395*	*0,00*	*-0,46*	*-0,04*	*-0,69*
Fertiliser	27 247	-0,07	-0,22	-0,15	-0,39
Feeding stuff	77 279	-0,06	-0,54	0,11	-0,51
Remonte	31 712	0,36	-1,40	-0,02	-2,53
Other inputs	103 158	-0,05	-0,17	-0,13	-0,33
Premiums	*49 210*	*-6,31*	*-6,31*	*-3,03*	*-2,07*
Gross value added at producer prices plus premiums	*202 977*	*-1,44*	*-1,54*	*-0,65*	*-0,51*

P1 = first pillar, cap = physical capital investments, age = agri-environment schemes, P2 = second pillar. Source: CAPRI.

What may be surprising is the decrease in premium receipts, given that the funds are transferred to the second pillar and topped up with co-financing. The explanation for the decreasing premium receipts is straightforward: only the three measures LFA, N2K and AE are accounted for directly in CAPRI, thus a major share of all second pillar payments are not considered in this accounting. This is a limitation of the study, but it is also important to keep in mind that the definition of the income statement in this form is focussing on gross value added, whereas the omitted measures mainly relate to either capital and labour investments or to non-farming activities.

The cost saving for fertiliser is due to technical progress in input use, which counteracts the effect of somewhat higher fertiliser prices (not shown) that result from the boost of the general economy simulated in LEITAP. For feed stuffs, there are two main effects that result in lower costs. Firstly, there is lower demand for feed stuffs due to technical progress. This reduces the use as well as the prices. This is also reflected in reduced production values of some activities in the table (cereals, fodder). Secondly, the net effect of the second pillar on fodder production is a small production increase. This is partly caused by the linkage of some measures to grazing, working as a subsidy on fodder production, and partly (mainly) due to higher yields resulting from the technical progress, most of all in the vast European grassland areas.

Figure 5.10 Change in gross value added plus premiums per hectare in Health Check scenario versus baseline.



Simulation results from the partial equilibrium model CAPRI. The map shows the relative difference in Gross Value Added plus premiums between the Health Check and the baseline scenarios for 2013.

Figure 5.10 shows percentage change in total MGVA divided by UAA in all regions, to indicate the regional distribution of the income effects. Yellow colour indicates regions where there is approximately no change, darker shades of red denote larger losses in MGVA per hectare, and green shades denote increases. There are broadly speaking different classes of regions where income decreases:

- In north-western Europe, due to a (general) redistribution FEOGA budget of the north-west towards EAFRD budget in the south
- In beef producing regions, due to the more protected beef markets and coupled premiums
- In the new Member States, because they are almost exclusively indirectly affected via the lower market prices

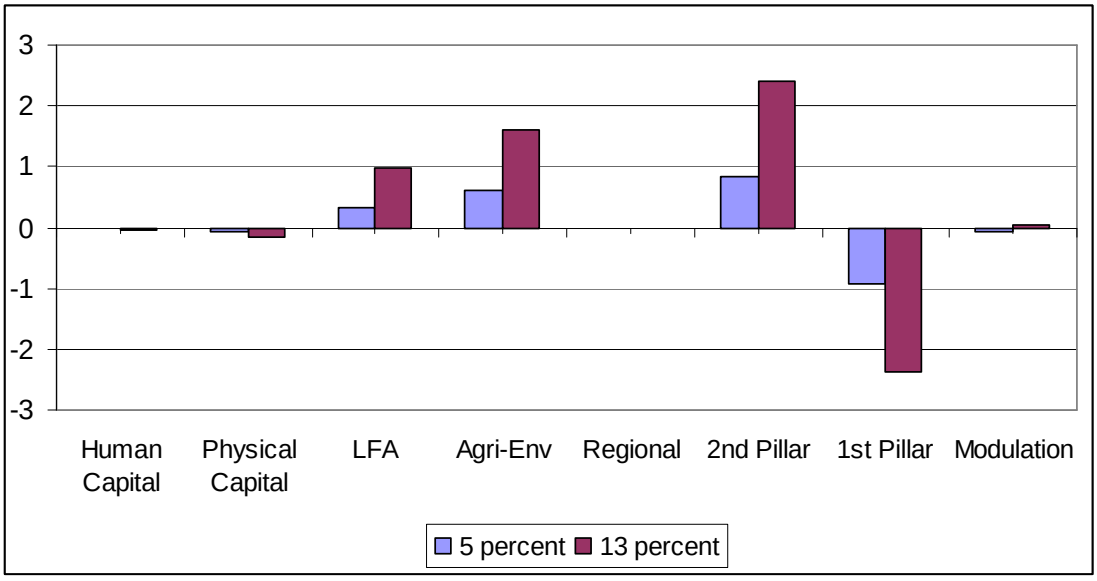
In Sweden, Austria and in particular in Finland, the return of modulated money in the form of agri-environment measures (including co-financing and top-ups) is relatively large, and contributes to supporting agricultural income there by supporting the provision of environmental services. As noted in section 5.1.4, authorities in regions with farms experiencing a potential decline in income as measured by MGVA, may

increase payments for EAFRD measures in areas where the maintenance of specific farming practices or systems is a priority.

5.2.5 Findings from LEITAP

Simulations with the LEITAP model show that modulation of the First Pillar reduces agricultural income in the EU-27: by about 1% under 5% CM and by more than 2% under 13% CM (Figure 5.11). On the other hand, CM of the Second Pillar boosts agricultural income. This is mainly caused by compensatory payments in the scope of the LFA and agri-environment measures. Agricultural income effects of physical and human capital investments in Axis 1 are negligible, as the benefits of these measures are given to consumers by reduced prices. On the whole, modulation of the First and Second Pillar in the EU-27 is basically income neutral.

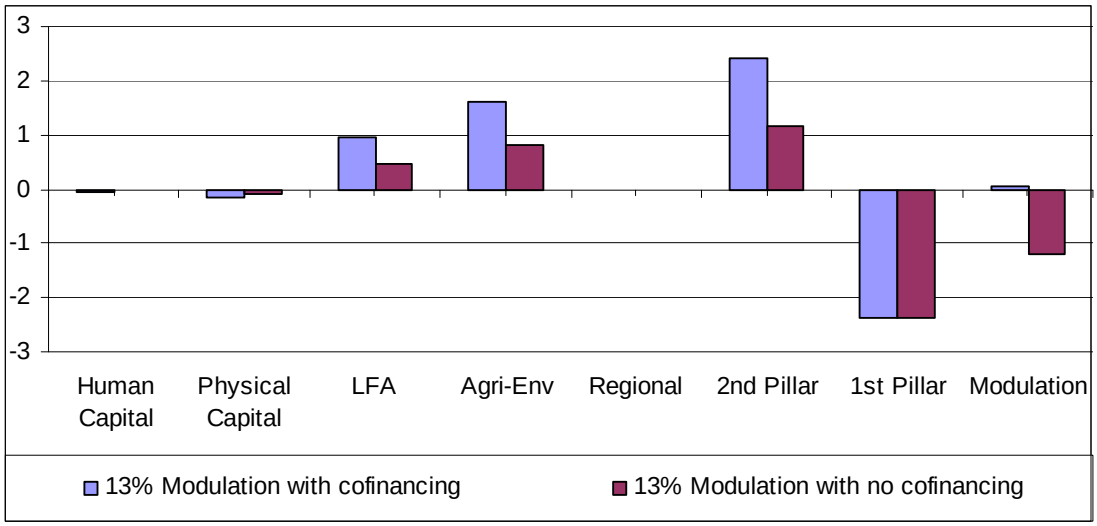
Figure 5.11 EU-27 agricultural income growth in primary agriculture with 5% and 13% modulation, 2013 (% change relative to no modulation in 2013)



Source: LEITAP.

Modulation funds raised in Pillar 1 are augmented by national co-financing and often also by private funds when they are used for the measures of the Second Pillar. In Figure 5.12 simulations are presented for situations with 0% national co-financing. As in this situation less funds become available for the measures of the Second Pillar, the income increase due to modulation of the Second Pillar is less than in the Health Check Scenario with 13% modulation. In the situation of an absence of national co-financing, modulation of the First and Second Pillar even results in a decrease in agricultural income by over 1%. This simulation shows that national co-financing tends to have an important impact on the results of modulation on agricultural income.

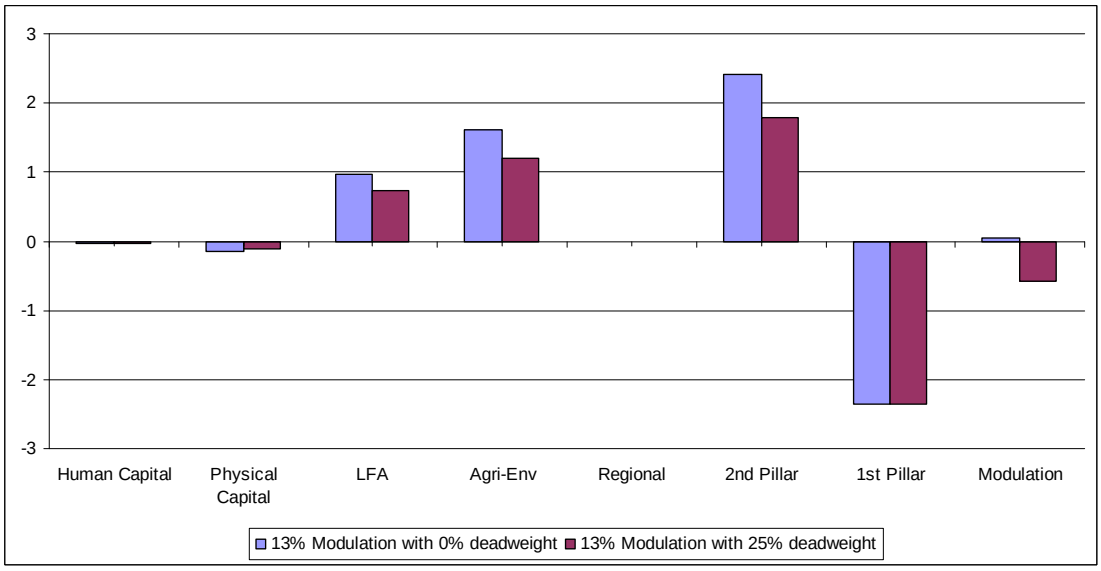
Figure 5.12 Impact of co-financing on EU-27 agricultural income with 13% modulation, 2013 (% change relative to no modulation in 2013)



Source: LEITAP.

With 25% deadweight or crowding out effects of the second pillar investments, the very slight positive impact on agricultural income becomes reduced to less than half a percent for EU-27 (see Figure 5.13).

Figure 5.13 Impact of deadweight or crowding out on EU-27 agricultural income with 13% modulation, 2013 (% change relative to no modulation in 2013)



Source: LEITAP.

5.2.6 Findings from the case studies

On the whole, experts consulted in the case studies expected a negative impact on farm income due to modulation of Pillar 1, and a zero to slightly positive impact on farm income due to the use of modulation funds in Pillar 2.

Evidence from the case studies also sheds some light on the differential effects of reducing Pillar 1 payments on farms of different types and sizes. For example, the

Portuguese case study expert suggests that the greatest income effects are most likely to be experienced by medium-sized full-time farmers (i.e. those in receipt of between 5,000-15,000 euro in direct payments), where P1 payments are a significant part of farm income. In the UK, it is the grazing livestock (beef & sheep) producers in lowland areas and the LFA which have the lowest incomes, and direct payments make up a high proportion of farm income. Reductions in Pillar 1 payments, therefore, have a disproportionate effect on the income of these producers. However, research has shown that even for these farms, reductions in Pillar 1 payments, even at a 25% modulation rate, has a minimal impact of farm income (no more than 1% reduction).

The economic impact of CM in France depends primarily of the rate of reduction applied. Currently the average rate of P1 reduction is about 4% based on a 5% rate in combination with the franchise (cuts will be closer to 5% for larger farms in line with size of the Single Farm Payment). In 2006, P1 payments were on the average euro 24,100 for all professional farms – or euro 12,000 per farm employee – representing 82% of all direct aids and the equivalent of 74% of the income.

The economic weight of P1 payments varies according to production type and region. In 2006 P1 payments exceeded income from other sources, for the following farm types and regions, respectively:

- No. 13 (Specialist cereals, oilseed and protein crops), No. 42 (Specialist cattle-rearing and fattening), No. 43 (Cattle-dairying, rearing and fattening) and No. 81 (Field crops, grazing livestock combined);
- Auvergne, Centre, Ile de France, Lorraine, Midi-Pyrenees and Pays de la Loire.

78% of professional farms are subject to P1 cuts, which in isolation cause a loss of euro 960 per farm or 2.9% of income (averaged over all French farms). Among the various types of production identified, the maximum decrease of income is 6.2% (or euro 1,830) for holdings of major crops. In all French regions, the impact is less than 5% of the income, with a maximum average of 2,200 euro per farm in Ile de France.

An analysis of the 2006 FADN data for France seems to indicate that only 56%[19] of the collected modulation funds are redistributed to farms through the rural development measures under Pillar 2. This analysis does not concern the non-professional farms; such holdings are numerous in France (nearly 40% of the total), but they produce just 5% of the national agricultural production. These small farms probably receive an even lower proportion of direct aids.

The overall impact of modulation in France is estimated to be 328 million euro. Among the 342,800 professional farms, several categories can be distinguished according to the situation with regard to the financial impact of modulation.

[19] This percentage takes account of the fact that only 80% of modulated funds are returned to France, and of that amount a proportion does not go to farmers, whereas all of the original direct payments in Pillar 1 would have gone to them. (*Source:* Case study for France.)

Figure 5.14 Analytical Framework for assessing the redistributive effects of compulsory modulation between Pillar 1 and Pillar 2 at the level of the beneficiary in France

Unaffected o 63,800 holdings (19% of farms). o They retain all Pillar 1 direct payments, as these are below the euro 5,000 franchise. o They do not receive any Pillar 2 payments. o These farms are often specialised in wine, fruits and vegetables. o Comparatively to the other categories of farms discussed in this figure, they have a higher income per family work unit. o They have, on the average, 3.1 jobs and 15 hectares.	**Outright winners** o 9,900 holdings (3% of farms). o They receive Pillar 2 support even if they are not affected by the modulation of Pillar 1. o This category, with the 'mixed' category below, has a high proportion of 'sheep and goats' (80%) and 'specialist cattle rearing and fattening' (58%) farm types.
Losers o 196,900 holdings (57% of farms). o 138,800 farms (40% of total farms) experience the reduction of Pillar 1 payments and receive nothing through Pillar 2. o 58,100 farms (17% of the total) have reduced Pillar 1 payments that are not compensated for by Pillar 2 receipts. o The proportion of 'specialist cereals' and mixed (cereals and beef production) farm types is very high. o These farms have, on the average, 96 acres, euro 34,200 of direct aid and euro 24,100 income per family work unit. o The impact of modulation (with P2 reallocation) corresponds to a 3% decrease of income.	**Net winners** o 72,100 holdings (21% of farms). o They receive more from Pillar 2 than they lose through the modulation of Pillar 1 funds. o In common with the 'winners', this farm category has, on average, 96 acres, euro 34,000 of direct aid (P1) and euro 24,100 of income per family work unit. o The impact of modulation (with P2 reallocation) corresponds to a 5% increase in income.

Source: Case study for France.

The impact of modulation at the regional level in France is heavily dependent on agricultural specialisation. Thus, modulation is positive for regions (notably in mountain areas) specialised in extensive systems of cattle and sheep production. On the contrary, it is negative for regions with a high proportion of farms specialised in cereals.

According to the French case study, there are clear redistribution effects of modulation. For example, the impact of modulation corresponds to -3% of the income (after reallocation) for the 53,100 big farms (over 100 ESU) from the category "losing farm". These farms have, on average, 57,400 euro of direct aid (Pillar 1) and an income of 34,600 euro per family AWU. At the opposite, the modulation corresponds to +6% of the income (after reallocation) for the 51,300 small farms from the category "winning farm" ('outright' and 'net' combined). These units receive 13,600 euro of direct aids (Pillar 1) and have an income of 14,900 euro per family AWU. If the modulation plays in the direction of reducing income inequalities, the redistributive effect is low (with a uniform rate of 5% modulation).

5.2.7 Concluding comments

Experts consulted in the case studies expected a negative impact on farm income due to modulation of Pillar 1 and a zero to slightly positive impact on farm income due to

the use of modulation funds in Pillar 2. This expectation was confirmed by the findings from FES. However, whereas FES calculations show that the combined effect of a reduction of Direct Payments of Pillar 1 and an increased spending on Pillar 2 under the Health Check Scenario results in a small income loss for the average farm in all EU-15 countries, except for Luxembourg and the UK, CAPRI calculations show a slightly positive income effect for the EU-27 as a whole.

Field cropping, grazing, milk and mixed farms tend to have the highest share of Direct Payments in their Farm Income. It appears that Farm Income shows the most changes on these farm types under the Health Check Scenario: both a large proportion of these farms face an income loss and a high proportion experience an income gain relative to the Baseline Scenario. The Health Check Scenario evidently results in a redistribution of funds within farm types rather than among farm types.

In our analysis, we only focussed on the impact of modulation of the first and second pillar on farm income. It goes without saying that rural development measures could also directly or indirectly affect income of non-agricultural actors. This is especially the case for measures of Axis 3 and Axis 4 (the LEADER programme).

5.3 Employment

The availability of jobs is a crucial issue for the viability of rural areas. In the process of economic development, the structure of the economy changes: employment in agriculture shrinks and employment in the industry and services sector increases. As agricultural employment is predominantly located in rural areas, the loss of agricultural jobs in these areas could result in outmigration, unless there are other employment opportunities available, be it on- or off-farm. Policies could facilitate the creation of jobs in many ways, for example, by providing stable macro-economic conditions, road and other infrastructure, and investments in physical and human capital. The second pillar especially aims to enhance the competitiveness of the agricultural sector and the viability of rural areas. As such, it is directed at accompanying the process of labour exodus from the agricultural sector, rather than reversing this trend. It hopes to contribute ‘to increase the agricultural productivity by promoting technical progress and by ensuring the rational development of agricultural production and the optimum utilization of the factors of production, in particular labour’ as was formulated in the Treaty of Rome (1958). In the scope of the analysis of the impact of modulation on employment, it could be argued that the second pillar measures, on the one hand, try to improve the conditions for the workers still employed in agriculture and, on the other hand, try to improve the conditions for non-agricultural employment in rural areas, either by means of support for diversification into non-agricultural activities on farms or by support for business creation, encouragement of tourism activities and LEADER. This last type of support could also result in the creation of jobs. Support under the first pillar never had as a primary objective to create jobs. However, the stabilising effect that the support has on farm income might very well have slowed down the exodus of labour from the agricultural sector.

In this section the effects of modulation on employment will be analysed as the results of a decrease in Pillar 1 and the increase of measures in Pillar 2. Changes in the budget might lead to changes in sectoral and total employment, and to changes in the employment conditions in rural areas.

5.3.1 Issues

Questions in this study theme relate to the impact of modulation on rural households' on-farm and off-farm employment, job security, job creation and working conditions, while paying attention to possible sector employment effects.

Employment creation and the sectoral structure of employment are shown here as changes in growth of employment, based on results of the LEITAP model. The *ex-ante* evaluation of the CMEF indicators and the case-studies also give indications of the effect of modulation on job creation. Social conditions reflect the employment diversification, job security and working conditions in the agricultural sector, and the case-studies are the main source for the assessment.

5.3.2 Summary

Employment effects are conditioned by a complex set of factors such as labour productivity, market growth, unemployment, proximity to urban centres and strategy of the farmer. Isolating the effect of compulsory modulation on employment is therefore not straightforward. However, it is possible to make some inferences at a very general level. The results indicate that, while some changes in employment, both within agriculture and the services, energy and industry sectors, are experienced as a result of compulsory modulation, these changes are very minor. Overall, under the Health Check scenario, LEITAP shows that employment in the food processing and services sectors increases very slightly (0.02%) and decreases within the primary agriculture, the energy and industries sectors. The greatest decrease is experienced in the primary agriculture sector, although the reduction is still very small (-0.12%) across the EU-27.

In relation to the agricultural sector, the main reason for this decrease stems from the reductions in Pillar 1 direct payments. This is then reinforced by the Pillar 2 investments in physical capital (mainly Axis 1), some of which may encourage further structural change. Expert judgement from the case studies correlates with the model results.

The models, CMEF indicators and case studies, all suggest that, under the Health Check Scenario, higher employment levels are likely to be experienced than would be the case with no modulation, as a result of the input of additional funds in Axis 2 and Axis 3 of the second pillar. However these do not outweigh the decreases seen as a result of reductions in Pillar 1 and the additional availability of funds for physical capital measures.

Additional funds available under the LFA and agri-environment measures contribute to farm income and thereby the maintenance of employment in rural areas. In the case of agri-environment schemes, in many Member States positive employment effects could be experienced as a result of the use of additional contractors on farm, and the reallocation of existing on-farm labour, as well as to secondary and indirect employment benefits resulting from increased tourism and recreation.

Axis 3 measures, as well as activities funded through the LEADER approach, all have the potential to increase employment in rural areas, largely outside the agricultural sector. While the impact of these measures on employment creation are small, given the limited resources allocated to these measures, however the impact may be locally

significant, and may help to leverage additional jobs, thereby contributing to a more diverse and secure job market in rural areas.

At an aggregate level, increased levels of modulation appear to have a minor influence on social and working conditions and these are hard to measure. However, this may mask more significant local impacts, and the case-studies point to modulation having a positive effect, particularly as a result of investment in physical and human capital measures, for example improved on-farm infrastructure and increased availability of training. LEITAP also indicates that the physical investment measures (Axis 1) and land management incentives (Axis 2) can have a stabilising effect on employment. Investments related to diversification and service provision under Axis 3 can also contribute to a more secure job market.

5.3.3 Sector and total employment

The general trend with regard to employment in the agricultural sector is a long-term decline in the agricultural work force (about 3% p.a. in the EU-25), and composing only a small part of total employment (5% in the EU-15)[20]. The two case study countries in EU-10 experience either particularly high unemployment in the sector (PL) or a particularly low level of agricultural worker productivity (SI). Hidden unemployment in agriculture would be best handled through a strong pull-factor: the creation of jobs in other sectors so that people can leave agriculture. Those who remain in agriculture are likely to enlarge their farming enterprise and become more competitive. In this section we look at how modulation affects sectoral and total employment.

The employment effects of compulsory modulation on the First and Second Pillar in primary agriculture is slightly negative: -0.04% under 5% CM and -0.12% under 13% CM (Table 5.12). Cutting first pillar funds reduces income in the agricultural sector, and therefore encourages some people to find a more profitable job outside agriculture. Increasing the second pillar has also a slightly negative impact on employment, in particular because physical capital investment (modernisation) saves labour. This phenomenon is further strengthened by the human capital investments that make people more attractive for employment outside agriculture. On the other hand, LFA and agri-environment measures tend to keep some labour inside agriculture.

Table 5.12 Change in employment in primary agriculture in the EU-27, 2013 (% change relative to no modulation in 2013)

	5% modulation	13 % modulation
First Pillar	-0.02	-0.04
Second Pillar	-0.03	-0.07
Of which:		
Human Capital Measures	-0.01	-0.02
Physical Capital Measures	-0.03	-0.09
LFA Measures	0.01	0.03
Agri-environment Measures	0.01	0.02
Regional Measures	0.00	-0.01
Total modulation First and Second Pillar	**-0.04**	**-0.12**

Source: Simulation with LEITAP.

[20] This is well documented in DG AGRI studies such as Scenar 2020.

The additional modulation in the Health Check scenario hardly affects the process of structural change, as shifts in employment from agriculture and industries to services are very small (Table 5.13). Modulation slightly increases GDP and this increase in income leads especially to more spending on services as the income elasticity for services is highest. Employment is increasing with 0.02% in services, which employ a large part of all people in the EU-27 economy. The impact of modulation on the processed food industry is negligible since the effects of Pillar 1 and Pillar 2 counterbalance each other. Reducing the first pillar increases input prices of primary agricultural products for the food industry, and therefore leads to higher prices and a bit of a loss in competitiveness and employment. Due to the increase in the second pillar, the processed food industry benefits from the lower input costs and improves its competitiveness, which leads to production and employment growth. The second pillar has a negative impact on the energy and industrial sectors as technological change reduces demand for inputs in (mainly) primary agriculture, and the increased GDP does not lead to a big increase in demand for products from the energy and industry sector.

Table 5.13 Change in employment in the EU-27, 2013 (% change Health Check Scenario relative to no modulation in 2013)

	First Pillar	Second Pillar	Total modulation First and Second Pillar
Primary agriculture	-0.04	-0.07	-0.12
Processed	-0.01	0.02	0.02
Energy	0.00	-0.02	-0.02
Industries	0.00	-0.05	-0.04
Services	0.00	0.02	0.02

Source: Simulation with LEITAP.

5.3.4 Findings from the case studies

According to the experts' judgements in the case study reports, it is likely that a rate of 5% compulsory modulation of direct payments in the first pillar has a marginally negative impact on employment and that the input of CM funds in the second pillar budget has a slightly positive impact on employment. However, it is rather difficult to quantify these impacts, as CM is intertwined with many other forces. The impacts are expected to be rather small as the size of the CM funds is generally considered to be very limited, both in relation to the total amount of direct payments and to the size of the second pillar budget.

Some case studies report that the reduction in Pillar 1 has an insignificant impact on employment at a low CM rate (FI, PT), and that any impact would vary between the sectors (NL). The Central European countries have a different perspective: P1 cuts may affect the possibility to hire farm labour (PL) or may accelerate the decrease in farm labour (SI), and it is noted in France that these cuts may encourage farms to increase in size to achieve economies in scale with regard to labour input. Basically, however, the dynamics of supply, prices and technological progress have a stronger influence on employment than P1 cuts (FR, UK); and there is also a decrease in agricultural employment that can be associated with decoupling (DE).

