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This report is accompanied by Annex prepared in a separate document.

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Executive summary

This report summarizes the main results from the Cross-Compliance project (EU 6th Framework Programme, Priority 8.1; European Commission, DG RTD, contract no. SSPE-CT-2005-006489). The core aim of this EU funded research project is to analyse the external competitiveness impact arising from an improvement in the level of compliance with mandatory standards. Important factors affecting this are the degree of compliance with standards and the (additional) costs associated with complying to standards, as well as the expected improvement in compliance with standard. Potential improvement in compliance depends on the (estimated) existing degrees of compliance and the extent to which they deviate from full compliance. Achieved improvement in compliance is likely to be affected by various factors, including policies aiming at improving compliance such as the EU's (obligatory) cross compliance policy. Another factor might be the interaction with voluntary standards. For this reason within the project also the role (requirements, participation, costs) of a selected number of voluntary standards has been analysed and potential interactions are explored.

This report summarises the main results of this work. Although attention is paid to intermediate results (deriving best-estimates of degrees of compliance and costs of compliance; relevance of voluntary standards) it in particular focuses on the main aim of this project, i.e. the possible trade impacts of an improvement in compliance with selected standards for a number of sectors (beef, dairy, pigs, poultry, cereals, fruit and vegetables, olives). This rise in compliance could be attributed to cross compliance. The aggregated impact on trade across all sectors is also shown. The work presented here follows on from an earlier phase of the project, which focused on the level of compliance with standards and the costs associated with compliance.

The standards considered for the quantitative competitiveness impact assessment are selected from those included in the EU's cross compliance package i.e. the 19 Statutory Management Requirements (SMRs) and the standards imposed under the Good Agricultural and Environmental Condition (GAEC) framework (which refers to soil management and habitat maintenance). For two member states (Netherlands, Spain) and one region (England in the UK) the overlap between standards that exist in certification schemes and in cross compliance was examined. The results show that, although there are some strong limitations, there is sufficient overlap in the standards set and in approaches to control to warrant further investigation of the potential for the harmonisation of standards and collaborative approaches to control. The main limitations lie in the differences in the standards set and arguments about the mutual role of government and private bodies in ensuring compliance with both legal standards and standards that sit outside of the regulatory framework. The conclusions of the comparison suggest that the further assessment of these synergies would provide an additional dimension to current and prospective debates not only on cross compliance, which is reviewed by the European Commission in 2007, but also about the CAP Health Check scheduled to take place in 2008.

Cross compliance, introduced with the 2003 CAP reform, is best understood to be an additional enforcement mechanism, which uses financial leverage to encourage compliance with standards. The SMRs are all pre-existing items of EU legislation, although there have been compliance issues in the past. The GAEC standards, whilst presenting a new framework to impose standards, have largely been utilised by Member States as a tool to enforce and

enhance understanding of other pre-existing mandatory requirements. Only in some cases have entirely new standards been introduced. Most costs and benefits that arise are associated in this analysis with the standard itself. Cross compliance does present some additional benefits as an enforcement mechanism that stimulates improved understanding of legal requirements and, through the threat of financial penalties, an improvement in compliance levels where these were previously less than universal. Some of these benefits are explored in this paper.

The scope of the research is limited in that it focuses on seven agricultural products (dairy products, beef, pigs, poultry, cereals, fruit and olives) and seven EU Member States (Germany, France, Italy, the Netherlands, Spain, the UK and Poland). For each product and each Member State, the most relevant standards were identified and an assessment was made of the level of compliance and the cost of compliance. The subsequent analysis then focused, first, on the additional cost of compliance if compliance levels were to become universal, and second, on the impact this would have on trade flows.

In parallel, standards applied to farmers in the US, Canada and New Zealand are taken into account as they are considered to be among the key competitors of the EU. In these three non-EU countries, comparable standards to those in the EU were identified, and an attempt made to assess the level of compliance and the cost of compliance.

Table 1: Standards Selected for Each Product in EU and non-EU Countries

Chapter	Product	Evaluated standards
4	Dairy	• Nitrates (EU, non-EU) • Identification and Registration (EU) • Food Safety (bST) (non-EU)
5	Beef	• Nitrates (EU) • Identification and Registration (EU) • Food Safety (growth hormones) (non-EU)
6	Pigs and poultry	• Nitrates (EU) • Animal Welfare (EU) • Clean Water (non-EU)
7	Cereals	• GAEC Standards (EU, non-EU)
8	Fruit & vegetables	• Nitrates (Spain) • Plant Protection (Spain) • GAEC Standards (in particular, water conservation in Spain)
9	Olives	GAEC Standards (Spain): • Erosion, Soil organic matter, Soil structure

From the review of all SMR and GAEC standards (see Chapter 2) it appeared that in particular the Nitrates Directive, food safety requirements and animal welfare standards might give rise to non-negligible cost of production increases, at least at individual farm level and potentially also at sector level. Although the potential cost impact of the rules concerning the identification and registration of farmed livestock (i.e. using eartags, passports etc) is low, the analysis shows that farmers face significant problems with compliance. Whilst the SMRs mainly affect animal production, many of the GAEC standards mainly affect the arable sector. Based on this review, a selected number of products and standards were selected for the quantitative competitiveness impact assessment (see Table 1 for overview).

Summary of main findings for the dairy sector

At sector level full compliance to the nitrates standard for all affected farmers would involve a percentage cost of production increase of 0.1 to 0.6 percent, with rates varying between Member States. The estimated percentage cost increases associated with full compliance with the Identification and Registration standard for all affected farmers would be less than 0.15 percent and thus rather marginal. As shown in Table 2 the negative impact of these measures (for nitrates, and animal identification and registration) on EU imports and exports are less than 3 percent. If a smaller increase in compliance takes place, these already relatively small trade impacts will be further diminished.

When the standards for nitrate pollution taken by the US, Canada and New Zealand are taken into account and it is assumed that compliance to these measures improves to full compliance, just like was assumed for the EU, this would more or less ‘neutralise’ the trade impacts. The projected change in EU exports would be approximately -0.1%. As such this underscores that for a competitiveness impact analysis assumptions about what is happening in key competitor countries are rather important. The trade impacts obtained when no changes are assumed to happen in key competitor countries can thus be argued as providing the upper bound of the likely trade impacts.

Summary of main findings for the beef sector

Within the EU, beef is produced in a wide range of farming systems, ranging from the extensive cow calf farms in Ireland, the UK and the centre of France down to the very intensive beef fattening systems located in Italy and parts of Spain. The Nitrates Directive affects 4.2% of beef cattle raised in intensive finishing farms and 3.0% of beef produced on cow calf farms. This low percentage of farms affected by the Nitrates Directive explains the limited sector cost increase, which has been estimated to be 0.095%. The relatively low cost impact associated with the standards arising from the Nitrates Directive does not have a significant consequence for the competitive position of the EU beef production on the world market. The actual trade deficit in EU beef would increase, as exports would fall by 0.68% and imports would rise by 0.51%.

The regulations concerning the identification and registration of beef cattle are highly relevant to beef farms. Implemented as a reaction to the BSE crisis the beef farmers have to register all cattle movements and make sure that all animals are correctly identified. According to the estimates carried out these important measures would generate a cost increase for EU beef farms of 0.454% if full compliance was achieved. As a consequence of this measure, the EU’s beef imports would grow by 2.2% and exports would decline by the same percentage.

Summary of main findings for the cereals sector

As regard the cereals sector, the estimated percentage cost increases associated with the GAEC standards are in all cases less than one per cent of total production costs. Several factors explain this result. The additional costs per hectare are generally low, although the cost of maintaining idled land is an exception. The best estimates of the current level of compliance are rather high. Partly this is due to the fact that farmers have, for several reasons, already included a number of GAEC standards into their existing farming practices. This is partly because many GAEC standards simply reinforce pre-existing national legislation, whilst many standards underline good farming practice and result in benefits generated from preventing soil erosion and maintaining the soil condition.

Since the estimated costs associated with satisfying the GAEC standards for normally cultivated land and for idled land are different, the use of set-aside land (e.g. use of set-aside land to cultivate energy crops) and the set-aside rate will affect the estimated percentage costs increases. To test for the potential impact of idled land, different scenarios were established based on the assumption that higher cultivation rates of set-aside land or lower set-aside rates lead to less idled land and thus lower costs. Of course a reduced set-aside rate will also affect total cereal supply and farmers' other costs and revenues but here the focus is on doing a sensitivity analysis of the pure GAEC standard costs impact, rather than on evaluating all impacts of the set-aside policy. With the set-aside rate set to zero (or alternatively assuming all set-aside land is cultivated with special crops), the calculated percentage cost increase more or less halved as compared to the baseline scenario assuming a 10% set-aside rate and all set-aside land being idled land. The 3% buffer strip requirement in France, previously accounted for within the 10% set-aside requirement, can be interpreted as effectively a 3% minimum set-aside requirement (which holds even when the formal rate goes down to zero).

The impact of full compliance with the GAEC standards on the EU's cereals sector's external competitiveness would vary from a 1.8% reduction in exports (assuming a set-aside rate of 10% with all land idled) to a reduction of 1.1% (assuming a set-aside rate of 0% or no land idled). EU imports would increase with approximately a similar percentage as exports decline. Total world trade would hardly be affected by the impact of the GAEC standard (although it is likely to be affected by changes to the set-side policy).

Summary of main findings for the pig and poultry sectors

As the pig and poultry sectors are the most intensive livestock activities in the EU it is quite comprehensible that these sectors are the most affected by the Nitrates Directive. In the present analysis the effects have been quantified only for the pig sector, as poultry farms are very marginally touched by cross compliance. The overall EU cost increase to be attributed to the pig sector assuming if full compliance with the Nitrates Directive is attained has been estimated to be 0.55%. Such a cost increase results in a significant impact on the EU trade balance of pigmeat. Total EU exports would decline by 3% and imports would increase by 4.4 %.

A comparison was made with the impact of the Clean Water Act in the US. This Act raises the cost to the US pig sector by 1.08%, almost double the impact of the Nitrates Directive in the EU. The reason for this substantial rise of costs has to be attributed to the large percentage of pigs affected by this measure and its rather recent application to US pig farms, which implies a rather low degree of compliance. This rise in costs would cause a fall in US exports of pigmeat of 7.3% whereas its imports from the EU would increase by approximately 4.5%. Canada would gain the most from this situation, increasing its exports to the world market by 4%, and increasing exports to the US by 4.5% and to Japan by 2.1%.

A calculation of the cost of achieving full compliance with the animal welfare regulations for all pig farmers in the EU shows that the cost increase would be very limited. The reasons for this minor cost impact are the high degree of compliance with the standards and the limited rise in costs for farmers who still have to adapt their farm to the new legislation. At farm level the cost increase is well below 1% and this generates a rise of costs at sector level of 0.11%. This cost impact would cause a growth of imports of only 0.8% and a decline of exports of 0.7%.

Summary of main findings for the fruit, vegetable and olive sectors

Case studies were undertaken for the fruit and vegetables and olive sectors. Competitiveness impacts were analysed using a farm level approach (calculated according to relative changes in gross margin due to compliance with standards). From these studies it emerged that, in general terms, the cost of compliance with the environmental regulations for these sectors in Spain is likely to be small (or might even be zero or lead to cost savings in some specific cases). It has to be noted, however, that due to the limitations of the study, not all production regions have been considered and, therefore, these general conclusions may differ across regions, farming systems and types of farms.

Summary of aggregated results

The impact of the achievement of total compliance with the various standards for those sectors considered by this study on the EU's trade position is summarised in Table 0.2. A trade position can be considered in terms of imports, exports and product trade balances. The changes were calculated according to the GTAP model.

As the first row of Table 2 indicates, the cost increases associated with full compliance to the Nitrates and Identification and Registration standards in the EU dairy sector lead to a decline in EU dairy product exports of 0.87 percent and an increase in imports of 1.01 percent. The associated impact on the trade balance for dairy products is a loss of US$27 million , which is the sum of, on the one hand, the loss in export revenues and, on the other hand, the increase in expenditure on imports. Similarly, the cost increase associated with full compliance to the GAEC standards for the cereals sector across the examined Member States leads to a decline in EU exports of 1.8 percent and an increase of imports of 2.2 percent (see final row of Table 2). The impact on the cereals trade balance is a loss of US$42 million. Aggregating all trade balance impacts (see right-hand column of Table 2) generates a total reduction in value of the considered products and measures of US$289 million (measured in US$ of 2001). As the small percentage changes (see middle columns) confirm, this amount is only a small fraction of the total trade balance value. Moreover, when looking to the overall trade balance impact, taking into account the spill-over effects to other sectors (e.g. food industry, etc.) in the EU economy, the net impact is almost zero (see further details in Chapter 8).

The information presented in Table 2 is based on a number of assumptions. Firstly, it is assumed that all EU Member States unilaterally introduce GAEC standards and SMRs in the context of cross compliance. Secondly, it is assumed the level of compliance increases to

100% compared with the baseline level of compliance (taken to be before cross compliance was introduced). Thirdly, it is assumed that no changes to comparable standards in the three non-EU countries have taken place.

The numbers given in Table 2 (see third column) show, for each product, the trade impact for all standards considered together (e.g. the combined impact of standards relating to nitrates and animal welfare in the pigs sector). Also the interaction effects rising from simultaneously imposing the analysed standards in the four considered sectors are accounted for (spill-over and feedback effects). The total aggregated impact comes down to 289 million US dollar (measured in constant prices of 2001).

The estimates provided in this study are likely to present the upper bound of the expected impacts. For, example, in reality full compliance might not actually be achieved. Or instead of passing on the cost burden to the buyers of their products, farmers may partly or wholly bear the burden themselves.

Table 2 Trade impact on EU imports, exports and product trade balances arising from full compliance with selected EU standards

	EU-15 Imports (%-change)	EU-15 Exports (%-change)	Product trade balance (million US$ in constant prices of 2001)
Dairy	1.08	-0.82	-27.1
Beef	2.7	-2.7	-94.1
Pigs & poultry	5.2	-3.7	-125.4
Cereals	2.2	-1.8	-42.1

Source: Own calculations with GTAP model, calibrated on base year data for 2001.

The pigs and poultry sector is the most significantly impacted by a rise in compliance levels. As these sectors are the most intensive livestock activities in the EU it is quite understandable that these sectors are the most affected by the Nitrates Directive, if fully enforced (whilst noting some Member States have derogations). However, the change in trade balance should not be attributed wholly to cross compliance. In particular, the poultry sector is barely concerned by cross compliance since poultry farmers do not generally receive the Single Payment. The same is true for pig farmers, unless they have a mixed enterprise.

Cross compliance bears more of an influence on the dairy, beef and cereal sectors because the majority of farmers in these sectors receive the Single Payment. Cross compliance, as an enforcement mechanism, may encourage compliance with the examined standards. Of these three product sectors, the greatest impact is on dairy, followed by beef and cereals. This is in line with expectations, given that the SMRs more greatly affect livestock producers, and that the underlying EU legislation may be more costly to comply with. The cereals sector shows the lowest product trade balance impact.

The estimates provided in this study are likely to present the upper bound of the expected impacts. For example, if the EU does not act unilaterally, but its key competitors also adopt similar standards or aim for increasing compliance with existing standards, this is likely to 'neutralise' the impact on trade flows.

Although there are some uncertainties in the calculations (for example, with respect to the assessment of costs, the best estimates of the degree of compliance, the actually achievable improvement of compliance, as well as limitations in the modelling tool) the general picture that emerges is that the impact of improvements in compliance with the considered standards on the EU's competitiveness is rather limited.

Concluding remarks and brief policy outlook

Cross compliance is a policy mechanism designed to achieve some specific benefits in the agriculture sector but which may, as a result of the way in which the policy is applied, impose some new costs on the farming sector. Cross compliance only imposes new costs on farmers where new standards are introduced e.g. through GAEC or by imposing new administrative requirements. Since SMRs are based on pre-existing legislation, any costs associated with meeting SMRs are costs of the underpinning legislation and not costs of cross compliance. The balance between benefits and costs is critical in determining the acceptability as well as the efficiency of the policy. This study is particularly concerned with the extent to which cross compliance results in costs which are negatively affecting the competitive position of EU agriculture when compared to agriculture in certain non EU countries included in this project (US, Canada and New Zealand).

The results derived from this research state that the costs of compliance can be significant at individual farm level in the EU, at least for certain farm types affected by certain standards. These costs may, in turn, affect the competitiveness of such farms. However, when scaled up to sectoral level, the costs of compliance with standards are relatively limited and do not have any substantive impact on trade flows. For the dairy, beef, pigs and poultry and cereals sectors, full compliance with selected standards results in a cumulative total loss of trade of US$289 million, a small fraction of the total EU trade balance for these sectors. Furthermore, when the EU does not act unilaterally, but its key competitors also adopt similar standards or aim for increased compliance with existing standards, the impact on any trade flow is reduced.

The costs identified and the impacts on competitiveness are those associated with achieving compliance with certain selected EU standards. These standards form part of the cross compliance policy but most of the costs and impacts identified are not those of the cross compliance policy since, in the majority of cases, farmers were already required to meet these standards i.e. they pre-existed cross compliance. Cross compliance is likely however to have encouraged farmers to comply with the standards examined and can therefore be said to have induced certain costs. These costs are rather limited at sectoral level and unlikely to competitively disadvantage EU farmers. Based on this evidence, arguments put forward against the use of cross compliance as a means of meeting standards - on the basis of the high costs imposed on the agriculture sector - appear rather weak.

The non EU countries considered by this research appear to use alternative and fewer regulatory approaches to achieving compliance with standards in the agriculture sector. Voluntary approaches, cost sharing programmes and technical assistance appear to be much more common. Such differences may reflect different institutional structures, the lower intensity of the problems needing to be addressed or different cultural values or societal expectations in relation to agriculture. It may also be possible for the EU to learn from experiences in non EU countries regarding alternative methods of meeting standards in the agriculture sector. For example, it might be worth considering whether cost sharing programmes and technical assistance can achieve the same or similar benefits to cross compliance at lower cost.

Regarding the future of cross compliance in the EU, several observations can be made. Cross compliance is a relatively new mechanism and early experiences of implementation led to the need for some technical and administrative revisions,). The scope of cross compliance is also open to scrutiny. Cross compliance currently consists of a defined list of legislation in Annex III and a set of issues and standards in Annex IV. As new pressures become more apparent, there is an opportunity to revise these Annexes to incorporate new standards in relation to issues such as climate change and water management. Some existing standards may also be considered unnecessary as circumstances change. The inclusion of any new requirements should always however be determined on the basis of the relative costs and benefits of any such addition and consideration of alternative means of achieving similar outcomes. The question of incentive led approaches versus regulatory approaches is likely to play out here.