The case studies show that the net positive effects on employment of Pillar 2 payments are either very small (FI, NL) or not likely (SI). Farms receiving P2 payments generally have lower productivity, so therefore these payments reinforce

their viability (FR); they are also expected to favour the establishment of young farmers (FR). General effects in the rural economy are either neutral or slightly positive (FR), but to truly have an effect the current CM rates are insufficient to generate an adequate 'return' in terms of P2 payment levels (PT). It is considered, nevertheless, that Axis 3 measures are likely to have a positive effect on rural employment as a whole (UK), and is likely to slow down the outflow of young people from rural areas (SI) but that they could diminish unskilled, seasonal labour (PL). The employment possibilities brought about by P2 measures are noted in different ways according to the country. As with working conditions, the effects are anticipated to be potentially positive (FI), but difficult to measure (NL, DE). They could benefit labour intensive agricultural sectors (PT), and are likely to be associated with capital works (UK) and might potentially be associated with the tourism sector (UK). Reference is made to positive effects for basic services and infrastructure (PL); for micro-enterprises in renewable energy (SI); and for nature conservation and tourism (SI).

The economic impact CMEF-indicator on employment creation, measured in terms of net additional full-time equivalent jobs created, could be used to explore the effect of the use of compulsory modulation funds in the second pillar. Although not all case study countries set a specific target for this impact indicator in their RDPs, other countries give a detailed overview of the number of expected jobs created per measure. The expected number of additional jobs varies from 64 in Wales to 17,250 in Portugal. Usually, measures from Axis 3 and Axis 4 contribute to this impact indicator. Given the overall moderate expected contribution of the RDP to this impact indicator on employment creation, it could be derived that the contribution of CM funds is even more moderate. If we apply the shares of the input induced by CM funds per RDP measure, the contribution of CM funds could be estimated to vary between about 5-30% of the target value of the impact indicator. As a way to emphasise the size of the impact, in the case of Portugal – which reports the highest target value for the number of created jobs – this would imply that CM funds are expected to create about 1,300 jobs in a total population of approximately 10 million.

Employment conditions in rural areas

Employment conditions are important for a viable rural area. Three aspects of this are being analysed here: job security, diversified job market and working conditions. Can modulation contribute to these issues?

Pillar 2 measures are likely to have impacts in the following ways: cooperation for the development of new products, processes and technologies in the agricultural and food sector and in the forestry sector; and setting up of management and advisory services. In some cases these are associated with diversification, in particular with regard to tourism. P2 measures in the form of LFA, agri-environment and afforestation payments are by their nature linked to maintaining the viability of the agricultural sector. But, in general, opportunities for job creation are minor (no evidence reported), and are more likely to contribute to the preservation of existing jobs.

Job security

The issue of job security is elucidated by the case studies. Secure salaried jobs, in terms of labour on the farm, are not (or hardly) affected by modulation (FR).

Decoupling, recent price shifts, and bioenergy support are more relevant to the level of on-farm labour (DE). Therefore, any observable effects are unlikely (NL, UK, FI); and in some countries, resort to salaried labour is simply not frequent (FI, SI). With regard to the use of farm contractors, any change is unlikely or insignificant (FI, FR, NL, UK). A possible increase of farm contractors, however, was noted in PT as a way to replace permanent staff. For a country such as Slovenia, use of farm contractors is an infrequent practice at this time.

The Pillar 2 measures that are likely to have the greatest positive impact on farm labour through their impact on the agricultural economy are agri-environment (1.5% increase in farm income in FI) and LFA payments (50% of P2 expenditure in FR; in these areas, many farms are unlikely to be viable without them).

Family labour on-farm is not likely to feel any impact in some countries (FI, NL, UK), whereas in France there might be some shedding of family labour, and the implications are unclear in two other countries (PT, PL). Nevertheless, decline in on-farm job security is likely to be countered by an increase in off-farm employment possibilities or by diversification (SI: into tourism).

With regard to the impact on the rural economy as a whole, Pillar 2 favours adaptation to market requirements (FR); and job creation will also occur in the non-agricultural sector (PL). For instance, Axis 1 will have the greatest impact in Portugal because of needed technology and productivity improvements. P2 payment will have a positive impact in the rural economy through spin-off effects linked to particular AE measures that could also stimulate related activities such as tourism, and also the creation and marketing of agri products (UK). Livestock and energy crop measures under Axis 1 have potential upstream effects (UK). Diversification measures are by their nature a positive contribution to the rural economy in general (PL, SI).

With regard to working conditions, P2 measures should have a potentially positive effect (FI), but may be difficult to measure (NL, DE). Positive effects are particularly expected when farm modernisation is the result (FR) and when there is investment in new technologies and better equipment (PT, SI). These measures may lead to an increase in labour costs, but at the same time would provide improved safety and better working conditions (PL).

5.4 Quality of Life in Rural Areas

5.4.1 Issues

This section considers the extent to which modulation has an impact on specific parameters affecting the quality of life in rural areas. It also considers possible effects on the links between agriculture and the other sectors of the rural economy with a view to the long-term viability of rural communities.

5.4.2 Summary

Overall the quality of life in rural areas is expected to benefit from increased levels of modulation, although it has not been possible to quantify this impact. The extent to which this is the case will differ across the EU-27 depending on the specific situation within a Member State, the level of CM, associated national co-financing, and the way in which the relevant measures are used.

At low levels of modulation, reductions in Pillar 1 would not appear to have any real impact on the quality of life in rural areas, as no significant effects in terms of farm restructuring or land abandonment are experienced. However, drawing mainly on evidence from the case studies, increases in expenditure in Pillar 2 do have a positive effect on quality of life by increasing the funding available for measures that promote innovation, create employment opportunities, improve access to services for the rural population or provide funding for activities that can improve the economic attractiveness of, and thereby encourage investment in, rural areas. Increased availability of funding for activities implemented under the LEADER approach can help to further increase capacity building, and strengthening co-operation within local areas, which alongside the social benefits, may also lead to economic and environmental benefits. Beyond Axis 3 and the LEADER approach, the LFA and the agri-environment measures stand out as having the potential to enhance the quality of life in rural areas in relation to their role in maintaining and enhancing the attractiveness of rural areas, and hence in attracting increased tourism. In addition, the case studies highlighted the value of these measures for keeping people in farming, which therefore constrains somewhat the trend towards outmigration.

The models also indicate that increased rates of modulation under the Health Check scenario have a positive, albeit very small, impact on GDP growth, due to the increased availability of funds within Pillar 2. The effect is largely caused by those Axis 3 measures which are focused predominantly on investments outside of the agricultural sector, for example on the setting up of new businesses, improving rural services and promoting tourism

5.4.3 Definition of Quality of Life

Quality of life is a multi-dimensional concept concerned with the overall well-being in society. Quality of life in rural areas is derived from a range of different factors, which interact together to create the socio-economic and cultural conditions which allow people to have sufficient access to material resources as well as choose the lifestyle they want[21] [22]. In relation to rural areas, the following factors tend to be considered as particularly significant in contributing to quality of life:

- Levels of employment and the existence of employment opportunities for both genders;
- Access to local services, such as transport, shops, schools, healthcare, childcare etc;
- Housing availability;
- Levels of income;
- Levels of educational attainment;
- Degree of social cohesion; and
- Attractiveness of surroundings.

[21] European Foundation for the Improvement of Living and Working Conditions (2006) 'First European Quality of Life Survey: Urban-rural differences', ISBN 92-897-0960-X, Luxembourg, Office for Official Publications of the European Communities, 2006

[22] Fahey, T., Nolan, B. and Whelan, C.T. 2003, Monitoring quality of life in Europe, European Foundation for the Improvement of Living and Working Conditions, Luxembourg, Office for Official Publications of the European Communities, 2003

Support through the CAP, to farmers and rural areas more generally, can affect all these factors, with the exception perhaps of housing availability. The effect of compulsory modulation on employment is dealt with separately in Section 5.3. In this section, therefore, the key issues which are explored in relation to compulsory modulation are the provision of local services, general growth in the economy and income levels (using GDP as a proxy), human capital (particularly in relation to training and capacity building), the attractiveness of the local surroundings, and social cohesion. In addition, the interaction between agriculture, the structural changes that are being experienced within this sector and the wider economies of rural areas are explored.

Evidence for this section is drawn predominantly from the eight case study reports, existing evaluation literature including mid term evaluations of the previous programming periods and ex ante evaluations for the 2007-13 RDPs, as well as trends in the CMEF indicators for the case study Member States where suitable information was provided. The models have been used to provide information on GDP and employment.

Rural areas differ in terms of their socio-economic characteristics between and within Member States, and these characteristics change over time in response to economic and social drivers. For example, population densities differ significantly across the EU-27[23] and rural communities are much more dispersed in some countries than others. This leads to structurally diverse rural economies across the EU-27, with different areas experiencing different issues with regard to remoteness, access to services and social cohesion, and the degree to which agriculture continues to play an important role in maintaining the viability of rural communities, and in the economy of rural areas. Nonetheless, it is possible to identify some key trends against which the impacts of different policy interventions can be assessed.

A European Quality of Life Survey[24] found that rural areas in Europe are undergoing a transition as a result of rural restructuring. The economies of rural areas are becoming increasingly diverse, with agriculture as a primary sector no longer dominating in the majority of Member States. In many rural areas, sectors, such as business and financial services, public administration, education, health, training and tourism have gained in importance, bringing with them employment opportunities as well as in-migration, thereby contributing to maintaining the viability of rural communities.

The key trends highlighted by the EQLS report show that areas which remain predominantly agricultural (for example much of Greece, Portugal, Ireland) are experiencing a loss of local employment as a result of increased mechanisation of primary agriculture and associated activities. In other areas, however, where agriculture is no longer so dominant, trends such as the outmigration of young people to urban areas, increased diversification of farms into other economic activities, the immigration by service classes, and a widening gap between the rich and the poor are

[23] For example, the average population density of France is four times lower than that of the Netherlands, and that of Finland is even lower.

[24] European Foundation for the Improvement of Living and Working Conditions (2006) 'First European Quality of Life Survey: Urban-rural differences', ISBN 92-897-0960-X, Luxembourg, Office for Official Publications of the European Communities, 2006

becoming increasingly evident. A significant proportion of the rural population, particularly in more remote and isolated areas, continue to experience lack of employment opportunities and lack of services. These changes in the social fabric of rural areas can also lead to reductions in social capital and social cohesion, with people less willing, or with less time, to engage in community activities. These trends are also evident within the case studies. For example, the outmigration of younger people, is a key problem experienced in rural areas of Eastern Germany (particularly in relation to younger women), Poland and Slovenia, while higher rates of unemployment for women related to the lack of childcare facilities is highlighted in the French case study.

One of the key findings from the EQLS was that the perceived quality of life in rural areas is lowest within the poorer Member States, and particularly in the New Member States.

5.4.4 Impacts of reducing Pillar 1 payments

It is unlikely that Pillar 1 payments, in general, have a significant impact on the quality of life in rural areas, as the way in which the payments are allocated means that the majority of the spend tends to benefit larger farms within richer regions, with lower unemployment rates and a higher than average population growth[25] rather than peripheral regions where investment is most needed. Whilst this picture will have changed with decoupling, the broad distribution of Pillar 1 payments remains the same as it is based on historic receipts.

However, where reductions in Pillar 1 payments directly influence structural change, drive intensification or increase labour productivity, this could lead to negative impacts on quality of life in rural areas.

Particularly in remoter areas, and those of low population density where alternative employment opportunities are limited, if decreases in Pillar 1 payments lead to farmers leaving the sector, then this can have an adverse impact on the quality of life as a result of the need to move away from the area to find work. The land that remains often either becomes amalgamated into other holdings in the area or abandoned, both of which tend to lead to a reduction in on-farm employment opportunities and a reduced sense of community for those remaining in the sector. This can have a knock-on effect on the provision of rural services, as there may be a reduction in the critical mass of economically active people who play a key role in justifying the maintenance of some services, such as schools or shops. These potential impacts were highlighted in both the Finnish and French case studies. In some, particularly less remote areas, however, the decline in the number of farmers does not necessarily mean a decrease in local services because they represent a small proportion of the population. In addition, the decline in the number of farms may encourage development in other ways, such as the conversion of old farm buildings into new houses or for tourism (as illustrated in the French case study).

Land abandonment or the loss of agricultural land use may also negatively impact upon the quality of life in rural areas, depending on the nature of the land use that

[25] Shucksmith, M, Thomson, KJ, Roberts, D (eds) (2005) The CAP and the Regions – The Territorial Impact of the Common Agricultural Policy, Wallingford: CABI.

follows. The attractiveness of the landscape is an important component of quality of life, and can be a driver for the development of small-scale employment opportunities as well an important aspect of feelings of social well-being and cultural identity. For example, in Finland, surveys have shown that the open landscape provided by agriculture is valued as an important aspect of quality of life in rural communities, with the encroachment of forestry up to the boundaries of settlements viewed negatively.

However, at low levels of CM, as demonstrated in previous chapters, structural changes are likely to be minimal, and therefore the impacts of reducing Pillar 1 payments on the quality of life in rural areas will be minor. This is confirmed by all the case studies, and the modelling of impacts on GDP, as a proxy for overall economic growth, also show that reducing Pillar 1 payments, even under the Health Check Scenario have no negative impact upon GDP across the EU-27. Greater impacts may start to be experienced at higher levels of CM but this is difficult to establish at the current time due to the methodological problems inherent with modelling quality of life impacts and the absence of research investigating the impact of Pillar 1 payments on the quality of life in rural areas.

5.4.5 Impacts of increased availability of funding within Pillar 2

Within Pillar 2, whilst measures from all Axes have the potential to influence quality of life in rural areas, the Axis 3 measures have the specific overall objective of improving the quality of life in rural areas. These include Diversification into non-agricultural activities (311); Support for business creation and development (312); Encouragement of tourism activities (313); Basic services for the economy and rural population (321); Village renewal and development (322); and Conservation and upgrading of the rural heritage (323). The main objective of these measures is to reverse trends towards economic and social decline and depopulation of the countryside. While some aim to promote innovation and to create employment opportunities, others aim to improve access to services for the rural population or to provide funding for activities that can improve the economic attractiveness of, and thereby encourage investment in, rural areas. In the majority of Member States, Axis 3 measures do not comprise a large proportion of the RDP budget. Between them, these measures account for 12% of total public funding (EAFRD plus national co-financing) planned for 2007-13 across the EU-27.

The training measures within Axis 3 and the activities funded through the LEADER approach can also contribute to improving quality of life by increasing the level of community engagement and hence improving social cohesion through capacity building and involvement of local people in actions to meet their local needs. Taken together, however these measures only account for 6 % of planned expenditure across the EU-27.

Beyond Axis 3 and the LEADER approach, the LFA and the agri-environment measures stand out as having the potential to enhance the quality of life in rural areas in relation to their role in maintaining and enhancing the attractiveness of rural areas. The LFA measures, by providing a basic area payment in areas experiencing natural handicaps, can help to maintain farmers in areas where the number of farmers might otherwise decline, thereby helping to maintain the viability of rural communities. The importance of the payments from the LFA measure for maintaining the viability of

farming is highlighted in the Polish and the French case study, and the role of Pillar 2 measures in preventing abandonment and decreasing depopulation trends is highlighted in the Portuguese case study.

In general, with the exception of the Netherlands and Germany, it is the New Member States that are planning to invest the highest proportion of funds into Axis 3 measures, with BG, CZ, EE, LV, MT and RO as well as NL and DE all planning to spend over 20% of their RDP expenditure on Axis 3 measures. In contrast, eight out of the nine Member States who are planning to spend under 10 per cent of the total RDP budget on Axis 3 measures are from the EU-15 (BE, ES, IRE, FR, LU, AT, FI and the UK). Cyprus is the only NMS in this category. The planned budget for these measures tends to be fairly evenly split between measures.

There is paucity of evidence from the evaluation literature on the impacts of Axis 3 measures. Some information does exist, however, particularly in relation to the diversification, village renewal and the promotion of tourism measures, primarily relating to the 2000-2006 programming period.

Information from the Mid Term Evaluations of the 2000-2006 programming period [26], showed that the village renewal measure has had some positive impacts on the quality of life. In France, investment has predominantly served to increase the tourism potential of remote rural areas, whereas in Germany positive impacts on living and working conditions have been reported as a result of funding being used to refurbish old buildings, improve traffic flows, provide support to village shops and build youth and meeting centres. In some Länder, the use of support to provide improved recreational facilities, or better access to existing amenities, also provided quality of life benefits. Tackling issues linked to remoteness was a priority for Member States such as Spain, France, Austria, Finland, and Italy. In Austria, this took the form of significant investment in the creation of access roads to farmland and improvements to housing conditions through water resource projects. Improvements in road infrastructure were also highlighted in Italy (Trento), leading to improved communication between farms. In contrast, the emphasis in Finland was on providing additional services, such as day-care for elderly people and children, and improved access to the natural environment.

However, in those countries with a relatively high population density, and where support and facilities for rural communities is already relatively high (for example the Netherlands and Denmark), the additional benefit brought about by rural development funding in relation to rural services, for example on living conditions and the welfare of rural communities, was thought to bring about less additionality than that within poorer, remoter regions. Evidence of some (albeit unquantified) deadweight and displacement effects were also found in some cases, the latter particularly in relation to funding for rural tourism related activities.

The benefits of the LEADER approach are difficult to quantify, but evaluations tend to emphasise the positive benefits on raising awareness, capacity building, and the strengthening of co-operation within local areas. The Portuguese case study highlights

[26] AGRA CEAS (2005) Synthesis of Rural Development Mid-Term Evaluations Lot I EAGGF Guarantee, Final Report for the European Commission.

the benefits brought about by the LEADER approach to deprived rural areas, particularly in relation to developing new skills, new ideas and new projects, for example to encourage and develop rural tourism.

The Polish case study indicates that entry into the EU and the availability of CAP money has positively influenced the quality of life in rural areas. The availability of funding has stimulated rural development activities and helped to reduce rural deprivation, thereby encouraging more people to stay within rural areas rather than migrate out to the cities or abroad. The Slovenian case study also reported similar positive effects of rural development funding on the quality of life, particularly in terms of providing opportunities for increasing off-farm employment for the rural population. In the case studies for France and Portugal, the role of the LFA and agri-environment measure in keeping people in farming is highlighted, which therefore constrains somewhat the trend towards outmigration.

The availability of additional funds for these measures as a result of compulsory modulation, should, in principle, enhance these benefits by extending the potential number of projects and beneficiaries funded, thereby broadening the proportion of the population that can benefit. Overall, non-farming recipients of funds will be net beneficiaries as they will not have experienced any reduction of Pillar 1 payments.

The CMEF indicators provide information on the degree of internet penetration and the number of tourists that spending through RDPs is anticipated to bring to rural areas. This shows, for example that the number of tourists in NL, DE (NRW and TH) are expected to increase through expenditure under measure 313 (encouragement of tourism activities). The lack of any benchmark information for these indicators means that it is not possible to assess the extent of this growth or determine the proportion that might be a result of compulsory modulation. We can assume, however, that compulsory modulation is responsible for a proportion of these anticipated increases, relative to the proportion of CM within the total RDP budget.

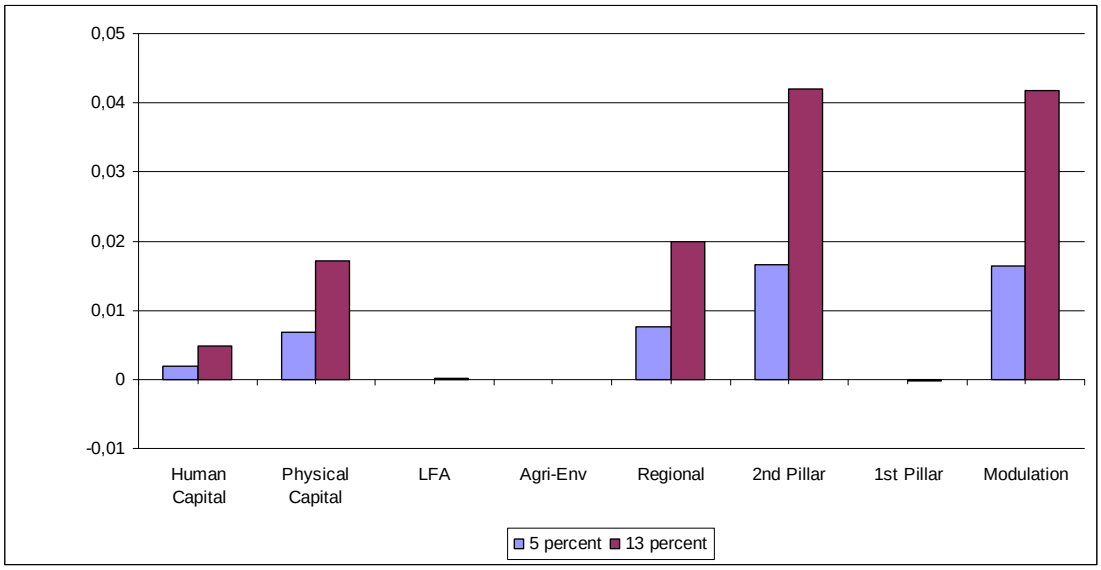
Given that, within the UK and Finland, compulsory modulation funds are targeted specifically at the agri-environment measure, the additional benefits that are likely to be seen with respect to quality of life will relate to the extent to which these schemes are seen to be contributing to keeping land in production, thereby preventing land abandonment and hence the loss of population from rural areas, and increasing the attractiveness of rural areas by requiring certain land management practices, which in turn may also lead to positive secondary effects in terms of increased demand for recreation and tourism. This is difficult to quantify in any meaningful way, however. The benefits of the agri-environment, as well as the LFA measure for maintaining and enhancing the character of the landscape – and hence in attracting increased tourism to rural areas – is highlighted in the French case study. In some Member States, particularly evident in France, a combination of Axis 1 and Axis 3 measures have encouraged the development of tourism based on the promotion of local identity, particularly linked to locality food. This has the potential to have multiple benefits through enhancing cultural identity, improving social cohesion, providing small scale off-farm employment opportunities, as well as increasing the viability of farming enterprises.

The Slovenian case study expert suggested that, the capacity of farmers to take up rural development measures is a limiting factor on uptake of Axis 1 and Axis 2 measures, and that, under an increased Pillar 2 budget, this would allow a larger proportion of the budget to be used to fund activity within the wider rural economy on activities that benefit rural populations as a whole, particularly through the measures 322, 323 and use of the LEADER approach.

It would appear that increased rates of modulation under the Health Check scenario, and the baseline scenario, also have a positive, albeit very small, impact on GDP growth (0.04% at rates of 13% modulation) (see Figure 5.15). GDP can be used as a somewhat crude proxy to reflect the material wellbeing across the EU and an increase in GDP can provide some indication of the potential improvement in the quality of life insofar as this relates to the growth in the economy overall.

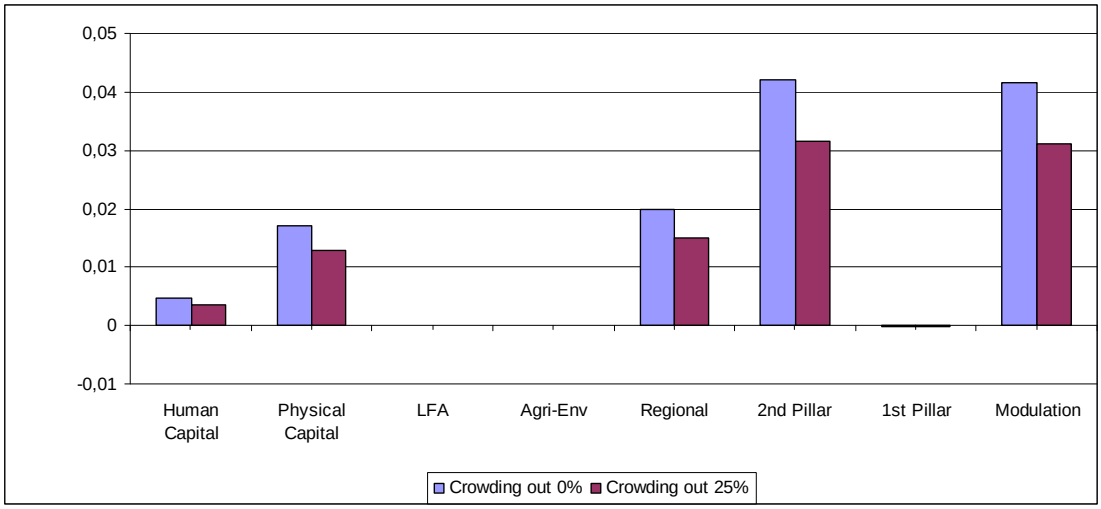
Reducing Pillar 1 payments appears to have no negative impact upon GDP, and so the positive result is entirely due to the increased availability of funds, and their associated national co-financing, within Pillar 2. The effect is mainly caused by the dynamic impact of those measures that increase the productivity of production factors within the agricultural sector and productivity more generally within the wider rural economy. A substantial element of this impact (almost half) is due to the 'regional measures', or those Axis 3 measures which are focused largely on investments outside of the agricultural sector, for example, on the setting up of new businesses, improving rural services and promoting tourism. Within the agriculture sector, the measures that make the largest contribution to this increase in GDP are those that provide an incentive to invest in physical capital (0.017%) and to a much lesser extent those relating to human capital investments (0.005%). If a 25% deadweight effect is assumed for expenditure under these measures, the increases in GDP are reduced proportionately (see Figure 5.16).

Figure 5.15 EU-27 GDP growth – 5% / 13% modulation (% change of the Health Check scenario relative to no modulation in 2013)



Source: LEITAP.

Figure 5.16 Impact of crowding out on EU-27 GDP growth – 13% modulation and sensitivity (% change relative to no modulation in 2013)



Source: LEITAP.

The RDPs (CMEF-analysis) of most case study countries suggest that the programmes are expected to positively contribute to economic growth, in particular due to an above average growth in the number of businesses supported. In a few RDPs economic growth rates are quantified: usually they do not exceed 2%. Most of the case study countries also expect that the RDPs will have a positive impact on labour productivity, but do not specify this more precisely, apart from within a few cases where it is anticipated to vary between 1-2.5% per year. Due to the fact that measures within Pillar 2 are only anticipated to have a moderate impact on the economic impact indicators, the contribution of CM funds will also be moderate, contributing to between 5-30% of the target values of the impact indicators. In general the CMEF-results thus show a more positive outcome than the modelling.

The majority of the case study experts, however, conclude that the levels of additional funding that are available for these measures at 5% modulation, even with national co-financing, are insufficient for any significant improvement in quality of life to be seen. Increasing CM to 20%, however, is likely to increase the benefits proportionately, by extending the number of projects that could be funded and hence the number of beneficiaries within rural areas. Based on the results above, one might also expect this investment to lead to a further slight increase in GDP. This would, however, depend on which measures Member States decided to allocate the additional funds to, and whether the current distribution of funding remained, or whether other priorities would prevail.

Under the Health Check Scenario, given that the additional funds would be required to be focussed at addressing the 'New Challenges', it is likely that the majority of the additional funds will be focused on measures within Axis 1 and 2. This is likely to have benefits for the quality of life in rural areas in two distinct ways. First, the additional funds would improve the viability and competitiveness of farming, which will have quality of life benefits. This would be likely to be the case particularly in remoter areas where this would prevent land abandonment, and keep farmers on the land, thereby helping to maintain the viability of rural communities. Secondly the additional funds would encourage sustainable land management practices that

enhance the attractiveness of rural areas, which in turn may offer opportunities for developing niche products, encouraging tourism, and attracting inward investment, either on the basis of the quality of environment, or by developing a demand for new businesses linked to, for example, the provision of renewable energy.

Overall, therefore, it can be concluded that CM is likely to lead to have a positive impact on the quality of life in rural areas, although the extent to which this is the case will differ across the EU-27 depending on the specific situation within a Member State, the level of CM, associated national co-financing, and the way in which the relevant measures are used.

6 ENVIRONMENT

6.1 Issues

The focus of this chapter is the examination of the extent to which modulation contributes to environmental protection and/or degradation. The assessment focuses on the effects of modulation on changes in land use and the risk of land abandonment, and on biodiversity and habitats, water quality and quantity, soil quality, landscape and climate change, in line with the environmental objectives of the EAFRD and the 'New Challenges' as set out in the Commission's Health Check proposals[27].

6.2 Summary

Overall, the impacts of modulation on the environment are positive for all environmental parameters including biodiversity, water quality, soil quality, landscape and climate change. These positive impacts are the result of the availability of additional funds within Pillar 2 and relate to a whole range of measures across all four Axes. The extent of these impacts, however, is hard to quantify beyond general terms.

The reductions in Pillar 1 direct payments do not appear to have had significant impacts on the environment. This is unsurprising, given that the impacts on agricultural producers (in terms of influencing factors of productivity, farm structure and income) of reducing Pillar 1 payments have been shown to be limited. The models show that there may be a small increase in land leaving agriculture as a result of reductions in Pillar 1 payments; however, these appear to have been more than compensated for by increases in the availability of funds within Pillar 2, particularly for the LFA and agri-environment measures. These impacts could, of course become more significant as the modulation rate increases and/or the franchise level changes.

The availability of additional funds within Pillar 2, however, is likely to have a significant impact upon the environment across the EU-15, but particularly in Finland and the UK (England) where the additional funds have been specifically focused on the agri-environment measure. In all Member States, modulation can be seen to have a positive impact on the trends identified for the CMEF impact indicators relating to the area of HNV farmland, the farmland bird index, nutrient surplus and production of renewable energy. In relation to the CMEF result indicators, modulation, under the baseline scenario, is estimated to enable over 5 million hectares of land to be managed in ways that benefit biodiversity, 3 million hectares to be managed to help improve water quality and soil quality and 1 million hectares to be managed in ways that will help with climate change mitigation and/or adaptation.

The results also suggest that the availability of additional funds for, in particular, the agri-environment and LFA measures is likely to retain slightly more land under agricultural management that would be the case without modulation. The models show that this land is more likely to be grassland, than cropped land. The CMEF impact indicators also show that a significant area of land is anticipated to be prevented from being abandoned over the 2007-13 programming period. While the proportions of land indicated by the models are very small (under 1% of all

27 COM(2008) 306 final, European Commission's proposals for the Health Check of the Common Agricultural Policy, Brussels, 20.5.2008

agricultural land), in reality, the effect could be much greater. It would certainly not be a uniform impact across the EU-15 and will depend crucially on local factors such as succession, land ownership, remoteness from markets etc.

The results from CAPRI enable the potential environmental benefits of investment aid for farm modernisation and other Axis 1 measures to be seen, particularly in terms of reducing nutrient surpluses, pesticide use and greenhouse gas emissions. It is also clear from the case studies that a number of Member States are using these measures to improve the sustainability of the agricultural sector and limit its environmental footprint. Increased funding for these measures is likely to be leading to an increase in investments in infrastructure that improves waste management in water saving solutions/technologies; in renewable energy technologies and infrastructure; the development of community led projects for the production of renewable energy; and improvements in energy efficiency for local businesses.

6.3 Analytical Approach

A significant challenge for this analysis has been to explore the complexity of local environmental impacts of expenditure from Pillar 1 and Pillar 2 on the ground, understand how these relate to the variety of ways in which Member States have implemented their RDPs and to disentangle the extent to which modulated funds have contributed to these impacts.

To achieve as comprehensive an assessment of the impacts of compulsory modulation on the environment as possible, the analysis first explores the impact on land use more generally, before turning to a consideration of each of the different environmental parameters in turn[28], drawing on information gathered through a range of tools. This includes:

- an assessment of the financial impacts of modulation on relevant EAFRD measures using the Budget Model;
- an assessment of a suite of environmental indicators (including the CMEF indicators), using data generated through the modelling and non-modelling approaches as set out in Table 6.1; and
- A more qualitative analysis of the relevant evidence, primarily using information from the eight case studies and existing evaluation literature.

This chapter sets out in some detail the impact that compulsory modulation is likely to have under different rates of modulation for each of these issues systematically. Where possible, environmental impacts are assessed using both the modelling approach and non-modelling methods. However, given the range of actions that can be undertaken under rural development measures in individual Member States, and the complex nature and geographical specificity of the interactions between farm management and environmental outcomes, the use of the models in this regard has been somewhat limited and has led to a greater use of other sources of data, much of

[28] The environmental issues considered in the analysis are those that are covered by Council Regulation 1698/2005 and the associated Community Strategic Guidelines, namely biodiversity, water quality, water quantity, soil quality, landscape and climate (emissions). These impacts are set within the context of land use change more generally.

which is qualitative in nature. The indicators and tools used to assess the impacts of modulation on each of the environmental issues are set out in Table 6.1.

6.3.1 Data and analytical issues arising

The environmental effects of a reduction in Pillar 1 payments will be indirect and result from any changes that modulation has brought about in terms of farm income, farm viability, levels of production, forward planning and related farm structural change, as discussed in earlier chapters. In particular, environmental impacts will arise from changes that have taken place in relation to land use, input use or stocking density as well as changes in relation to farm size and infrastructure.

Possible Adjustments to Pillar 2 measures as a result of compulsory modulation

The precise nature of the environmental impacts that are brought about through increased availability of funding in Pillar 2 will be directly related to a range of factors, including the measures on which the compulsory modulation funds have been focused, the priority and funding levels allocated to these measures within Member States' Rural Development Programmes (RDPs), the design and implementation of the associated schemes at national/regional level; and the uptake, outcomes and effectiveness of implementation in relation to environmental priorities. It is, therefore, essential to have an understanding of the way schemes have been operated, mainly at the national and regional levels, for example in terms of their precise objectives, the types of management commitments that are required, any restrictions on entry imposed by eligibility criteria and so on. In addition it is also helpful to consider the differing ways in which measures may be adjusted in response to the availability of additional funds generated through compulsory modulation, as this may have implications for their implementation and environmental impact.

If we take the agri-environment and LFA measures, for example, two measures which have a significant impact on the environment, a recent evaluation on the operation of the LFA measure across Europe[29] showed that there was a strong path dependency in terms of the operation of the schemes. Neither the area covered by payments, or the eligibility criteria for the scheme, tend to change in response to changing budgetary availability. However, one way in which LFA schemes can respond to increased budgets is to raise the payment rate (to the maximum allowable under the regulations). The agri-environment measure, on the other hand, is far more elastic in terms of being able to respond to the availability of additional funds. Schemes can generally expand to cover a greater area of land, the types of farms and environmental obligations that are eligible for funding can be expanded and the payment rates can be increased (again, within the parameters set by the regulation). As a result of this, it is important to understand how agri-environment schemes are implemented in individual Member States in some detail, and how these have changed in response to the availability of additional funds, in order to effectively assess the environmental impact of compulsory modulation.

[29] IEEP (2006) An Evaluation of the Less Favoured Area Measure in the 25 Member States of the European Union. Report for DG Agriculture and Rural Development.

Table 6.1 Environmental indicators and their potential for use within the study

Environmental issue	Relevant Indicators	Modelling Approach	Non-Modelling Approach	Commentary
Biodiversity: Aim: to estimate the degree to which RD measures are resulting in the maintenance and/or enhancement of biodiversity across the countryside.				
Relevant indicators:	Population of Farmland Birds		CMEF Impact Indicator	Viewed as a fairly good proxy for farmland biodiversity as a whole
	High Nature Value Farmland and Forestry		CMEF Impact Indicator	It is not yet possible to calculate the forestry element of this indicator
	Proportion of UAA under Organic management	FES	IRENA 2005 indicator Uptake statistics	
	Arable intensity index	CAPRI		Compares cropping intensity by measuring changes in yields
	Grassland intensity index	CAPRI		Compares cropping intensity by measuring changes in yields
	Area of successful land management contributing to biodiversity and HNV farming		CMEF Result Indicator	
Water Quality: Aim: to estimate the degree to which RD measures are contributing to a reduced level of N and P concentrations (and hence eutrophication) in water bodies				
Relevant indicators:	Gross Nutrient Balance Nutrient Surplus per ha	CAPRI	CMEF Impact Indicator	Calculated as the difference between nutrient sources and sinks at soil level
	Area of successful land management contributing to water quality		CMEF Result Indicator	
Water Quantity: Aim: to establish the extent to which water abstraction from both surface and ground water is sustainable, and the effect of RD measures is achieving sustainable water abstraction				
Relevant indicators:	Volume of irrigation water used Intensity of water use Water abstraction rates for agriculture Proportion of agricultural land that is irrigated			Unable to assess the impact of RD measures on water quantity due to lack of EU level data[1] and the lack of indicators specifically linked to RD measures. No relevant CMEF indicators There is also limited qualitative information from the case studies or evaluation literature.
Soil Quality: Aim: to measure the extent of soil erosion and loss of organic matter taking place and the degree to which this is reduced through RD measures.				
Relevant indicators:	Area of successful land management contributing to soil quality		CMEF Result Indicator	There is a lack of data availability to demonstrate changes in soil erosion risk generally[1], and little qualitative information linked to the impacts of RD measures from the case studies or evaluation literature.
	Land at risk of soil erosion			

Landscape: Aim: to estimate the extent to which the character of a particular landscape has been maintained, enhanced or has declined as a result of the use of RD measures.				
Relevant indicators:	Landscape maintenance & enhancement		Uptake/anticipated uptake of landscape options within Agri-Environment Schemes in Case Study MSs IRENA 2005 Indicator	It has not been possible to source detailed data on uptake of specific options at Member State level for this project
	High Nature Value Farmland and Forestry		CMEF Impact Indicator	Although there is a high correlation between the extent of HNV farmland and forestry and valued landscapes, the basis for this indicator is biodiversity, not landscape, so care needs to be taken in interpreting these results.
Climate (emissions): Aim: to estimate the degree to which RD measures are contributing to GHG emission reductions and facilitating the adaptation of habitats and species to climate change				
Relevant indicators:	Renewable energy production Area under successful land management contributing to climate change		CMEF Impact indicator CMEF Result Indicator	
	Carbon Sequestration		Uptake of the afforestation measure and relevant options within AE schemes	It has not been possible to source detailed data on uptake of specific options at Member State level for this project

[1] *Conclusions of the EEA IRENA Indicator Report, 2005*

Measuring the impacts of compulsory modulation

The outcomes of measures on the environment, and hence the contribution of compulsory modulation, are difficult to quantify empirically. One cannot assume a simple linear relationship between environmental results and budgetary expenditure for a particular scheme, as impacts at the margin may be highly variable, especially where schemes include many options, or are altered in response to new funding. However, this has had to be assumed for the purpose of this analysis, in the absence of more detailed evidence of links between levels of expenditure and outcomes, on the basis that these sorts of comparisons can provide a general sense of the significance of the additional funds from compulsory modulation. Information from the case studies can also help to provide some elucidation.

As explained in Chapter 3, for the purposes of this study it has been determined that the majority of EU-15 Member States have combined the compulsory modulation funds and the core EAFRD budget and used them as one 'pot' of money. The contribution of compulsory modulation to specific measures is, therefore, proportional to their overall budgetary allocation. The exceptions to this are Finland and the UK (England), where the case studies have identified that the compulsory modulation funds have been effectively focused on one specific measure, the agri-environment measure. In these two cases, therefore, the environmental impacts of compulsory modulation can only be assessed in relation to this measure.

Both Portugal and the UK are also applying voluntary modulation over the 2007-2013 programming period. In the UK the majority of receipts generated from voluntary modulation (80 per cent) are co-financed nationally and are focused on the agri-environment measure, with ten per cent allocated to Axis 1 measures to benefit the livestock sector, and ten per cent allocated across Axis 3. A proportion of those funds allocated to Axis 1 are aimed at providing environmental benefits, such as through grants to farmers for investing in waste minimisation and the establishment of energy crops. In Portugal, half of the funds generated through modulation are allocated to Axis 2, specifically the agri-environment measure.

Indicators

A range of indicators have been developed as proxies for measuring the impacts of agriculture on the environment across the EU[30][31]. One of the key issues that recurs, however, is the availability of robust and consistent data from Member States to feed into these indicators. Even more difficult is linking the indicators to specific policy outcomes, including those from Pillar 1 direct payments, or specific measures within Pillar 2.

The CMEF result and impact indicators can also help to give some indication on how the operation of measures are anticipated to impact upon a number of discrete environmental variables. It must be borne in mind, however, that the CMEF figures within the RDPs are only anticipated effects of the RDP measures, not actual results, and as such must be treated with caution. In addition, not only is the data relating to

[30] EEA (2005) Agriculture and the Environment in the EU-15 – the IRENA Indicator Report, No 6/2005, European Environment Agency, Copenhagen.

[31] OECD (2006) Environmental Indicators for Agriculture, Volume 4, OECD, Paris.

these indicators within the RDPs not consistently available for all Member States, but there is also a lack of baseline data against which to measure change in many cases.

Evaluation Literature

More broadly, there is a lack of quantitative data on the environmental impacts of specific measures, including the agri-environment measure[32] and it is generally more problematic still to identify the actual outcomes of a particular measure, either because these outcomes are difficult to measure, causality is difficult to determine or because detailed monitoring programmes are not in place. The mid term evaluations of the 2000-2006 programming period provide some information on the effectiveness of some of the measures (particularly where there have been no changes in scheme design between programming periods) and the *ex ante* evaluations for the 2007-2013 programming period, where these are publicly available, can give an indication of anticipated outcomes.

6.3.2 Significance of Pillar 2 measures for the environment

Pillar 2 is the main source of financial support to farmers for delivering many of Europe's environmental priorities, including the halting of biodiversity loss by 2010, achieving good ecological status of water bodies as required through the Water Framework Directive, and has a significant contribution to make in helping agriculture adapt to and mitigate the impacts of climate change. It also has an important role to play in the protection of Europe's soils and valued cultural landscapes. Improving the environment and the countryside through 'encouraging farmers and forest holders to employ methods of land use compatible with the need to preserve the natural environment and landscape and protect and improve natural resources' (preamble to Council Regulation 1698/2005) is the main focus of Axis 2. Measures from Axes 1 and 3 as well as the LEADER approach, can, however, also be used to achieve positive environmental outcomes if applied in appropriate ways. For example, the vocational training and information measure under Axis 1 can lead to improved skills in relation to nutrient management, and the farm modernisation measure can be used to provide grants for upgrading farm infrastructure, for example in relation to waste and nutrient management or renewable energy. An example from Axis 3 is the measure for the conservation and upgrading of the rural heritage, which can also be used to draw up management plans for Natura 2000 sites and to restore and upgrade sites of high nature value[33] [34].

Member States have been obliged to operate agri-environment schemes since 1992, when the measure was made compulsory through the introduction of Council Regulation 2078/92. It remains the only compulsory measure and many of the schemes that are currently in operation, particularly in the EU-15 have developed and grown from these earlier schemes. Different Member States have taken different

[32] European Commission (2005) Agri-environment Measures - Overview on General Principles, Types of Measures, and Application, DG Agriculture, March 2005.

[33] Keenleyside, C and Baldock, D (2006) Background Paper: The Relationship Between the CAP and Biodiversity, Outcome of the International Seminar 'The Common Agricultural Policy, Warsaw, 7-8 December 2006.

[34] LUPG, Natuur en Milieu, WWF (2006), Rural Development Environmental Programming Guidelines: a Manual based on the finding of the Europe's Living Countryside Project, Brussels, 2006

approaches to the design of their schemes, and an overview of the priorities which they seek to address is set out for a selection of Member States in Table 6.2. This shows that, in some Member States, the agri-environment measure has been implemented in a very targeted way, restricting payments to certain geographical areas of high environmental value or certain habitat types which are deemed to be under threat. For example, in Portugal the agri-environment payments are prioritised within specific geographic regions (Integrated Territorial Interventions) which are based around Natura 2000 sites, and the Higher Level Stewardship scheme in England and Tir Gofal in Wales focus on targeted management to achieve specific outcomes in relation to biodiversity, cultural heritage and landscape. In other Member States, the schemes have been designed to have broad reach and achieve maximum coverage of the farmed landscape requiring farmers to undertake simple management across the whole farm (for example Finland and the Entry Level Stewardship scheme in England) or focused on particular farm systems, such as extensive grazing systems through the Prime Herbagère Agro-Environnementale (PHAE) in France. As a result, the environmental outcomes of the agri-environment measure will be a function of scheme design and type of options, as well as absolute levels of expenditure. Given the large proportion of the overall budget spent on this measure (approximately 20% of public funding), it is of particular relevance in assessing the environmental impact of the additional modulated funds within Pillar 2.

Table 6.2 Priorities for Agri-environment schemes in 19 EU Member States

Member State	Landscape & Cultural Heritage	Biodiversity	Water	Soils	Organic	Genetic Diversity	Other Objectives
Austria	✓✓	✓✓	✓		✓	✓	Promotion of extensive farming practices
Belgium	✓✓	✓✓	✓				Reducing the intensity of farming
Denmark	✓	✓	✓		✓✓		
Finland[1]	✓	✓	✓✓		✓		
France[1]		✓✓	✓✓		✓✓		
Germany		✓	✓		✓		
Bavaria[2]	✓✓	✓✓					
North Rhine-Westphalia[2]		✓✓	✓✓	✓✓	✓✓		
Saxony-Anhalt[2]	✓✓	✓✓	✓✓	✓✓			To produce high quality products through environment-friendly processes
Baden Württemberg[2]	✓✓	✓✓	✓✓	✓✓			Encourage extensive production practices
Greece		✓	✓✓		✓✓	✓	
Ireland	✓✓	✓✓	✓✓		✓	✓	To produce quality food through extensive and environmentally friendly practices.
Italy		✓	✓	✓	✓✓	✓	adoption of integrated farming
Netherlands[1]	✓	✓	✓✓				
Portugal[2]	✓	✓✓	✓✓	✓✓		✓	
Spain	✓✓	✓✓	✓✓	✓✓		✓✓	Fire prevention;
Sweden	✓✓	✓✓	✓✓		✓✓		
UK (England)[2]	✓✓	✓✓	✓✓	✓✓	✓✓	✓	Promotion of public access and understanding of the countryside (HLS); Flood management;
Czech Republic			✓✓	✓✓	✓✓		
Hungary				✓✓	✓✓		
Poland[1]	✓✓	✓✓	✓	✓	✓✓	✓✓	
Slovak Republic				✓	✓✓	✓	
Slovenia[2]	✓	✓			✓✓		

Key: ✓✓ = key priority ✓ = secondary priority
Source: OECD (2008) Environmental Performance of Agriculture in OECD Countries Since 1990
1 OECD (2008), case studies and 2007-13 RDPs
2 case studies and 2007-13 RDPs

6.4 Impacts of compulsory modulation on the environment

6.4.1 Overall assessment

In general, the findings suggest that the availability of additional resources in Pillar 2 do have positive impacts upon the environment. The additional resources available for the agri-environment measure stand out as having a significant impact, mainly due to the level of expenditure allocated to this measure across the EU.

Taking Axis 2 as a whole, however, the budget model shows that the increase in the availability of total funding for the Axis 2 element of Member States' RDPs, as a result of compulsory modulation (including national co-financing), ranges from 7 per cent in Austria, Ireland and Portugal to 48 per cent in Denmark. The average increase in the budget for Axis 2 across all 15 Member States is 14 per cent. However, it should be noted that, as highlighted in the case studies for France and Germany, and the EU questionnaire for Belgium (Wallonia), the overall EAFRD allocation for the 2007-13 programming periods is lower than that available in the previous period and as a result, the compulsory funds are viewed by many national authorities as making up for a proportion of this shortfall, rather than as additional funds. Nonetheless, the additional funds generated through compulsory modulation have led to a larger available budget than would otherwise have been the case.

According to the case study, in the UK (England), compulsory and modulation funds have allowed for the introduction of Entry Level Stewardship and the growth of Higher Level Stewardship, two of the elements of their agri-environment scheme. Without these funds it would not be possible to operate Entry Level Stewardship and Higher Level Stewardship would have to be closed to new applicants. In Germany the agri-environment budget declined between the two programming periods, mainly as a result of the introduction of the axis minima requirements and the need to use funds for measures in other Axes. However, the compulsory modulation funds are thought to have prevented a more severe decrease in the resources devoted to the agri-environment measure across the Länder.

The CMEF result indicators provide figures to demonstrate the impact of compulsory modulation on the environment. Although these figures are open to some interpretation[35], just looking at the anticipated area of farmland brought under successful environmental management through Axis 2 measures, we can see that compulsory modulation, under the baseline scenario, is anticipated to result in an additional 5 million hectares of land being managed in ways that benefit biodiversity, an additional 3 million hectares for water quality, 3 million hectares for soil quality and an additional 1 million hectares to help meet climate change objectives across the EU-15 than is likely to have been the case without the availability of this additional funding (see Table 6.3). These areas are likely to overlap with one another. In addition it would seem from these indicators that it is anticipated that Axis 2 measures will prevent over 3 million hectares of farmland being abandoned.

[35] The figures in Table 6.3 are provided to give an indicative picture of the effect that compulsory modulation has on land under successful management for a range of environmental parameters. Issues of accuracy with this data have been due to the different way in which Member States have recorded their data and/or interpreted the indicators. It has not been possible to rectify these within the remit of this study.

Table 6.3 Result indicators – contribution of modulation to the anticipated area of UAA supported by Axis 2 measures (hectares)

UAA under successful management attributed to CM (ha):	HNV	Water quality	Climate change	Soil quality	Avoidance of land abandonment
BE	N.d.	N.d.	N.d.	N.d.	N.d.
DK	236,976	236,976	236,976	236,976	236,976
DE[3]	811,655	856,241	407,666	720,230	702,061
IE	N.d.	N.d.	N.d.	N.d.	N.d.
GR[4]	272,760	N.d.	N.d.	N.d.	N.d.
ES[3]	1,092,008	492,802	330,307	390,603	456,167
FR[2]	864,570	864,570	88,200	786,870	1,554,420
IT[3]	303,124	232,187	204,213	285,283	235,227
LU	N.d.	N.d.	N.d.	N.d.	9,600
NL	14,400	N.d.	282	N.d.	N.d.
AT	196,000	182,000	84,000	231,000	175,000
PT[5]	58,100	29,750	12,425	93,100	71,050
FI	N.d.	N.d.	N.d.	N.d.	N.d.
SE[6]	957,735	N.d.	N.d.	90,000	108,000
UK (Eng)[1]	480,000	288000	N.d.	288000	N.d.
EU-15	5,287,328	3,182,526	1,364,069	3,122,061	3,548,500
Target UAA for all Axis 2 measures in EU-15	29,274,390	20,172,409	9,190,094	21,365,688	22,781,022

Source: Derived from unpublished Commission summary of CMEF indicator targets for EU-27
N.d. = no data
1 Target figures for UAA under successful management relate to England exclusively.
2 France figures taken from Hexagone RDP (mainland) not overseas territories.
3 Germany, Italy and Spain figures calculated from sum of regional targets.
4 Greece figures refer to all agricultural and forestry area targeted by RDP.
5 Portugal figures for Continent (mainland) only. UAA targets are presented as a range so figures in this table are based on averages.
6 Swedish target for HNV is based on Axis 2 target of 30% of 2005 UAA.

In relation to forestry, similar calculations can be made (with the same caveats as above). From Table 6.4 we can see that it is estimated that Axis 2 measures are anticipated to result in an additional 0.8 million hectares of forest area being managed in ways that benefit biodiversity, an additional 0.7 million hectares for water quality, 0.7 million hectares for soil quality and an additional 0.7 million hectares to help meet climate change objectives across the EU-15 than is likely to have been the case without the availability of this additional funding.