Finally, the future of cross compliance is inextricably linked with the future of CAP payments. Currently, the threat of reductions or withdrawal of payments is a strong lever the EU can use to influence farmer behaviour. The reduction of direct payments in the future could lessen the leverage administrations have on compliance behaviour. In addition, the role of cross compliance and direct payments could be shaped by increasing internal (societal) or external (WTO) pressure to demonstrate that payments are linked to the provision of public goods that are not provided by the regulatory baseline. These questions may be rehearsed during the CAP Health Check and the EU Budget Review and the answers will have a significant bearing on the future of cross compliance. It is certain that the cross compliance mechanism will need to adapt and evolve to the changing circumstances around it. Currently, its use as a mechanism to achieve compliance with standards appears justified as the impact on costs and competitiveness are rather limited. As the CAP evolves, the need for a mechanism that defines a link between payments, mandatory standards and basic environmentally beneficial land management requirements is likely to remain appropriate.

1 Introduction and overview

1.1 CAP and cross-compliance

The 2003 Mid-Term Review (MTR) of the Common Agricultural Policy (CAP) introduced a number of adjustments to agricultural support. One of the most substantive changes was the introduction of a system of decoupled payments per farm (known as the Single Farm Payment). Moreover these payments were made conditional on recipients meeting environmental, food safety, animal and plant health, animal welfare requirements as well as standards of good agricultural and environmental practice (cross-compliance). The primary objective of this policy reform was to promote a more market-oriented agriculture and sustainable agriculture. This summary report evaluates the impact of a selected number of standards on the EU's external competitiveness. As such special attention will be given to the impact of the requirements on costs of production, which is in part determined by the current degree of compliance and the expected feasible improvements in the degree of compliance.

The concept of cross-compliance originated in the United States, where it was used from the 1970s and onwards. It referred to conditions farmers must meet in order to be eligible for assistance under government support schemes for agriculture, notably commodity programs. Claiming support under one program, US farmers had to meet the rules of that program and simultaneously also certain obligations of other programs. In that way a linkage between programs, or 'cross-compliance' was introduced. Since its first application in the US, the term has been extended and used to in particular refer to linkages between agricultural and environmental policies. Currently such conditions are attached to the Conservation Reserve Programme (IEEP, 2006).

With the growing commitment in the EC in the late 1980s to integrating environmental considerations into the CAP, cross-compliance became part of the debate on agricultural policy reforms. The 1992 MacSharry reforms of the CAP, which increased the reliance on direct payment-instruments, also increased the potential relevance of cross-compliance. The greater transparency of these payments prompted a debate about the return-transfer EU agriculture should give to society. This intensified the debate about the tangible social and environmental benefits farmers should provide in return for these payments. Although elements of environmental cross-compliance were introduced into the CAP by the MacSharry reform its impact remained rather limited. Member states were obliged to apply so-called appropriate environmental conditions to the management of compulsory set-aside in arable cropping. Moreover, they were allowed (but not obliged) to introduce environmental conditions on the direct payments offered as headage payments for beef cattle and sheep. Only a limited number of Member States (notably the UK) implemented such schemes.

The Agenda 2000 reform of the CAP extended the switch from traditional price support to direct payments already initiated under MacSharry. Also cross-compliance started to play a more prominent role in the agricultural policy package. Regulation 1259/1999 (Article 3) required member states to take measures to ensure that agricultural activities within the scope of the 'common rules regulation' were compatible with environmental projection requirements. It allowed Member States several options for such measures among which support in return for agri-environmental commitments, the introduction of general mandatory environmental requirements, and the introduction of specific environmental requirements constituting a condition for direct payments (cross-compliance). Member States were able to decide on a sanctioning system punishing violations. Punishment should be appropriate and proportionate and could include withdrawal or even cancellation of direct payments. Only a limited number of Member States (among them Denmark, France, Greece, the Netherlands and the UK) set down conditions for direct payments.

With the 2003 MTR policy reform, cross-compliance became a compulsory measure. Together with decoupling of support and the renewed rural development pillar that were then introduced, it (what does the it refer to here, cross compliance? You should make that clear) intrinsically sought to promote and contribute to sustainable agriculture (Swales, 2006). At the same time it could be seen as a means to justify the direct payments to farmers. Moreover, its scope was extended from its original environmental focus to one dealing with a much wider range of public concerns, each of which was already covered by EU legislation; added concerns regarded animal welfare, food safety and good agricultural practice. More specifically, Regulation 1782/2003 in return for direct payments under the SFP-scheme requires farmers to observe certain standards in the following areas:

- Environment
- Identification and registration of animals
- Public, animal and plant health
- Animal welfare
- Good agricultural and environmental condition

More precisely farmers must comply with 19 Statutory Management Requirements (SMRs) defined in Annex III of the regulation, and a number of standards ensuring good agricultural and environmental condition of agricultural land (GAEC) as defined in Annex IV of the Regulation.

SMRs cannot be interpreted as cross-compliance standards, as they all are pre-existing EU Directives and Regulations such as the Birds and Habitat Directives and the Nitrates Directive. Cross-compliance, with respect to these SMRs acts as an additional incentive to stimulate enforcement of existing legislation (see Figure 1.1; Jongeneel and Brouwer, 2007)[1].

[1] Because the GAEC standards were newly introduced together with cross-compliance they are often seen as belonging together (we follow that convention). However, following Figure 1.1. also here a distinction could be made between standard and standard-enforcement mechanisms just like with the SMRs.

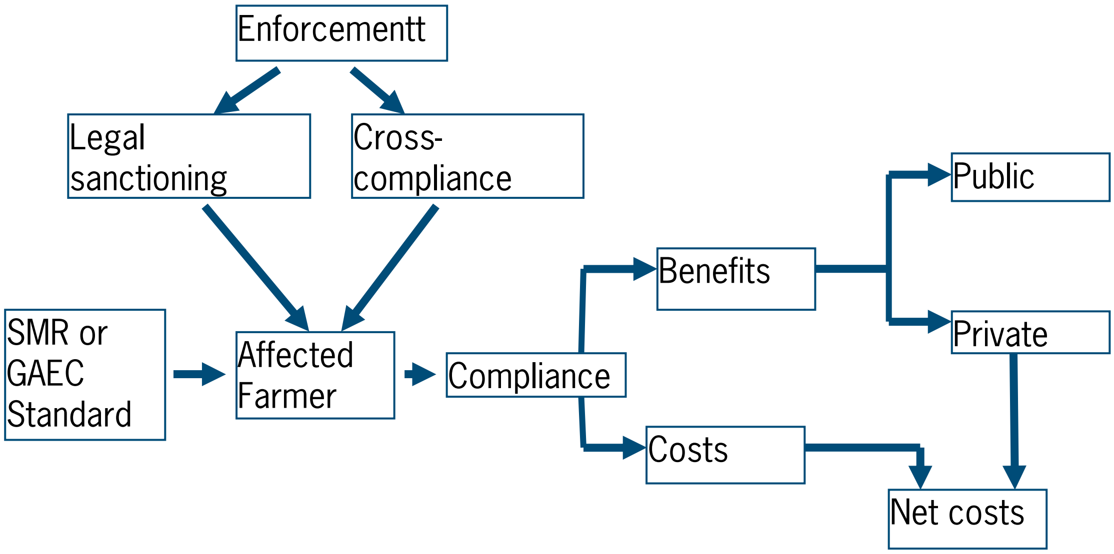

Figure 1.1: Standards, enforcement, compliance and benefits and costs

The GAEC framework represents a new requirement and consists of a total of 11 standards relating to the protection of soils and maintenance of habitats. In addition, Member States must ensure that area of permanent pasture is maintained at the same magnitude as in 2003. The latter addition was added to avoid the abandonment of land and associated environmental degradation. Abandonment of land was feared as a potential by-effect of the introduced decoupling, which delinked support from production activities. As such the GAEC requirements can be seen as a precautionary policy to prevent potential problems which might occur in the future.

With respect to the GAEC standards, Member States have introduced a wide range of measures to implement the standards as set out in Annex IV. The majority of Member States have implemented measures for some, but not all of the Annex IV standards. The requirements vary from very basic, simple and already required or satisfied measures, to more complex measures (see next Chapter for further details). The result is a highly variable approach to Annex IV standards. Given the aim of of the standards and taking into account the specific characteristics of the areas concerned, including soil and climatic conditions, existing farming systems, land use, crop rotation, farming practices and farming structures, the variability is not surprising. Member States do not have an obligation to justify their choice of GAEC standards.

Detailed rules for the implementation of cross-compliance are set down in Regulation 796/2004. The implementation started in year 2005 with the SMRs on environment, public and animal health, and the identification and registration of animals. The GAEC standards were also imposed in 2005. In 2006 additional SMRs related to food safety (public health) and notification of diseases were implemented. The last SMR, regarding animal welfare was implemented in 2007.

1.2 Why regulate and why standards?

As is well-known from economic theory, market processes, in the presence of negative and positive externalities do not allocate resources in an economically efficient way (i.e. market failure). To correct for this failure, governments intervene in the market by for example setting standards for the achievement of environmental quality and the provision of public goods, both of which will enhance the well-being of society. Such standards, those especially relevant to cross-compliance, relate among others, the preservation of habitats, a certain level of biodiversity, environmental quality (e.g. water and air), food safety, animal welfare, preservation of landscape characteristics, erosion control, etc.

As is well-known from the economics of production and environmental economics literature, the market process does not automatically ensure a proper level of standards. In particular when the agricultural production process involves negative and positive externalities, or the public goods the market may fail to deliver an adequate provision (i.e. market failure). As Figure 1.1 shows, the main aim of imposed standards is to achieve certain benefits or policy objectives, which could in the case of the cross-compliance related standards vary from preserved habitats, a certain level of biodiversity, environmental quality, food safety, animal welfare, preservation of landscape characteristics, avoidance of erosion losses, etc. The benefits that these standards create for society may have a public character, but could also be private. For example, the GAEC standard to preserve soil organic matter affects soil fertility and will positively impact on yields, and therewith hence on private revenuesreturns, depending on how the standards have been implemented by the Member State or Region. In this Report report the focus is not on the benefits arising from cross compliance but rather on the costs. But the discussion of costs and cost-impacts should not distract attention from the benefits or policy objectives the standards aim for.

As regards the cross-compliance enforcement mechanism, its benefits and costs need to be considered in terms of its own objectives. A strict reading of Regulation 1782/2003 reveals two main purposes, although, as suggested in the text below, it can be argued that there are additional less clearly articulated objectives. The Regulation expresses the requirement to attach *basic* standards to the receipt of direct aid and to *avoid* the abandonment of agricultural land and ensure that it is *maintained* in good agricultural and environmental condition. The Regulation also gives an idea of the level at which cross compliance is aiming. It is the intention for it to deliver no more than basic standards, to avoid abandonment and to maintain, as opposed to enhance, agricultural and environmental condition. Cross compliance plays a role in wider agricultural policy and can also be interpreted as providing the baseline of standards upon which more targeted actions are promoted through agri-environment schemes.

The benefits also need to be considered relative to the situation when cross compliance was introduced. If the overall aim of cross compliance can be considered to improve compliance with statutory requirements, its added value and ability to provide benefits very much depends on there being less than satisfactory levels of compliance before its introduction. The chief parameter for success, “added value” and benefit is therefore improved compliance. Improving levels of compliance is however dependent on a range of sub-factors, which may also provide benefits relative to the status quo. These can be grouped into two broad categories. The first refers to the operational benefits arising from the introduction of the system of cross compliance. The second set directly arises from the implementation of standards in the form of SMRs and GAEC standards. Thus, the first group is process oriented, whilst the second refers to on-the-ground impacts of improved regulatory compliance. There is also a more fundamental, overarching benefit. This can be expressed in terms of cross compliance’s role in contributing to sustainable land management.

1.3 Outline of the report

The report starts with an introduction (Chapter 1), which briefly introduces the EU's cross compliance policy, its origin and development. It distinguishes cross compliance as an enforcement mechanism from the underlying standards and the costs and benefits associated with compliance with these standards. In addition Chapter 1 provides a brief overview of the modelling approach chosen to evaluate the impacts on competitiveness, including some remarks on strength and weaknesses of this approach. Chapter 2 presents the overall methodological framework of the analysis. Chapter 3 reviews the SMR and GAEC standards included under the cross-compliance regime and examines at a general level the (potential) cost implications at farm level of these standards. The outcome of Chapter 3 is used to make a selection of standards, which will be analysed in a quantitative way in subsequent chapters. The following six chapters analyse various product-measure combinations (see Table 1.1).

Table 1.1: Standards Selected for Each Product in EU and non-EU Countries

Chapter	Product	Evaluated standards
4	Dairy	• Nitrates (EU, non-EU) • Identification and Registration (EU) • Food Safety (bST) (non-EU)
5	Beef	• Nitrates (EU) • Identification and Registration (EU) • Food Safety (growth hormones) (non-EU)
6	Pigs and poultry	• Nitrates (EU) • Animal Welfare (EU) • Clean Water (non-EU)
7	Cereals	• GAEC Standards (EU, non-EU)
8	Fruit & vegetables, and olives	• Nitrates (Spain) • Plant Protection (Spain) • GAEC Standards (in particular, water conservation in Spain)
9	Olives	• GAEC Standards (erosion)

Each of the chapters (4 – 9) for the selected products, starts with introduction to the main trade and production relationships of that product. This is followed by an exposition about the determination of the impacts of the selected standards on the sector's cost of production. Estimates concerning the extent to which farms are or are not affected, as well as best estimates of their current degrees of compliance have been used to upscale the farm based impact analysis to sector level. Next the estimated increases in the costs of production at sector level are used in the economic trade model, which is than used to simulate the impacts on trade, for the EU as well as main other world regions or countries. Each chapter finishes with a concluding section. The simulated scenarios not only consider unilateral changes in compliance within the EU, but where relevant and feasible also the impact of bilateral changes (changes both within the EU and changes within one or more of the EU's key competitors).

Chapter 10 reviews possible benefits of the cross-compliance. The final chapter of the report (Chapter 10) closes with some conclusions and a comparative overview of all the products (based on a monetary evaluation of the trade balance impacts).

2 Methodological approach

2.1 Overall procedure

The focus of this research is on the assessment of the impact of standards on competitiveness. The methodological approach and design of the study is based on qualitative as well as quantitative modelling assessments, drawing from the experiences of earlier studies, and a series of workshops and interviews with experts in the field. Differentiation is made with regard to 'long term' and 'short term' impacts on competitiveness, at farm, sector and global level..

As Figure 1.1 shows that standards not only involve benefits but also costs (private costs less the private benefits of regulation) to farmers. Costs associated with achieving compliance with mandatory cross compliance standards can occur in the following ways:

- Investment costs: need to purchase new equipment (e.g. storage facilities), build new facilities etc.
- Production costs: potentially reduced yield due to change in production practises (e.g. minimum maintenance, standards on tillage/ploughing), seed for green cover, et.
- Administrative costs: time needed to become familiar with new requirements/ procedures/ controls (training events etc.); time needed to complete documentation, prepare controls and inspection time.
- non-compliance costs: deduction made from the SFP, potential loss of accreditation

The main determinants of farm level costs arising from both SMRs and GAECs are:

- whether the requirement is applicable to the farm, and if whether the farm is already compliant (or to which degree he or she is already compliant) with the requirements. (There are no additional costs associated if the farmer is already fully compliant, but s/he might have faced costs in the past to achieve compliance. It could also be true that the requirements are part of the farmer's normal farming practises and therefore invoke no additional costs).
- whether the standard is based on items of national legislation or EU legislation[2] that was already in place before the introduction of cross compliance, meaning that there was already a need to comply.

Moreover, it needs to be noted that SMRs and GAEC standards only apply to farmers claiming Single Farm Payment.

Costs associated with achieving compliance with mandatory standards are studied in this report. If compliance to standards affects production costs at the farm-level, aggregate agricultural production is affected, which might spatially shift production from the most affected farm groups to the least affected ones (see also Isik, 2004). At the aggregate level, these production shifts translate into a shift of the supply curve, i.e. a supply response. The supply response, in turn, displaces the equilibrium between supply, demand and

[2] Note that all SMRs represent pre-existing legislation, whereas a number of GAEC imply new legislation.

international trade. Differing standards and degrees of compliance to standards, and heterogeneity of farming conditions can change the market share of a trading partner within a sector. Market share between sectors is also affected, due to substitution and complementarity and spill-over effects between produced commodities in the economy.

To account for effects that occur at farm, sector and economy level, the following steps are taken in the analysis:

Step 1: Review and select the standards which will be quantitatively evaluated;

Step 2: Create best estimates of current degree of compliance and assumed improvement in the degree of compliance

Step 3: Determine the percentage cost increase at the farm level, taking into account farm structure;

a. Determine the relevant number of farms affected by the regulation;

b. Calculate the costs of compliance with the regulation for the affected farms;

c. Calculate additional costs of compliance taking into account the best-estimate base year level of compliance and the improvement in compliance (various assumptions can be used here, including full compliance);

d. Calculate measures of competitiveness (e.g. gross margin) for the initial and improved levels of compliance.

Step 4: Determine the percentage cost increase at sector level taking into account prevailing and estimated final compliance levels as well as taking into account the relative shares of affected and non-affected farms;

Step 5: Analyse the impact on market conditions and trade patterns (imports, exports), i.e. perform external competitiveness analysis.

The sectoral analysis performed for the livestock sectors considered closely follow the above outline, for the fruit& vegetable and olives however, a case study approach based on selected regions was used. In addition, a bio-physical farm model is employed in this case study to assess cost impacts of selected cross compliance measures. Moving from Step 3 to 4 requires an aggregation (or up-scaling) procedure, which is needed to assess competitiveness at the global level.

In Step 1 the selection of sectors, standards but also countries and data is made. The selection of sectors is based on several criteria, such as the EU's share in global production, the importance of the products for external trade with non-EU countries, the socio-economic importance for the northern and southern parts of the EU and the linkage to market and price support measures of the CAP as well as the direct payment schemes.

The selection of the standards analysed is based on several considerations: information about the importance of standards, best estimates of degrees of compliance and qualitative assessment of effects (marginal, limited, significant) and costs (negligible, low, potentially significant) across standards, sectors and countries. Qualitative assessments were made during the first stage of the project (Jongeneel *et. al.*, 2007).