Table 6.4 Result indicators - anticipated forestry area supported by Axis 2 measures

Forestry area under successful management attributed to CM (ha) for:	HNV	Water quality	Climate change	Soil quality	land abandonment avoidance
BE	N.d.	N.d.	N.d.	N.d.	N.d.
DK	102672	102672	102672	102672	102672
DE	51976	54317	46358	18682	17454
IE	N.d.	N.d.	N.d.	N.d.	N.d.
GR	N.d.	N.d.	N.d.	N.d.	N.d.
ES	317361	245765	262580	303063	156312
FR	N.d.	N.d.	N.d.	N.d.	N.d.
IT	55475	49362	51527	53677	49061
LU	N.d.	N.d.	N.d.	N.d.	N.d.
NL	N.d.	N.d.	N.d.	N.d.	N.d.
AT	274680	274680	274680	274680	N.d.
PT	N.d.	16450	16450	16450	N.d.
FI	N.d.	N.d.	N.d.	N.d.	N.d.
SE	6075	N.d.	N.d.	N.d.	N.d.
UK (Eng)	N.d.	N.d.	N.d.	N.d.	N.d.
EU-15	808239	743246	754266	769224	325499
Target forestry area for all Axis 2 measures in EU-15	6,998,235	6,998,235	6,998,235	6,998,235	6,998,235

Source: Derived from unpublished Commission summary of CMEF indicator targets for EU-27
N.d. = no data or forestry measures not implemented

The CAPRI model can also be used to provide information on the potential impacts of modulation on several environmental indicators. Although the level of aggregation is coarse, and cannot provide full insights into the environmental effects of the second pillar, it is helpful in that it applies an identical methodology across all regions of the EU. As such these indicators are a valuable complement to the information deriving from the CMEF indicators, and the case study experts.

Table 6.5 provides an overview of the results from CAPRI on a selection of indicators, showing the impact of an increase in modulation under the Health Check Scenario compared with the situation without modulation. The remaining columns demonstrate the breakdown of this overall result between the reduction of Pillar 1 payments and the increase in availability of funding for various groups of Pillar 2 measures. As follows:

- "P1 only" shows the effect of reducing the first pillar.
- "lab-P1" shows the effect of human capital investments relative to "P1 only", i.e. attempts to isolate the effect of only the human capital investment measures.
- "cap-P1" similarly isolates the effect of physical capital investments
- "lfa-P1" similarly isolates the effect of LFA payments
- "n2k-P1" similarly isolates the effect of Natura 2000 payments
- "age-P1" similarly isolates the effect of agro-environment (AE) schemes
- "reg-P1" similarly isolates the effect of "regional support" measures

Not all measures have a linear impact on the indicators, thus the sum of the last seven columns may deviate slightly from the total effect "Δ Health Check".

As with the CMEF indicators, this shows that overall, increased levels of modulation are having positive, albeit fairly small environmental effects. Under the Health Check Scenario, nutrient surpluses are slightly reduced, the intensity of production is reduced, and the global warming potential of both methane and nitrous oxide is reduced. These results are aggregated for the EU-27. In reality there will not be a uniform impact across the EU, and one would expect a range of impacts depending on the local agricultural situation.

Table 6.5 Selected environmental indicators from CAPRI, for EU-27 in the Health Check scenario versus the zero modulation scenario, for 2013, various units and indices (absolute value in the reference scenario and percent difference for Health Check and selected simulations)

	No modulation	ΔHC	P1 only	lab-P1	cap-P1	lfa-P1	n2k-P1	age-P1	reg-P1
Surplus N	63.02	-0,38	-0,06	-0,03	-0,10	0,00	-0,06	-0,13	0,00
Surplus P	15.67	-0,45	-0,06	0,00	-0,06	0,00	-0,06	-0,19	0,00
Surplus K	29.13	-0,48	-0,07	-0,03	-0,07	0,00	-0,10	-0,17	0,00
Pesticides	85965	-0,66	-0,10	-0,03	-0,14	0,01	-0,11	-0,28	0,01
Intensity Ar	1.00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Intensity Gr	1.00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Crop diversity	2.72	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
GWP CH_4	188796	-0,06	-0,10	0,00	-0,02	0,00	-0,01	0,09	0,00
GWP N_2O	523269	-0,27	-0,08	-0,02	-0,09	0,00	-0,04	-0,02	0,00

Surplus N: Nitrate surplus at soil level (kg/ha)
Surplus P: Phosphate surplus at soil level (kg/ha)
Surplus K: Potassium surplus at soil level (kg/ha)
Pesticides: Total spending on pesticides (1000 EUR)
Intensity Ar: Laspeyres index of yields of arable crops using baseline areas as weights
Intensity Gr: Laspeyres index of yields of grassland using baseline areas as weights
Crop diversity: Diversity of cropping mix measured as entropy of crop shares in all regions.
GWP CH_4: Global warming potential of emitted methane in CO_2 equivalents (1000 tons).
GWP CH_4: Global warming potential of emitted N_2O in CO_2 equivalents (1000 tons).

6.4.2 Changes in Land Use

Agriculture and forestry are the dominant land uses in Europe, accounting for 47 per cent and 31 per cent, respectively, of the territory of the EU-27 (CEC, 2006). The environmental impacts of these two land uses can be both positive (for example in relation to the provision of a range of goods and associated services, including varied cultural landscapes and a wide range of habitats and species adapted to varying levels of human disturbance), and negative (for example soil erosion, water pollution, loss of biodiversity and the degradation of landscapes).

In terms of agricultural land use, approximately 60 per cent of all agricultural land is devoted to arable cropping, with just over 30 per cent as grassland and six per cent under permanent crops[36]. Extensive farming systems, mostly dominated by grazed semi-natural vegetation, tend to be richest in biodiversity, and biodiversity value generally decreases as the intensity of farming increases. Negative environmental impacts can also occur as a result of marginalisation and land abandonment. The risk of land abandonment is often greatest in areas of marginal productivity, for example Mediterranean regions and the mountainous regions of central and eastern Europe.

[36] CEC (2006) Rural Development in the European Union - Statistical and Economic Information - Report 2006. DG Agriculture, Brussels.

The maintenance of permanent pasture and forests are also important for soil and water quality, and for mitigating the effects of climate change, in terms of their role in sequestering carbon.

Earlier chapters have shown that, under both the baseline and Health Check scenarios, the reductions in Pillar 1 payments are not thought to have significant impacts on farm incomes, productivity or farm structural change. As such, significant effects upon land use will not be experienced. Indeed, the majority of case study experts also highlight the fact that other factors are thought to be far more important in influencing changes in land or input use.

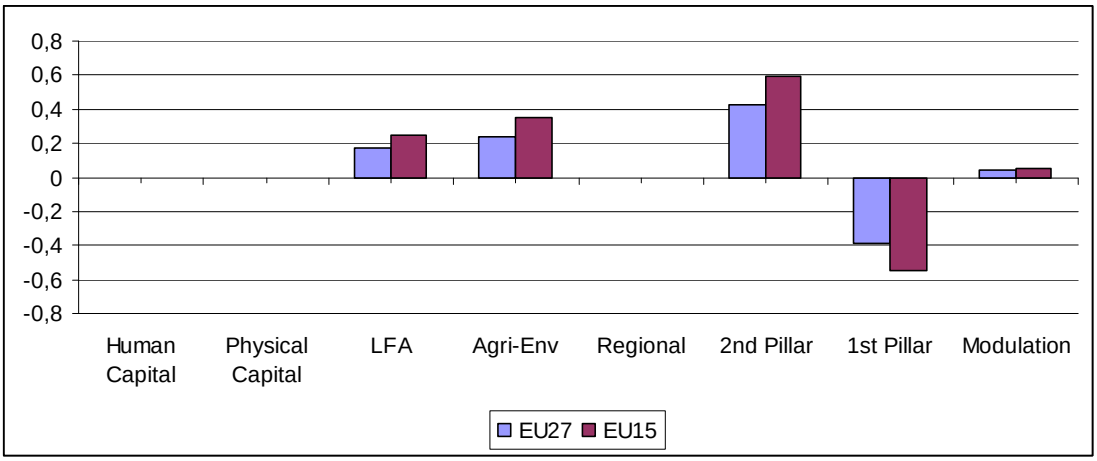
However, it may be that, in certain situations, especially where the reductions in Pillar 1 payments affect farming sectors that are struggling in terms of financial viability, compulsory modulation can exacerbate existing impacts of market forces which drive structural change (see Chapter 4). These structural changes may have environmental implications which can be both positive and negative.

Anecdotally, the case study experts in France and the UK believe that reductions in Pillar 1 payments may lead to an increase in the area under the agri-environment measure, which would be positive from an environmental perspective. They argue that reduced direct payments may make agri-environment payments look more attractive, and in many cases may be seen as a means of recouping money lost through reductions in Pillar 1 payments. This could also be the case for schemes operating in other Member States, particularly those which have elements focusing on the maintenance of existing environmental value.

The results from LEITAP show that under the Health Check Scenario, a greater proportion of land would be under production than is the case without compulsory modulation. The model indicates that compulsory modulation has a very small positive effect on land use, retaining some land under production across the EU-27 that might otherwise have been abandoned or have moved into alternative land uses, such as forestry (Figure 6.1). While the reduction of Pillar 1 payments alone would be likely to see a small proportion of land go out of production, the increased availability of funding in Pillar 2, particularly in relation to the agri-environment and LFA measures, more than makes up for this.

In practice, these results seem surprisingly small. Given the extent of implementation of agri-environment and the LFA measures, with schemes operating in all 27 Member States, one might anticipate greater effects on land use than those modelled; however the general orientation of response indicated through the modelling is certainly what we would expect to see in reality.

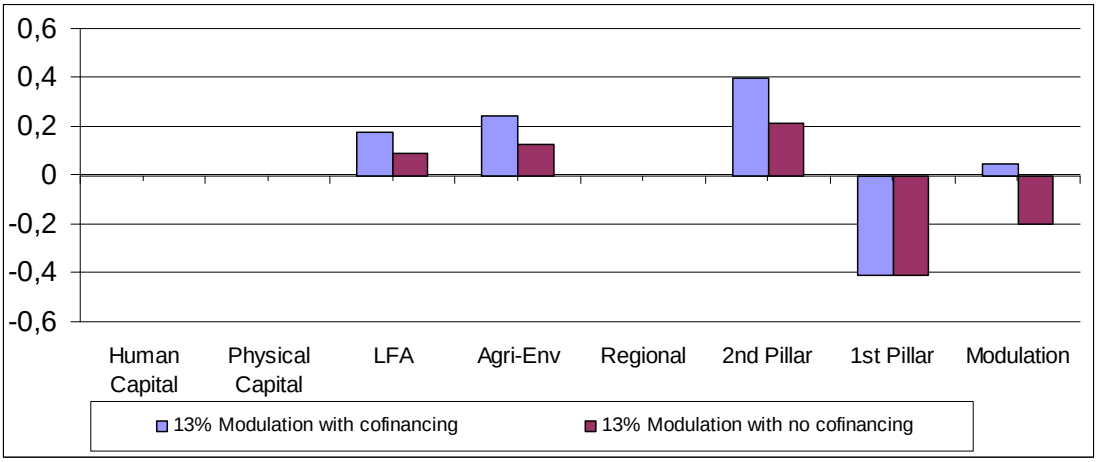
Figure 6.1 Agricultural land use – EU-15 / EU-27 (% change Health Check scenario relative to no modulation in 2013)



Source: LEITAP, 2008

Figure 6.2 illustrates the influence of national co-financing on compulsory modulation receipts within Pillar 2 on these results. Without national co-financing, these figures indicate that, despite the positive effects of the LFA and agri-environment measures, land would continue to leave agricultural production. This highlights the importance of sufficient funds being allocated to such schemes to allow their coverage to be adequate to retain sufficient land of high nature and landscape value under agricultural use.

Figure 6.2 Impact of co-financing on EU-27 land use of primary agriculture with 13% modulation, 2013 (% change relative to no modulation in 2013)

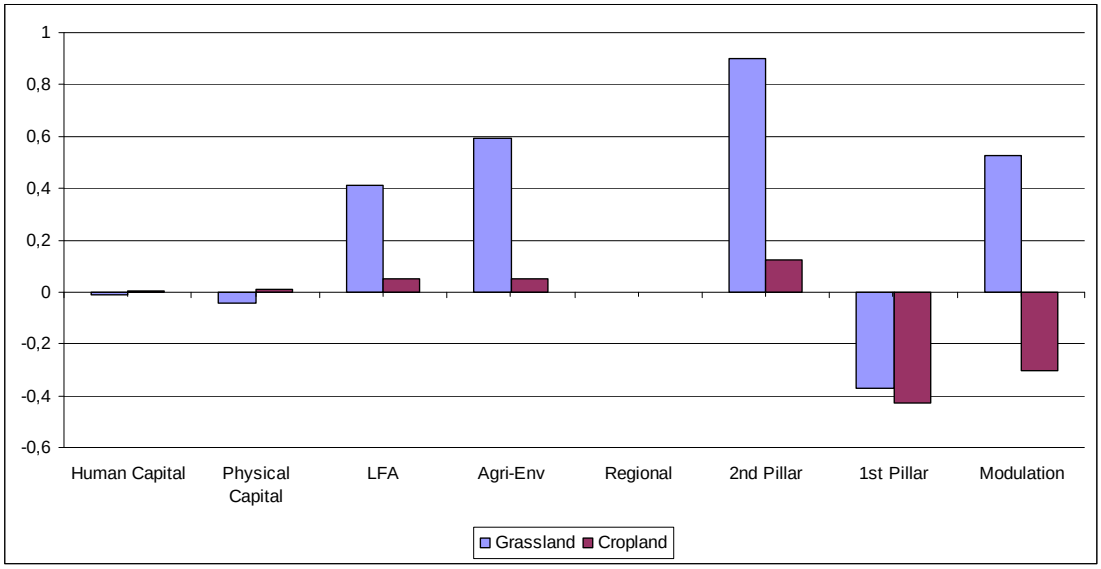


Source: LEITAP, 2008

LEITAP also suggests that compulsory modulation under the Health Check Scenario leads to a greater retention in the area of grassland than the area of arable land. Figure 6.3 shows that under the Health Check Scenario, approximately 0.6% more grassland is retained in production than would be the case without compulsory modulation – largely due to Pillar 2 environmental measures – while the area under crops is reduced by 0.3%, largely as a result of the reductions in Pillar 1 payments. These losses are likely to be primarily from marginal arable areas. This effect is mainly influenced by payments made under the agri-environment, LFA and Natura 2000 measures, a greater proportion of which are focused on livestock systems than arable farmland. It

would appear to indicate that increased expenditure on such measures is helping to reduce grassland decline at the margins, although, as above, the impact is likely to be more significant in practice.

Figure 6.3 EU-27 agricultural land use – Grassland / Cropland (% change Health Check scenario relative to no modulation in 2013)



Source: LEITAP, 2008

These findings are partially backed up by the limited information available on this topic within the case studies, the CMEF indicators and the evaluation literature. For example, evaluations of the agri-environment and LFA measures suggest that these measures have helped to maintain agricultural activity in marginal areas in some Member States. For the three case study Member States where information has been provided for the result indicator 'area under successful management for the avoidance of marginalisation and land abandonment' (see Table 6.6), it can be seen that the agri-environment measure is anticipated to prevent over 7 million hectares of UAA being abandoned in France (14% of which can be attributed to compulsory modulation), compared with 115,000 hectares in Germany - North Rhine Westphalia (16% of which is due to modulation) and 13,200 hectares in Portugal (8% of which is due to modulation).

In France and the UK it is thought that the additional funds available for the agri-environment and LFA measure through modulation are likely to significantly increase the area of land under extensive grazing, although whether this will involve a shift of land use from arable to grassland is not reported. The case study experts in the UK and Finland also suggest that increased funding for the agri-environment measure will lead to an increase in the area of UAA under extensive arable crops, although again, this will not necessarily result in a change in the total land area under arable production.

Table 6.6 CMEF Result Indicator for agri-environment measure: anticipated area of land on which land abandonment is to be avoided

Agri-Environment (214)	FR*	PT	DE-NRW
Result 6			
ha avoidance m/l.a.	7,402,000	165,000	115,000
% due to modulation	14	8	16
Ha due to modulation	1,036,280	13,200	18,400
Benchmark	27,590,940	3,679,590	1,523,747
Total as % of benchmark	27	4	8
Modulation as % of benchmark	4	0.3	1

** The result indicators are for measures 211,212, 214 and 216 together. To be able to calculate the effect of modulation all were put under measure 214 with a modulation rate of 14%.*

6.4.3 Biodiversity

Biodiversity across Europe continues to decline as a result of habitat degeneration, destruction and fragmentation, resulting particularly from agricultural intensification and increased irrigation, alongside built development and infrastructure. Reduced management and abandonment is also an issue in economically marginal areas, particularly those within which high nature value (HNV) farmland – low intensity farming systems associated with high levels of semi-natural vegetation – are to be found[37]. It has been estimated that 50 per cent of all species in Europe depend on agricultural habitats, including a number of endemic and threatened species[38]. Over 40 per cent of European bird species have unfavourable conservation status[39] and of the more common bird species, it is farmland and forest species in particular that have declined over the past 30 years.

Against this backdrop, rural development measures, particularly those within Axis 2 of the current EAFRD, provide payments to encourage sustainable farming and forestry practices in order to help maintain and enhance the biodiversity value of farm and forest land, and to help reverse the overall decline in farmland birds. We would expect, therefore, that increased funding for such measures, as a result of modulation would lead to:

- An increase in the area of HNV farmland being maintained/ managed;
- The continued maintenance of OR increase in overall levels of farmland biodiversity in the wider countryside (as measured through the population of farmland birds);
- An increase in the area under organic cultivation, with associated biodiversity benefits; and
- A greater proportion of Natura 2000 sites brought under favourable management.

The key measures in this regard are the natural handicap measures (211, 212); agri-environment (214); Natura 2000 (213); alongside the forestry measures, which

[37] EEA, 2004b. The State of Biological Diversity in the European Union. Malahide Conference: Biodiversity and the EU – Sustaining Life, Sustaining Livelihoods, 25-27 May 2004 (document MALAHIDE/INF2)

[38] Kristensen, P. (2003) EEA core set of indicators: revised version April 2003. Technical report. EEA, Copenhagen.

[39] EEA (2007) Europe's Environment: The Fourth Assessment, European Environment Agency, Copenhagen.

encourage afforestation (221-223); forest-environment payments (225); Natura 2000 (224); and restoring forestry potential after natural disasters (226). Between them the two natural handicap payment measures (LFA measures) and the agri-environment measure account for a 38% of total public funding for EAFRD for 2007-13.

Environmental benefits of selected rural development measures

The agri-environment measure is a critical means of achieving biodiversity benefits across the EU-27, and for the majority of Member States, the maintenance and enhancement of biodiversity, both within Natura 2000 areas and across the wider countryside, is a key objective of their agri-environment schemes. All but ten Member States (Finland, France, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia and Spain) allocate over half their Axis 2 budget to the agri-environment measure.

In general, evaluations of the agri-environment measure have shown that, overall, its implementation has achieved benefits for biodiversity[40]. Since agri-environment schemes tend to require reduced agrochemical inputs, extensification of production and the maintenance of existing low intensity systems, they can be expected to have positive impacts on biodiversity[41] [42]. While the focus in most Member States tends to be on the maintenance of existing extensive grassland management rather than targeting more intensive farming systems, increasingly agri-environment schemes are introducing options for creating field margins and buffers strips within arable systems, which have significant benefits for biodiversity (for example, birds, small mammals, butterflies) as well as soil and water protection (see below). Most Member States also use the agri-environment measure to encourage organic farming practices, providing incentives to cover conversion costs and in some cases to provide payments for the maintenance of these practices. Figures show that between 2000-2006 the area of land certified as organic and in conversion rose by 34% to over 7 million hectares[43], with increases of over 450% experienced in many of the new Member States such as BG, PL, LT, LV and CY. It can be assumed that the majority of these increases are likely to have been funded through the agri-environment measure, either through SAPARD or the 2000-2006 Rural Development Regulation, although market forces also play a major role.

Although not an explicit aim of the natural handicap measures, LFA schemes have been used to support extensive livestock based systems which, if appropriately managed, are crucial to the maintenance of species rich semi-natural pastures and the avoidance of land abandonment[44]. There is general consensus from evaluation studies that payments have contributed to continued agricultural land management in marginal areas but that the measure has been poorly targeted at need, for example

[40] See for example: CSL and CCRI (2008) A review of environmental benefits supplied by agri-environment schemes, Report to the UK Land Use Policy Group, August 2008 and Oréade-Brèche (2005) Evaluation of Agri-Environmental Measures – Report for DG Agriculture.

[41] EPEC (2004) Impact assessment of rural development programmes in view of post 2006 rural development policy, for DG Agriculture.

[42] Kleijn, D et al (2006) Mixed biodiversity benefits of agri-environment schemes in five European countries, Ecology Letters 9.

[43] Aberystwyth University (2008)– Organic Farming Statistics accessible at: http://www.organic.aber.ac.uk/statistics/europe2008.shtml#europe%20land

[44] IEEP (2006) An Evaluation of the Less Favoured Area Measure in the 25 Member States of the European Union. Report for DG Agriculture and Rural Development.

where public goods are most apparent, and the risk of land abandonment is greatest[45]. Together the LFA measures account for approximately one third of the Axis 2 budget across the EU-27, ranging from under five per cent of the budget in Hungary and Denmark to over 50 per cent of the budget in Finland, Malta and Slovakia. A low level of expenditure is likely to be indicative of either a small proportion of the land designated as LFA, or a product of the eligibility criteria that restrict the number of beneficiaries who are eligible for the aid.

The Natura 2000 measures provide support for the costs of undertaking appropriate management on agricultural and forestry Natura 2000 sites, in order to maintain or increase their biodiversity value. Expenditure on the two Natura 2000 measures is, however, rather low across the EU[46], with many Member States either choosing not to use EU funding mechanisms to meet a substantial share of the cost of meeting Natura 2000 obligations, or drawing on other EAFRD measures, particularly the agri-environment measure, and to a lesser degree the forest-environment measure and the two non-productive investment measures. For example in Portugal, the bulk of agri-environment expenditure is spent within geographical areas (Integrated Territorial Interventions), containing a high proportion of Natura 2000 areas.

Seven measures within Axis 2 focus on encouraging the sustainable use of forestry land. While not a significant focus of many RDPs (14 per cent of Axis 2 budget for 2007-13), these measures do comprise a significant proportion of the Axis 2 budget in some Member States, for example Spain (42 per cent) and Portugal (37 per cent). The environmental impact is, therefore, subject to considerable local variation. Whilst all forestry measures can result in benefits for biodiversity, they can also lead to biodiversity losses, depending on how the measures are implemented. The species of trees that are planted and the biodiversity value of the land on which any planting takes place are critical in this regard. If used appropriately, the targeted planting of appropriate tree species may help improve functional connectivity of habitats, and provide significant benefits for biodiversity. While there are examples of poor implementation of these measures in the previous programming period, which have been environmentally damaging, Member States are now required to ensure that afforestation is suited to local conditions and compatible with environmental requirements, particularly biodiversity. There are some reports, however, that this requirement is not always heeded in practice, for example Hungary intends to use these measures to create new plantations of non-native black locust trees, which, while having potentially positive benefits for soils, carbon sequestration and water quality, could have negative implications for biodiversity[47].

The ex ante evaluations from France, the UK (England) and the German Länder, also show that other Pillar 2 measures have the potential to bring about biodiversity benefits. The training and advice measures are particularly emphasised as is the

[45] IEEP (2006) An Evaluation of the Less Favoured Area Measure in the 25 Member States of the European Union. Report for DG Agriculture and Rural Development.

[46] Only 14 Member States have used the measure for Natura 2000 and Water Framework Directive (WFD) payments for agricultural land, and 11 have used Natura 2000 payments for forest, together accounting for 0.75% of total public funding to the EAFRD over the current programming period.

[47] FERN (2008) Funding forests into the future? How the European Fund for Rural Development Affects Europe's Forests.

LEADER approach where it is used to encourage community involvement in conservation work.

Impact of Modulation on environmental outcomes
The evidence from the CMEF Indicators, the case studies and where available, the models, shows that increased availability of funding within Pillar 2 from modulation generally enhances the benefits to biodiversity brought about by these measures. The greater the rate of modulation, the greater the benefit, depending on the precise nature of the land management practices that are incentivised.

Two of the CMEF impact indicators are specifically related to biodiversity, namely 'reversing biodiversity decline', as measured by the population of farmland birds and 'maintenance of HNV farmland and forestry' (see Table 6.7). Most Member States either aim to maintain farmland birds at levels for a particular reference year (stated variously) or to increase levels (with targets generally in the region of 0.5%-2.5%), although this does mask some continued anticipation of decline. For example Finland anticipates a continued decline in farmland bird species reliant on arable areas or field margins over the programming period. Agri-environment is the key measure mentioned in reference to achieving targets set under this indicator, with LFA also playing a role in some Member States.

In relation to the HNV farmland area[48], most Member States either anticipate maintaining the existing area of HNV farmland or increasing the area slightly (where Member States have been able to make an estimate). The key measures for achieving this are considered to be the LFA measures primarily, followed by the agri-environment measure. It should be noted, however, that Member States have taken quite different approaches to defining their baseline figures of HNV farmland, with some countries referring only to Natura 2000 areas, and others taking a much broader approach, and as a result, the targets set for this indicator need to be treated with some caution.

For most Member States, the contribution of compulsory modulation funds to these targets is estimated as proportional to the share of the RDP budget made up from these funds and associated national co-financing (see Chapter 3). Under the baseline scenario this varies, therefore, between 5%-30% of the target values of the ecological impact indicators. In the case of the UK (England) and Finland, however, this contribution is only related to the proportion of the target achieved through the agri-environment measure, as all compulsory modulation funds are targeted solely at this measure.