With respect to countries, the analysis is performed for selected EU-countries, EU-15 as a whole, and such non-EU countries as US, Canada and New Zealand. The selected non-EU countries are important competitors of the EU in the selected products. Individual member states are selected upon their contribution to EU production and to some extent upon data availability. If not specified otherwise, the assumption made is that other EU countries have minor exports and import shares (<5%) and therefore do not influence the global competitiveness analysis. While the old member states are struggling with implementation of standards since 1991, the new member states have to only start to introduce the standards in the next years. Therefore a case study approach with limited reference to farm data and costs of compliance is used for Poland in the current analysis.

The following major data sources are used in the analysis. For a single EU country, data have been processed from the Farm Structure Survey (FSS) or from Farm Accountancy Data Network (FADN). For an overview and individual EU country-specific contributions to the EU-15 or EU-27 the EUROSTAT aggregated data were assessed. In many cases regional databases were used, for example (REGIO). The data from existing networks, for example International Farm Comparison Network Dairy (IFCN) or a network of European research institutes coordinated by the Meat and Livestock Commission and the British Pig Executive (Interpig) were used to enable for international comparison of competitiveness. For non-EU countries, the farm as well as regional data were used. From the United States Department of Agriculture (USDA), Statistics Canada (for Canada) and Ministry of Agriculture and Forestry (for New Zealand) and regional authorities were enquired among numerous sources.

Survey data are used for selected case studies at the province level of two EU countries: Italy and Spain.

In Step 2, expert judgments, discussions within the project group, the outcomes of seminars and discussions within the Enduser Group (including representatives form DG Research, DG Agri, OECD, some national governments and other stakeholders (COPA)), and findings obtained from other projects and a literature review are used to establish the initial level of compliance to certain directives and to suggest the degree of possible improvement. The distinction is made between SMRs and GAECs, since GAECs were introduced after the Cross Compliance regulation came operative. An overview is thus performed for each of SMRs and GAECs directives across different sectors and countries for which policy areas/legislation are likely to have cost implications on the examined sectors. Requirements with potential cost implications are listed as well.

When considering potential cost implications due the compliance with standards, it needs to be noted that implementation of standards varies considerably between Member States. Therefore the assessment of potential costs is done for particular member states. In addition, to assure comparability of competitiveness between EU and non-EU countries, implementation of comparable standards and potential cost implications are provided for New Zealand, Canada and USA.

The estimates about the prevailing level of compliance and the improvement in compliance is estimated as the change in compliance as compared to 2005, the year for which best estimates of compliance could be obtained.

In Step 3, the procedure followed in determining the costs of compliance follows a bottom-up approach, which starts from farm level (taking into account farm type, production intensity, and farm location). To define the number of affected farms (animals) in the sector of each European country, the map of Nitrate Vulnerable Zones was used.

In non-EU countries, case study approach was used. The results are presented in individual product-chapters and in the Annex to this report.

The costs associated with (assumed full) compliance to the standards have to be related to the costs of production in order to be suitable for incorporation in the GTAP-model (see Demont *et al.*, 2007b; Demont *et al.*, 2007a for details and also in section 2.3). For European countries, the most recent and available farm accountancy data (FADN, year 2003) and FSS (year 2005) data are used for the analysis. In non-EU countries, data from 2005 are used.

A modelling framework as applied in Spanish case complements the work done at the farm level A model-based analysis integrating an economic (mathematical programming model) and agronomic model (Cropsyst) is performed to simulate policies and assess the cost of selected cross compliance measures (nitrates directive and water use). The data from years 2005 and 2006 are used. In the Spanish case of the Olive sector, main data sources are from 2005 (cost of compliance with standards on erosion or green covers maintenance).

For Step 4 an up-scaling procedure is employed to derive the percentage cost increase at the national level. In EU countries, the percentage costs increase as a whole is determined by a production weighted share of the specialised farms which faced a cost increase and the specialised farms which do not face a costs increase (affected and non-affected farms). Under these assumptions the aggregation of costs to the national level is done for all sectors and countries where GTAP model was specified (see Step 5 and also Table 2.1).

In Step 5, a multiregion, multisector, computable general equilibrium (CGE) model, which is capable to take into account the various behavioural responses and related market adjustments, is exploited to determine the impacts on the EU's and other countries trade positions from the increases in the cost of production.. The percentage costs increase at the sector level of each major market player is inputted into GTAP model to simulate changes in trade. More details are presented in section 2.3

Table 2.1: Design of competitiveness analysis in selected countries for selected sectors

Sector	Country	Data		Farm level competitiveness (Year)		Global level competitiveness, countries included (Year 2001)**
		Average farm	Case study	% costs increase	Gross Margin	
Dairy	EU-15 (BE, NL, FR, DE, UK, DK, ES)	2003	IT (Lombardia) 2005	2003	2001 and 2005	☒ (see Table 4.8)
	New Zealand	2005		2005	2001 and 2005	☒ (see Table 4.8)
	Canada					minor trade
	USA	2005	Wisconsin, California, 2005	2005	2001 and 2005	☒
Beef	EU-15 (BE, NL, FR, DE, UK, IT, ES, IR)					☒ (see Table 5.15)
	New Zealand					☐
	Canada					☐
	USA		Texas, 2007			☒
Pigs* and Poultry	EU-15 (NL, FR, DE, UK, IT, ES, IR)	2005	IT (Lombardia) 2005			☒ (see Table 6.11)
	New Zealand					minor trade
	Canada					no data
	USA		Iowa	2006		☒
Cereals	EU-15					☒ (see Table 7.11)
	New Zealand					minor trade
	Canada					minor trade
	USA					☐
Fruits and Vegetables	Spain	2003	Valencia and Castilla la	2003 and 2005	2005	No data
	US			2005		
Olives	Spain (Andalusia)	2003	Andalusia, 2005	2005	2005	No data

Notes: ☒ The box is ticked-off when changes in costs due to the compliance to standards in this country are modelled in GTAP model; corresponding percentage changes for non-EU countries are mentioned in parentheses. ☐ The box is not ticked off when the country is included in the model but changes are not modelled. In all other cases the country is not included either due to low (<5%) percentage in the total trade, or when no data is available (no data).

* Analysis in GTAP is only done for the pig sector. Poultry sector is not distinguished in the model.
** Year 2001 is a base year; price situation of the year 2003 is introduced in the dairy sector to account for the reform of 2003.

2.2 Challenges in assessing farm level competitiveness

In the project the main emphasis is on external competitiveness of each sector (see section 2.3 in this report). In that the GTAP trade-impact analysis plays a key-role and therefore the results of farm level analysis which form the input to the GTAP model – percent cost increase – should be aligned as much as possible. Using farm-budget analysis allows for comparability of the results across sectors as well as countries. Using different units and currencies is not critical since the percentage cost increase is calculated, that later enters as input into he GTAP model.

Although knowledge of the components of costs are useful for a better understanding of competitiveness, one should be careful to draw conclusions about competitiveness from simple cost of production comparisons. It could be argued that alongside costs also revenues should be taken into account, because ultimately it is profitability rather than costs which drives competitiveness. Competitiveness addresses the comparison of firms on one market: one firm is more competitive compared to one other if it can supply a product at lower costs, without affecting its overall profitability on the long term. In the case of farms, the profitability can therefore be approached by the farm's gross income (revenue earned with main product and by products as well as product related policy payments and subsidies) minus the costs of variable and (quasi-)fixed factors.

Given the context the following set-up of the farm level competitiveness analysis is realised.

1. Farm level analysis is performed, which corresponds to the external competitiveness analyses as done within the GTAP approach. For the selected measures and countries the average farm accountancy figures and the calculated on-farm impacts are provided. Both short- and long-term competitiveness are analysed.
2. For the in-depth analysis of specific issues, a number of selected cases (countries) is analysed, using typical farm data (rather than average farms).

The implementation of the farm competitiveness analysis requires detailed data on (i) the average farm-level impact of the regulations under research, (ii) the degree of compliance to standards in the sector and (iii) average farming budgets (production costs) representative for the sector. Difficulties to derive the imputed value of family labour directly from FADN data and thus to allow for a comparability of results across countries is limited. For example, for dairy sector the costs of imputed labour are available only for the Netherlands (LEI, 2006) and the US (Winrock, 2007). Therefore, the analysis of competitiveness focuses on gross margin (revenues minus variable costs) as the performance measure across countries and not on net result.

Since results at the farm level are likely dependant on farm structure, which varies across Europe and to a greater extent between the countries under investigation, the calculations of costs as well as impacts on competitiveness in some cases are presented for farms of different structure (size, intensity). However, it is impossible to account for all the heterogeneity in production. Rather representative farm studies (per country) were done and used as a basis for the cost increase calculations. More emphasis on farm representativity is paid in Spanish case studies, which as expected is a time-consuming investment that permits to use a farm-based model approach in one of the inland regions. This representative farm approach is also used in the other regions considered for homogenizing the analysis on competitiveness. Aggregation of farm types to the national level will require further analysis and specific assumptions that will reflect the intra-regional differences and variations. Best-estimates of compliance are used, but these still contain a certain degree of uncertainty. In a number of cases alternative approaches and the different sources were used to cross-check both cost of production and degree of compliance estimates in order to test for the robustness in terms of order of magnitude. To allow for cross-country comparisons, the *typical* farm data from the well established networks are used. Two of these, for example, are International Farm Comparison Network (IFCN, see Hemme, 2002) and a network of European research institutes coordinated by the Meat and Livestock Commission and the British Pig Executive (Fowler, 2006). The advantage of these data is that they have been harmonized prior to analysis and distinguish family labour costs, thereby allowing to focus on the net results.

As it was mentioned earlier, an aggregation (or up-scaling) procedure has been performed in order to assess percentage cost change at the national level by using the farm level results. Estimates of the number of farms affected by the specific SMR or GAEC and of the degree of compliance have been used in order to carry out this up-scaling procedure. As attended the impact of full compliance with the SMRs is minor at sector level than at the single farm level as not all farms are affected. Significant differences between Member States occur due to relevant differences in the degree of compliance.

2.3 Challenges in assessing global level competitiveness

The approach chosen for the costs impact calculations follows the procedures as outlined in Deliverable 7 (De Roest *et al.*, 2006) of this project and as further detailed and put in an competitiveness context in (Demont *et al.,* 2007a). The main focus is on assessing external competitiveness for which the world trade consequences of the considered regulations have to be analysed. The tool used for this latter exercise is the GTAP computable general equilibrium model.

The highest level of disaggregation of the GTAP 6 Data Package is 87 regions, 57 sectors and 5 production factors. To model production factors, we use the full disaggregation of five production factors available in GTAP (land, unskilled labour, skilled labour, capital and natural resources). We shock total factor productivity to simulate an increase in total production costs engendered by standards on agricultural production. The sectors are aggregated to three main sectors, i.e. food, manufactures and services. In our modelling framework, we consider four sectors, i.e. (i) the sector under research, (ii) the rest of the food sector, (iii) manufactures and (iv) services. The focus is however on the agricultural sector. GTAP models are develop for four sectors, i.e. the beef, pigmeat, dairy and cereal sectors.

About 30 GTAP experiments were designed to tune with factoral aggregation, modelling of shocks, regional aggregation (see also Demont et al, 2007a). Thus, for each sector, the major trade partners are identified and the relevant trade model is constructed for assessing the impact of standards on the external competitiveness of European agriculture and generating global export quantity elasticities.

The following procedure was followed to create four GTAP models for each sector:

1. Generate the full regional disaggregated trade matrix of 87 regions using GTAP;

2. Create EU-15 aggregate. We use the EU-15 as the correct aggregate as the GTAP database is constructed on 2001 data, i.e. before accession of the 10 New Member States;
3. Select the trade partners that represent at least 5% of global exports or imports of the sector under research. This step ensures that the major exporters and importers of the global sector are included;
4. Aggregate the remaining countries in two regions: (i) the rest of OECD (ROECD) countries and (ii) the rest of the world (ROW);
5. Correct for intra-trade. In GTAP, aggregating does not eliminate intra-trade. Therefore, the trade matrix has to be corrected for this by setting the intra-trade of the EU-15, the ROECD and the ROW to zero and recalculating the totals of the matrix;
6. Repeat step 3. The trade matrix created so far is square, implying that also exports of net importing sectors are tabulated. Therefore, only trade partners that represent at least 5% of global exports or imports of the sector under research are selected.

The 30 GTAP experiments, which were assessed before the percentage cost estimates were derived, allow for sensitivity analysis, which identified possible ranges of solutions in simulation of trade effects. One could in addition perform tests on the distribution of costs, which to some extent was delivered within the analysis of Nitrate Directive impacts by varying the final degree of compliance.

As regards the GTAP model alongside it strengths it has some drawbacks. Firstly, the model has a high product aggregation level, which makes the analysis a bit rough. For example, where for dairy there are a host of derived traded products (like butter, skimmed milk powder, hard cheese, soft cheese, cream, whole milk powder, casein, etc.) GTAP distinguishes only one dairy product, and therewith looses a lot of detail. The beef sector is not disaggregated in GTAP (includes bovine animals, sheep, goats, horses, asses, mules). This is however does not have strong implications since the shares of traded sheep, goats, horses are minor among countries selected for the analysis. The model does not distinguish pig and poultry production and therefore this aggregated sector has been disaggregated using the tool “Splitcom”. In the standard settings of the tool, the sector is split in two identical sectors. However, based on trade data form FAOSTAT, we created a new split taking into account the real trade patterns but kept the elasticities from the original sector. Partly this might be remedied by the used Armington assumptions, which allow to account for product heterogeneity, but it is not always easy to understand the relationship between the elasticity of substitution parameters and actual market conditions.

Secondly, the GTAP model version used for this analysis uses 2001 as a base year. Since the reform in the dairy sector was very prominent not to account for it, we introduced a price decrease in the base year of 2001, i.e. replicating the situation in the dairy sector of 2003 which is closer to the situation when compliance to standards was introduced. The improvement in compliance is estimated as the change in compliance as compared to 2005, the year for which best estimates of compliance could be obtained. The results of the GTAP model are then interpreted as estimates of improvement in compliance since 2005 are evaluated as if they are happening in 2001 (the GTAP base year data). For this reason percentage changes as compared to the baseline scenario are analysed and not absolute numbers.

Thirdly, the GTAP model is a relatively static model, reacting instantaneously to changes in costs, etc., where in reality adjustments might be more less fast. Capital and labour factors are mobile in the model, therefore negative effect on one sector is balanced out by other sectors. Financial sectors are fixed (no money borrowing from country to country) and overall shifts in production factors are rather long-term effects and are not important with respect to Cross Compliance regulations.

More importantly, the GTAP model assumes rational profit maximizing producer behaviour, like most production models based on micro economic theory do. It is known however, that in agriculture farmers might, at least in the short term, behave sometimes in an adverse manner. For the case analysed here, this can imply that the burden of the calculated cost increases is partly or fully carried by family labor rather than passed on to buyers of farm products. The GTAP calculation procedure does not take this into account. To the extent that this phenomenon yet occurs, the calculations given below are likely to give an upper bound of the impacts, where the really observed impacts on trade patterns might be smaller than the predicted ones.

Formulation of a scenario on hormone ban deserves special attention. When simulating the trade impact of hormone use ban in the U.S. for dairy and beef sectors, the percent costs increase is imposed on the U.S. One may argue that since the hormone use is allowed in the U.S. and prohibited in the EU, the effects on trade are foregone benefits for the EU in case the hormone use is allowed. From the modelling perspective, the shifts of supply curves in these polar cases would in fact lead to the same net trade effect. Since both formulations of this scenario are hypothetical and since the results of potential cost decrease for the EU are not available and contrarily it is easier to obtain numbers on costs associated with hormone use in the U.S., the scenario is modelled as mentioned above: increase of costs for the U.S. For the GTAP simulation, a point for discussion is whether the estimate of percentage cost decrease due to use of hormone applies to a combination of production expansion (a movement along the cost curve) and the innovation-shift (a shift of the supply curve), as it is assumed. For the GTAP percentage cost increase it seems important to isolate the pure costs reduction percentage rather than the cost change associated with the combined effect. The latter is likely to lead to an underestimation.

2.4 References

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3 Review of SMR and GAEC standards and their likely cost implications on farms

3.1 Introduction

The following chapter will outline which cross compliance standards (SMR and GAECs) are likely to have cost implications on farm sectors examined within this project.

These farm sectors are: dairy products, cereals, pigs and poultry, beef, fruits and olive oil.

This paper is intended to stimulate discussion at the project meeting on cost impacts of compliance with cross compliance standards.

The results of this paper are preliminary and based on the outcomes of the project deliverables within previous work packages, expert judgement and discussions within the project group, with DG Agri as well as the end user group. Results are also based on the analysis of compliance rates[3] and the outcome of the Brussels workshop in 2006. Moreover, it builds on some of the findings of the CC net project and other projects.[4]

First an overview will be given of which policy areas/ legislation included in Annex III of regulation 1782/2003 (SMRs) are likely to have cost implications on the examined sectors (see Table 3.1). The cost implications in Table 3.1 refer to an assumed situation of introducing standards that have not yet been implemented. However, it is important to highlight that these are not the "(additional) costs of cross compliance", but the "cost implications of compliance with (previously existing) standards". Costs of cross compliance will be the subject of the second part of this paper.

A clear distinction of both concepts ("costs of compliance" versus "cost of cross compliance") is crucial to correctly interpret the project's results. In this respect, the costs for farmers for reaching standards pre-existing to the introduction of cross compliance cannot be considered as due to cross compliance.

[3] With restrictions the current level of compliance with SMRs and GAEC can serve as an indicator for an estimation on the proportion of farmers that may incur costs now or in the future

[4] particularly Farmer, Martin et al 2007: The Possible Impacts of Cross Compliance on Farm Costs and Competitiveness, Deliverable 21, A Research Paper of the Cross Compliance Network, Institute for European Environmental Policy (IEEP), January 2007, also Muessner, Karaczun, Dworak, Marsden 2006: WFD and Agriculture Linkages at the EU Level. Final Report about Cross Compliance and the WFD", june 2006, Deliverable within the projec "CAP & WFD", supported by the European Commission

Costs associated with achieving compliance with mandatory cross compliance standards can occur in the following ways:

- Investment costs: need to purchase new equipment (e.g. storage facilities), build new facilities etc.
- Production costs: potentially reduced yield due to change in production practises (e.g. minimum maintenance, standards on tillage/ ploughing) etc.
- Administrative costs: time needed to become familiar with new requirements/ procedures/ controls (training events etc.); time needed to complete documentation, prepare controls and inspection time.
- non-compliance costs: deduction made from the SFP, potential loss of accreditation

However, these costs can only be attributed to cross compliance if the requirement was not mandatory before the introduction of cross compliance. If the requirement was mandatory before cross compliance, than this is a cost of meeting the pre-existing legislation.

Moreover differentiations should be made with regard to ‘long term’ and ‘short term’ impacts on competitiveness: the impacts should decline in the longer term as farmers become more aware of the standards and what needs to be done to achieve compliance.

The main determinants of farm level costs arising from both SMR and GAEC are:

- whether the requirement is applicable to the farm
- if so, whether the farm is already compliant (or to which degree he or she is already compliant) with the requirements. (There are no additional costs associated if the farmer is already fully compliant, but s/he might have faced costs in the past to achieve compliance. It could also be true that the requirements are part of the farmer’s normal farming practises and therefore invoke no additional costs).
- whether the standard is based on items of national legislation that was already in place before the introduction of cross compliance, meaning that there was a already need to comply.

Moreover, it needs to be noted that SMRs and GAEC standards only apply to farmers claiming Single Payment.

3.2 Costs of Compliance

The following Table 3.1 gives an overview of which policy areas/ legislation included in Annex III of regulation 1782/2003[5] (SMRs) are likely to have cost implications on the examined sectors.

[5] Only those aspects of the respective regulations and directives have been analysed that are part of the SMRs. e.g.. for the Nitrates Directive this would be the Articles 4 and 5 (see Reg 1782/ 2003, Annex III) instead of the whole Directive.

Three categories of cost implications can be distinguished:

+	**No costs**: Policy indicated as a marginal constraint on farming and implies no costs to the sector
++	**Marginal costs**: Policy indicated as a noteworthy constraint on farming and implies marginal costs to the sector (e.g. limited geographical coverage or low-cost implications)
+++	**Noteworthy costs**: Policy indicated as a significant constraint on farming and implies noteworthy costs to the sector
Empty cells:	not relevant

These categories of evaluation will be used further on in the report evaluating cost implications implementing national GAECs standards in selected Member States.

It needs to be noted that the classification can only be rough, since concrete cost implications will always be case specific (e.g. depending on country/region, farm size, reference year, farm type and structure, etc.).

Table 3.1: Cost implications of compliance with SMRs for selected sectors

Directive [with year of introduction of regulation/ directive]	**Cereals**	**Dairy**	**Beef**	**Pigs/ poultry**	**Fruits/ vegetables**	**Olives (oil)**	**Requirements with potential cost implications**
Environment							
1979 Conservation of wild birds	++ [6]	++	++	+	++	++	Management inside and outside protected areas, establishment of biotopes, no disturbance of birds during breeding (loss of yields?)
1980 Protection of groundwater	++	++	++	++	+	+	Limitations on discharge of substances
1986 Sewage sludge	++				+	+	Prohibitions on use
1991 Nitrates from agriculture	++	+++	++	+++	+++ [7]	++	Prohibitions on periods when the application of fertilizer is inappropriate, storage facilities, might be

[6] With regards to the Birds Directive and cereal sector: It may be more a constraint for cereal farmers because some valued farmland bird species nest and breed in cereal fields.

Directive [with year of introduction of regulation/ directive]	**Cereals**	**Dairy**	**Beef**	**Pigs/ poultry**	**Fruits/ vegetables**	**Olives (oil)**	**Requirements with potential cost implications**
							costly for farmers in Vulnerable Zones
1992 Conservation of natural habitats, wild flora and fauna	++	++	++		++	++	Maintenance habitats and conservation measures
Public and animal health; identification and registration of animals							
1992 Identification and registration of animals[8]		++	++	++			Administrative requirements on the identification and registration systems
1997 Identification and registration of bovine animals		++	++				Rules as regards identification and registration systems
2000 Identification of bovine animals, labelling of beef		++	++				Rules as regards identification and registration systems and labelling of beef
2004 Identification and registration of ovine and caprine animals		+					Rules as regards identification and registration systems
Public, animal and plant health							
1991 Placing of plant protection products on the market	+++				+++		Use and control of Plant protection Products, requirements on classification, packaging and labelling
1996 Use of hormones		+++	+++	+++			Prohibition of the respective substances
2002 Requirements of food	+++	+++	+++	+++	+++		Food safety requirements, traceability of food

[7] Although the Nitrates Directive has a major impact on the cereals sector, it is the most relevant standard in the vegetables sector, as it produces important yield decreases in some crops, mainly in potato.

[8] With regard to the I&R Directive: as a pre-existing requirement, any costs arising should be attributed to the legislation and not cross compliance. These costs are likely to be those of replacing eartags and accompanying inspectors on farm when the animals are checked (can take a long time on larger units).

Directive [with year of introduction of regulation/ directive]	**Cereals**	**Dairy**	**Beef**	**Pigs/ poultry**	**Fruits/ vegetables**	**Olives (oil)**	**Requirements with potential cost implications**
law							
2001 Prevention, control and eradication of spongiform encephalopathies		+++	+++				Prohibitions concerning animal feeding (feeding of ruminants with protein derived from mammals prohibited), animal health certificates
Notification of diseases							
1985 Control of foot-and-mouth disease		++	++	++			Control measures in the event of outbreak, notification of authority
1992 Control of swine vesicular disease				++			Control measures in the event of outbreak, notification of authority
2000 Control of bluetongue		+++	+++				Control rules in the event of outbreak, notification of authority
Animal welfare							
1991 Standards for the protection of calves		+++	+++				Requirements to holdings/ space allowances/ conditions for rearing calves
1991 Standards for the protection of pigs				+++			Space allowances/ Standards for rearing and fattening
1998 Protection of animals kept for farming purposes		++	++	++			Conditions under which animals are bred or kept (staffing, inspection, record keeping, equipment, feed, water etc.)

3.3 Costs of Cross-Compliance

When considering the additional costs of cross compliance at farm level, one has mainly to consider the costs derived from meeting the standards of GAEC. Unlike the SMRs, the standards in Annex IV of Regulation 1782/2003 are not based on EU legislation. This therefore enhanced the possibility of the introduction of entirely new standards, depending on the extent to which Member States have pre-existing national legislation for soil erosion, soil organic matter, soil structure and minimum maintenance and whether this legislation is included as GAEC standards.[9]

The applicability of GAECs to different farm sectors varies and affects some more than others. For example, in France the requirement to create a buffer strip on three per cent of UAA has a cost implication in particular for arable farms, as a small amount of land is taken out of production. In Lithuania, a more significant cost impact is expected on farmers grazing livestock in more remote areas in order to meet the minimum maintenance requirement, where the farmer will either need to keep more animals or pay to have the grass removed.[10]

If costs are applicable to cross compliance depends on the level of implementation of standards into national legislation before they were part of cross compliance and if the GAECs are applicable to the farm. In most cases, Member State GAEC standards are, as with SMRs, based on pre-existing national legal requirements. However, several Member States have included new standards within the national GAEC framework, and it is these standards that may result in a cost that the farmer did not have to meet before the introduction of cross compliance.[11]

3.4 Implementation of GAECs into national legislation

As outlined above, when considering potential cost implications due the introduction of GAEC, it needs to be noted that implementation of GAEC standards varies considerably between Member States. For UK, Germany, the Netherlands, Spain, Poland, Italy and France the following tables will therefore outline the differences in implementation. Moreover it will be noted, which of the GAECs are new legislation rather than covering pre-existing legislation. An additional text section will comment on the evaluations and analysis made.

In addition, implementation of GAEC comparable standards and potential cost implications will be provided for the three not-EU countries New Zealand, Canada and USA. The same four categories of evaluation of cost implications, i.e. "+", "++", "+++" and an empty cell, are used, as provided in the text above for costs of compliance with SMRs.

3.4.1 Implementation of GAEC standards in England and costs associated

The Table 3.3 shows for each GAEC standard, the corresponding Annex IV standard (note in some cases we use 'other' where the English standard does not clearly match an Annex IV standard), whether the requirement was newly introduced with cross compliance (i.e. it was not part of pre-existing national legislation) and a judgement as to the extent each sector of interest to this study is likely to be affected in terms of costs.

This table probably requires greater contextualisation e.g. farms with smaller fields with more hedgerows are exempt from the 2m margins requirement. Also, specialist pig and poultry

[9] Farmer et al 2007
[10] Farmer et al 2007
[11] Farmer et al 2007. See also for an overview which GAEC standards were newly introduced (for selected Member States: Denmark, France, Italy, Netherlands, UK)

producers and fruit horticulture producers are less likely to receive the Single Payment and therefore be subject to cross compliance. In the UK uptake of the Single Payment was lowest among pig, poultry and horticultural holdings (see Table 3.2 below).

Table 3.2: Uptake of the Single Payment in the UK

	N holdings	Total area 000ha	% holdings in SPS	% in SPS (adjusted)
cereals	22726	3005	90.0	87.9
general cropping	9041	1390	90.6	84.0
horticulture	9592	117	29.5	22.9
pigs	2387	28	28.4	26.4
poultry	6513	55	25.1	28.5
dairy	12919	1123	92.1	79.0
LFA grazing	10707	1015	83.8	83.2
lowland grazing	32925	1016	65.0	67.4
mixed	14584	972	58.4	55.3
other	74514	558	32.8	40.9

The following Table 3.3 gives an overview of which GAEC standards are likely to have cost implications on the examined sectors. The Table 3.3 shows that GAEC standards have the greatest cost implication for cereal farmers. Although this cost is fairly minimal, it affects 88% of all cereal holdings (see above Table 3.2). This is in contrast to the SMRs where livestock farmers are more affected (mainly dairy and LFA farmers, as uptake of SPS among pig and poultry farmers is low although not insignificant).

In England there are often several separate GAEC standards for each Annex IV standard. The constraints imposed for each standard are therefore listed (in italics in the table), as is the overall constraint for each Annex IV standard (minimum soil cover etc, shown with a bullet point in the table). Some caution is required when interpreting the table, particularly where strong effects have been identified, and where constraints from different standards have been averaged out in order to make a judgement as to the total constraint in relation to each Annex IV standard. These effects are purely relative and in the wider policy/regulatory context may not impose the greatest constraints.

Table 3.3: Cost implications implementing GAEC standards in England

GAEC Issue	GAEC standard	Cereals	Dairy	Beef	Pigs/	Fruits/ horticulture	Olives (oil)	New requirement (N) or pre-existing legislation (P)? (and comments)
Soil erosion:	• Minimum soil cover *(Soil Protection Review, SPR)*	+ +	+ +	+	+	+		N Impact on farmers will depend on existing management, farm type and conditions (e.g. crops grown, livestock housed or outside, rainfall, topography, etc.).
	Post-harvest management	+						N Involves requirement for some soil cover over winter.
	• Minimum land management reflecting site-specific conditions	+	+	+	+	+		N SPR has potential to limit soil damaging activities.
	Soil Protection Review (SPR)	+ +	+ +	+	+	+		N (see comments above)
	Post-harvest management	+						N Applies after harvest of oilseeds, grain legumes and cereals (not maize).
	Waterlogged soil					+		N Applies to harvesting of fruit & veg. Main impact on potatoes + root crops.
	• Retain terraces							Not relevant to England.
Soil organic matter:	• Standards for crop rotations where applicable							No corresponding GAEC standard implemented in England.

GAEC Issue	GAEC standard	Cereals	Dairy	Beef	Pigs/ poultry	Fruits/ horticulture	Olives (oil)	New requirement (N) or pre-existing legislation (P)? (and comments)
	• Arable stubble management *(Burning of crop residues)*	+						P Marginal constraints upon farming
Soil structure:	• Appropriate machinery use *(Waterlogged soil – mechanical operations)*					+		N Applies to harvesting of fruit & veg. Main impact on potatoes + root crops. Could limit access to livestock in extreme cases.
Minimum level of maintenance:	• Minimum livestock stocking rates or/and appropriate regimes		+	+	+			N (Previous requirement under GFP) Overgrazing and unsuitable supplementary feeding. Applies only to natural and semi-natural grasslands, mainly beef and sheep farming.
	• Protection of permanent pasture	+	+	+	+	+		P Requirement for EIA on uncultivated and semi-natural areas. Unclear what impact this has on farmers in practice.
	• Retention of landscape features	+	+	+	+	+		N Main impacts are hedge cutting dates and protection of hedges and watercourses (both N)
	Stone walls	+	+	+	+	+		N Stone walls are protected where they occur but minor constraint on farming.

GAEC Issue	GAEC standard	Cereals	Dairy	Beef	Pigs/	Fruits/ horticulture	Olives (oil)	New requirement (N) or pre-existing legislation (P)? (and comments)
	Hedgerows (cutting dates)	+	+	+	+	+		N No hedge cutting between 1 March and 31 July (bird nesting season).
	Hedgerows removal							P Authorisation needed to remove hedges based on pre-existing legislation. Farmers with large filed and few hedges particularly unaffected.
	Protection of hedges and watercourses	+	+	+	+	+		N 2m margins from centre of hedge. 1m margin from edge of watercourse. Fields < 2ha exempt. Does not prevent livestock grazing on margins but does prevent cultivations, input applications and supplementary feeding.
	• Avoiding the encroachment of unwanted vegetation on agricultural land	+	+	+	+	+		N, P.
	Eligible land not in agricultural production	+	+	+	+	+		N Only applies to non set-aside ungrazed or uncultivated land. Many farms unaffected. Requirement to cut scrub. Also relevant for permanent pasture.

GAEC Issue	GAEC standard	Cereals	Dairy	Beef	Pigs/	Fruits/ horticulture	Olives (oil)	New requirement (N) or pre-existing legislation (P)? (and comments)
	Control of weeds	+	+	+	+	+		P All reasonable steps to be taken to control injurious weeds where they occur. Marginal constraint on farming except where infestations occur.
	Other *Scheduled monuments;* *SSSIs (sites of special scientific interest);* *Public rights of way;* *Heather and grass burning;* *Felling of trees;* *Tree Preservation Orders.*							P All based on pre-existing legislation. Inclusion within GAEC may improve awareness and enforceability of existing obligations but they are not new. Marginal constraints upon farming. Heather and grass burning applies to upland areas.

3.4.2 Implementation of GAEC standards in Germany and costs associated

In 2004, a new national ordinance (DirektZahlVerpflV 2004)[12] containing the provisions on maintenance of agricultural land in good agricultural and environmental conditions has been issued by the German federal government and covers the majority of the GAEC standards set by the Annex IV of Council Regulation 1782/2003. Although the ordinance sets uniform standards for GAEC in Germany, they are implemented under the responsibility of the Länder. The Länder (regional) authorities may approve exceptions in certain cases or areas, and are also responsible for measures concerning the retention of permanent pasture.

[12] National ordinance on maintenance of agricultural land in good agricultural and environmental conditions (2004): Verordnung über die Grundsätze der Erhaltung landwirtschaftlicher Flächen in einem guten landwirtschaftlichen und ökologischen Zustand (Direktzahlungen-Verpflichtungenverordnung - DirektZahlVerpflV) vom 4. November 2004 (BGBl 2004 I, S. 2778 ff. vom 12.11.2004 Nr. 58) and Change of the national ordinance on maintenance of agricultural land in GAEC (26.5.2006, BGBl. 2006 I S. 1252).

Nevertheless, rules on soil use and good agricultural practice (GAP)[13] applied to agricultural land have existed in Germany before this new ordinance was adopted. The Federal Soil Protection Act (BBodSchG[14] 1998, Art. 17) and the Federal Nature Conservation Act (BNatSchG[15] 2002, Art. 5) define the principles of GAP related to soil and prescribe several rules concerning agricultural soil use. The national GAP standards are legally binding for all farmers, while the German GAEC standards (DirektZahlVerpflV 2004) are binding only for farmers receiving direct payments.

In summary, the previously existing German legislation overlaps in large parts with the new GAEC standards, the latter being more specific and detailed or in several cases going beyond GAP rules, for instance regarding crop rotation, minimum soil coverage, and the definition of landscape features. Against this background, it can be assumed that the GAEC requirements, or cross-compliance hardly can introduce new costs, with the exception of additional administrative costs (for more information see Chapter 8.2 in D5 for Germany (Müssner et al 2006[16])). Cross compliance might however pose a greater challenge to small scale and part-time farmers as well as specialised farms. The Table 3.5 to Table 3.7 (as adapted from D5 for Germany (Müssner et al 2006[17])) below present the GAEC standards as given by Annex IV of Council Regulation 1782/2003 and the national implementation of these standards. Where possible, they also list the corresponding provisions of national law that define the GAP independent of cross compliance. The following Table 3.4 gives an overview of which GAEC standards are likely to have cost implications on the examined sectors.

Table 3.4: Cost implications implementing GAEC standards in Germany

GAEC Issue	GAEC standard	Cereals	Dairy	Beef	Pigs/	Fruits	Olives (oil)	New requirement (N) or pre-existing legislation (P)? (and comments)
Soil erosion:	• Minimum soil cover	++	+	+	+	+		N, P
	• Minimum land management reflecting site-specific conditions							P

[13] "Good Agricultural Practice" and "Good Farming Practice" are understood as synonymous terms. German term: "Gute fachliche Praxis".

[14] BBodSchG 1998: Gesetz zum Schutz vor schädlichen Bodenveränderungen und zur Sanierung von Altlasten (Bundes-Bodenschutzgesetz - BBodSchG) vom 17. März 1998 (BGBl. I S. 502), zuletzt geändert durch Artikel 3 des Gesetzes vom 9. Dezember 2004 (BGBl. I S. 3214). [Federal Soil Protection Act 1998].

[15] BNatSchG 2002: Gesetz über Naturschutz und Landschaftspflege (Bundesnaturschutzgesetz - BNatSchG), vom 25. März 2002 (BGBl. I S. 1193), zuletzt geändert durch Artikel 8 des Gesetzes vom 9. Dezember 2006 (BGBl. I S. 2833). [Federal Nature Conservation Act 2002].

[16] Müssner, Rainer; Anna Leipprand and Stephanie Schlegel 2006: Deliverable 5: Mandatory standards in 7 EU countries and 3 non-EU countries. Germany Country Report. Project no. SSPE-CT-2005-006489: Cross-Compliance - Facilitating the CAP reform: Compliance and Competitiveness of European Agriculture. Ecologic. Germany.

[17] Müssner, Rainer; Anna Leipprand and Stephanie Schlegel 2006: Deliverable 5: Mandatory standards in 7 EU countries and 3 non-EU countries. Germany Country Report. Project no. SSPE-CT-2005-006489: Cross-Compliance - Facilitating the CAP reform: Compliance and Competitiveness of European Agriculture. Ecologic. Germany.