[48] No Member States have yet set out targets for measuring HNV forestry

Table 6.7 2013 Targets for biodiversity impact indicators in the case study Member States

Indicator	Percentage target	Quantitative target	Qualitative target
Reversing biodiversity decline - as measured by farmland bird species population	▪ 0.5%-2.5% increase (NI) ▪ 2.28% increase (FI) ▪ 50% trend reversal (SI)	▪ 42000 ha (DE -BAV) ▪ 627500 ha covered = 24.4% of UAA (DE - NRW) ▪ 255200 ha (DE -THU) ▪ 2550 ha woodland area increase (WAL)	▪ Maintenance (PT) ▪ Maintain 2003 levels (FR) ▪ Slow down until 2010, maintain thereafter (NL) ▪ Decline reversed by 2010 (UK -ENG) ▪ Improve, no target (UK - SCO) ▪ Positive contribution (DE-SAX-A)
Maintenance of HNV farmland and forestry	▪ 0.5%-2.5% (NI) ▪ 95% of HNV and 95% of Natura 2000 in favourable condition by 2010 (UK - ENG) ▪ Maintain current are of HNV (2% of UAA) (NL)	▪ 452500 ha covered = 17.6% of UAA (DE-NRW) ▪ 425000 ha split on several measures (PT) ▪ Maintenance of 513500 ha by several measures and maintenance by other measures (DE - SAX-A) ▪ +2700 ha (SI) ▪ 43500 ha (DE-THU) ▪ 350 ha of woodland and Natura 2000 (UK-WAL) ▪ 4,2 Mha (= maintaining current) (FR) ▪ 590000 ha (PL)	▪ Maintain tree diversity (FR) ▪ In preparation (FI) ▪ Maintain (UK - SCO) ▪ Maintain and enhance HNV area (UK - WAL) ▪ No serious target possible (DE -BAV)

Source: Based on information provided within individual Member State Rural Development Programmes

The result indicator for the 'area of agricultural land under successful management for biodiversity' indicates that, overall the Axis 2 measures are anticipated to ensure that over 29 million hectares are brought under successful management for biodiversity, with approximately 5 million hectares of this attributable to modulation. More specifically, looking at the RDPs of the case study countries, the agri-environment measure is anticipated to ensure that over 15% of UAA is managed in ways that maintain and enhance its biodiversity value in two German Länder, the UK (England) and Portugal (see Table 6.8). The contribution of compulsory modulation is estimated to lead to an additional 0.5 million hectares of land being managed for biodiversity in France (2% of total UAA), and 0.6 million hectares in the UK (England) (7% of UAA) than would be the case without modulation. There is insufficient data provided for other measures in relation to this result indicator, to make analysis meaningful.

Table 6.8 CMEF Result indicator for the agri-environment measure: anticipated area under successful management for biodiversity and HNV farmland

Agri-Environment (214)	FR*	NL	PT	UK-E	DE-BAV	DE-NRW
Result 2						
ha HNV	4,117,000	96,000	590,000	2,000,000	1,036,500	290,000
% due to modulation	14	19	8	31	10	16
Ha due to modulation	576,380	18,240	47,200	620,000	103,650	46,400
Benchmark (ha UAA)	27,590,940	1,958,060	3,679,590	8,716,179	3,264,724	1,523,747
Total as % of benchmark	15	0.5	16	23	32	19
Modulation as % of benchmark	2	0.9	1.23	7	3	3

Source: Based on information provided within individual Member State Rural Development Programmes
** The result indicators are for measures 211,212, 214 and 216 together. To be able to calculate the effect of modulation all were put under measure 214 with a modulation rate of 13%.*

Results from CAPRI, in relation to the indicator "Intensity Ar" (see Table 6.5) capture how intensively land is managed, by weighing together all yield changes in all crops. The underlying assumption of this indicator is that lower yields reflect less pesticide and fertiliser use as well as the introduction of non-productive elements into the farming system, such as buffer strips and hedges. The indicator is thus broader than nitrate surplus or pesticide use. The results indicate that increased modulation will bring about a decrease in intensity for arable land of 0.19%, which is likely to be beneficial for biodiversity. The decomposition of these results reveals that the effect is primarily due to the agri-environment and Natura 2000 measures.

With higher levels of compulsory modulation one would expect to see an increase in the level of biodiversity benefits that are achieved, as long as the additional funding is allocated to those measures that are key to achieving improvements in the biodiversity resource. It is difficult to ascertain what strategy individual Member States would take for using the additional funding, but it could lead to:

- An increased area of UAA under existing agri-environment or forestry schemes;
- A greater proportion of Natura 2000 areas brought into favourable management;
- Revisions to agri-environment schemes made to include more demanding (and costly) management options, such as those encouraging the reversion of arable land to pasture, wetland creation, etc;
- Higher payment rates for a number of measures (within the parameters prescribed through the regulation) to improve the financial attractiveness of extensive production at a time of potentially high commodity prices, as well as to avoid the risk of abandonment.

6.4.4 Landscape

The character of the landscape is derived from the interaction of a range of manmade and natural factors. The EU comprises a wide range of agricultural and forested landscapes reflecting a wide range of differences in bio- and geo-physical conditions, farm management practices and cultural heritage. Agriculture and forestry management practices play an important role in maintaining the character of

landscapes, but can also have a damaging influence as a result of homogenisation and/or neglect of feature management, as well as actual loss of whole landscapes.

We would expect that increased funding in Pillar 2 would lead to:

- an increase in the area of 'valued' landscapes that are maintained or enhanced;
- a decrease in the decline in landscape character; and
- an improvement in the condition of farmland features.

The key measures that can influence landscape character include the two natural handicap measures (211, 212), the agri-environment measure (214), the afforestation measures (221; 222; 223), and the conservation and upgrading of the rural heritage measure (323) within Axis 3.

Given that the character of a landscape is encapsulated by the interaction of a range of factors, including landscape features, habitat types and cultural aspects, it is difficult to find indicators that can act as proxies for these factors in combination and that reflect the complexity and multiple functions of the EU's landscapes[49]. Instead, a range of indicators are needed that can examine the different parameters linked to land use that can impact upon the functionality, diversity and cultural characteristics of landscape.

The majority of Member States include the protection of cultural landscapes as a key priority of their agri-environment schemes; however, there is very little evaluation literature that sets out how effective these schemes have been at achieving these aims. A recent evaluation of the agri-environment measure[50], showed that it had a generally positive impact upon landscape, particularly in terms of maintaining, restoring and recreating landscape features, such as hedges, or small patches of woodland, by maintaining extensive grassland, reverting arable land to grassland, and maintaining or improving the habitat mosaic within a particular area; and by helping to prevent land abandonment in some cases, particularly important where farming systems are an integral part of the culture and identity of an area (this is particularly the case for marginal and upland farming systems across Europe which are also often of high nature value.

The LFA measures are also important from a landscape perspective, by helping to support the continuation of farming activity in areas of high landscape value. The afforestation measures can also have beneficial impacts upon landscape, as long as planting is sensitive to the character of the surrounding landscape and native species are planted.

The availability of additional funds through Pillar 2 as a result of compulsory modulation will help to enhance these benefits, by both improving and extending the implementation of such schemes. The figures in Table 6.3 on land abandonment show, for example, that approximately 22 million hectares of farmland are anticipated to be prevented from being abandoned as a result of Axis 2 measures over the 2007-

[49] EEA (2005) Agriculture and the Environment in the EU-15 – the IRENA Indicator Report, No 6/2005, European Environment Agency, Copenhagen.

[50] Oréade-Brèche (2005) Evaluation of Agri-Environmental Measures – Report for DG Agriculture.

13 programming period, of which 3.5 million hectares can be attributed to compulsory modulation.

6.4.5 Water Quality

The past 30 years have seen the levels of water pollution significantly reduced as a result of declines in nutrient surpluses in the majority of Member States[51]. However, while there has been a major drop in point source pollution, diffuse pollution, primarily from agriculture, continues to be a major issue in many areas, and many water courses continue to be of poor water quality, mainly as a result of nutrient enrichment and soil sediment deposition. The main causes of poor quality in surface water continue to emanate from nitrate and phosphate contamination as a result of agricultural management. In some Member States, particularly in the Baltic, North Sea and Mediterranean, pollution of coastal waters by nutrients is also a significant issue.

In order to meet the requirements of the Water Framework Directive (requiring Member States to bring all water bodies into 'Good Ecological Status' by 2012), and the Nitrates Directive, Member States are increasingly making use of EAFRD measures to improve water quality, either through incentivising sustainable land management practices, particularly those that reduce nutrient leaching and soil erosion, or by funding investments in improved infrastructure, particularly in relation to waste water treatment. We would, therefore, expect that increased funding within Pillar 2 would lead to a decrease in the levels of nitrogen and phosphorous in surface and groundwater. Improving water quality is a key overarching priority of the 2007-13 RDPs in a number of the case study Member States, for example Finland, France and Germany.

The gross nutrient balance, or the nutrient surplus per hectare of agricultural land, is commonly used as a proxy to measure the nutrient pressure on water, and hence as an indicator of water quality. This measures the difference between the quantity of nutrient inputs entering the agricultural system and nutrient outputs leaving the system in the form of uptake by crops, pasture etc. The surplus is either stored in the soil or is washed out, with consequential risks for water quality (as well as soil fertility).

The key Pillar 2 measures for helping to improve water quality are the agri-environment measure, the afforestation measures from Axis 2 and the farm modernisation measure within Axis 1. Evaluations from the previous programming period suggest that the main benefits for resource protection are delivered through the agri-environment measure, with improvements being mainly a result of actions requiring reductions in inputs, cover crops, appropriate arable rotations, arable reversion to grassland and organic agriculture[52] [53] [54] [55]. More recently, agri-

[51] OECD (2008) Environmental Performance of Agriculture in OECD Countries Since 1990, Paris

[52] EPEC (2004) Impact assessment of rural development programmes in view of post 2006 rural development policy, for DG Agriculture

[53] Oréade-Brèche (2005) Evaluation of Agri-Environmental Measures – Report for DG Agriculture

[54] AGRA CEAS (2005) Synthesis of Rural Development Mid-Term Evaluations Lot I EAGGF Guarantee, Final Report for the European Commission.

environment scheme funding has been increasingly used to incentivise the introduction of buffer strips of varying widths alongside water courses, as they are seen as a key means of achieving a reduction in the pollution of water courses, and helping achieve the requirements of the Water Framework Directive[56]. Table 6.2 shows that water quality features as a key objective of agri-environment schemes in the majority of Member States. This is backed up by information from the 2007-13 RDPs and the targets provided for the CMEF indicators.

Evidence from CAPRI, the CMEF indicators and the case studies all suggest that the additional funds generated through compulsory modulation are likely to have a positive impact on water quality, by either maintaining nutrient surpluses at sustainable levels, or reducing them across the EU-27.

The results from CAPRI (Table 6.5) indicate that there will be a reduction in N-surpluses (-0.46%), and use of pesticides (-0.76%) under the Health Check scenario. The results show that this is a result of both a reduction in first pillar payments as well as an increase in availability of funding for second pillar measures, in particular Axis 1 physical investment measures to improve farm technology, and the Natura 2000 and agri-environment measures which contribute to reducing pesticides by requiring more extensive management practices.

In Finland, for example, improving water quality is a key objective of the agri-environment scheme. As this measure is the focus of all additional modulation funds, increased availability of funds could potentially allow for either greater uptake of the scheme (which is already very high), higher payment rates for existing options or potentially the introduction of new, more demanding, and higher cost options. In the Netherlands, the case study expert suggested that the additional resources made available for the agri-environment measure would have positive effects on the quality of water resources. As in Finland, compulsory modulation funds in the UK (England) are focused specifically on the agri-environment measure. Although it is too early to fully assess the impacts of Entry Level Stewardship (ELS) on water quality, early modelling indicates that the current approach of targeting action within priority catchments with pollution problems is effective, estimating average potential reductions in N losses of between 2.1 and 4.3% and of approximately 4% for P, based on levels of uptake of relevant management options in 2006/07[57]. As modulated funds (both compulsory and voluntary) makes up the majority of the budget for agri-environment expenditure in the UK, the majority of such impacts can effectively be attributed to the funds generated through modulation.

The use of the farm modernisation measure to provide funding for capital investment, alongside the use of other measures, such as the training and advice measures, also play a significant role in improving water quality. For example, the French case study indicates that in France, improvements in water quality are most likely to be brought

[55] Primdahl, J, Peco, B, Schramek, J., Andersen, E and Onate, JJ (2003) Environmental effects of agri-environment schemes in Western Europe, Journal of Environmental Management 67 (2003) 129–138.

[56] CSL and CCRI (2008) A review of environmental benefits supplied by agri-environment schemes, Report to the UK Land Use Policy Group, August 2008

[57] CSL (2007) An Evaluation of the operation of Environmental Stewardship, final report to Defra, September 2007

about through the use of the training measures, which are used to provide training programmes focused on efficient fertiliser use, and the farm modernisation measure, which can be used for the modernisation of livestock buildings, with the aim of reducing pollution. In Ireland, the Farm Waste Management Scheme provides investment aid for animal manure storage, winter housing for cattle and sheep, silage storage and equipment for spreading animal wastes, and in the UK (England), voluntary modulation has been specifically targeted at nutrient management in the livestock sector, which should have beneficial impacts on water quality. Sweden, Italy, Austria and the UK all also focus a proportion of their farm modernisation measures on improved manure storage and spreading.

In relation to the CMEF impact indicator on water quality (see Table 6.9), where Member States have provided quantified baseline and target figures, these relate mainly to reductions in nitrogen surplus, with anticipated reductions ranging widely - from 4% in the Paris Basin to 70% in the south east region of France. It should be noted that the baseline figures for nitrogen surplus/ha vary significantly between Member States and regions within Member States, reflecting the different nature of farm practices across the EU-27. The extent to which the additional compulsory modulation receipts contribute to these reductions in nutrient surplus, will again be proportional to their contribution to the overall RDP budget (see Chapter 3).

Table 6.9 Targets for the water quality impact indicator in the case study countries, 2013

Indicator	Percentage target	Absolute quantitative target	Qualitative target
Improvement in water quality	▪ 0.5%-2.5% (NI) ▪ 13% = 55 kg N/ha (PL)	▪ 612500 ha covered = 23.9% of UAA (NRW) ▪ -4 kg N/ha (SI) ▪ 73500 ha (THU) ▪ 600 farms (WAL) ▪ N-balance 46 kg/ha (FI)	▪ Qualitative improvement (PT) ▪ Qualitative improvement (DE -SAX-A) ▪ Improve, no target (UK - SCO) ▪ Improvement (UK - WAL) ▪ Improvement (FR)

Source: Based on information provided within individual Member State Rural Development Programmes

In relation to the result indicator relating to water quality for the case study Member States, again, it is the agri-environment scheme that is anticipated to contribute the most in terms of bringing land under appropriate management for achieving improved water quality. The proportion of UAA that it is anticipated will be brought under appropriate management for water quality varies from 45 percent in Germany (Bavaria), 14 per cent in the UK (England), and 12 per cent in Portugal (see Table 6.10). In terms of the impact of compulsory modulation on this indicator, it is estimated to lead to an additional 0.5 million hectares of land being managed to bring about improvements in water quality in France (2% of total UAA), compared with only 34,000 hectares in Portugal (0.9% of total UAA) There is insufficient data provided for other measures in relation to this result indicator, to make analysis meaningful.

Table 6.10 CMEF Result Indicator for Agri-Environment measure: Area under successful management for water quality

Agri-Environment (214)	FR*	PT	UK- E	DE - BAV	DE- NRW
Result 3					
ha water quality	4,117,000	425,000	1,200,000	1,455,000	275,000
% due to modulation	14	8	31	10	16
Ha due to modulation	576,380	34,000	372,000	145,500	44,000
Benchmark (UAA)	27,590,940	3,679,590	8,716,179	3,264,724	1,523,747
Total as % of benchmark	15	12	14	45	18
Modulation as % of benchmark	2	0.9	4	4	3

Source: Based on information provided within individual Member State Rural Development Programmes
** The result indicators are for measures 211,212, 214 and 216 together. To be able to calculate the effect of modulation all were put under measure 214 with a modulation rate of 14%.*

As improving water quality is one of the challenges identified as part of the Commission's Health Check proposals, we would expect to see improvements to water quality increase as additional modulation funds are made available under the Health Check scenario. This is illustrated by looking at the outputs of the nitrate surplus indictor from the CAPRI model, which is derived as a function of a range of factors, including yield, changes in cropping mix, the application of more efficient technologies, and changes in the use of different types of nutrients (i.e. manure versus agro chemical inputs). In general CAPRI shows that reductions in Pillar 1 payments lead to a slight increase in N-surplus, although this differs between regions. The availability of additional funds within Pillar 2 in contrast leads to a decrease in N-surplus, both as a result of investments in human and physical capital (as a result of the development of more efficient technology and increased levels of awareness) as well as support for agri-environment and LFA measures. Overall, therefore, increases in compulsory modulation according to the Health Check scenario will lead to a slight decrease in nitrate surplus across the EU-27 (up to 1.3%).

6.4.6 Water Quantity

Estimates show that 50% of the EU population currently live in water stressed areas[58], largely due to the increasingly unsustainable exploitation of water resources by abstraction, particularly for agricultural use. This is being exacerbated by climate change. The latest comparable figures available show that between 1990-1992 and 2001-2003 water use for agriculture increased by an average of 10% (with much higher figures recorded for Greece and Portugal), compared to an overall decline in total water use of 9% [59].

For environmental benefits to be experienced, increased funding in Pillar 2 would need to be focused on actions that lead to:

- An increase in the sustainability of water abstraction from surface and ground water; and
- a decrease in the volume of water used for irrigation

[58] EEA (2007) Europe's Environment: The Fourth Assessment, European Environment Agency, Copenhagen

[59] OECD (2008) Environmental Performance of Agriculture in OECD Countries Since 1990, Paris

Indicators for measuring improvements in water management and water resource use are notoriously difficult to quantify at an EU level as data on available water resources at a national level are difficult to calculate, methods for calculating water use balances are complex and consistent methodologies for collecting data are often not used[60] [61]. In addition there are no CMEF indicators that relate to water resource use.

Axis 1 measures, particularly the farm modernisation measure, can be used to fund more efficient irrigation systems. However, it is unclear from the case studies, the extent to which different Member States have used this measure for this purpose, and therefore to calculate the contribution that compulsory modulation could be making to improve the sustainability of water usage. There are, however, individual examples of some Member States, most notably Portugal, using rural development measures to fund irrigation projects. In the current programming period, Portugal is using a significant proportion of its Axis 1 funds (18% of total Pillar 2 public expenditure) on irrigation projects, including the building of the Alqueva dam and supporting associated irrigation projects. The outcomes of this project are not available at the time of writing, however it can be estimated that eight per cent of the EU funds allocated to this project will be due to compulsory modulation, given that this is the proportion of the total EAFRD budget provided by modulated funds.

6.4.7 Soil Quality

Soil erosion by water and wind and declines in soil organic matter are the key factors affecting the quality of soils, along with compaction in a number of arable areas. Soil erosion affects over 17% of Europe's land area and Southern and Eastern Member States experience the most severe risk[62] [63]. Soil erosion is exacerbated by cultivation techniques, and in general, land used to grow arable and permanent crops is more at risk than permanent pasture due to the levels of vegetative cover. However intensive production, both within grazing and arable systems, particularly on steep slopes and fragile soils, will lead to increased risk of soil erosion.

While the protection of soils is a fundamental element of the cross-compliance requirements of Good Agricultural and Environmental Condition, a number of measures within rural development programmes are also focused on improving the quality of the soil resource. As a result, we would expect that increased funding within Pillar 2, as a result of modulation would lead to:

- reduced levels of soil erosion;
- reduced levels of soil compaction; and
- to a lesser extent, increased levels of soil organic matter;

The main measures that tend to be used for improving soil quality include the agri-environment measure (214), and the afforestation measures (221, 222, 223).

60 EEA, 2006, The European Environment - State and Outlook 2005, EEA, Copenhagen

61 OECD (2008) Environmental Performance of Agriculture in OECD Countries Since 1990, Paris

62 EEA (2007) Europe's Environment: The Fourth Assessment, European Environment Agency, Copenhagen.

63 OECD (2008) Environmental Performance of Agriculture in OECD Countries Since 1990, Paris

There is a lack of information on the impact of Axis 2 measures on soil quality within the evaluation literature, although findings from the recent DG Agri project on the conservation of agricultural soils (SoCo) may shed further light on this. Two reports state that soil quality has improved and soil erosion been reduced due to the implementation of the agri-environment measure, although in many cases data was insufficient to make a full assessment and no quantitative assessments had been undertaken[64][65]. This is despite the fact that improving soil quality is a key objective of the agri-environment measure and a priority for agri-environment schemes in many Member States, particularly as a means of decreasing water pollution through increasing infiltration capacity and reducing run-off. The types of options that are likely to provide these sorts of benefits are similar to those that are used to improve water quality and include the creation of buffer strips, conversion of arable to pasture, overwintered stubbles, and cover crops. The production methods associated with organic farming, particularly techniques such as minimum tillage, are also beneficial to soil quality, which in turn can lead to significant benefits for biodiversity.

The presence of trees and woodlands can also help to protect soils and reduce soil erosion as the maintenance of a complex root structure can improve the stability of soils[66]. A number of RDPs have used the afforestation measures with the specific aim of improving soil quality and reducing soil erosion.

There is no CMEF impact indicator that relates to soil quality, and the CMEF result indicator relating to soil quality has not been completed for many of the case study Member States. However, most of the information provided relates to the anticipated impact of the agri-environment measure (see Table 6.11). This shows that a relatively high area of agricultural land is anticipated to be managed in a way that will provide benefits for soils as a result of this measure – 45% of UAA in Germany (Bavaria), 17% in Germany (North Rhine Westphalia), 14% in the UK (England) and France, and 13% in the Netherlands. A crude estimate, based on the proportion of the RDP budget made up of modulated funds, indicates that compulsory modulation, under the baseline scenario, may lead to an additional 0.5 million hectares of land under management that contributes to improved soil quality in France (2% of total UAA), compared with 38,400 hectares in Portugal (1% of total UAA) There is insufficient data provided for other measures in relation to this result indicator, to make analysis meaningful.

[64] EPEC (2004) Impact assessment of rural development programmes in view of post 2006 rural development policy, for DG Agriculture.

[65] Oréade-Brèche (2005) Evaluation of Agri-Environmental Measures – Report for DG Agriculture.

[66] Broadmeadow & Nisbet, 2004 quoted in: CSL and CCRI (2008) A review of environmental benefits supplied by agri-environment schemes, Report to the UK Land Use Policy Group, August 2008

Table 6.11 CMEF Result Indicator for Agri-Environment measure: Area under successful management for soil quality

Agri-Environment (214)	FR*	PT	UK – E	DE-BAV	DE-NRW
Result 5					
ha soil quality	3,747,000	480,000	1,200,000	1,475,000	255,000
% due to modulation	14	8	31	10	16
Ha due to modulation	524,580	38,400	372,000	147,500	40,800
Benchmark (ha UAA)	27,590,940	3,679,590	8,716,179	3,264,724	1,523,747
Total as % of benchmark	14	13	14	45	17
Modulation as % of benchmark	2	1	4	4	3

Source: Based on information provided within individual Member State Rural Development Programmes
** The result indicators are for measures 211,212, 214 and 216 together. To be able to calculate the effect of modulation all were put under measure 214 with a modulation rate of 14%.*

6.4.8 Climate Change

Europe's temperature has risen faster in the last 100 years than the global average (0.95°C compared to 0.7°C globally). Some impacts are already becoming apparent, including more frequent droughts in the south and increased incidence of flooding and storms in the north and west. Climate change will undoubtedly affect the productivity of agriculture and forestry, and will impact on soil quality and structure, as well as the distribution and proliferation of pests and diseases. Agriculture contributes to global warming mainly through:

- The production of nitrous (N_2O) gases in mineral fertiliser production;
- The production of methane (CH_4) in the stomachs of ruminants; and
- The use of fossil fuels for machinery and drying.

The EU agriculture sector is responsible for 9 per cent of EU greenhouse gas emissions, but some habitats and production systems, for example woodland, peat land and permanent grassland, can also act as carbon sinks, by facilitating carbon sequestration and provide sources for renewable energy through the growing of biomass crops. In addition agriculture and forestry have an important role to play in facilitating the adaptation of biodiversity to climate change.

Many of the measures used within the 2007-13 RDPs, across all Axes, are likely to promote activities and management practices that will contribute towards climate change mitigation and adaptation. Alongside the production of bioenergy, a large proportion of the mitigation potential of agriculture arises from soil carbon sequestration[67]. Forestry also plays an important role in this regard. In relation to adaptation, one of the key roles for agriculture and forestry land use is in ensuring management practices that will increase habitat resilience and develop the functional connectivity of habitats and features. Measures focused on developing infrastructure for the production of renewable energy, both on and off farm are also important in terms of addressing the challenges of climate change. As a result, we would expect that increased funding in Pillar 2, brought about through modulation, would lead to:

[67] IPCC 2007, Climate change 2007: Impacts, adaptation and vulnerability. Contribution of Working Group II to the fourth assessment report of the Intergovernmental Panel on Climate Change.

- A reduction in GHG emissions, including:
    - reductions in CO_2 emissions through: biomass production (crops and wood); investments in renewable energy infrastructure for on farm use; investments in community renewables;
    - reductions in nitrous oxide emission as a result of reduced input use and improvements in nitrogen management;
    - reductions in methane emissions, as a result of improved livestock housing;
- The maintenance or increase in the capacity of soils to sequester carbon;
- An increase in the capacity of the land to be able to adapt to climate change through:
    - improving the resilience of habitats to climate change;
    - helping develop the functional connectivity of habitats and features.

The most relevant rural development measures that can help achieve climate objectives are to be found across all four Axes of Pillar 2 and include the farm modernisation measure (121), measures for training and advice (for example 111, 114 and 331), the agri-environment measure (214), the afforestation measures (221; 222), and Axis 3 measures aimed at providing basic services for the economy and rural population (321) and village renewal and development (322), as well as the LEADER Approach.

The use of rural development measures for achieving climate objectives is a more recent focus than other environmental parameters, although for the 2007-13 programming period, addressing the climate challenge is set out as an objective within the Community Strategic Guidelines for the EAFRD. As a result, evaluations of the previous programming period do not consider the impact of measures on reducing emissions, improving carbon sequestration or helping habitats and species adapt to climate change. The CMEF impact indicator, measuring the increase in the production of renewable energy can help to give some indication of the potential impact of measures, as can information from the case studies.