GAEC Issue	GAEC standard	Cereals	Dairy	Beef	Pigs/	Fruits	Olives (oil)	New requirement (N) or pre-existing legislation (P)? (and comments)
	• Retain terraces					+		N
Soil organic matter:	• Standards for crop rotations	+ +	+	+				N, P
	• Arable stubble management	+	+	+				N, P
Soil structure:	• Appropriate machinery use	+				+		P
Minimum level of maintenance:	• Minimum livestock stocking rates or/and appropriate regimes		+	+				P
	• Protection of permanent pasture (*Maintenance of set-aside land*)	+	+	+				N, P
	• Retention of landscape features	+	+	+		+		N, P
	• Avoiding the encroachment of unwanted vegetation on agricultural land							Not defined by the national legislation.

The German GAEC standards (DirektZahlVerpflV 2004) address all the issues indicated by the Annex IV of the Council Regulation 1782/2003 (e.g. soil erosion, soil organic matter, soil structure and minimum level of maintenance), however do not deal with all the indicated standards (see Table 3.5 to Table 3.7 below). Although soil structure is not addressed specifically by the German GAEC standards, the requirements for maintenance of soil organic matter are seen as sufficient to address the issue of soil structure at the same time (Nitsch and Osterburg 2007[18]).

The German GAEC standards focus on erosion, soil organic matter, and minimum level of maintenance. Most emphasis receives the minimum level of maintenance, defining requirements for greening and removing of vegetation on land taken out of production, and also describing in detail the landscape elements to be maintained. Another important aspect of GAEC is the maintenance of soil organic matter with minimum requirements concerning the share of crops or, as an alternative detailed prescription, for the determination of the content of soil organic matter and compliance with thresholds. The standards on minimum soil cover,

[18] According to protocol of meeting of the working group cross-compliance 30.10.2003 and 6.11.2003.

standards for crop rotations and retention of landscape features are more specific and going beyond the principles of GAP defined in the Federal Soil Protection Act and the Federal Nature Conservation Act. These standards are mostly relevant to the arable, dairy and beef sectors, as far as dairy and beef farms have arable land, for example because of fodder maize growing. For example, the standards relating to the minimum maintenance of land taken out of production have been adapted in 2006[19]. Before this adaptation the frequency of mulching or mowing on arable land out of production was not specified and is now the same as for grassland. The time where mulching or mowing is not allowed has been reduced to the 30 June. Standards for the minimum maintenance of land taken out of production are not based on existing legislation. The landscape elements were also not generally protected, although some of them have already been covered by Federal and Regional Nature Conservation Legislation (protected wetland habitats and single trees). In some Laender certain types of hedges have already been protected by the regional legislation (e.g. “Knicks” in Schleswig-Holstein and Lower Saxony) (Nitsch and Osterburg 2007).

The general discussion in Germany and most statements by stakeholders focus on the requirements for the maintenance of set-aside land, since 700,000 hectares of set-aside land exist in Germany, and the de-coupling of the agricultural subsidies may lead to additional areas being set aside (Müssner et al 2006[20]). For example, mulching as a standardised mechanical low-cost measure is approved for the maintenance of lands, it might increasingly compete with more costly extensive livestock keeping practices on grassland areas.[21]

Soil erosion (Minimum soil cover)[22]: Farmers may have to sow winter grain or winter catch crop on 40% of the farm’s crop land area. Costs for the sowing of winter crops lie in the range of 550-650 EUR/ha (including the costs for seeds, fertiliser and equipment). However, since a positive profit margin is to be expected when the product is marketed, below the line farmers will incur no extra costs.

Maintenance of organic matter and soil structure[23]: With regard to the *Standards for crop rotations,* farmers probably only choose the crop ratio option if additional crops can be marketed, which again implies that extra costs will not arise. For the compilation of the humus balance, farmers may purchase software for 20-50 EUR, but it can also be done by hand. The alternative, analysis of soil samples, costs approximately 50 to 80 EUR, but has to be done only once in six years.

Maintenance of set-aside lands[24]: The maintenance measures, i.e. sowing of grassland, mulching and mowing, which are required of farmers may constitute a cost factor.

The costs for sowing on set-aside land were estimated to be between 400 and 500 EUR/ha by farmers’ associations. However, sowing is not mandatory, and farmers can also choose to allow natural regeneration of vegetation cover.

[19] Change of the Regulation on the principles of maintaining agricultural land in GAEC (26.5.2006, BGBl. 2006 I S. 1252).
[20] Müssner, Rainer; Anna Leipprand and Stephanie Schlegel 2006: Deliverable 5: Mandatory standards in 7 EU countries and 3 non-EU countries. Germany Country Report. Project no. SSPE-CT-2005-006489: Cross-Compliance - Facilitating the CAP reform: Compliance and Competitiveness of European Agriculture. Ecologic. Germany.
[21] DVL and NABU 2005.
[22] Müssner et al, (2006).
[23] Müssner et al, (2006).
[24] Müssner et al, (2006).

Mulching costs between 35 and 60 EUR/ha, depending on the size of the parcel of land and on working width.

As an alternative to mulching once a year, set-aside land may be mowed every second year. The costs of mowing and removal of cut material depend on machinery used, size of the parcel of land, distance from the farm, and quantity of hay per hectare and may vary between 50 and 300 EUR/ha.

Recovering of grassland could however cause costs, which cannot be quantified at this stage.

Due to the prohibition of mulching and mowing on set-aside land during the period from April 1 to July 15, weed growth could not be controlled sufficiently, which implies an increased need for plant protection products later on.

Maintenance of permanent pasture[25]: In a few regions, permanent pasture area might decline in the future to an extent that will require Länder governments to restrict the ploughing of permanent pasture or even to demand re-sowing. Re-sowing of grassland could cause costs; however, it cannot be quantified at this stage to what extent these costs will become relevant.

Retention of landscape features: No significant cost implications are associated with the retention of landscape features standard.

No direct requirements are specified for minimum land management reflecting site-specific conditions, appropriate machinery use, and minimum livestock stocking rates. However, indirectly the German GAP provisions are constraining them, e.g. recommendations on the equipment used for agricultural soil use, and animal husbandry can be found in guidance documents on GAP, however, these are not relevant for cross compliance. Avoidance of the encroachment of unwanted vegetation on agricultural land are not relevant and/or no constraints were specified.

Table 3.5: National implementation of GAEC standards in Germany: soil erosion[26]

Annex IV standard (Reg. 1782/2003)	German national standards for cross compliance (DirektZahlVerpflV 2004)	German GAP standards (national law)
Minimum soil cover	*DirektZahlVerpflV 2004, Art. 2, clause 1-3:* To prevent soil erosion, at least 40% of the arable area of the farm has to be covered by plants, i.e. not ploughed	*BnatSchG 2002, Art. 5(4)*: (e) "On erosion-prone slopes, in flood plains, at sites with elevated groundwater table and in boggy locations, farmers shall refrain

[25] Müssner et al, (2006).

[26] According to the National act on cross compliance [Gesetz zur Regelung der Einhaltung anderweitiger Verpflichtungen durch Landwirte im Rahmen gemeinschaftsrechtlicher Vorschriften über Direktzahlungen (Direktzahlungen-Verpflichtungengesetz - DirektZahlVerpflG) vom 21. Juli 2004 (BGB1 I 2004,S. 1767 vom 26.7.2004 Nr. 38)], standards for prevention of erosion will be based on a classification of agricultural soils according to their vulnerability to erosion from 2009 on.

[27] For example, a farmer may choose either to grow at least 40 % winter grain or winter catch crop and to sow them before 1 December, or not to plough in the harvest residues before the 15 of February. In Bavaria,

Annex IV standard (Reg. 1782/2003)	**German national standards for cross compliance (DirektZahlVerpflV 2004)**	**German GAP standards (national law)**
	after harvest till the 15 of February of the following year, unless sown again before the 1 of December.[27] The regional administrations of the Laender can decide that this is not applicable in areas with low danger of erosion or fair weather conditions.	from ploughing up grassland".
Minimum land management reflecting site specific conditions	Not defined by the *DirektZahlVerpflV 2004.*	*BbodSchG 1998, Art. 17(2)*: 1. "The soil shall be worked in a manner that is appropriate for the relevant site, taking weather conditions into account". 4. "Soil erosion shall be avoided wherever possible, by means of site-adapted use, especially use that takes slope, water and wind conditions and the soil cover into account". *BnatSchG 2002, Art. 5(4)*: (a) "Land used for agriculture must be appropriately managed in accordance with the requirements of the site in question, and the sustained fertility of the soil and long-term usability of the land must be ensured".
Retain terraces	*DirektZahlVerpflV 2004, Art. 2, clause 4-5:* Terraces[28] must not be removed. The competent regional authority can approve the removal of a terrace if there are no soil erosion risks.	

exceptions from this rule are possible under certain conditions (AGRA-EUROPE 43/06, 23.Oktober 2006, KM 26).

[28] According to the Art. 2 clause 2 of the National act on cross compliance 2004 [Gesetz zur Regelung der Einhaltung anderweitiger Verpflichtungen durch Landwirte im Rahmen gemeinschaftsrechtlicher Vorschriften über Direktzahlungen (Direktzahlungen-Verpflichtungengesetz - DirektZahlVerpflG) vom 21. Juli 2004 (BGB1 I 2004,S. 1767 vom 26.7.2004 Nr. 38)]: Terraces are man-made straight-line structures in the agricultural landscape destined to reduce the slope steepness of the area used.

Table 3.6: National implementation of GAEC standards in Germany: soil organic matter and soil structure

Annex IV standard (Reg. 1782/2003)	**German national standards for cross compliance (DirektZahlVerpflV 2004)**	**German GAP standards (national law)**
Soil organic matter		
Standards for crop rotations where applicable	DirektZahlVerpflV 2004, Art. 3, clause 1-5: For the maintenance of organic matter in the soil and of the soil structure, farmers can choose between different options.[29] Either a crop ratio may be kept that includes at least three crop cultures, each of which has to cover at least 15% of the crop land area. Different cereal species count as independent cultures, as well as summer and winter crops and set-aside land. Crop land where permanent cultures or perennial cultures are grown are exempted from these provisions. If this crop ratio is not realised, farmers have to either provide an annual humus balance or a soil analysis on the basis of soil samples at least every six years. Detailed guidance is provided on how these analyses are to be conducted, and limit values for the content of humus are defined. If these limit values are exceeded, the farmers are obliged to make use of consulting offers and eventually to prove that farming practices have been changed in order to increase or maintain the organic matter content of the soil.	*BbodSchG 1998, Art. 17(2):* 6. “The soil's biological activity shall be conserved or promoted by means of appropriate crop rotation”. 7. “The soil's humus content, as is typical for the site in question, shall be conserved, especially by means of adequate input of organic substances or of reduction of the intensity with which the soil is worked”.
Arable stubble management	*DirektZahlVerpflV 2004, Art. 3, clause 6-7:* Stubble burning is prohibited. For phytosanitary reasons, the responsible authority of the Laender can approve exceptions to the ban on stubble burning.	Majority of German Länder define this standard in their Nature Protection Acts or Regulation on Plant Wastes (e.g. Saarland).
Soil structure		

[29] Here, Germany has established measures in their cross compliance that go beyond the compulsory requirements in Annex IV of Reg. 1782/03.

Appropriate machinery use	Not defined by the *DirektZahlVerpflV 2004.*	*BbodSchG 1998, Art. 17(2):* 2. "The soil structure shall be conserved or improved". 3. "Soil compaction shall be avoided as far as possible, especially by taking the relevant soil type and soil humidity into account, and by controlling the pressure exerted on the soil by equipment used for agricultural soil use".

Table 3.7: National implementation of GAEC standards in Germany: maintenance of set-aside lands

Annex IV standard (Reg. 1782/2003)	German national standards for cross compliance (DirektZahlVerpflV 2004)	German GAP standards (national law)
Minimum livestock stocking rates or/and appropriate regimes	Not defined by the *DirektZahlVerpflV 2004.*	*BnatSchG 2002, Art 5(4):* (d) "Animal husbandry must to be in a balanced relationship to cropping; any adverse impacts on the environment are to be avoided".
Maintenance of set-aside land/Protection of permanent pasture	*DirektZahlVerpflV 2004, Art. 4, clause 1-6:* On obligatory or voluntary set-aside arable land, vegetation cover has to be re-established, either by natural regeneration or by sowing. The plant cover is to be cut and mulched or to be mowed and removed. Set-aside permanent pasture has to be cut and mulched at least once a year, or mowed with removal of the cut material at least every second year. For reasons of nature conservation or water protection the competent authority of the Länder can approve exceptions. With regard to the protection of wildlife, mulching, cutting and mowing is not permitted between 1 April and 15 July. However, a shortening of this period to two months is currently being discussed. According to a draft new ordinance, the retention period would end	In many cases permanent pasture is already protected under agri-environmental schemes

[30] Agra-Europe 11/06, Länderberichte p. 40.

Annex IV standard (Reg. 1782/2003)	German national standards for cross compliance (DirektZahlVerpflV 2004)	German GAP standards (national law)
	15 June.[30]	
Retention of landscape features	*DirektZahlVerpflV 2004, Art. 5, clause 1-3:* Several landscape features are defined that may not be removed by farmers. Elements such as hedges, tree rows, field woods, wetlands and single trees fall under this regulation if they fulfil certain criteria: hedges (minimum length 20 m); tree rows (minimum length of 50 m and at least 5 trees; not agriculturally used trees); field woods (size of 100 –2000 m²); wetland habitats up to 2000 m² that are registered and protected according to the German Federal Nature Conservation Act 2002, Art. 30; single trees that are protected according to the German Federal Nature Conservation Act 2002, Art. 28. Laender maintain the right to approve the removal of the terraces or the destruction of certain landscape features (e.g. trees or hedges).	*BbodSchG 1998, Art. 17(2):* 5. “The predominantly natural structural elements of field parcels that are needed for soil conservation, especially hedges, field shrubbery and trees, field boundaries and terracing, shall be preserved”. *BnatSchG 2002, Art. 5(4):* (b) “Any avoidable impairments of existing biotopes must not be incurred”. (c) “The landscape components required for the interlinking of biotopes must be preserved and, where possible, increased”.
Avoiding the encroachment of unwanted vegetation on agricultural land	Not defined by the *DirektZahlVerpflV 2004.*	

3.4.3 Implementation of GAEC standards in Italy and costs associated

The following Table 3.8 gives an overview of which GAEC standards are likely to have cost implications on the examined sectors.

Table 3.8: Cost implications implementing GAEC standards in Italy

GAEC Issue	GAEC standard	Cereals	Dairy	Beef	Pigs/ poultry	Fruits	Olives (oil)	New requirement (N) or pre-existing legislation (P)? (and comments)
Soil erosion	• Appropriate measures against water runoff on slopes	++	++	++	++			N Relevant for dairy, beef, pigs and poultry too as often these farms produce cereals and other arable crops on farm
Soil organic matter:	• Arable stubble management	+	+	+	+			N Relevant for dairy, beef, pigs and poultry too as often these farms produce cereals and other arable crops on farm
Soil structure:	• Maintenance of draining network efficiency	+	+	+	+	+	+	N Relevant for all sectors but with low cost implications
Minimum level of maintenance:	• Protection of permanent pastures		+++	+++				N Rather strong cost implications in mountain farming
	• Management of set aside land	+	+	+	+			P
	• Maintenance of olive groves						++	N Only for olive groves with risk of abandonment
	• Retain terraces		++	++		++	++	N Relevant only for fruits, permanent grass and olive trees grown on terraces

Soil erosion

In order to protect soil against erosion in Italy one GAEC has been established which provides for the realisation of temporary furrows for collecting rainwater in channels and natural watercourses placed at the edges of the fields. This measure applies to the GAEC standard “minimum land management reflecting site-specific conditions”. The standard applies to arable areas (ex art. 2, point 1 Reg. 796/04 EC), only if they show erosive phenomena. The standard does not apply to these areas if constantly covered with grass or cropped all the year around.

The total costs of compliance for this measure has been estimated by CRPA[31] in € 28,638,000, which represents approximately 3,5% of the production value of arable crops in mountain and hill farming.

Soil organic matter

In order to maintain soil organic matter levels this single standard enforces the prohibition of burning stubble, straw and crop residues left in the field after harvesting. The standard applies to arable areas and to areas subjected to set-aside. Regions may established time intervals for the application of the standard and alternative obligations in the presence of specific regional or local measures allowing a derogation of burning stubble prohibitions.

Three types of costs for farmers are to be expected:

1. lower production of straw;
2. longer ploughing time due to the presence of stubble and straw to be covered with earth; and
3. costs related to the shredding of maize poles.

The total costs of these operations on part of the cultivated interested by this GAEC has been estimated in € 17,316,600 which represents 0,3% of the production value of cereals in Italy.

The GAEC standard “arable stubble management” only refers to the prohibition to burn the stubble. According to cost estimates carried out by CRPA this measure has only minor cost impact on arable crops at national scale.

Soil structure

The standard establishes that the farmers must maintain the efficiency of the draining network for the outflow of the surface waters and, if present, the convexity of the surfaces. The standard applies to any agricultural area eligible for single farm payments and enforces the clean-up of the drains and maintenance intervention of the collecting channels to keep them efficient. Over the last years, farmers have neglected these practices in order to reduce “immediate” costs or due to the shortage of labour.

The costs related to this GAEC are:

1. expenses deriving from a proper levelling of the surface;
2. drastic cleaning of the sluices and collecting channels; and

[31] Details of the cost calculation can be found in the national report for Italy D5.

3. yearly cleaning of ditches and sluices.

The costs inherent to this GAEC equals about € 238,000,000, which represents 1,1% of the production value of agricultural products produced in the plains of Italy.

Minimum level of maintenance.

In Italy four GAEC measures have been implemented in order to obtain a minimum level of maintenance.

- *Protection of permanent pastures*

The standard contemplates the prohibition of reducing the permanent pasture surface or converting the permanent pasture surface to other productive destinations. The main purpose is to assure the protection of the permanent pasture in such a way as to assure a constant vegetal covering of the land. The greatest danger of pasture degradation derives from an incorrect management of surface waters. If the surface waters are not properly regulated, they can cause surface creeps that become more and more important in time causing the separation of the grass layer and landslides in particularly on clay soils.