For example, the UK case study shows that agri-environment schemes are thought to have the potential to contribute to climate change, both in terms of mitigation and adaptation, with a key role to play in helping biodiversity adapt to climate change through improving the connectivity of habitats and resilience of existing high value habitats. A recent evaluation of agri-environment schemes[68] states that the schemes already have a positive impact on climate change, but can be improved to make more of a contribution to meeting the climate change challenge in the future, however they will need to work in conjunction with other measures outside of the CAP to do this effectively. Voluntary modulation is also anticipated to have an impact on the production of renewable energy in the UK, as a proportion of these funds have been targeted specifically at the establishment of energy crops with the objective of developing renewable energy supply chains and reducing greenhouse gas emissions. In France, the training that farmers are given on more efficient fertiliser use through Axis 1 measures could possibly reduce nitrous oxide emissions, and the use of the farm modernisation measure to improve livestock housing may have a positive impact on air quality.

[68] Defra, Natural England (2008) Environmental Stewardship Review of Progress, Defra, London

A number of evaluation studies have reported that the afforestation measures have contributed positively to carbon storage, although the levels of carbon stored vary between Member States. Afforestation can also help flood alleviation by protecting soils and increasing the infiltration capacity of the land. Beyond the information from the case studies, there is little further information available on the degree to which investment has been made in renewable energy infrastructure through Axis 1 measures, or to fund community based renewable energy schemes through Axis 3.

CAPRI is able to provide information on the impacts of increased levels of modulation on both methane and nitrous oxide emissions. In relation to methane, under the Health Check scenario, the results show that overall modulation will result in a 0.14% decrease in the emissions of methane from agriculture (see Table 6.5). This is explained in the model by the potential for Axis 1 measures, such as the farm modernisation measure to lead to more efficient feeding systems, for example, as well as the predicted decline in beef cattle resulting from decreases in Pillar 1 direct payments. Although the figures indicate that increased expenditure under the agri-environment measure increases methane emissions, this is based on an assumption that agri-environment support keeps more grassland in production, and therefore more livestock grazing, that would otherwise be the case. In reality, therefore, this support is more likely to be retaining methane emissions at current levels, rather than actually increasing them *per se*.

Larger decreases of N_2O emissions (-0.37%) are indicated by CAPRI under the Health Check scenario (see Table 6.5). Since the global warming potential of N_2O is even larger than that of methane, this reduction is even more significant in terms of greenhouse gas mitigation. Since N_2O is a by-product in the production of fertiliser, the indicator is linked to mineral fertiliser use and thus on intensity in the arable cropping sectors. The reductions in emissions, therefore results from both the reduction of the first pillar payments (which reduce somewhat the area under arable crops), and the increase in availability of funding for Axis 1 capital investment measures (which can lead to more efficient fertiliser use, or changes in crop varieties), and Axis 2 measures supporting more extensive management practices.

In relation to the CMEF impact indicator, which considers the anticipated contribution that the programme measures will make to climate change as measured by renewable energy production, data has been provided in a range of different forms (see Table 6.12). Where target amounts are specified these generally predict the number of Ktoe of renewable energy that will be produced over the lifetime of the programme. For some Member States targets are calculated for the agricultural and forestry sectors separately. Where baseline information is available to allow the relative increase to be measured, these increases range from 8% in the UK (Scotland) to 120% in Slovenia for the forestry sector, and from 14% in Finland to 77% in Poland for the agriculture sector.

Given the range of different measures that could be used to contribute to meeting these targets, it is difficult to estimate the contribution that compulsory modulation makes, however a crude estimate could be made based on the proportional contribution that compulsory modulation makes to the overall EAFRD budget within the specific Member State. As with the other indicators, this will range from 5%-30% of the target values under the baseline scenario.

Table 6.12 Targets for the climate change impact indicator in the case study countries, 2013

Indicator	Percentage target	Absolute quantitative target	Qualitative target
Contribution to combating climate change	No specific percentage targets set – although these can be created by assessing quantitative targets against baseline figures where these are available	▪ 592500 ha covered = 23.1% of UAA (DE-NRW) ▪ 137000 ha (DE - THU) ▪ 5.95-6.94 Mtoe (+77%) (PL) ▪ 41 Ktoe/year of renewable energy (UK -ENG) ▪ 5 ton CO_2/ha (PT) ▪ Agriculture: 108 Ktoe, Forestry: 7.895 Ktoe (+14%), arable area: 200000 ha, open landscape: 2,2-2,3 million ha (FI) ▪ 10.058 Kton CO_2 can be absorbed from afforestation measure (NL) ▪ Increase from forestry: significant 1,000 Ktoe (+120%) (SI) ▪ Carbon savings from forestry 0.6 MtC by 2013 (+8%) (UK – SCO)	▪ Positive contribution (PT) ▪ Positive contribution (DE - SAX-A) ▪ Contribute, no target (UK-SCO) ▪ Increase agriculture: low, (SI) ▪ Financing independent of Pillar 2 (FR)

Source: Based on information provided within individual Member State Rural Development Programmes

Not many of the case study Member States have completed data on the CMEF Result indicator relating to the anticipated area of land brought under successful management in relation to climate change (Table 6.13). For the four programmes where this has been done, the data shows that agri-environment schemes are expected to result in between 2% (France) and 17% (Germany – North Rhine Westphalia) of land managed for climate change objectives. A crude estimate, based on the proportion of the RDP budget made up of modulated funds, indicates that compulsory modulation, under the baseline scenario, is estimated to lead to an additional 58,000 hectares of land being managed to meet climate change objectives in France (0.2% of total UAA), to 19,600 hectares in Portugal (0.5% of total UAA). There is insufficient data provided for other measures in relation to this result indicator, to make analysis meaningful.

Table 6.13 CMEF Result Indicator for Agri-Environment measure: Area under successful management for climate change

Agri-Environment (214)	FR*	NL	PT	DE-NRW
Result 4				
ha climate change	420,000	1,880	245,000	255,000
% due to modulation	14	19	8	16
Ha due to modulation	58,800	357	19,600	40,800
Benchmark (ha UAA)	27,590,940	1,958,060	3,679,590	1,523,747
Total as % of benchmark	2	0.1	7	17
Modulation as % of benchmark	0.2	0.02	0.5	3

Source: Based on information provided within individual Member State Rural Development Programmes
** The result indicators are for measures 211,212, 214 and 216 together. To be able to calculate the effect of modulation all were put under measure 214 with a modulation rate of 14%.*

Climate change is one of the priority challenges set out under the Commission's Health Check proposals. The proposals focus predominantly on the role that agriculture and the forestry sectors can play in providing feedstocks for bio-energy, in promoting carbon sequestration and in reducing greenhouse gas emissions, rather than on they way in which they can aid biodiversity to adapt to climate change. However,

it is likely that increased investment in a number of key environmental measures (for example agri-environment) as a result of the availability of additional modulated funds under the Health Check scenario, will also lead to adaptation benefits being provided as a result of increased funding. We would anticipate, therefore, that under the Health Check Scenario, compulsory modulation will lead to a greater reduction in greenhouse gas emissions, increase the carbon sequestration potential of soils and that can improve the capacity of biodiversity to adapt to climate change.

7 CONCLUSIONS

This study has sought to assess the economic, social and environmental impacts of compulsory modulation, both under current rates and rules (the baseline scenario), and a potential future scenario (the Health Check scenario), based on the Commission's proposals for increasing modulation as part of the CAP Health Check. The timeframe for the study is the 2007-13 programming period. The study has focused predominantly on the impacts across the EU-15, however, results are also provided for the EU-27 to take into account the introduction of modulation for the new Member States at the end of the programming period. Specifically the study has sought to explore the impacts of compulsory modulation on farm structures, the competitiveness of the agricultural sector, farm and farm household income, employment, quality of life in rural areas and the environment.

7.1 Methodological Approach

Given the aims of the study, an approach was needed that allowed for an assessment of the full range of social, economic and environmental impacts of compulsory modulation, both as a result of the effect of a reduction in Pillar 1 direct payments and the redistribution of these funds through Pillar 2: 8.8 billion euro in the period 2007-2013 under the Baseline Scenario. To do this, ideally an understanding of the impact at both the farm level and the Member State/regional level is needed. In addition, the impact of the redistribution of modulated funds through Pillar 2 is dependent on a wide range of variables including the way in which the modulated funds are used, how schemes are targeted and who is eligible. One of the key challenges for this study, therefore, has been to reflect the complexity of local impacts on the ground (social, economic and environmental), to understand how these relate to the variety of ways in which Member States have implemented their Rural Development Programmes, and to then disentangle the extent to which modulated funds have contributed to these impacts.

It was not possible to find a single analytical tool that could provide a comprehensive picture of the full range of impacts arising from the two modulation scenarios. In order to assess the impacts of modulation, therefore, two separate, but interlinked methodological approaches – a modelling approach and a non-modelling approach – have been used. The modelling approach consists of: a budget model, providing the financial and budgetary information relating to the redistribution of funds between Pillar 1 and Pillar 2, between Member States, and, based on a number of assumptions, the breakdown between RDP measures; and a suite of economic models (CAPRI, FES, LEITAP) which were used to assess the economic and sectoral impacts. The modelling approach allowed for results to be generated on impacts across the EU-27, and for projections to be made about how these impacts might change under different rates of modulation. It also permitted an exploration of any differences that might emerge from changes to rules relating to franchise levels, co-financing requirements, or allocation of funds within Pillar 2 to specific measures, albeit based on a set of generalised assumptions. The models were complemented by the non-modelling approach which consisted of case studies carried out in eight Member States; telephone interviews with officials in those Member States where case studies were

not undertaken; an analysis of the relevant CMEF indicators from the 2007-13 RDPs and a literature review. These tools allowed for more context specific insights into the impacts of modulation to be made.

Despite the use of a range of different methodological and analytical tools, identifying the precise impacts of compulsory modulation on the range of themes addressed by this study, has, in reality, been difficult. There are a number of reasons for this, some of them methodological, and some relating to data availability.

The main methodological issue concerns the accuracy with which it is possible to assess the impacts of compulsory modulation on Pillar 2 measures, as so many of the impacts are dependent on the way in which Member States have chosen to use the CM funds, the structure of the RDP more generally, and how they have designed and implemented the specific measures. The accuracy and degree to which detailed analysis of the impacts of modulation on Pillar 2 measures is able to be undertaken is also limited by the lack of availability of detailed data on the impacts of specific measures on particular indicators and parameters. In addition, because of the short time span between the implementation of the current system of compulsory (and voluntary) modulation and the present time, there is relatively little data available with which to inform an *ex post* study of the impacts of modulation. Literature relating to the impacts of Pillar 2 measures were restricted to the mid-term evaluations of the 2000-2006 period, which meant that much of the analysis had to be based on an *ex ante* approach, predicting the likely impacts of compulsory modulation over the 2007-2013 programming period.

In addition, the impacts of modulation are conditioned by global trends that are driving the evolution of the agricultural economy. In contrast to these macro-trends, the direction and the degree of this inflection caused by modulation that is the focus for the analysis within this study were not straightforward to distinguish.

Issues relating to the modelling

Prior to this study, a systematic assessment of the impacts of Pillar 2 measures had not been attempted with the economic models used. This has let to significant developmental challenges for the models, not all of which have been easy to resolve. The models have had to tackle a wide variety of issues, which include the heterogeneity of measures and farm circumstances, the multi causality of farm management decisions, and the fact that Member States can use additional funds to adjust and expand their individual schemes within RDPs in a range of different ways. With regard to the last point, this means, for example, increasing the area under agreement/ the number of agreement holders for existing schemes, increasing payment rates (up to set limits), introducing additional options, etc. Added to this, the lack of detailed monitoring of the outcomes of Pillar 2 measures to date means that there continues to be little quantified data in the majority of Member States with which to measure the impacts of individual measures, including information for accurately estimating the deadweight and displacement effects associated with different measures.

This means that the models have to rely on assumptions that are based largely on expert judgement rather than empirical data, which adds an additional margin of error to the subsequent calculations and has limited the accuracy with which any impacts of

compulsory modulation can be assessed. All assumptions have been made transparent within the report, in order to make sure that the results highlight the margin of error associated with them and hence the degree of accuracy of any subsequent analysis.

Issues relating to the case studies

Eliciting reliable information about the likely response of authorities in the Member States to hypothetical increases in modulation is a challenge given the political sensitivity of the topic and the inherent uncertainty of future policy choices. In this case, information was sought from Ministry officials, whose response was conditioned by their limited authority in this domain and the CAP policy context at the time of the enquiry – the run up to the publication of the Commission's Health Check legislative proposals on May 20th 2008. While the case study experts sought to separate these policy considerations from the actual empirical effects of reducing Pillar 1 payments and increasing available funding in Pillar 2, it is apparent from the case study reports that the on-going policy debate affected the data collection to some extent, particularly in relation to the prospective element of the study. This was either because Member States were not prepared to divulge what they think the potential impacts of increased rates of compulsory modulation might be before they made official statements on their position, or because insufficient thought had as yet been given to what the implications of an increase in funding for Pillar 2 might be. This means that the prospective dimension of the case study reports has not been as elucidating as it might otherwise have been.

It also proved difficult for the case study experts to identify precisely which measures within the 2007-13 RDPs that the additional compulsory modulation funds had been focused upon, beyond a general overall increase to the Pillar 2 budget. As a result, analysis has had to be based on the assumption that the additional funds have been spread across the Axes and measures in the same way as the core EAFRD budget. In reality, however, it is clear that not all measures are able to absorb additional funds equally due to, for example, where payment rates are at the maximum allowed, or measures are geographically delimited. This is particularly the case with the LFA measure, for example.

The introduction of the indicators within the Common Monitoring and Evaluation Framework (CMEF) has been a helpful step towards facilitating a more informative analysis of the impacts and estimates provided by Member States within their RDPs on the anticipated outputs, results and impacts of the various measures within Pillar 2. However, these data, by their very nature, are projections rather than actual values, and given the fact that they will be used as a means of evaluating the RDPs, are likely to have been developed with this in mind. As such, they are likely to have some margin of error associated with them, and should probably be treated as a slight underestimate of the likely actual situation in 2013.

Within the limits of these significant methodological and practical issues, the study has identified a range of impacts that can be attributed to modulation. Overall, the net aggregated impacts of modulation are generally small, in percentage terms with the impacts of the additional funds within Pillar 2 generally being significantly greater than those of reducing Pillar 1 direct payments. More significant impacts are likely to be visible at the local level or by farm type, but these have not been possible to identify within this study.

Before turning to the specific impacts of compulsory modulation on the study themes, it is helpful to set out the more generic effects of the modulation instrument itself in terms of budgetary redistribution.

7.2 The Redistribution Effects of Compulsory Modulation

As a policy instrument, modulation redistributes money from Pillar 1 direct payments to Pillar 2. However, its effects extend considerably beyond a simple readjustment to the funds available within the two pillars, as the additional funds that are made available for Pillar 2 are then augmented by national co-financing and, for certain measures, by private sector contributions. As such, compulsory modulation acts as a conduit for leveraging an increase in funding available for rural areas, both to the agricultural sector and beyond.

Modulation, under the baseline scenario, also redistributes money between Member States. Due to the fact that funds are not distributed proportionately between Member States, predominantly Southern Member States (but also Austria and Finland) have benefited by receiving back more funds than they have generated through compulsory modulation, thereby accelerating the growth of their RDPs (some of which, in the past, have been criticised for not being particularly ambitious). This effect is considerably lessened under the Health Check scenario, however, as all the additional funds generated return to the country of origin.

Although it was anticipated that the increased availability of funds within Pillar 2, as a result of modulation, would result in some differential impact between funding for the different Axes and measures, in fact, under the baseline scenario, the additional funds were allocated across measures in the same way as the core EAFRD allocation for the 2007-13 programming period. Two exceptions to this exist – Finland and the UK (England) – where the funding has been specifically targeted at the agri-environment measure. This effect changes under the Health Check Scenario. Due to the fact that this scenario assumes that additional funds are specifically focused on measures that are able to deliver against the 'new challenges' of biodiversity, climate change, renewable energies and water management, this means that the additional modulated funds in all Member States are focused predominantly on measures within Axes 1 and 2 – although measures within Axis 3 and the LEADER approach may also play a small role.

In addition, modulation can lead to a significant transfer of support between farms of differing type and size. Logical deduction from the existing pattern of payments suggests that, in general, modulation tends to lead to a redistribution of funds from:

- Larger to smaller farms, although the participation of rather small farms in many Pillar 2 measures is low in many Member States
- Larger arable farms to:
    - Livestock farms, including a significant proportion of more extensive farms, which are the main recipients of Axis 2 money, but also dairy farms, potentially accessing funding under all axes.
    - other farm types which are able to access physical and human capital investments under Axis 1
    - Forestry and farm/forestry enterprises (through the forestry measures)
    - Beyond the agricultural sector to the broader rural economy

There is some evidence to support this analysis from the FES model using 2005 FADN data, which also suggests that the smallest category of farm (2-4 ESU) will be least affected by modulation.

7.3 Impacts of Modulation on the Study Themes – Summary of main findings

Turning to the specific thematic impacts of modulation, it is evident that the programming approach that characterises Pillar 2, whereby support is directed to specific goals, subject to clear rules and requirements in terms of implementation, monitoring and evaluation, makes expenditure inherently more likely to be more supportive of EU objectives than untargeted direct payments. In principle, the redistribution of funds from Pillar 1 to Pillar 2 should intrinsically bring about better added value in terms of outputs, bearing in mind the significantly higher transaction costs involved with Pillar 2 expenditure compared to Pillar 1. Calculating the additional transactions costs associated with modulation has been beyond the scope of this study, however the under representation of this important factor needs to be borne in mind when interpreting the results.

Overall impact
The models suggest that the overall net economic impacts of compulsory modulation at the rates explored here are positive, albeit relatively small. The case studies do not contradict this but point to larger impacts within certain groups of farms. Most notably, the reduction in P1 payments does not appear to have a significant impact on any of the study themes, whereas the availability of additional funds through Pillar 2, especially when these are reinforced with additional national co-financing, does have some considerable positive impacts, particularly in relation to the environment. Indeed, the results indicate that the major benefits from modulation are environmental and social (through Axis 2) as well as with regard to productivity (through human and social capital support under Axis 1). However the precise scale of the socio-environmental benefits is difficult to determine without much improved data.

In general, the results show a greater impact for EU-15 than for the EU-27, but this is simply due to the fact that compulsory modulation does not apply to the new Member States until 2012.

Due to the methodological and data limitations highlighted above, many of the results are very generalised in nature, often referring to the situation for the EU-15 and/or EU-27. These results are complemented by findings from the case studies, which demonstrate that these averaged results will mask more significant impacts at the local level. However, it has not been possible to quantify these more localised impacts within the scope of this study.

Specifically, in relation to the individual study themes:

Farm Structure: Modulation on the scale examined here is not seen to have a significant net impact on changes in the number or size of farms within the EU-15 – although it may accelerate existing trends towards fewer, larger farms and certain categories of investment, particularly as a result of the availability of additional funds for the physical and human capital investments in Pillar 2. Measures that specifically aim to bring about restructuring, such as the Early Retirement measure, however, are

only used in a minority of Member States (nine) and account for a very small proportion of the overall EAFRD budget for 2007-13 and as a result, increases in the availability of funds via CM are unlikely to have a significant impact. However, CM may also serve to slow down structural change as a result of increased support for Pillar 2 measures, such as LFA and agri-environment, which can help maintain the economic viability of farm businesses, particularly in marginal areas, that would otherwise disappear. Increased Pillar 2 expenditure potentially could counteract localised abandonment arising from direct payment reductions, depending on how it is targeted.

Production: According to the models the net overall agricultural production effect due to modulation under the Health Check scenario appears to be positive, albeit small, for primary agriculture in the EU-15 (0.48%) and the EU-27 (0.4%). Taken alone, the reduction of Pillar 1 direct payments has a minimal negative production effect (-0.06%), which is to be expected, given that payments are decoupled.

There are some differences between products. The net production effect is slightly positive for all broad groups of products (e.g. oilseeds, vegetables and permanent crops, meat), with the meat sectors being the most strongly influenced by modulation in terms of production. The exception to this is cereals, where the models indicate a slight net decrease in production. However, this relates solely to a number of specific cereal crops, particularly durum wheat, which at present still receives coupled payments in some areas, and, benefits from significant Article 69 support, particularly in Italy.

The main cause of this positive effect is the availability of additional money for Pillar 2 measures, particularly physical capital investment measures. However, there are a number of factors at play here. While investments in human and physical capital measures through Axis 1 may increase production, investments in Axis 2 measures will equally require the maintenance or introduction of more extensive management practices, which may conversely constrain production. Equally overall results for EU-27 may mask more significant changes at the regional level.

Competitiveness: Increased rates of compulsory modulation appear to have a small net positive impact upon competitiveness within the agriculture sector, albeit measured in the narrow sense of gross value added within agriculture.

Outputs from the economic models suggest that the increased rates of modulation under the Health Check scenario have a small net positive impact on GVA, compared with the baseline scenario. The impact on welfare is slightly positive. This is the case, even without taking into account the anticipated impacts of the additional funds on the delivery of environmental non-market goods, which it is not possible to quantify as part of this analysis. On the other hand, transaction costs are not taken into account. The growth of value added as a result of modulation is highest in the primary agriculture (0.14%), services (0.04%) and processed food (0.02%) sectors. The impact is negligible for energy sectors and services. The figures for the agricultural sector are similar to those estimated by the Member States in relation to the GVA CMEF Impact Indicator.

The positive impact is mainly caused by the impacts of Pillar 2 measures, particularly the dynamic impact of measures that increase the productivity of production factors such as human and physical capital mainly in Axis 1, for example those that enable investments in new technologies and physical infrastructure to be made, as well as those that focus on improving human capital, thereby helping to rationalise production processes, or to improve the quality of products. In relation to the service and processed food sectors, Axis 3 measures also have a role to play in contributing to increased competitiveness outside the agricultural sector, particularly those focused on incentivising diversification, improvements to rural infrastructure and stimulating tourism.

In addition, the models suggest that net exports increase for all products except for dairy products under the Health Check scenario. Again this positive net trade effect comes from the availability of additional funds for the human and physical capital measures within Pillar 2. In contrast, other Pillar 2 measures seem to be showing the opposite effect on the net trade balance.

Farm Income: The impact of modulation on farm family income is unclear, with different economic models giving slightly differing results. According to FES, at the Member State level it would appear that aggregate farm household income declines very slightly as a result of modulation. Conversely, CAPRI and LEITAP indicate a slightly positive income effect. These results, however, have to be treated with extreme caution as they are very dependent on the assumptions made about which Pillar 2 measures that focus on the agricultural sector are considered to have an income effect. It also masks potentially more significant local and regional differences, particularly between farm types, whereby some types of farms/businesses are likely to benefit and some will lose out in terms of income.

Accepting that most measures within Pillar 2 will only have a small income effect, we would expect that, looking at the overall impact of modulation, the main farm types to 'lose' from modulation would be arable/permanent crops, and beef producers. These types of farm tend to be recipient of higher levels of direct payments through Pillar 1, and although they may receive money back through Axis 1 and Axis 2 measures, it will be conditional on meeting additional obligations in many cases and probably not be sufficient to make up for the losses in their direct payments.

Those that are more likely to gain from modulation include dairy farms and fruit and vegetable producers, due to the lower level of direct payment receipts, and the possibility of them accessing funds through Axis 1 (and possibly Axis 2), as well as suckler cows and sheep and goats, due to the likelihood of their being able to access Pillar 2 funds, particularly agri-environment and LFA support, but also support through Axis 1.

In addition, there may be some counter-intuitive effects, whereby farms with attributes highly compatible with Pillar 2 objectives lose out under modulation because they experience Pillar 1 reductions but cannot access any further Pillar 2 measures, for example because they are participating in all the schemes for which they are already eligible. Such farms are most likely to be those enrolled in multi-annual schemes such as LFA and agri-environment schemes and will include some farms providing significant public goods.

This issue has been explored in the FES model using 2005 FADN data. The results suggest that net changes in farm income are small in most cases. Across the EU-15, grazing farms show the largest proportion of net winners from modulation, with 36% of farms experiencing an increase in farm income of over 0.5% – although this figure masks much higher proportions of grazing farms gaining in France (69%) and the UK (96%). Mixed and diary farms, on the other hand, tend to have the largest proportion of net losers, with 45% of farms experiencing a net decrease in farm income of more than 0.5% – again the figures are as high as 90% in Denmark and 88% in Ireland.

Employment: While some changes in employment both within agriculture and the services, energy and industry sectors are likely to be experienced as a result of compulsory modulation, these changes are very minor. Overall, under the Health Check scenario, employment in the food processing and services sectors increases very slightly (0.02%) and decreases within the primary agriculture sector, albeit only by 0.12%. In relation to the agricultural sector, the main reason for this decrease stems from the reductions in Pillar 1 direct payments. This is then reinforced by the Pillar 2 investments in physical capital (mainly Axis 1), some of which may encourage further structural change. Modernization implies that some labour might be released in the short run but that the remaining farmers are more competitive in the long run. The ones who leave agriculture find a job in other sectors due to Axis 3 measures and a small GDP growth. Modulation therefore encourages and accommodates the process of structural change.

The models, CMEF indicators and case studies, all suggest that, under the Health Check Scenario, higher employment levels are likely to be experienced than would be the case with no modulation, as a result of the input of additional funds in Axis 2 and Axis 3 of the second pillar. However these do not outweigh the decreases seen as a result of reductions in Pillar 1 and the additional availability of funds for physical capital measures. The LFA and agri-environment measures help maintain and generate additional employment both directly within the agricultural sector and well as indirectly within other economic sectors. LFA payments, for example, contribute to farm income and the maintenance of employment in rural areas, and agri-environment schemes can have beneficial employment effects, for example by promoting organic farming, which is generally more labour intensive, and through generating the need for the use of contractors with specialist and traditional skills. In addition, the environmental benefits that accrue from these schemes can lead to indirect employment benefits resulting from increased tourism and recreation. Axis 3 measures relating to creating diversification opportunities, new business start-ups, improving service provision in rural areas an enhancing an area's tourism potential, as well as activities funded through the LEADER approach, all have the potential to increase employment in rural areas, largely outside the agricultural sector. While the impact of these measures on employment creation will be small, given the limited resources allocated to these measures, the impact may be locally significant, contributing to a more diverse and secure job market in rural areas.