The costs generated by this GAEC for farmers are:

1. expenses for the thickening the grass layer and the removal of undesirable vegetation; and
2. cleaning of small water channels and supplementary fertilisation.

Together these costs sum up to € 192.812,000 which represents 16,8% of the production value of agricultural products of mountain farming in Italy.

- *Set aside management*

This GAEC applies to arable areas subject to set-aside and other areas voluntary withdrawn from production and eligible for single farm payments. This measure applies to the GAEC standard “avoiding the encroachment of unwanted vegetation on agricultural land”. On these lands the standard prescribes:

1. to maintain a vegetal covering all the year round;
2. to carry out mowing or other equivalent operations in order to preserve the state of fertility of the land, protect the wild fauna, prevent fire and avoid the diffusion of weeds. Frequency of mowing interventions must be at least once a year; and
3. in Natura 2000 areas the standard does not permit harvesting before the 15th of July.

Costs inherent to this GAEC are essentially due to the preservation of vegetal covering during the year and the creation of fire barriers. The costs of this measure has been estimated by CRPA in € 107,184,000 which interests 264,000 ha of set-aside land. These costs can however be discarded as this is not a new measure introduced within the framework of the cross-compliance policy.

- Maintenance of olive groves

Objective of this standard is to maintain the olive groves in a good vegetative conditions in order to have an equilibrated development of the grove and to prevent a deterioration of its status. Those cultivation techniques should be used which may guarantee this minimum maintenance objective. Moreover the olives have to be pruned at least each five years. The main purpose is to assure a minimum level of maintenance of the areas destined to olive tree cultivation through a proper plant care.

CRPA has estimated the costs of compliance of this GAEC in € 146,900,000, primarily related to pruning the olive tree at least each five years. As olive groves in full production are pruned anyhow, only those groves which are at risk of abandonment have been taken into consideration. These costs represent about 5.6 % of the production value of olive oil in Italy.

- Retention of landscape features

The main requirements to satisfy according to this standard are:

1. The prohibition to eliminate terraces. Terraces can be remodelled in order to make them more efficient and mechanisable;
2. to comply with the measures adopted by regional administration for the preservation of the elements of the agricultural landscape of historical and cultural importance not included in the previous point; and
3. to comply with the management plans laid down by the regional administrations to fulfil the objectives of the Wild Bird and Habitat Directive.

The main purpose is to assure the preservation of the rural landscape and prevent the deterioration of the habitats by maintaining their typical elements. Terracing is one of the elements that characterises the landscape in Liguria, some valleys of the Alps and areas of the inner Apennines.

The cost of compliance with this new measure interests about one third of the total area dedicated to terraces in Italy and can be estimated in € 55,680,000, which implies about € 520 per hectare of terrace. An estimate of the total area dedicated to terraces is about 106,700 ha, which represents only 0,8% of the Utilised Agricultural Area of Italy.

An estimate of the costs of compliance with management plans in Natura 2000 areas has not been carried out, as most of these plans have not been implemented yet.

If we aggregate the compliance costs of all the single GAECs which have been introduced by Italy we will end up with the following calculation (see Table 3.9). The total production value of Italian agriculture is € 44,989,542,000. The cross-compliance costs of the six new GAECs represent therefore 1.5% of the production value of Italian agriculture.

In Italy the GAEC standard “arable stubble management” only refers to the prohibition to burn the stubble. According to cost estimates carried out by CRPA this measure has only minor cost impact on arable crops at national scale.

Table 3.9: Compliance costs of new GAEC standards

Type of GAEC	€ per year
Soil erosion	28.638.000
Soil organic matter	17.316.600
Soil structure	238.000.000
Permanent pastures	192.812.000
Olive groves	146.900.000
Landscape features	55.680.000
Total	**679.346.600**

3.4.4 Implementation of GAEC standards in Spain and costs associated

The following Table 3.10 gives an overview of which GAEC standards are likely to have cost implications on the examined sectors.

Table 3.10: Cost implications implementing GAEC standards in Spain

GAEC Issue	GAEC standard	Cereals	Dairy	Beef	Pigs/	Fruits	Olives (oil)	New requirement (N) or pre-existing legislation (P)? (and comments)
Soil erosion:	• Minimum soil cover	+				+	++	P (in previous Agri-Environmental programme, voluntary)
	• Minimum land management reflecting site-specific conditions					+	++	P (in certain areas of protection of bird species, SPAs)
	• Retain terraces					+	++	P
Soil organic matter:	• Standards for crop rotations where applicable	+				+	+	N
	• Arable stubble management	+				+	++	P
Soil structure:	• Appropriate machinery use	+				+	++	N

GAEC Issue	GAEC standard	Cereals	Dairy	Beef	Pigs/	Fruits	Olives (oil)	New requirement (N) or pre-existing legislation (P)? (and comments)
Minimum level of maintenance:	• Minimum livestock stocking rates or/and appropriate regimes		+	+	+			P
	• Protection of permanent pasture	+			+			P
	• Retention of landscape features	+				++	++	P
	• Avoiding the encroachment of unwanted vegetation on agricultural land	+				+	+	N
	• Water and irrigation: in over-exploited aquifers holding legal water use administrative concession and installing water meters	++				++	++	N for the Agricultural administration (1) P for the Water Administration (requirements for the control of water abstractions) (2)
	• Water and irrigation: Avoiding manure, fertilizers and other substances on certain sources of water	++				++	+	P (Agri-Environmental programme, voluntary) (3)

Some of the requirements on soil covers, stubble management and minimum level of maintenance have been regulated through agri-environmental programmes (AEPs) in Spain as voluntary requirements. The minimum land management reflecting site conditions have been established in Special Protected Areas for bird species conservation (in Spain called ZEPAS, *Zonas de Especial Protección para las Aves*).

(1) In relation to the new measures that Spain has introduced in Annex IV (section related to avoid deterioration of habitats), that relate to water use in areas of over-exploited aquifers, the new requirements are controlled by the Regional Agricultural Administrations (Agriculture Departments in the regional governments) in charge of the application of the Cross Compliance measures (see D5). These new measures establish that irrigators in these areas

must hold legal water use concessions and have installed a water meter device but do not require the obligation to comply with the water abstraction maximum volumes permitted by the water administration. Therefore the new cross compliance measures related to water consumption by the agricultural sector can be regarded as synergy measures of the already existing water abstraction limitations whose control is the responsibility of the River Basin authority (2).

As the river basin Authority is the administrative unit responsible for the application of the EU Water Framework Directive (requiring to reach the 'good ecological status of all water bodies' by 2015, article 4 WFD), these new Cross Compliance measures can be regarded as a clear benefit for policy integration of both water policies and agricultural policies at EU level. In sum, these measures are direct control measures of water abstractions for the Water Administration and indirect control measures of water abstractions for the Agricultural Administration.

(3) In some areas in Spain, special agri-environmental programs were implemented (and are still open) to limit water abstractions and also the use of fertilizers, pesticides and other environmentally damaging substances utilized for irrigation agriculture as part of past and present CAP measures[32].

3.4.5 Implementation of GAEC standards in the Netherlands and costs associated

For the Netherlands all GAEC requirements specified reflect previously existing national legislation. As such the GAEC requirements, or cross-compliance hardly can be said to introduces new costs, except for maybe some additional efforts to improve the record keeping level. Farms in erosion sensitive areas have to come up with an erosion plan, in which they indicate the erosion problems and the strategy chosen to avoid erosion damage. This plan has to be evaluated and the evaluator can add additional elements if the proposed strategy is interpreted to be unsatisfactory. Submission of such a plan involves a cost to the farmer of €114. The following Table 3.11 gives an overview of which GAEC standards are likely to have cost implications on the examined sectors.

Table 3.11: Cost implications implementing GAEC standards in the Netherlands

GAEC Issue	GAEC standard	Cereals	Dairy	Beef	Pigs/	Fruits	Olives (oil)	New requirement (N) or pre-existing legislation (P)? (and comments)
Soil erosion:	• Minimum soil cover	+ +						P
	• Minimum land management reflecting site-specific conditions	+ +						P

[32] See Brouwer, F. and Van der Straaten, J. (eds) (2002): Nature and Agriculture Policy in the European Union. International Library of Ecological Economics. Edward Elgar Publishing Ltd. Cheltenham, UK.

GAEC Issue	GAEC standard	Cereals	Dairy	Beef	Pigs/	Fruits	Olives (oil)	New requirement (N) or pre-existing legislation (P)? (and comments)
	• Retain terraces							Not relevant
Soil organic matter:	• Standards for crop rotations where applicable	++						P
	• Arable stubble management	++						P
Soil structure:	• Appropriate machinery use	++						P
Minimum level of maintenance:	• Minimum livestock stocking rates or/and appropriate regimes							Not applied since no fear for land abandonment due to high land scarcity
	• Protection of permanent pasture		++	++				P
	• Retention of landscape features							Has low relevance
	• Avoiding the encroachment of unwanted vegetation on agricultural land							Has low relevance

Most GAEC measures are focused on erosion, and particularly affecting the arable sector in one particular region (Limburg province). As far as dairy and beef farms have arable land (for example because of fodder maize growing), what applies to the arable sector also applies to them.

There are some standards for crop rotation, but they are mainly following from the strategy to combat erosion and not primarily aimed at improving the soil organic matter. There are some requirements with respect to stubble management, which only apply if no green cover crops are sown (if not stubble material has to remain on the fields).

The appropriate machinery use regards the removing of wheel compaction lines in case of cereals and maize.

No direct stocking density requirements are specified. However, indirectly the Dutch manure legislation (based on the Nitrate Directive-SMR) is constraining (maximum) stocking densities.

Protection of permanent pasture actually applies to all permanent pasture, which is however mainly allocated to dairy and beef producers.

Terracing, retention of landscape features and the avoidance of the encroachment of unwanted vegetation are not relevant and/or no constraints were specified.

3.4.6 Implementation of GAEC standards in Poland and costs associated

On 1 May 2004 Poland as a new EU member state started to implement CAP measures, including direct payments under the First Pillar of the CAP. Poland has chosen to receive the payments under the Single Area Payment Scheme. There were several reasons behind that decision, but one of the main ones was lower level of payments that farmers from the new member states received when compared to the payments for farmers of the EU 15[33]. The minimum size of the plot which has to be cultivated in order to be eligible for payments equals 1 ha.

When choosing payments based on the Single Area Payment Scheme, Polish Government becomes responsible for ensuring that farmers obtaining direct payments maintain their farmland, especially if it is not used for production purposes, in good agricultural and environmental condition (GEAC). This requirement differs substantially from the standards that have to be fulfilled by farmers from the EU 15, which not only have to maintain their farmland in good environmental and agricultural condition but also are obliged to meet the SMR. The following Table 3.12 gives an overview of which GAEC standards are likely to have cost implications on the examined sectors.

Table 3.12: Cost implications implementing GAEC standards in Poland

GAEC Issue	GAEC standard	Cereals	Dairy	Beef	Pigs/ poultry	Fruits	Olives (oil)	New requirement (N) or pre-existing legislation (P)? (and comments)
Soil erosion:	• Minimum soil cover							Lack of requirements
	• Minimum land management reflecting site-specific conditions	+	+	+	+	+		N
	• Retain terraces	+ +				+ +		N
Soil orga nic matte	• Standards for crop rotations where applicable							Lack of requirements

33 In order to compensate for lower payment rates, the European Commission agreed that the governments of the new member states increase the amount of payments from their own financial resources (until 2006 a part of funds from the budget of the Second Pillar can be allocated for this purpose). Direct payments rates should become equal before the end of 2013.

GAEC Issue	GAEC standard	Cereals	Dairy	Beef	Pigs/ poultry	Fruits	Olives (oil)	New requirement (N) or pre-existing legislation (P)? (and comments)
	• Arable stubble management (1)	+ +	+ +	+ +				N
Soil structure:	• Appropriate machinery use	+	+	+	+	+		N
Minimum level of maintenance:	• Minimum livestock stocking rates or/and appropriate regimes							Lack of requirements
	• Protection of permanent pasture	+	+	+		+		N
	• Retention of landscape features	+	+	+		+		N
	• Avoiding the encroachment of unwanted vegetation on agricultural land (2)	+ +	+ +	+ +		+ +		N

(1) The cost of the arable stubble management in dairy and beef sector in Poland is mostly due to the specific of the Polish agriculture sector, where still mixed farms (plant and animal production in the same farm) still dominate. Implementation of this requirement by the typical dairy and beef producers will not induce additional cost.

(2) The reason of the showing cost for the dairy and beef sector is same as in the note (1) –above.

Poland has implemented limited numbers of GEAC requirements, most of them are rather general. The GEAC requirements are not new for farmers, but previously they were form of the general framework for the good agriculture practices, currently they are based on the regulation issued by the Minister of Agriculture and Rural Development. Therefore their implementation seems problematic for some farmers but it could be assess that their influence on the cost of the agriculture production in Poland are rather limited.

3.4.7 Implementation of GAEC standards in France and costs associated

GAEC standards defined by France principally concern buffer strips, crop rotation, arable stubble management, regulation of irrigation and land maintenance (cultivated land, set-aside, grassland and non-productive land).

The French GAEC standards are summarized in the following Table 3.13.

Table 3.13: GAEC standards in France

Issue	GAEC standards
1. Soil erosion: protection of soil through appropriate measures	- Set-aside of farmland (3%) = buffer strips - Obligation of land maintenance (set-aside land, grassland, non productive land)
2. Soil organic matter: maintain soil organic matter levels through appropriate practices	- Interdiction of burning straw - Diversity of cropping pattern
3. Soil structure: maintain soil structure through appropriate measures	- Regulation of irrigation - Diversity of cropping pattern
4. Minimum level of maintenance: ensure a minimum level of maintenance and avoid deterioration of habitats	- Set-aside of farmland = buffer strips - General regulations of land maintenance - Maintenance regulations of cultivated land - Maintenance regulations of set-aside land - Maintenance regulations of grassland - Maintenance regulations of non productive land
Permanent pasture maintenance	No obligation at farm level until now

GAEC in their present state imply no costs for dairy and beef farmers[34]. Cereals and crop systems are, in principle, largely affected by the GAEC standards, but some dispensations weaken the requirements (Poux 2007)[35]:

- Buffer strips: The main constraint from GAEC in crop systems will deal with the requirement of 3% uncultivated land nearby the watercourses (buffer strip). As these 3% are part of the 10% of mandatory set-aside, the economic impact will be none[36]. However GAEC will affect farming systems having less than 3 % of permanent pastures, i.e. principally types “specialist cereals” and “general field cropping”[37].

- Diversity of cropping patterns: It affects in principle all types of farming systems. As for crop systems diversity already comply with the existing standards of the SMR[38]. But

[34] Poux, Ramain 2006: Country report France (D5): Mandatory standards in 7 EU countries and 3 non-EU countries (France), Xavier Poux, Blandine Ramain, May, 29, 2006.
[35] Xavier Poux 2007.
[36] Poux, Ramain 2006: Country report France (D5): Mandatory standards in 7 EU countries and 3 non-EU countries (France), Xavier Poux, Blandine Ramain, May, 29, 2006.
[37] Poux 2007.
[38] source: AScA, 2003, cited in Poux 2006.

dispensations exist for those with monocropping maize due to expected disproportionate economic impacts expected[39].

- Interdiction of burning straw: It principally affects crop production, so farm types “specialist cereals” and “general field cropping”, situated in NUTS 3 Indre, Cher and Yonne, in north of the Massif Central (cf. enquête pratique 2002). Local dispensation are provided till now[40].

3.4.8 Implementation of GAEC comparable standards in New Zealand and costs associated

The following Table 3.14 gives an overview of which GAEC comparable standards are likely to have cost implications on the examined sectors.

Table 3.14: Cost implications implementing GAEC comparable standards in New Zealand

GAEC Issue	GAEC standard	Cereal	Dairy	Beef/Sheep	Pigs	Fruit	Olives(Oil)	National requirements (and comments)
Soil erosion:	• Minimum soil cover							No requirements
	• Minimum land management reflecting site specific conditions			+ +				P vegetation clearance rules specific to steep country
	• Retain terraces							Not relevant
Soil organic matter:	• Standards for crop rotations where applicable							Not relevant
	• Arable stubble management							Not relevant
Soil Structure:	• Appropriate machinery use		+					P appropriate machinery for effluent disposal
Minimum level of maintenance:	• Minimum stocking rates or/and appropriate regimes							No rules

[39] Poux 2007.
[40] Poux 2007.

GAEC Issue	GAEC standard	Cereal	Dairy	Beef/Sheep	Pigs	Fruit	Olives(Oil)	National requirements (and comments)
	• Protection of permanent pasture			+				P burning of native tussock rules only in a few areas. The cost implications are small and it is in two regions in NZ.
	• Retention of landscape features							P forestry harvesting rules to protect landscape only
	• Avoiding the encroachment of unwanted vegetation on agricultural land	+	+	+	+	+	+	P weed control applies to regions not to specific crops. The cost implications for farmers are not that great and the overall sector cost is minimal.

GAEC rules as such do not exist in New Zealand however, many Regional Councils (the decision making bodies with regard to the use of natural resources) encourage farmers through advice, farm plans, and inputs to especially deal with soil erosion issues. However, most regions have in place rules with regard to vegetation removal. The cost of those rules (implied costs of not being able to use the land for productive use) is not high. However in some regions (similar to provinces) Regional Councils are now enforcing rules which require farmers to plant eroding land types in trees or other vegetation and stops them from removing vegetation. This rule has only been fully implemented on one region and will impose significant costs on high country sheep and beef farmers. However, as a percentage of the total sheep/beef sector this is still only a small cost.

Rules relating to appropriate machinery use only applies to effluent disposal machinery (effluent sprayers) and imply only a small part of the total cost of effluent disposal.

Protection of permanent pasture only applies to two regions in NZ where a burning ban is in place regarding burning of native tussock (native pasture). The cost of this rule are not great especially not when considered from a sector point of view.

3.4.9 Implementation of GAEC comparable standards in Canada and costs associated

In Canada, management practices similar to the GAECs in the EU are implemented through various cost share programs. These agricultural practices are known as Beneficial Management Practices or BMP's. Agriculture and Agri-Food Canada (AAFC) (2006) defines Beneficial Management Practices (BMPs) as "farm management practices that: minimise and mitigate impacts and risks to the environment, by maintaining or improving the quality of soil, water, air and biodiversity; ensure the long term health and sustainability of natural resources used for agricultural production; and, support the long-term economic and environmental viability of the agriculture industry.