Increased levels of modulation only have a minor influence on social and working conditions and these are hard to measure. However, the case-studies point to modulation having a positive effect, particularly as a result of investment in physical and human capital measures, for example improved on-farm infrastructure and increased availability of training.

Quality of Life: Overall the quality of life in rural areas is expected to benefit from increased levels of modulation, although it has not been possible to quantify this impact. Taking GDP as a somewhat crude proxy to reflect the material wellbeing across the EU, any increase in GDP can provide some indication of the potential improvement in the quality of life insofar as this relates to the growth in the economy overall. The models indicate that increased rates of modulation under the Health Check scenario have a positive, albeit very small, impact on GDP growth (0.04% at rates of 13% modulation). This positive result is entirely due to the increased availability of funds, and their associated national co-financing, within Pillar 2. The effect is largely caused by those Axis 3 measures which are focused predominantly on investments outside of the agricultural sector, for example on the setting up of new businesses, improving rural services and promoting tourism.

Looking beyond GDP, at low levels of modulation, reductions in Pillar 1 would not appear to have any real impact on the quality of life in rural areas, as no significant effects in terms of farm restructuring or land abandonment are experienced. However, drawing mainly on evidence from the case studies, increases in expenditure in Pillar 2 do have a positive effect on quality of life by increasing the funding available for measures that promote innovation, create employment opportunities, improve access to services for the rural population or provide funding for activities that can improve the economic attractiveness of, and thereby encourage investment in, rural areas. Increased availability of funding for activities implemented under the LEADER approach can help to further increase capacity building, and strengthening co-operation within local areas, which alongside the social benefits, may also lead to economic and environmental benefits. Beyond Axis 3 and the LEADER approach, the LFA and the agri-environment measures stand out as having the potential to enhance the quality of life in rural areas in relation to their role in maintaining and enhancing the attractiveness of rural areas, and hence in attracting increased tourism. In addition, the case studies highlighted the value of these measures for keeping people in farming, which therefore constrains somewhat the trend towards outmigration.

Environment: Overall, the impacts of modulation on the environment are positive for all environmental parameters including biodiversity, water quality, soil quality, landscape and climate change. These positive impacts are the result of the availability of additional funds within Pillar 2 and relate to a whole range of measures across all four Axes. The extent of these impacts, however, is hard to quantify beyond general terms.

The reductions in Pillar 1 direct payments do not appear to have had significant impacts on the environment. This is unsurprising, given that the impacts on agricultural producers (in terms of influencing factors of productivity, farm structure and income) of reducing Pillar 1 payments have been shown to be limited. The models show that there may be a small increase in land leaving agriculture as a result of reductions in Pillar 1 payments; however, these appear to have been more than compensated for by increases in the availability of funds within Pillar 2, particularly for the LFA and agri-environment measures. These impacts could, of course become more significant as the modulation rate increases and/or the franchise level changes.

The availability of additional funds within Pillar 2, however, is likely to have a significant impact upon the environment across the EU-15, but particularly in Finland

and the UK (England) where the additional funds have been specifically focused on the agri-environment measure. In all Member States, modulation can be seen to have a positive impact on the trends identified for the CMEF impact indicators relating to the area of HNV farmland, the farmland bird index, nutrient surplus and production of renewable energy. In relation to the CMEF result indicators, modulation, under the baseline scenario, is estimated to enable over 5 million hectares of land to be managed in ways that benefit biodiversity, 3 million hectares to be managed to help improve water quality and soil quality and 1 million hectares to be managed in ways that will help with climate change mitigation and/or adaptation.

The results also suggest that the availability of additional funds for, in particular, the agri-environment and LFA measures is likely to retain slightly more land under agricultural management that would be the case without modulation. The models show that this land is more likely to be grassland, than cropped land. The CMEF impact indicators also show that a significant area of land is anticipated to be prevented from being abandoned over the 2007-13 programming period. While the proportions of land indicated by the models are very small (under 1% of all agricultural land), in reality, the effect could be much greater. It would certainly not be a uniform impact across the EU-15 and will depend crucially on local factors such as succession, land ownership, remoteness from markets etc.

The results from CAPRI enable the potential environmental benefits of investment aid for farm modernisation and other Axis 1 measures to be seen, particularly in terms of reducing nutrient surpluses, pesticide use and greenhouse gas emissions. It is also clear from the case studies that a number of Member States are using these measures to improve the sustainability of the agricultural sector and limit its environmental footprint. Increased funding for these measures is likely to be leading to an increase in investments in infrastructure that improves waste management in water saving solutions/technologies; in renewable energy technologies and infrastructure; the development of community led projects for the production of renewable energy; and improvements in energy efficiency for local businesses.

7.4 Gaps / Research and analytical issues that need follow-up

The study has sought to explore the impacts of modulation through the use of economic models and national case studies. This has revealed the considerable methodological and data challenges inherent in a complex policy evaluation exercise of this kind. This is particularly the case in seeking to specify and quantify the impacts of rural development policies in Pillar 2. Since these measures are a growing element of the CAP it is recommended that further investment both in analytical tools and data collection (at different geographical levels) is prioritised at both the Member State and EU level.

The availability of good quality, precise and comparable empirical evidence on the impacts of Pillar 2 measures at local, regional and Member State level is critical to inform future policy evaluations. While the CMEF indicators are a helpful step towards facilitating a more informative analysis of the impacts and estimates provided by Member States within their RDPs on the anticipated outputs, results and impacts of the various measures within Pillar 2, these need to be complemented by detailed monitoring programmes at the Member State level.

The newly established rural development and evaluation networks could offer a timely opportunity in this regard. These networks could be used to provide an assessment of current monitoring and evaluation programmes within individual Member States and work with the national networks to share good practice, and improve monitoring programmes to ensure that the benefits of Pillar 2 measures can be assessed more precisely and the information disseminated widely across all Member States.

If modelling is to be used to predict the impacts of different policy scenarios in relation to Pillar 2 measures with greater confidence, then again empirical evidence of the efficiency and effectiveness of these measures is crucial. For example, information about the rates of return to human and physical capital investments is needed, the level of deadweight or crowding out effects, transaction costs, and the impact of environmental measures on yields. Europe-wide economic models need to be developed further to enable them to reflect more locally differentiated impacts, including by farm type, based on the different ways in which measures are implemented in different locations. The work currently being undertaken in EUruralis 3.0 and the FP7 project 'CAPRI-RD' is a good start in this regard. Another large area of research is the conceptualization, modelling and monetization of public goods.

ANNEX 1 DESCRIPTION OF THE CHAIN OF MODELS: LEITAP – ESIM – CAPRI – FES – DYNA-CLUE

To perform the analysis, a modelling framework is constructed, existing of four economic models (LEITAP, ESIM, FES, CAPRI) and a land use allocation model (Dyna-CLUE) to disaggregate the outcomes spatially. In this modelling framework the economic and environmental consequences of different scenarios are quantified and analysed, starting from 2007 up to 2013, for several regions in the world[69] and in the EU-25 or EU-27, according to which model is being used.

The role of ESIM is the projection of developments in EU agricultural markets into the future (Banse, 2008). The role of FES is to assess the impact of changes in modulation at the farm level (specifically the viability of farms) in the EU-25. CAPRI's main function is to assess the regional impact of modulation (NUTS2 level, Britz at al., 2008). In order to be able to assess the impacts of modulation as accurately as possible, the CAPRI model has been extended to take account of article 69 payments within the Pillar 1 and the second pillar measures. Within CAPRI, RD measure groupings[70] *03 LFA*, *04 Natura 2000* (N2K) and *05 Agri-environment* (AE) are assumed to have a direct impact on agricultural land use. The remaining measures are assumed to work indirectly by influencing factor productivity and costs. Therefore the LFA, N2K and AE measures are directly accounted for in CAPRI, and the remaining measures are captured by linking the costs and production technology of CAPRI to the simulated results of LEITAP, where those other measures are explicitly implemented. This is consistent with the CAPRI accounting principle, according to which agricultural income is accounted for as modified gross value added, i.e. agricultural revenues plus premiums minus variable costs. The main contribution of LEITAP is to consider the impacts of modulation on the rest of the economy (other industries and factor markets). The ESIM and CAPRI models are EU-25 partial equilibrium models for the agricultural sector at country and NUTS2 level respectively, with a strong focus on the CAP.

The FES model is a farm level financial economic simulation model originally developed for Belgium and the Netherlands. For the purposes of this study, the FES model has been extended to the EU-25 countries. The model uses FADN data and has a strong focus on the CAP. FES calculates the effects of modulation in relation to farm structures and viability for FADN farms. Aggregations are made to enable analysis of the effects of modulation by farm type (TF8) and by size class (ES7). At the Member State level there is information available on the effect of modulation on a range of variables. The most important ones for this project are: the Pillar 1 payments, farm viability and farm income. The cut in Pillar 1 payments is returned to the Member States through an increase in the money available for Pillar 2 measures. FES, takes into account the additional money available for LFA, agri-environment (AE), physical capital and human investment payments.

[69] In order to understand the development of agricultural development in the baseline, as was the case in Scenar 2020 (Nowicki et al, 2007)), and in particular to analyse competiveness in the EU compared to the rest of the world.

[70] As set out in Chapter 1, Section 1.4.

LEITAP is a global computable general equilibrium model that covers the whole economy including factor markets and is often used in WTO analyses (Francois et al., 2005) and CAP analyses (Meijl and Tongeren, 2002). More specifically, LEITAP is a modified version of the global general equilibrium Global Trade Analysis Project (GTAP) model. Agricultural policies are treated explicitly (e.g. production quotas, intervention prices, tariff rate quotas, (de)coupled payments). Information is used from the OECD's Policy Evaluation Model (PEM) to improve the production structure (Hertel and Keening, 2006) and a new land allocation method, that takes into account the variation of substitutability between different types of land (Huang et al., 2004), as well as a new land supply curve have been introduced (Meijl et al., 2006b; Eickhout et al., 2007). A key feature of modulation is that some measures like physical and human capital investment have dynamic impacts. For example training increases labour productivity, and increased labour productivity has a positive impact on yields; an investment in one year has cumulative effects over following years. To include these dynamics the LEITAP model has been extended to include a recursive dynamic version with endogenous technological change by specifying a relation between investments and productivity change.

In the final modelling stage the spatially explicit land use model Dyna-CLUE (Dynamic Conversion of Land Use and its Effects) is used. The Dyna-CLUE model disaggregates the outcomes of ESIM – CAPRI – LEITAP to a temporal resolution of two years and a spatial resolution of 1 km. Dyna-CLUE provides a cross-sectoral approach that includes all land use relevant sectors, while ESIM – CAPRI – LEITAP mainly address agricultural land use. To provide a comprehensive analysis of land use dynamics it is important to include all relevant sectors because the future of Europe's rural areas is dependent on the combined effect of various developments including changes in agricultural land use, land used primarily for nature conservation, peri-urban development, forestry, recreation, etc. The Dyna-CLUE model takes information on the amount of agricultural land used by the different sectors at the national level, provided by the economic models, and allocates this over the land area according to location suitability, spatial policies (LFA, Natura 2000) and rules for natural succession. With regard to location suitability, environmental (biophysical) driving forces, which determine the allocation of land use, are explicitly accounted for. In the economic model chain these factors are not taken into account.

The Dyna-CLUE model helps in assessing the modulation impacts by downscaling and visualising the impacts of modulation shown by LEITAP in relation to local land use patterns. It is possible to identify critical regions impacted by the effects of changes in total agricultural area and possible land abandonment. Moreover, the spatially explicit results allow an assessment of the changes within geographically delineated areas, where some Second Pillar measures are targeted, including Less Favoured Areas and Natura 2000 areas.

More specifically, the model addresses the possible impacts of strengthening a number of Pillar 2 measures through modulation, including measure:

- 211: Natural handicap payments to farmers in mountain areas
- 212: Payments to farmers in areas with handicaps, other than in mountain areas.
- 213: Natura 2000 payments and payments linked to the Water Framework Directive

- 221: First afforestation of agricultural land
- 224: Natura 2000 payments for forestry

The estimated effects of enhancing these measures are assessed in a semi-quantitative way since these measures can have different types of implementation that may be region dependent making a consistent assessment difficult.

Links between the models

To obtain consistent results the models are linked to each other (see Figure 2.4 in main text). The budget model provides information to the other models on the effects of modulation on the first and second pillar budgets under the different scenarios. The case studies and literature review provide information on the impact of modulation on variables such as production and technology. This information is used by the models to adjust their model structure and to obtain a link between measures and inputs to their models. The LEITAP model uses information on policy changes from the budget model and information from the case studies and the literature on, for example, the impact of human capital investments. It provides to the other models the changes in national income (GDP), consumer price index (CPI) and factor prices, and especially the change in land use for Dyna-CLUE. Based on the macro-economic indicators of LEITAP, the partial equilibrium model ESIM provides projections of agricultural commodity quantities to CAPRI at national level. The farm level FSS model uses budget information and expert information and provides information on the impact of modulation on yields and revenues to CAPRI. CAPRI uses the information of all other models and provides results at the regional level.

The link between CAPRI and LEITAP was set up by linking, top-down, and the following items in LEITAP to parameters of CAPRI:

Table 1. Link between LEITAP and CAPRI

LEITAP	**CAPRI**
Consumer expenditure	Consumer expenditure
Price index of consumption	Consumer price index of the non-agric. good
Price index of tradable inputs that are not agricultural and not services	Prices of fertilizers and other variable inputs
Price of services	Price of maintenance and service inputs
Prices of Capital and Skilled and Unskilled labour	Shift of the behavioural term of the producers' objective function
Total factor productivity (Hicks-neutral technical change[71])	Yield increase 50%, input reduction 50%

The linking of the prices of capital and labour to the behavioural function is important. It was obtained in two steps. In the first step, the approximate use of labour and capital in the production of CAPRI goods was computed. This was done using a special aggregation of the GTAP[72] database, where agricultural products were disaggregated as finely as possible, and the regions were aggregated in a way similar to CAPRI. The shares of labour and capital in the agricultural sectors of GTAP were computed and mapped to the CAPRI products, where they were multiplied by the sum of market revenues plus premiums for the corresponding agricultural activities. The resulting numbers were termed *quasi-input-coefficients*, and are interpreted as the use

[71] The relation between and the amount of input does not change but more output is produced.

[72] Global Trade Analysis Project

of capital and labour in constant euro. In the second step, LEITAP is run for any scenario, and the percentage change in the prices of capital and labour is computed. That percentage change is used to shift the behavioural term of the CAPRI objective function, i.e. to change the marginal cost of each production activity in direct proportion to its quasi-input-coefficients.

The link for capital and labour has the drawback that it does not consider possible substitution of capital for labour or vice versa in LEITAP, because it uses static quasi-input-coefficients. Nevertheless, it essentially captures the effect of changes on the factor markets. However this effect is marginal, and therefore the error in the specification due to the static coefficients should be negligible.

LEITAP translates the Human and Physical Capital Investment measures into (Hicks-neutral) technical change, which implies an expansion of the entire production function. As this turns out to be key to the impact of the second pillar, it is important to link CAPRI technical progress in LEITAP in a way that captures its *essence*. In LEITAP, the (Hicks-neutral) technical change does not distinguish "producing more output with the same inputs" from "requiring less inputs for producing the same output". In contrast, CAPRI assumes a micro-economic model where the producer decides about the allocation of land and numbers of animals, not about tons or euros of final product. Most technical input/output coefficients in CAPRI, such as yield and input use, are on "per hectare" or "per animal" basis, and the production structure is more rigid (essentially "Leontieff"[73]). Simply increasing yields and leaving the input coefficients unchanged (per hectare or head) would formally imply the proper sort of technical progress, but the rigid Leontieff structure would prevent the "CAPRI-farmer" from moving along the production possibilities frontier to a position where some of the output increase is traded for less input use *per hectare*. In reality, technical progress consists of a multitude of small improvements, many of which are input saving (per hectare or animal). In order to reflect this in CAPRI, an interpretation of the result from LEITAP was chosen where technical progress is partly neutral (a yield increase) and partly biased input saving in such a way that less inputs per hectare or animal is required. Since neither LEITAP nor the case studies provides detailed information on the details of technical change, a blanket assumption of 50% yield increase and 50% input saving was applied across all activities and inputs in CAPRI.

Treatment of first and second pillar measures within the models

In order to be able to asses the reliability of the outputs of models effectively, it is necessary to elaborate on the way in which the first and second pillar measures have been treated in the quantitative models. The economic tools, as they currently stand, are more useful tools for the analyses of the effects of modulation on the first pillar of the CAP, but less so for the analyses of effects of modulation on the second pillar. However, modelling the reductions in direct payments within the first pillar is also not without its problems as the impact of decoupling and the reductions of decoupled payments are not yet empirically known. Pillar 2 measures are difficult to analyse mainly because of the range of different measures, with different objectives, and which can be implemented in many different ways in individual Member States or

[73] Big parts are driven by fixed coefficients in input and output.

regions. In addition, any attempt of modelling second pillar measures such as physical and human capital investments needs to include *dynamic* effects.

The effects of reducing first pillar payments

There are two methodological issues to be dealt with in relation to reducing first pillar money. The first is the issue of how to model payments in the SPS, and the second is how to model the implementation of the reduction of the direct payments themselves (see Table 2). Decoupling of first pillar money from production is difficult in agricultural commodity models, as the impact of decoupling is not yet empirically known. The way that direct payments have been dealt with within the models for this study is based on the general logic of intervention for direct payments, accompanied by available literature which considers the effects of these payments on production factors.

It is clear that, due to the coupling options provided in regulation 1782/2003, not all payments enter the single payment system (SPS). Most total direct payments in 2013 will consist of explicitly decoupled SPS payments, but some will be partially coupled to production either via the options for maintaining coupled support or via "article 69". The effect differs across Member States depending on their choices in implementing the 2003 reform

In 2007, the 82% of the SPS payments that are fully decoupled continue to be largely based on historic entitlements and do not relate to current prices. There is, however, a weak *direct* production link still in place, via restrictions that the land corresponding to the payment entitlements must be kept in "good agricultural and environmental condition", i.e. land cannot be abandoned or leave agriculture. Furthermore, there may be an *indirect* effect via income: theoretically, a lump sum payment has no influence on production decisions, if farmers operate in perfect market with no risk and uncertainty. But these are rather strong assumptions. Therefore one observes the following five lines of arguments which imply some effect of decoupled income support on production:

Firstly, because direct decoupled income support is a rather fixed and reliable income component, farmers may go for more risky production in agriculture, with higher levels of input use and output. This would be a reason for a positive production effect of direct decoupled income support (Sckokai 2005, Roche and McQuinn 2004).

Secondly, farmers might be liquidity constrained and also because of differences in interest rates for debts and savings, the availability of direct decoupled income support can stimulate investment (Vercammen, 2003; Sckokai, 2005; Bezlepkina et al, 2005, Hennessy and Thorne 2005).

Thirdly, direct decoupled income support leads to an increase in income and wealth (either directly or via asset prices). This income and wealth effect may reduce the labour time of farm households in agricultural production (Ooms and Hall, 2005; Ahituv and Kimhi, 2006; Kimhi and Rapaport, 2004).

Fourthly, decoupled income support may influence the structure of agricultural production by keeping more farms in business than would be the case in the absence of support (a freezing effect), but also by an increasing number of small and medium

sized farms who give up farming and sell land, quota (including the rights on direct income support) to larger and more efficient farms. Often large farms generate more production per hectare. The structural effects of direct income support is ambiguous and an item for further research (Schunk, 2001).

Finally, decoupled direct income support can easily leak away to other parts of the economy, for example by being capitalized in agricultural land rent of land owners (Burfisher and Hopkins, 2003). As usual with agricultural policy measures, the rent element leaks away during the ownership change of farms or farm assets.

Given these considerations in CAPRI, the decoupled payment is modelled as a direct payment linked to land, but where the amount paid is the same regardless of how the land is used, as long as it is not completely abandoned. Thus, the payment has the effect of increasing land rents (compared to no policy), increasing agricultural income and of preventing land abandonment, but has no effect on the choice between eligible crops. Wealth and insurance effects are not modelled, and neither is the potential effect on farm viability, since neither risk nor single farms are explicitly modelled in CAPRI.

The treatment of abandoned land is particularly tricky. In CAPRI there is, in addition to set-aside, also the possibility to abandon land, which costs nothing at all for the producer to maintain (because it is not maintained). In reality, there appears to be a class of land that is something in between set-aside and fallow land, which is eligible for premiums but is not part of the rotation. Such an “activity” was created in CAPRI, with the same variable cost per hectare as voluntary set-aside by splitting up the class “fallow land”. It is as of yet empirically unclear how large a share of the fallow land actually is eligible for premiums. In the current study, we assumed that the share was proportional to the ratio of voluntary set-aside plus non-food production on set-aside in relation to total fallow land, limited to be between 25% and 75% of the total fallow land area. This implies that the single farm payments are treated as very close to fully decoupled (see analysis of the degree of coupling below).

A similar approach has been chosen for the general equilibrium model LEITAP. In LEITAP, decoupled direct payments are also modelled as factor payments. It is assumed that all production factors in all agricultural sectors that are eligible for single farm payments receive the same payment rate. Therefore, the payment has no effect on the choice between eligible crops within agriculture and no effect on the choice of which production factor to use in production. However, in this economy wide model the payment favours agricultural sectors relative to manufacturing and service sectors. Due to the payments, farm income increases and more production factors stay within the agricultural sector. And thus, for example, land abandonment will be less.

With regard to Pillar 1, the FES model is especially helpful to get insight with regard to the continuity perspectives and the impacts on financial ratios such as family income, modernity of the assets and solvency rates. Since the calculations are based on individual data, information can be provided about regions, farm types, etc.

The way that the models have dealt with Pillar 1 payments is set out in Table 2.

Table 2. Treatment of Direct Payments (Pillar 1) in models

	Treated in Model	Implementation
Direct Payments (1st pillar)	LEITAP	Farm payments are implemented as primary factor payments in the various agricultural sectors. Coupled payments are directly coupled to sectors. Decoupled payments are implemented as an equal payment rate to all factors in all eligible sectors and therefore do not provide an incentive to switch between eligible sectors and between production factors used within the eligible sectors.
	FES	Farm payments are directly calculated and implemented at farm level
	CAPRI	Analyses the effects of changes in farm payments at the regional farm and sector level. CAPRI distinguishes between a large number of types of premiums. Decoupled premiums as, for example, milk and sugar premiums are distributed over the eligible crops of the regional farm. Coupled premiums are linked to agricultural activities at the regional level.

After implementing the decoupling the implementation of the modulation reductions is rather straightforward.

All direct payments to the agricultural sector are subject to modulation, which means a reduction of payments. The effective rate of modulation enters the definition of each premium taken into account and is processed in the premium module of CAPRI. The challenge is thus to compute the proper modulation rate. In reality, the effective rate of modulation of direct payment differs per farm, depending on the amount of direct payment received, such that the funds above certain thresholds are subject to greater reduction rates. CAPRI computes the effects of modulation at the regional farm and sector level. Thus, the farm structure is not applicable within CAPRI. Moreover, the CAPRI database is not directly built from individual farm data but from regional statistics. Hence, direct payment per farm is not a variable in CAPRI and effects at market level can not be analysed directly. To overcome this problem, an approach using a static distribution of farm payment receipts is implemented.

The *Health Check* scenario increases the modulation rate, but allows for differing rates to be applied depending on the level of direct payments received. This is set out as a "banded" approach that implies that the more money a farm receives per year, the greater the rate of modulation. Great effort has been made to implement a flexible and policy-like computation of modulation rate. The effective modulation rate R is computed as

$$R = \frac{\sum_i \left[n_i \left(p_i - c_{i,"min"} \right) r_i + \sum_{j: c_{j,"max"} < c_{i,"max"}} n_i \left(c_{j,"max"} - c_{j,"min"} \right) r_j \right]}{\sum_i n_i p_i} \qquad (1)$$

where

i denotes the "bands", i.e. the farm classes of pillar 1 receipts;
n is the number of farms;
p is the average annual pillar 1 receipt per farm;

c is the matrix of lower and upper bands for the size class; and
r is the modulation rate per class.

The rationale behind the equation is the following: The numerator sums up the amount of modulated money within each band *i*. The first term of the numerator computes the modulated money for farms receipts that fall inside the current band, but only the part of the average farm receipt p_i that is greater than the lower bound $c_{i,\text{“min”}}$ for the current band (the part of p_i that is lower than the current lower bound of the band is handled by the second term) multiplied by the number of such farms n_i multiplied by the modulation rate for that band r_i. The second term adds the modulated money for farms falling in the current band for each band that is lower than the current band, e.g. it adds 0 EUR for the first 5000 EUR of receipts, plus 5% percent of the next 5000 EUR and so forth. Then the whole sum of modulated money for all bands is divided by the total premium receipt in the sample (the denominator). The computation of effective modulation rate is done separately for each region and premium scheme, and also separately for voluntary and compulsory modulation. Those indices are omitted in equation 1for clarity.

The classes used in the size distribution of farms are adapted to the bands proposed in the Health Check. The size classes are set out in Table 3.

Table 3. Modulation bands. Class limits for farm size classes (euro per farm), matrix ***c*** in equation 1.

Class	Min	Max
0 to 5	0	5000
5 to 10	5001	10000
10 to 100	10001	100000
100 to 200	100001	200000
200 to 300	200001	300000
300+	300001	No limit

Data on the number of farms *n* and the total CAP pillar 1 receipts *np* in each class are obtained from FADN for 2005. Furthermore, the number of farms and first pillar receipts are further disaggregated to each of eight broad farm types, set out in Table 5. Each premium scheme[74] of Pillar 1 in CAPRI has been mapped to one and only one of those farm types, so that there is potentially a different modulation rate for each premium depending on which farm type typically receives the premium. However, within the single payment scheme, most of the budget is allocated to direct payments, which cannot be attributed to a specific farm type, and thus most funds are linked to the aggregate farm type “Total”. For Bulgaria and Romania, no modulation was assumed in 2013. The computed effective modulation rate per country, aggregated over all premiums, taking all of the above into account, is shown in Table 4 below.

[74] E.G. for suckler cows, etc.

Table 4. Average effective modulation rates per EU member state in CAPRI in 2013 with both the 5% and Health Check scenario modulation rates and a franchise of 5000 euro.

	5% modulation rate			HC scenario modulation rate		
	Compulsory	Voluntary	Total	Compulsory	Voluntary	Total
Belgium	3.79		3.79	9.87		9.87
Denmark	4.08		4.08	10.80		10.80
Germany	4.04		4.04	11.84		11.84
Greece	1.57		1.57	4.09		4.09
Spain	2.96		2.96	7.73		7.73
France	4.17		4.17	10.90		10.90
Ireland	3.08		3.08	8.01		8.01
Italy	2.97		2.97	8.33		8.33
Netherlands	3.73		3.73	9.72		9.72
Austria	2.70		2.70	7.01		7.01
Portugal	2.84	5.69	8.53	7.58	1.02	8.61
Sweden	3.93		3.93	10.36		10.36
Finland	3.43		3.43	8.95		8.95
UK	4.40	14.00	18.40	11.94	6.51	18.45
Cyprus	2.83		2.83	2.83		2.83
Czech Republic	3.41		3.41	3.41		3.41
Estonia	2.93		2.93	2.93		2.93
Hungary	3.20		3.20	3.20		3.20
Lithuania	1.83		1.83	1.83		1.83
Latvia	2.62		2.62	2.62		2.62
Malta	3.18		3.18	3.18		3.18
Poland	1.48		1.48	1.48		1.48
Slovenia	1.09		1.09	1.09		1.09
Slovakia	3.82		3.82	3.82		3.82
Luxemburg	3.79		3.79	9.87		9.87

Source: Own simulations with CAPRI.

The farm size distribution obtained from FADN is constant. Thus, any impact of modulation or other policies in CAPRI on farm structure will not impact on the effective average modulation rates given in Table 4.

Human capital investments

Investments in human capital (7% of the total EAFRD budget), according to the intervention logics for these measures, are likely to lead to an overall increase in productivity, higher levels of knowledge may lead to better use of machinery and treatment of cattle, better fertiliser, pesticide and feed use, more efficient organisation of work, and more efficient use of land (for example through better timing, producing higher quality products). Thus, human capital investments result in a general productivity increase. The LEITAP model is extended by including a direct link between human capital payments and technological change. As we have no empirical information from the literature or case studies about the factor bias or effectiveness of human capital expenditure within the rural development programmes, we assume that they have a similar rate of return as other general human capital investments and we assume a Hicks neutral rate of technological change (all production factors and inputs will be reduced with the same rate of technological change). Evenson (2001) provides an excellent overview on human capital investments, suggesting a internal rate of

return of 40% for the OECD countries (see, tables 8 and 9). We explain the increase in labour productivity by the education and training expenditures per unit of output. The implementation implies that if 1% of total revenues are used for investment in human capital, output productivity increases with 0.40*1%= 0.40%.

The case studies and literature review indicate that, in some cases (for example in relation to the early retirement measure), investments are likely to have been undertaken also in the absence of Pillar 2 funding for human capital. In economic terms there is a crowding out or deadweight effect. Precise estimates on the magnitude of this do not exist, and therefore we have taken a crude assumption that 0% of the funds used for investments in human capital, fund investments that would have been carried out anyway. As this assumption is crude we have also carried out a sensitivity analyses with a deadweight effect of 25%. The deadweight element of the payments for human capital investments are considered as an income payment. It is important to realise that human capital investments provide a growth in productivity each year, so there will be a cumulative impact in 2013 Therefore in LEITAP output productivity will be increase by 100% (because 100% of the payments are assumed to be effective as deadweight is 0%) of 0.4% (because of the rate of return on investment in education) of investment per unit of output. In case of 25% deadweight loss, only 75% of the payments are effective and the other part of the payment has no consequences for behaviour, but increases farm income.

The CAPRI model includes the impact of human capital investments by a link with the LEITAP model. The measures "01 – Human capital investment" is implemented in LEITAP to produce a Hicks-neutral technical change. It implies that with a given input mixture, more output is produced, and is obtained by increasing the whole production function (per sector) in LEITAP by some factor a_o, where the index "o" denotes that it is the output that is affected (in contrast to factors of production). In a normal simulation with LEITAP, a_o equals "1", and in the modulation study it is only influenced by the investments in Human and Physical capital. It is worthwhile noting that a_o is sector specific.

CAPRI reads a_o from LEITAP, and uses it to on the one hand increase yield by 50% of a_o (since it is a factor, we use $1 + [a_o - 1]/2$), and on the other hand to decrease input requirement by 50%. This ad-hoc division of the effect is necessary in CAPRI since the production technologies essentially work with fixed input/output coefficient in contrast to a smooth production function as in LEITAP.

Physical capital investments

Physical capital investments, according to the intervention logics for these measures, are likely to lead to an overall increase in productivity. For example, new machines may automate feeding, improve the precision of fertiliser distribution (reducing use and increasing productivity), save on labour use, but increase the cost of capital. Physical capital investments are included in the FES and dynamic LEITAP model. We assume that physical capital investments provide each year a growth in productivity, so in 2013 we obtain the cumulative impact.

Extra capital investment may renew the capital stock, and therefore accomplish an increase in productivity because of capital embodied technology. In the implementation we did a very simple thought experiment. As we do not have

sufficient information from case studies or literature about the factor bias in technological progress we assume a general productivity increase (Hicks neutral technological change) in the same way as for human capital investments. As we have no solid empirical evidence of deadweight loss we also assume a 0% deadweight effect in relation to investments in physical capital that would also have been undertaken without funding. A sensitivity analysis with a 25% deadweight effect is also carried out around this assumption.

Indirect estimates of the vintage effect of investment in physical capital on productivity can be found in Wolff (1996), De Long and Summers (1991) and Gittleman, ten Raab and Wolff (2006). Wolff (1996) finds a coefficient of -0.041 for the change in the age of the capital stock. If we assume that one year decrease in average age of capital requires an investment of about 1/12 of capital stock, the implicit coefficient for the aoall is 15*0.041=0.66, i.e. higher than our coefficient. Gittleman, ten Raab and Wolff (2006) suggest that the vintage effect in Wolff (1996) is much too high.[75] So, we assume that an extra investment of 1% of the capital stock generates an increase in output productivity of 0.3*1%=0.3%.

As we do not have sufficient information from case studies or literature about the factor bias in technological progress, we assume a general productivity increase (Hicks neutral technological change) in the same way as for human capital investments. We also assume a 0% deadweight effect in relation to investments in physical capital that would also have been undertaken without funding. A sensitivity analysis with a 25% deadweight effect is also carried out around this assumption. A review of other sources of literature in relation to physical capital, suggests that the rate of return on investment in capital is 0.3, implying that investment of one dollar per unit of physical capital stock increases output productivity with 0.3%. Therefore, in LEITAP output productivity will be increased by 100% (because 100% of the payments are assumed to be effective) of 0.30% (because of the rate of return on investment) of investment per unit of physical capital stock. In case of 25% deadweight loss, only 75% of the payments are effective and the other part of the payment has no consequences for behaviour, but increases farm income.

The CAPRI model includes the impact of physical capital investments by a link with the LEITAP model similar to human capital investments. In FES physical and human capital payments are treated as a direct payment to investments. Additional investments in human and physical capital provide a small additional return to the farmer of about 10%. Since this return is received during the life span of the asset, only a very small increase in farm income is realized. The deadweight is assumed to be 25%.

LFA land use support

LFA payments provide compensation for producing under less efficient circumstances, with the aim of keeping land in marginal areas under production. Pufahl and Weiss (2008) have analysed the effects of LFA payments schemes in

[75] It is important to be aware that the vintage productivity effects are probably not long term effects. Faster implementation of new technologies may just speed up the process. But, on the other hand, through learning by doing and inventions made by experience with the new capital goods may speed up also long-term technical progress.

Germany by comparing similar farms with and without LFA payments. They find that LFA payments especially keep land into production and have a small positive production effect.

In CAPRI the LFA measure was implemented as a direct payment to arable cropping and grassland. The first challenge encountered when implementing the LFA premiums is that the regions do not coincide with the administrative regions used in CAPRI. It is important to remember that CAPRI only has one single representative firm in each NUTS2 region. In reality, only a share of the land in a NUTS region, generally much less than 100%, is eligible for LFA payments, and it may very well be the case that the specialisation of farms operating on that land is different from the regional average. For example, one may expect that a mountainous LFA area contains more grassland than the surrounding flat land agricultural areas in the same NUTS 2 region. In order to capture a possible bias of this nature, data from Dyna-CLUE was used to compute the shares Sij of LFA in different broad land-use classes j ∈ {non-irrigated arable land, irrigated arable land, pasture, permanent crops} in each region i. Those shares were multiplied by a nominal premium rate A to compute an average premium amount Pij for crops belonging to each class j in each region i. These computed amounts were taken to reflect the biased distribution of crops inside and outside of LFA regions. Since Dyna-CLUE does not distinguish "Mountainous" and "Other" LFA, the nominal amount A to which the shares S were applied was assumed the same everywhere: 250 euro, the maximum amount in mountainous LFA regions.

$$P_{ij} = AS_{ij} \qquad (2)$$

where P : Premium per hectare
i : Region
j : Group of crops
A : Maximum amount per hectare, 250 euro
S : Share of LFA in all land of class j

A value ceiling for the premium was computed by adding the budgets for the component measures, coming from the LEI budget model. Recall that the premium module of CAPRI will apply a cut factor to the amount *P* such that the ceiling is not overshot.

In economic terms, the potentially different premium rates for different groups of crops has a production effect, so that the type of production in CAPRI that receives the higher rates may expand at the expense of other activities. The interpretation would be that more farmers in the LFA areas comply with the LFA eligibility rules and modify their production plans to comply with the criteria within these areas. Nevertheless, this is a simplification, because in CAPRI, no special technical restrictions are required in order to comply with the payment.

In LEITAP a payment to land is used as a proxy for LFA payments. Information on the distribution of the payment across sectors from FADN (2005 data) is used to distribute payments across sectors (e.g. pork and poultry and horticulture receive no LFA payments, and relatively more payments are distributed to grassland than cropland). In FES, farmers in LFA areas receive an additional grant, dependent or their area.

Natura 2000 payments on agricultural land

In CAPRI the N2K premiums are modelled in a similar way to the LFA premiums, but now with the additional assumption that the payments are conditional on extensification, reflecting management restrictions. This was implemented using the two alternative technologies mentioned in the description of CAPRI. Thus, only the technological alternative with a yield 20% below the NUTS2 average and lower input requirements (following a yield function) was made eligible for the payment. This is based on no empirical investigation, but is a pure assumption based on the fact that the N2K payments are conditional on extensive management practices.

The interpretation is the following: If more money is spent on the measure, more farmers within the designated areas may switch to extensive agriculture OR maintain existing extensive management practices. Then the average payment per hectare of the NUTS2 region would increase, reflecting that a larger share of the farmers now participate in the measure. It is today indeed the case that not all farms within an N2K area receive support.

In LEITAP a land payment is used as a proxy for Natura 2000 payments as in the case of LFA payments.

Agri-environment payments

The agri-environment measure aims to encourage farmers and other land managers to introduce or maintain production methods compatible with the protection of the environment, the landscape and its features, natural resources, the soil and genetic diversity that go beyond mandatory standards. In terms of public funding, it accounts for the largest proportion of expenditure within Pillar 2. It provides compensation for income foregone as a consequence of lower land productivity, extra labour and other costs. Pufahl and Weiss (2008) show that agri-environment payments can generate an increase in land use, generally marginal land that might otherwise have gone out of production. Furthermore, the share of grassland increases.

The use of the agri-environment measure results in a very diverse set of schemes and management options being implemented in individual Member States. In CAPRI, in contrast to the way that the LFA and N2K measures are treated, it would not have been meaningful to model a uniform implementation across Member States. Instead, a way of capturing the national or regional preferences within the agri-environment schemes needed to be captured.

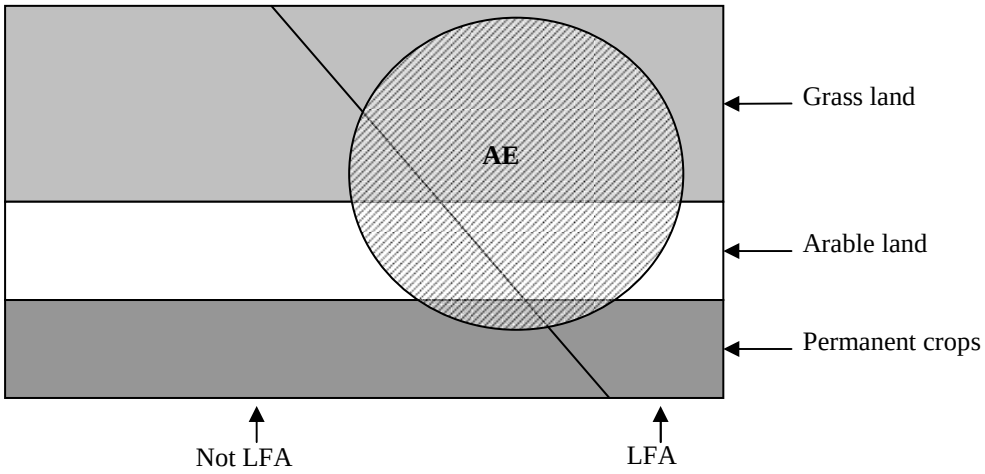
The method for doing this has been to distribute the sum of AE payments to agricultural sectors using the receipts by farm types according to FADN in 2005 as the key. This is obtained by splitting the single AE measure 05 into eight different types of AE measures, which do not correspond directly to real AE measures, but are intended to be homogeneous in respect to which type of farming (if any) is targeted. The translation from TF8 farm type to CAPRI production activities is given in Table 5.

Some of the case studies suggest that a farm is more likely to participate in an AE scheme if it is located in an LFA region. Given that farms in LFA regions may have a different production mix than farms which are not in an LFA region, the allocation of the eight TF8 types to CAPRI activities was refined further by using the share of a

region that is LFA. The allocation was accomplished as follows: (1) Compute for each region, using FES results (FADN 2005), the average AE payment per hectare per TF8 farm type conditional on a farm being inside or outside of LFA. (2) Compute the average payment per hectare for each crop in the whole nuts 2 region by multiplying the expected payment per hectare computed in step (1) with the share of the land type primarily used by that farm type that is inside or outside LFA, given by Dyna-CLUE.

The principle of the allocation of AE payments is illustrated using Figure 1. The large box is a NUTS 2 region. The horizontal fields are different land cover types. The diagonal line separates LFA from non-LFA areas. The dashed circle encloses farms that receive AE payments. From FES, we obtain the (historical) average regional amounts of AE per hectare of land or per animal for each field of the intersection of the circle with the land covers and LFA|Non-LFA. In fact, we know more, because FES gives not the intersection with land cover types but with the eight farm types. Drawing this would be too complex. Using the size of each such intersection in relation to the whole box, the average amount per hectare in each TF8 conditional on LFA|Non-LFA and a mapping from TF8 to land cover types, and finally a mapping from TF8 to CAPRI activities, we compute the average payment per hectare or animal for each CAPRI activity in whole NUTS 2 region.

Figure 1. Schematic description of the allocation of AE payments to activities in CAPRI.



Based on the French and the UK case studies, it was concluded that support directed toward different sub-sectors tends to have different technical constraints. In particular, it was assumed that measures applied in field crops or involving arable land frequently have an element of extensification (buffer strips that reduce the area of land available for cropping, maintenance of hedgerows that may otherwise be removed, less fertiliser use, etc), whereas for the livestock production sectors (especially in the French case study), the key issue is to maintain existing extensive systems of production. The share of support going to mixed farms (TF8) was assumed to have no particular extensification or production effect except that of maintaining farming, and was implemented by assigning equal support to all agricultural activities except land abandonment.

The mapping of support to activities in CAPRI implies linking the support to production. Whether this corresponds to reality is an empirical question. It is

doubtless the case for some measures in some regions, but certainly not so for all AE measures in all regions. Refining the implementation would thus involve conditioning the support on technical constraints. Nevertheless, the implementation described above has the merit that it allocates the correct budget, resulting from the LEI budget model, to approximately the right group of farmers.

Table 5. Mapping from aggregated farm types in FADN (TF8) to activity groups in CAPRI.

TF8 type	Group of activities in CAPRI
1	Grandes Cultures
2	Vegetables
3	Wine
4	Permanent crops
5	Dairy cows including pastures
6	Suckler cows, sheep and goats, including pastures
7	Pigs and poultry
8	All agricultural activities

In LEITAP a payment to land will be used as a proxy for agri-environment payments. In contrast with the LFA payments, the agri-environment measure can also reduce labour and output productivity. Information of current distribution across sectors from FADN is used to distribute payments across sectors (e.g. pork and poultry and horticulture receive no agri-environment payments, relatively more payments are distributed to grassland than cropland). In addition, to capture the extra labour effect, labour productivity will decrease (10% of increase in land payment rate). An important effect of these agri-environment payments should be improvements in biodiversity, landscape and environmental pollution. Because of a lack of information this can not be implemented directly in the CGE model, but has to be assessed using the other analytical tools.

Regional payments

Regional payments are group of diverse measures mainly directed to non-agricultural sectors. According to the intervention logics, the main objective of these measures is to reverse the trends towards economic and social decline and depopulation of the countryside through promoting innovation and creating employment opportunities in rural areas, thereby increasing productivity in the wider rural economy.

In LEITAP this diverse range of measures are treated as a Hicks neutral productivity increase. As in the case of human and physical capital payments we assume a 50% deadweight effect for investments and that impacts are dynamic in the sense that investments provide each year a growth in productivity (cumulative impact in 2013) We use estimates from the human capital investment as a proxy for these investments. Investment of one dollar per unit of output increases output productivity with 0.45%. This will be applied to all sectors. In CAPRI these regional measures will be implied by a link with LEITAP.

How coupled is "decoupled"?

In the model CAPRI, the actual production effect of the SPS payments depends on two main factors: (1) Which production activities are eligible for support (i.e. how is land abandonment handled)? In the simulations reported in this study, the assumption was made that a share of "fallow agricultural land", i.e. land which is not set-aside,

but actually abandoned, is in fact eligible for single farm payments (see above). (2) How are premium rights handled versus eligible land? In CAPRI, it is assumed that land is more scarce than premium rights, and that thus the single farm payment tends to keep land rents up. In addition to those two factors, the model behaviour also depends on the very structure of the model, i.e. that farmers maximise the sum of gross margins and that the direct payments enter that maximisation. There is thus no single parameter in the model that determines the "degree of coupling", but it results rather from the interplay of many assumptions and data with model structure. In order to quantify the joint effect of all such assumptions, additional simulations were carried out.

The definition of "degree of coupling" of a policy instrument *p* is defined as the ratio of the effect of *p* to the effect of a fully coupled reference policy. The fully coupled reference policy is generally price support (e.g. Sckokai and Antón, 2005). In other words: what is the effect of spending *x* euro on some measure *p* compared to spending *x* euro on price support, or

$$DD(p) = 1 - \frac{\text{effect of } p}{\text{effect of price support of the same size as } p} \qquad (3)$$

In order to compute *DD*("SPS"), we set up two simulation experiments. In the first (S1), we shock the price of a single commodity (soft wheat) by a tax of 10% and compute the effect on acreage, yield and production for soft wheat for all EU-27. This is the "fully coupled" reference policy. We then compute the tax revenues *C* of the policy by multiplying the production by the producer price times the tax. In the second experiment (S2), the same amount *C* is instead added raised by decreasing the SPS payments. Those simulation experiments are done with exogenous prices.

Table 6 shows the results of the simulation experiments. We see that the degree of decoupling of the SPS measure vis-à-vis a price support is 99.4 percent for production as a whole. The effect on yields of SPS is close to zero, and almost all the effect is coming from the effect on acreages, where the degree of decoupling also is very large (99.1%). Thus, the SPS is very close to fully decoupled as it is now implemented in CAPRI, having less than 1% of the effect of a price subsidy of the same size.

Table 6. Degree of decoupling in CAPRI determined by simulation experiments. All numbers relate to soft wheat in EU-27, changes relative baseline.

	Acreage	Yield	Production
S1	-6.701%	-1.709%	-8.296%
S2	-0.059%	0.007%	-0.052%
Degree of Decoupling	0.991	1.004	0.994

In any simulation, we do not only apply modulation to the single farm payments and the SAPS, but also to the payments that remained coupled in the reference scenario (continuing the policy resulting from the 2003 reform). The presence of such payments increases the production effects in CAPRI. Further influence on production comes from the interaction with LEITAP. In order to quantify those effects, another set of sensitivity analyses was carried out, with the following setup:

- Reference: 5% modulation for all payments, no link with LEITAP

- S3: 5% modulation applied only to SPS payments, no link with LEITAP
- S4: 0% modulation applied to all first pillar payments, no link with LEITAP
- S5: 0% modulation applied to all first pillar payments, with LEITAP feedback

Table DD2 shows the effects on the production of cereals, oilseeds, beef and pork and poultry, for S3 to S5 compared to Reference. In S3, with 5% modulation only for the SPS payments and no modulation to the coupled payments, i.e. relative to the baseline give a top-up to the still coupled payments, the production of cereals decreases by 0.011%, i.e. by approximately a tenth of a promille. This stupendously tiny change is due to land competition by the fodder production for beef, which increases due to the now increased coupled payments. The same mechanism is influencing the production of oil seeds positively via the oil cake prices. The pig and poultry meat production decreases due to the changes on the cereals markets.

In S4 we abolish modulation also for the SPS payments, thus relatively speaking also top up the SPS payment relative to the coupled premiums. Albeit the SPS premiums contain by far the most money, the additional effect is generally small. For cereals, the net effect is a change of signs relative to S3, from a decrease to an increase. For the other product groups in the table, the sign remains stable but only the absolute size of the production influence changes.

In S5, we also introduce the link with LEITAP. That means that less money is available for the second pillar, and thus less is invested in human and physical capital. That in turn has a negative impact on productivity, which in fact turns out to be stronger than the effect within CAPRI "stand-alone". This fits with the underlying assumptions and economic theory. Decoupled payments have little to do with production, whereas technical progress has a more pronounced influence.

Table 7. Production effects of SPS payments, coupled payments and LEITAP respectively.

	S3	S4	S5
Cereals	-0.011%	0.013%	-0.136%
Oilseeds	0.069%	0.088%	-0.143%
Beef	0.010%	0.016%	-0.279%
Pork & Poultry	-0.005%	-0.003%	-0.049%

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ANNEX 2 THE MONETISATION OF PUBLIC GOODS IN THE CONTEXT OF RURAL DEVELOPMENT

Over the past twenty years or so, various attempts have been made to calculate the monetary value of non-market goods. One of the rationales for doing so is to create a 'balance sheet' that enables the delivery of public goods by a particular policy intervention to be compared with the economic impacts of the same intervention using the same unit of measurement. Calculating the monetary value of a public good is beset with practical, theoretical and methodological issues. Some of these difficulties are briefly discussed below.

The key methodologies developed to generate a monetary value for non-market goods associated with agriculture and other forms of land management include stated preference techniques, such as willingness to pay, as well as deliberative methodologies (DIPs) (see Hanley *et al*., 1998; Brouwer and Slangen, 1998; Bateman, 1994; and Willis and Garrod, 1993). Both have methodological shortcomings which have been widely discussed in the academic literature. In the environmental sphere, factors such as water quality emissions or pollution lend themselves more readily to quantitative evaluation and monetisation, whereas others, such as landscape and biodiversity, do not. This is in part because of the composite and complex character of these environmental goods which causes problems in the expression of preference and in distinguishing between use and non use values. In the case of landscape, for example, distinguishing landscape values from the value of various ecosystem services provided by environmental assets within the landscape raises problems of double counting (Swanwick *et al*., 2007).

An analysis of the results from a range of studies indicates that widely divergent values are generated for individual environmental goods and services, explained in part by the different methodologies used, varying levels of information and understanding available to participants in WTP studies, and because the implicit counterfactual situations or policy frameworks are seldom the same. This means that any interpretation of the resulting values should be carried out with extreme caution.

Examining the figures in more detail, the cost of carbon emissions can be measured in different ways, depending on the assumed cost of carbon for example. In many studies this is valued at well above the market rate. Air pollution figures prominently in the estimates particularly for this reason. On the other hand, it is difficult to measure landscape values, with many methodological questions about the value of techniques such as contingent valuation. Buckwell (2005) suggests that conceptually, the EFTEC/IEEP methodology is the most fully developed, and empirically the most comprehensive. It is based on a clearly and explicitly stated green accounting framework that distinguishes – or seeks to distinguish – (1) the flows, stock changes and stock levels, (2) the effects attributable to agriculture versus those attributable to other sectors, and (3) the effects on economic welfare versus those on other sectors.

A more recent report by Jacobs (2008) attempts to update the 2004 work by EFTEC/IEEP, but emphasises the same issues and caveats. It highlights the fact that consensus valuation figures are only available for climate change and air quality impacts, and that significant gaps remain in relation to landscape, habitats and

biodiversity. The report concludes that, 'in the absence of a standardised set of physical data and damage cost curves for environmental impacts, calculation on environmental impacts from agriculture are frequently simplistic, requiring many assumptions'.

It is because of these concerns that we are doubtful that monetisation studies produce comparable results in Europe or that they are a strong enough foundation on which to make a quantitative assessment of the different impacts arising from policy interventions. The absence of valuation data in relation to landscape and biodiversity makes any analysis based upon accounting studies such as these partial at best. To base a quantification of the impacts of policy interventions on this rather shaky foundation would risk very serious inaccuracy.

References Annex 2

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