In order to help agricultural producers develop and implement Beneficial Management Practices, the Government of Canada initiated Canada's National Environmental Farm Planning Initiative through provincially delivered Environmental Farm Plan (EFP) programs. Agriculture and Agri-Food Canada (2006) states that the objectives of the National Environmental Farm Plan Initiative include helping the agriculture sector better identify its impacts on the environment; and promoting the growth of stewardship activities within the agriculture industry. At this point the program is scheduled to end with the expiration of the current Agricultural Policy Framework (APF) in 2008, but it is likely that it will be continued in a similar form in the new Agricultural Policy Framework.

As part of the program, farmers attend an Environmental Farm Plan workshop and complete a workbook designed to assess the current state of the farm and identify areas of concern. Then farmers develop an action plan for addressing the areas of concern. The action plan is confidentially reviewed by a group of locally appointed farmers. Once the Peer Review Committee approves the Action Plan, a farmer can participate in the EFP Cost-Share Program that helps cover a portion of the costs of implementing eligible projects from the action plan (Ontario Ministry of Agriculture, Food and Rural Affairs, 2006). Producers are eligible to apply for cost-share incentives through the Canada Farm Stewardship Program, Greencover Canada, and the Canada Water Supply Expansion Program.

There are 36 Best Management Practice categories, each containing several practices eligible for funding. Federal government covers up to 60% of the cost of implementing eligible practices. Many practices covered through federal cost share programs are also eligible for funding under different provincial cost share programs. As a result up to 90% of the total project cost can be covered by combining federal and provincial funds. However, the coverage varies depending on farmer eligibility, provinces and type of Best Management Practices. In Ontario, funding is available through the Nutrient Management Financial Assistance Program Wetland Farm Stewardship Incentive Program, Oak Ridges Moraine Environmental Enhancement Program and Greenbelt Farm Stewardship Program.

Despite the fact that the implementation of Best Management Practices is not mandatory, there has been a relatively high degree of participation. For example, between 2005 and 2007, more than 11,000 of 57,211 Ontario farmers implemented or were in the process of implementation of BMP’s. Even though the implementation of Beneficial Management Practices is partly subsidized by the federal and provincial governments, it is not costless to the farmers. As an example, Ontario farmers bore about a third of the cost of implementation of the management practices eligible for funding.

Table 3.15 summarises the allocation of federal, provincial and farmer funds for implementation of Best Management Practices in Ontario[41]. The 10 BMP categories highlighted in blue can be considered similar in form or purpose to the GAECs in the EU. Management practices eligible for federal and provincial funding and a list of eligible costs are summarised in Table 3.17. The farmer cost share, estimated by subtracting the average provincial cost share under different programs from the federal cost share, was between 18%

[41] Similar information may be available for other provinces but we came across this data fairly late in the project. Thus, obtaining the relevant data may not be feasible within the time frame of the project. We assume the participation rates and funding is similar.

and 25% of the total project cost. A project refers to one best management practice being implemented on one farm. The last column, representing the average cost per project borne by the farm, was used as a guide for filling Table 3.16. It is evident that most of the costs are at about $1,500 per project or below. Only improved cropping systems involved more significant costs at about $9,000 per project. Most fames implement one project; thus, this can also be interpreted as a per farm cost.

Table 3.15: Allocation of federal, provincial and farmer funds for implementation of Best Management Practices in Ontario

Category Code	BMP Category	Federal Funds[1]	Provincial cost share under different programs: NMFAP[2]	Greenbelt[3]	ORMEEP[4]	WFSIP[5]	Approved projects	Average Provincial Cost share	Farmer cost share[6]	Federal Funding	Provincial Funding[7]	Farmer cost[8] Farmer Cost	Farmer cost per[9] Project
1	Improved manure storage and handling	30%	60%	45%			1,145	53%	18%	$17,314,323	$30,300,065	10,100,022	8,821
2	Manure treatment	30%	60%	45%			87	53%	18%	$912,726	$1,597,271	532,424	6,120
3	Manure land application	30%	60%				298	60%	10%	$1,479,427	$2,958,854	493,142	1,655
4	In barn improvements	30%	60%				209	60%	10%	$840,489	$1,680,978	280,163	1,340
5	Relocation of livestock confinement and horticultural facilities from riparian areas	50%	40%	25%			741	33%	18%	$4,793,000	$3,115,450	1,677,550	2,264
6	Farmyard and horticultural facilities runoff control	50%	40%	25%			85	33%	18%	$1,260,194	$819,126	441,068	5,189
7	Wintering site pasture management	50%					88	0%	50%	$346,308	$0	346,308	3,935
8	Product and waste management	30%		45%			875	45%	25%	$2,241,727	$3,362,591	1,868,106	2,135
9	Water well management	50%	40%				989	40%	10%	$1,082,773	$866,218	216,555	219
10	Riparian area management	50%	40%	25%	40%		570	33%	18%	$1,681,895	$1,093,232	588,663	1,033
11	Erosion control structures (riparian)	50%	40%	25%	40%		159	33%	18%	$670,421	$435,774	234,647	1,476
12	Erosion control structures (non riparian)	50%	40%	25%	40%		182	33%	18%	$879,998	$571,999	307,999	1,692
13	Land management for soils at risk	50%		25%			29	25%	25%	$57,174	$28,587	28,587	986

14	Improved cropping systems	30%					1,992	0%	70%	$7,684,700	$0	17,930,967	9,001
15	Cover crops	30%		45%			159	45%	25%	$167,705	$251,558	139,754	879
16	Improved pest management	30%		45%			956	45%	25%	$1,619,973	$2,429,960	1,349,978	1,412
17	Nutrient recovery from waste water	30%	60%	45%			75	53%	18%	$635,018	$1,111,282	370,427	4,939
18	Irrigation management	30%					211	0%	70%	$981,076	$0	2,289,177	10,849
19	Shelterbelt establishment	50%		25%	40%		297	25%	25%	$519,866	$259,933	259,933	875
20	Invasive alien plant species control	50%		25%			6	25%	25%	$18,715	$9,358	9,358	1,560
21	Enhancing wildlife habitat and biodiversity	50%		25%	40%	50%	193	25%	25%	$530,493	$265,247	265,247	1,374
22	Species at risk	50%		25%	40%		6	25%	25%	$14,645	$7,323	7,323	1,220
23	Preventing wildlife damage	30%			60%		163	60%	10%	$582,184	$1,164,368	194,061	1,191
24	Nutrient Management planning	50%	40%	25%			778	33%	18%	$1,244,548	$808,956	435,592	560
25	Integrated pest management planning	50%		25%			26	25%	25%	$40,414	$20,207	20,207	777
26	Grazing management planning	50%		25%			6	25%	25%	$8,187	$4,094	4,094	682
27	Soil erosion and salinity control planning	50%	40%	25%			3	33%	18%	$4,108	$2,670	1,438	479
28	Biodiversity enhancement planning	50%		25%		50%	6	25%	25%	$4,140	$2,070	2,070	345
29	Irrigation management planning	50%					10	0%	50%	$15,804	$0	15,804	1,580
30	Riparian health assessment	50%	40%	25%			2	33%	18%	$2,650	$1,723	928	464
31	New water wells for agricultural purposes	33%					532	0%	67%	$1,369,149	$0	2,779,787	5,225
32	Ponds for storing water for agricultural purposes	33%			57%		227	57%	10%	$613,986	$1,060,521	186,056	820
33	Spring and sand point development for agricultural purposes	33%					4	0%	67%	$4,290	$0	8,710	2,178

34	Water supply to farm for agricultural use	33%					34	0%	67%	$124,435	$0	252,641	7,431
35	Farm water treatment equipment for agricultural use	33%					174	0%	67%	$306,426	$0	622,138	3,576
36	Water supply expansion planning	33%					9	0%	67%	$33,626	$0	68,271	7,586
	Total						**11,326**			**$50,086,593**	**$54,229,411**	**44,329,192**	**3,914**

Notes:

Federal Cost Share under Canada-Ontario Farm Stewardship Program, Greencover Canada and Canada-Ontario Water Supply Expansion Program

Provincial cost share under Nutrient Management Financial Assistance Program

Provincial cost share under the Greenbelt Program (protection of agricultural land from urban development in the Greater Toronto Area

Provincial cost share under the Oak Ridges Moraine Environmental Enhancement Program

Cost share covered by Ducks Unlimited under the Wetlands Farm Stewardship Incentive Program

Reported federal funds allocation

Provincial funds allocation estimated using the available cost share figures

Farmer funds allocation estimated using the available cost share figures

Calculated by dividing the total funds allocated to a given BMP category by the number of projects under that category

Sources:

Ontario Soil and Crop Improvement Association (2007) (http://ontariosoilcrop.org/cms/en/program_divide.aspx?menuid=58)

Conservation Ontario (2006) (http://conservation-ontario.on.ca/news/files/ORMEEP_brochure_final.pdf)

Table 3.16: Cost implications implementing GAEC comparable standards in Canada

GAEC Issue	GAEC standard	Comparable Best Management Practice in Canada	Cereals	Dairy	Beef	Pigs/poultry	Fruits[42]	Olives (oil)[43]	National requirements[44] (and comments)
Soil erosion:	• Minimum soil cover	• Cover crops	++	++	++	++			Establishment of a non-economic crop (crop cannot be harvested or grazed)
	• Minimum land management reflecting site-specific conditions								Not relevant
	• Retain terraces	• Erosion control structures (riparian)	++	+	+	+			Contour terraces, gully stabilisation, bank stabilization, drop inlets, enhanced infiltration systems, in-channel control, and water and sediment control basins
		• Erosion control structures (non riparian)	++	+	+	+			Contour terraces, gully stabilisation, drop inlet systems and enhanced infiltration systems, water and sediment control basins and constructed wind screens
		• Soil erosion and salinity control planning	+	+	+	+			Consultative services to develop soil erosion and salinity control plans
		• Land management for soils at risk	++	++	++	++			Forage or annual barrier establishment for soils at risk ; straw mulching to assist; grazing management; alternative watering systems, cross fencing

[42] Not examined
[43] Not examined
[44] None of the practices is mandatory. Practices eligible for funding are generally consistent across provinces. More detailed description of eligible practices and cost items is presented in a separate table.

GAEC Issue	GAEC standard	Comparable Best Management Practice in Canada	Cereals	Dairy	Beef	Pigs/poultry	Fruits[42]	Olives (oil)[43]	National requirements[44] (and comments)
		• Riparian health assessment	+	+	+	+			Consultative services for assessing riparian health and planning
		• Shelter-belt establishment							Establishment of shelter-belts/windbreaks for farmyard, field. Erosion reduction not the main purpose but often results from using this practice
Soil organic matter:	• Standards for crop rotations where applicable								Crop rotation is a common practice
	• Arable stubble management								*Cover crops* and *Improved cropping systems* BMP's likely to overlap with this standard
Soil structure:	• Appropriate machinery use	• Improved cropping systems	+ + +	+ +	+ +	+ +			Equipment modification for lower soil disturbance; chaff collectors and chaff spreaders installed onto combines; precision farming applications
Minimum level of maintenance:	• Minimum livestock stocking rates or/and appropriate regimes	• Grazing management planning[45]		+	+				Consultative services to develop range and grazing management plans
	• Protection of permanent pasture								Not relevant
	• Retention of landscape features								Not relevant

[45] The purpose of grazing management and planning in Canada is not related to minimum level of maintenance; rather, this measure is intended for decreasing the negative effects of grazing on water and soil quality and wildlife habitat.

GAEC Issue	GAEC standard	Comparable Best Management Practice in Canada	Cereals	Dairy	Beef	Pigs/poultry	Fruits[42]	Olives (oil)[43]	National requirements[44] (and comments)
	• Avoiding the encroachment of unwanted vegetation on agricultural land	• Invasive alien plant species control	+ +	+ +	+ +	+ +			Integrated approaches (cultural, mechanical, and biological) control of invasive and alien plant species (e.g. leafy spurge, purple loose-strife, scentless camomile)

Table 3.17: Management practices eligible for federal and provincial funding and a list of eligible costs

Best Management Practice Category	Eligible practices	Eligible costs
Riparian area management	Develop livestock watering systems • Summer/winter water systems (e.g. solar, wind, pipeline, other) Establish a buffer (greater than 10 metres) • Establishment/planting of forages, shrubs, trees; weed control, and mulch Construct fences to manage grazing and improve riparian conditions/function Restore or establish native rangeland Manage grazing in uplands surrounding riparian areas • Cross-fencing to implement rotational, seasonal, rest, swath, and extended grazing systems, summer/winter watering systems Improve stream crossings • Improve or remove structures to enhance riparian condition	Engineering and consultative fees • Fencing/construction materials and fees • Watering systems equipment and installation • Seed and seeding operation for re-vegetation Eligible in-kind costs - Labour ($15.00 per hour) • Equipment use (Manitoba Farm Machinery Rental and Custom Rate Guide) Ineligible costs - Perimeter fencing for upland grazing management
Erosion control structures	Constructed works: • Contour terraces	• Engineering and consultative fees • Geotechnical costs

Best Management Practice Category	Eligible practices	Eligible costs
(riparian)	• Grassed waterways (earthwork, seedbed preparation, seed, outlet structures) • Bank stabilisation works (bank shaping, re-vegetation, gabions, riprap, crib walls, blanketing) • Drop inlet structures and in-channel control structures • Retention ponds and erosion control dams • Works to improve infiltration of concentrated water flow (e.g. filter trenches, filter wells, diffusing wells, etc.) • Engineering design work	• Earthwork • Construction materials • Seed and seeding operation for re-vegetation • Labour costs Eligible in-kind - Labour ($15.00 per hour) Costs - Applicant's equipment use (Manitoba Farm Machinery Rental and Custom Rate Guide)
Erosion control structures (non riparian)	Constructed works: • Contour terraces • Gully stabilization/grassed waterways • Bank stabilization works • Retention ponds and erosion control dams 50% $20,000 • Drop inlet structures and in-channel control • Works to improve infiltration of concentrated water flow (e.g. filter trenches, filter wells, diffusing wells, etc.) • Mechanical wind screens	• Engineering and consultative fees • Geotechnical costs • Earthwork • Construction materials • Labour costs Eligible in-kind - Labour ($15.00 per hour) Costs - Applicant's equipment use (Manitoba Farm Machinery and Custom Rate Guide)
Land management for soils at risk	Establish a perennial (e.g. forage) or annual (e.g. cereals, corn, sunflowers) barrier crop Grassed waterway construction Perennial forage establishment on severely erodible or saline soils Strip cropping Straw mulching Grazing management in critical erosion areas not associated with riparian zones (e.g. watering systems, cross-fencing)	Engineering and consultative fees • Earthwork • Seed and seeding operation for re-vegetation • Fencing materials used to protect critical areas • Construction materials and contractor services • Labour costs Eligible - Labour ($15.00 per hour) in-kind costs - Applicant's equipment use (Manitoba Farm Machinery Rental and Custom Rate Guide)

Best Management Practice Category	Eligible practices	Eligible costs
Improved cropping systems	• Equipment modification on: re-seeding implements for restricted zone tillage for row crops, seeding and post-seeding implements for low disturbance placement of seed and fertilizer • Chaff collectors and chaff spreaders installed onto combines • Precision farming applications: GPS information collection, GPS guidance, manual and variable rate controllers for fertiliser application	Costs related to equipment modification[46]
Cover crops	Establishment of a non-economic crop (crop cannot be harvested or grazed) Options include: • Winter cover crops (seeded after harvest for late fall, winter, and spring soil protection); • Relay crops (planted with primary crop but remain after primary crop is removed); • Green fallow crops (annual legumes seeded during fallow year); and • Biennial green manure crops (under seeded crops providing soil protection for the following year). Equipment modification to facilitate inter-row seeding of relay crop within an existing row crop	Cost of seeding and weed control (see conditions above) • Materials, supplies, and modifications for equipment • Installation costs for equipment Eligible in-kind - Labour ($15.00 per hour) costs - Applicant's equipment use (Manitoba Farm Machinery Rental and Custom Rate Guide) • Funding will not be provided for complete seeding units, only components required to modify existing equipment
Shelter-belt establishment	First year establishment costs such as site preparation, planting, weed control, irrigation, and temporary fencing; Cost of purchasing tree or shrub seedlings.	Eligible costs - Site preparation • Planting • Weed control (e.g. mulches) • Irrigation (e.g. trickle or drip systems including pumps) • Temporary fencing to prevent livestock damage • Tree and shrub seedlings or cuttings for appropriate species (purchased tree and shrub

[46] This is an assumption. We have not been able to find the exact information on eligible costs

Best Management Practice Category	Eligible practices	Eligible costs
		seedlings must be less than 5 years old) Eligible – labour ($15.00 per hour) in-kind costs - Use of applicant's equipment (Manitoba Farm Machinery Rental and Custom Rate Guide)
Invasive alien plant species control	Biological Control: Selective Grazers and Biological Control Agents • Purchase of selective grazers (e.g. sheep for Leafy Spurge) or biological control agents (insects, fungi and bacteria) Cultural Control: Improved Grazing and Perennial Forages • Improved Grazing Systems: Cross-fencing where cross-fencing is expected to improve management of invasive alien plants, fencing supplies, equipment rental and labour will be eligible. • Perennial Forage: Purchase of forage species seeds or other plant material that can compete with invasive aliens. Mechanical Control: • Equipment modification and rental and/or associated labour to control alien invasive plants by pulling by hand, mowing, cutting, scraping, shearing, uprooting, discing and prescribed burning. Chemical Control: • Establishing competitive forage stands: • Chemical application for site preparation and stand establishment. • Integrated weed management strategies: Chemical application after consultation with the Technical Lead or other AAFC- PFRA or MAFRI staff as part of an integrated weed management	Purchase of selective grazers or biological control agents (at market price) Purchase of fencing supplies, forage species seeds or other plant material Herbicides Eligible Use of applicant's equipment (Manitoba Farm Machinery Rental and Custom Rate Guide) In-kind costs labour ($15.00 per hour) Ineligible costs The primary goal of eligible projects will be environmental improvement. Projects intended to increase agricultural production will not be considered for funding.

Best Management Practice Category	Eligible practices	Eligible costs
	program.	
Grazing management planning	Consultative services to complete a grazing management plan	• Consultant fees • Planning and decision support tools (computer software, aerial photos) Ineligible costs - Computer hardware
Soil erosion and salinity control planning	Consultative services to complete a soil erosion and/or salinity control plan	Eligible costs - Planning and decision support tools (computer software, aerial photos) • Electromagnetic (EM) surveys Ineligible costs - Computer hardware
Riparian health assessment	Consultative services to complete a riparian health assessment	Eligible costs -Planning and decision-support tools (computer software, aerial photos) Ineligible costs - Computer hardware
Sources: 1. Government Canada – Canada-Manitoba Farm Stewardship Program BMP Description Sheet (http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1182887804040&lang=e) 2. Ontario Soil and Crop Improvement Association ; Canada-Ontario Farm Stewardship Program (http://www.ontariosoilcrop.org/cms/en/Programs/ProgramsAboutCOFSP.aspx?menuid=63)		

3.4.10 Implementation of GAEC comparable standards in USA and costs associated

The GAEC comparable standards in USA can be found in the section labelled "Voluntary Cost-Share and Payment Programs" (see Table 3.18).

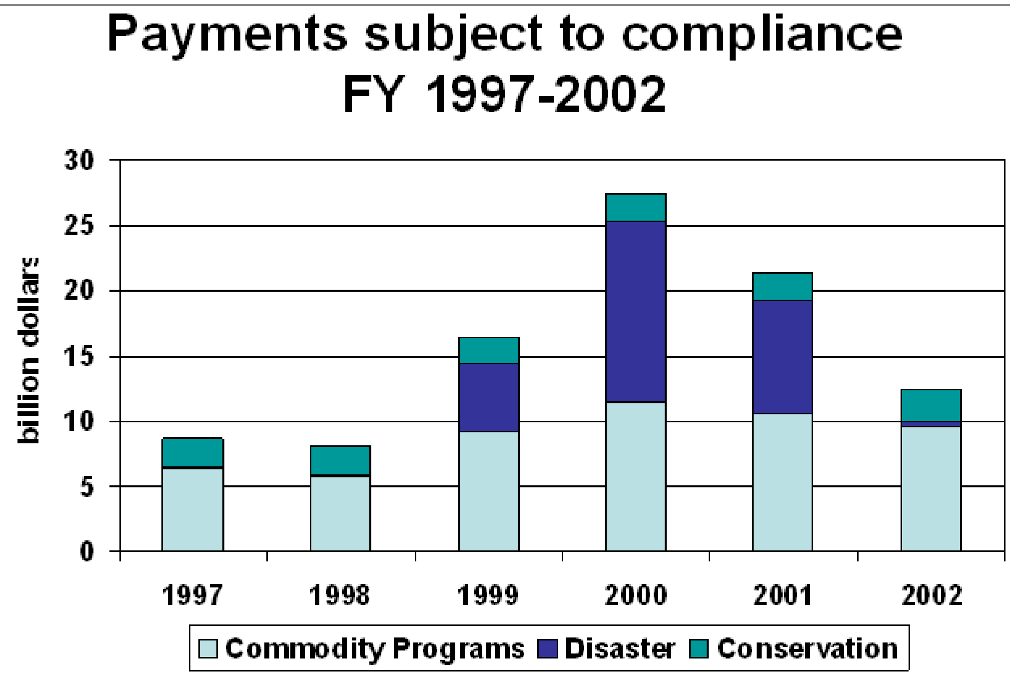
Table 3.18: Cost implications of compliance for selected sectors

Regulatory Compliance and Financial Assistance Program Requirements	Dairy	Pigs	Beef	Tomatoes	Oranges	Requirements with potential cost implications
Regulatory Compliance						
Conservation Compliance	+	+	+	+	+	Prohibitions on wetland conversion to cropland

Regulatory Compliance and Financial Assistance Program Requirements	Dairy	Pigs	Beef	Tomatoes	Oranges	Requirements with potential cost implications
"Swampbuster"						
Conservation Compliance -"Sodbuster"	+	+	+	+	+	Prohibitions on plowing native sod
Conservation Compliance -"HEL"	++	++	+	+	+	Prohibitions on cropping practices that allow excessive soil erosion
Clean Water Act (incl. CAFO Regs)	+++	+++	++	+	+	Prohibitions on point and non-point water pollution from CAFOs and other ag. Uses
Clean Air Act	+++	+++	++	++	++	Prohibitions on excessive emissions of 6 criteria pollutants
-- Methyl Bromide Regs	N/A	N/A	N/A	++	+	Prohibition on methyl bromide use
Comprehensive Environment Response, Compensation, and Liability Act (CERCLA)	+++	+++	N/A	N/A	N/A	Prohibition on large quantities of certain substances released to the environment, including ambient air (including ammonia emissions)
Resource Conservation and Recovery Act	+	+	+	+	+	Prohibition on improper hazardous waste (such as pesticide container) disposal.
Endangered Species Act	+	+	+	+	+	Prohibitions on removing endangered species habitat
Animal ID and Registration						
National Animal Identification System (NAIS)	++	+	++	N/A	N/A	Requirements for animal identification for certain species of meat animals
Plant, Animal, and Human Health						
Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)	+	+		++	++	Regulates control of pesticide distribution, sale, and use through federal licensing.
Hormones & beta-agonists regs (not applicable)	Certain synthetic growth hormones are allowed					
BSE regulations	+		++	N/A	N/A	Regulates use of Specified Risk Materials (SRMs)
Federal Meat Inspection Act	+	+	+	N/A	N/A	Regulates condition of animals and conditions of slaughter for animals meant for food.
Poultry Products Inspection Act	N/A	N/A	N/A	N/A	N/A	Regulates condition of animals and conditions of slaughter for poultry meant for food.
Egg Products Inspection Act	N/A	N/A	N/A	N/A	N/A	Regulates eggs and egg product handling
Animal Welfare						
Animal Welfare Act	Does not apply to agriculture					

Regulatory Compliance and Financial Assistance Program Requirements	Dairy	Pigs	Beef	Tomatoes	Oranges	Requirements with potential cost implications
Voluntary Cost-Share and Payment Programs						
Conservation Reserve (Enhancement) Program (CRP & CREP)	+	+	+	+	+	Land retirement program, also requires certain conservation practices to be installed in return for any payment.
Environmental Quality Incentives Program (EQIP)	++	++	++	+	+	Requires certain conservation practices to be installed for partial payment. Additional productivity reductions may also occur.
Wetland Reserve Program	+	+	+	+	+	Land retirement program, also requires certain conservation practices to be installed in return for any payment.
Farm & Ranchland Protection Program	++	++	++	++	++	Requires certain conservation practices to be installed for partial payment. Additional productivity reductions may also occur. Land easements are likely also applied.
Wildlife Habitat Incentive Program (WHIP)	+	+	+	+	+	Requires certain conservation practices to be installed for partial payment. Additional productivity reductions may also occur.
Conservation Security Program (CSP)	+	+	+	+	+	Requires certain conservation and other enhancement practices to be installed for partial payment. Additional productivity reductions may also occur.
Grassland Reserve Program (GRP)			+			Requires certain conservation practices to be installed for partial payment. Additional productivity reductions may also occur. Land easements may also be applied which restrict cropping use.

The following graph highlights how much USDA payments are subject to compliance regulations.



Source: USDA Office of Budget and Policy Analysis

3.5 Summarised evaluation of national GAEC implementation and associated costs

As mentioned above, the implementation of the GAEC standards varies considerably between Member States. It is due to the fact that Member States define minimum requirements to keep land in the good agricultural and environmental conditions, taking into account the specific characteristics of the areas concerned, including soil and climatic condition, existing farming systems, land use, crop rotation, farming practices and farm structures. This results in a high variety of minimum requirements depending on the country, and the location within the country, depending on the area chosen. For more details please see the tables in the Chapter "Implementation of GAECs into national legislation".

While some Member States have used cross compliance to compensate for gaps in their existing national legislation (e.g. Poland and Italy define the GAEC standards solely as new requirements), other Member States already had a legislative framework in place and merely adopted that framework for cross compliance (in particular, the Netherlands, where requirements are based just on pre-existing legislation). This resulted in some Member States incorporating measures within their GAEC framework that go beyond the scope and philosophy of Annex IV of Reg. 1782/03, i.e. "other" standards (e.g. Spain and England).

The Table 3.19 presents an overview of the national implementation of the GAEC standards in the selected Member States. (N) means that GAEC standard is set as a new requirement; and (P) means that the requirement has already been defined in the pre-existing legislation. The "other" standards mentioned above are not included in this summarising table. France is not included in the table due to non comparable data.

Table 3.19: National implementation of GAEC standards in selected Member States

GAEC Issue	GAEC standard	England	Germany	Italy	Spain	Netherlands	Poland
Soil erosion:	• Minimum soil cover	N	N, P		P	P	[47]
	• Minimum land management reflecting site-specific conditions	N	P	N	P	P	N
	• Retain terraces	[48]	N		P	[49]	N
Soil organic matter:	• Standards for crop rotations where applicable	[50]	N, P		N	P	[51]
	• Arable stubble management	P	N, P	N	P	P	N
Soil structure:	• Appropriate machinery use	N	P	N	N	P	N
Minimum level of maintenance:	• Minimum livestock stocking rates or/and appropriate regimes	N	P		P	[52]	[53]
	• Protection of permanent pasture	P	N, P	N	P	P	N
	• Retention of landscape features	N	N, P	N	P	[54]	N
	• Avoiding the encroachment of unwanted vegetation on agricultural land	N, P	[55]	P	N	[56]	N

The Table 3.20 to Table 3.25 present an overview of cost implications on each farm sector examined in selected Member States. It is understood, that the selected six Member States does not reflect the overall situation in the EU, but it can however serve as a preliminary estimation.

[47] Lack of requirements.
[48] Not relevant to England.
[49] Not relevant.
[50] No corresponding GAEC standard implemented in England.
[51] Lack of requirements.
[52] Not applied since no fear for land abandonment due to high land scarcity.
[53] Lack of requirements.
[54] Has low relevance.
[55] Not defined by the national legislation.
[56] Has low relevance.

Table 3.20: Cost implications on cereals sector implementing GAEC standards

GAEC Issue	GAEC standard	EN	DE	IT	SP	NL	PL
Soil erosion: Protect soil through appropriate measures	• Minimum soil cover	++ (N)	++ (N, P)		+ (P)[57]	++ (P)	[58]
	• Minimum land management reflecting site-specific conditions	+ (N)	(P)	++ (N)[59]	(P)[60]	++ (P)	+ (N)
	• Retain terraces	[61]	(N)		(P)	[62]	++ (N)
Soil organic matter: Maintain soil organic matter levels through appropriate practices	• Standards for crop rotations where applicable	[63]	++ (N, P)		+ (N)	++ (P)	[64]
	• Arable stubble management	+ (P)[65]	+ (N, P)	+ (N)[66]	+ (P)	++ (P)	++ (N)
Soil structure: Maintain soil structure through appropriate measures	• Appropriate machinery use	(N)[67]	+ (P)	+ (N)[68]	+ (N)	++ (P)	+ (N)

[57] In previous Agri-Environmental programme, voluntary.
[58] Lack of requirements.
[59] The national standard is called “Appropriate measures against water runoff on slopes” and is prescribed to the GAEC standard “minimum land management reflecting site-specific conditions” on the issue “Soil erosion”. Relevant for dairy, beef, pigs and poultry too as often these farms produce cereals and other arable crops on farm.
[60] In certain areas of protection of bird species, SPAs.
[61] Not relevant to England.
[62] Not relevant.
[63] No corresponding GAEC standard implemented in England.
[64] Lack of requirements.
[65] Marginal constraints upon farming.
[66] Relevant for dairy, beef, pigs and poultry too as often these farms produce cereals and other arable crops on farm.
[67] Applies to harvesting of fruit & veg. Main impact on potatoes and root crops.
[68] The national standard is called “Maintenance of draining network efficiency”. Relevant for all sectors but with low cost implications.

GAEC Issue	GAEC standard	EN	DE	IT	SP	NL	PL
Minimum level of maintenance: Ensure a minimum level of maintenance and avoid the deterioration of habitats	• Minimum livestock stocking rates or/and appropriate regimes	(N)[69]	(P)		(P)	[70]	[71]
	• Protection of permanent pasture	+ (P)[72]	+ (N, P)	(N)	+ (P)	(P)	+ (N)
	• Retention of landscape features	+ (N)[73]	+ (N, P)	(N)[74]	+ (P)	[75]	+ (N)
	• Avoiding the encroachment of unwanted vegetation on agricultural land	+ (N) (P)	[76]	+ (P)	+ (N)	[77]	++ (N)

Table 3.21: Cost implications on dairy sector implementing GAEC standards

GAEC Issue	GAEC standard	EN	DE	IT	SP	NL	PL
Soil erosion: Protect soil	• Minimum soil cover	++ (N)	+ (N, P)		(P)[78]	(P)	[79]

[69] Previous requirement under GFP. Overgrazing and unsuitable supplementary feeding. Applies only to natural and semi-natural grasslands, mainly beef and sheep farming.
[70] Not applied since no fear for land abandonment due to high land scarcity.
[71] Lack of requirements.
[72] Requirement for EIA on uncultivated and semi-natural areas. Unclear what impact this has on farmers in practice.
[73] Main impacts are hedge cutting days and protection of hedges and watercourses – both N.
[74] The national standard is called "Retain terraces".
[75] Has low relevance.
[76] Not defined by the national legislation.
[77] Has low relevance.
[78] In previous Agri-Environmental programme, voluntary.
[79] Lack of requirements.

GAEC Issue	GAEC standard	EN	DE	IT	SP	NL	PL
through appropriate measures	• Minimum land management reflecting site-specific conditions	+ (N)	(P)	++ (N)[80]	(P)[81]	(P)	+ (N)
	• Retain terraces	[82]	(N)		(P)	[83]	(N)
Soil organic matter: Maintain soil organic matter levels through appropriate practices	• Standards for crop rotations where applicable	[84]	+ (N, P)		(N)	(P)	[85]
	• Arable stubble management	(P)[86]	+ (N, P)	+ (N)[87]	(P)	(P)	++ (N)[88]
Soil structure: Maintain soil structure through appropriate measures	• Appropriate machinery use	(N)[89]	(P)	+ (N)[90]	(N)	(P)	+ (N)

[80] The national standard is called “Appropriate measures against water runoff on slopes” and is prescribed to the GAEC standard “minimum land requirements reflecting site-specific conditions” on the issue “Soil erosion”. Relevant for dairy, beef, pigs and poultry too as often these farms produce cereals and other arable crops on farm.
[81] In certain areas of protection of bird species, SPAs.
[82] Not relevant to England.
[83] Not relevant.
[84] No corresponding GAEC standard implemented in England.
[85] Lack of requirements.
[86] Marginal constraints upon farming.
[87] Relevant for dairy, beef, pigs and poultry too as often these farms produce cereals and other arable crops on farm.
[88] Relevant for dairy and beef sectors as most of the farms in Poland with those animal production produce as well cereals and other arable crops on farm.
[89] Applies to harvesting of fruit & veg. Main impact on potatoes and root crops.
[90] The national standard is called “Maintenance of draining network efficiency”. Relevant for all sectors but with low cost implications.

GAEC Issue	GAEC standard	EN	DE	IT	SP	NL	PL
Minimum level of maintenance: Ensure a minimum level of maintenance and avoid the deterioration of habitats	• Minimum livestock stocking rates or/and appropriate regimes	+ (N)[91]	+ (P)		+ (P)	[92]	[93]
	• Protection of permanent pasture	+ (P)[94]	+ (N, P)	+++ (N)[95]	(P)	++ (P)	+ (N)
	• Retention of landscape features	+ (N)[96]	+ (N, P)	++ (N)[97]	(P)	[98]	+ (N)
	• Avoiding the encroachment of unwanted vegetation on agricultural land	+ (N) (P)	[99]	+ (P)	(N)	[100]	++ (N)[101]

Table 3.22: Cost implications on beef sector implementing GAEC standards

GAEC Issue	GAEC standard	EN	DE	IT	SP	NL	PL
Soil erosion: Protect soil	• Minimum soil cover	+ (N)	+ (N, P)		(P)[102]	(P)	[103]

[91] Previous requirement under GFP. Overgrazing and unsuitable supplementary feeding. Applies only to natural and semi-natural grasslands, mainly beef and sheep farming.
[92] Not applied since no fear for land abandonment due to high land scarcity.
[93] Lack of requirements.
[94] Requirement for EIA on uncultivated and semi-natural areas. Unclear what impact this has on farmers in practice.
[95] Rather strong cost implications in mountain farming.
[96] Main impacts are hedge cutting dates and protection of hedges and watercourses – both N.
[97] The national standard is called “Retain terraces”. Relevant only for fruits, permanent grass and olive trees grown on terraces.
[98] Has low relevance.
[99] Not defined by the national legislation.
[100] Has low relevance.
[101] Relevant for dairy and beef sectors as most of the farms in Poland with those animal production produce as well cereals and other arable crops on farm.
[102] In previous Agri-Environmental programme, voluntary.
[103] Lack of requirements.

GAEC Issue	GAEC standard	EN	DE	IT	SP	NL	PL
through appropriate measures	• Minimum land management reflecting site-specific conditions	+ (N)	(P)	++ (N)[104]	(P)[105]	(P)	+ (N)
	• Retain terraces	[106]	(N)		(P)	[107]	(N)
Soil organic matter: Maintain soil organic matter levels through appropriate practices	• Standards for crop rotations where applicable	[108]	+ (N, P)		(N)	(P)	[109]
	• Arable stubble management	(P)	+ (N, P)	+ (N)[110]	(P)	(P)	++ (N)[111]
Soil structure: Maintain soil structure through appropriate measures	• Appropriate machinery use	(N)[112]	(P)	+ (N)[113]	(N)	(P)	+ (N)

[104] The national standard is called “Appropriate measures against water runoff on slopes” and is prescribed to the GAEC standard “minimum land requirements reflecting site-specific conditions” on the issue “Soil erosion”. Relevant for dairy, beef, pigs and poultry too as often these farms produce cereals and other arable crops on farm.
[105] In certain areas of protection of bird species, SPAs.
[106] Not relevant to England.
[107] Not relevant.
[108] No corresponding GAEC standard implemented in England.
[109] Lack of requirements.
[110] Relevant for dairy, beef, pigs and poultry too as often these farms produce cereals and other arable crops on farm.
[111] Relevant for dairy and beef sectors as most of the farms in Poland with those animal production produce as well cereals and other arable crops on farm.
[112] Applies to harvesting of fruit & veg. Main impact on potatoes and root crops. Could limit access to livestock in extreme cases.
[113] The national standard is called “Maintenance of draining network efficiency”. Relevant for all sectors but with low cost implications.

GAEC Issue	GAEC standard	EN	DE	IT	SP	NL	PL
Minimum level of maintenance: Ensure a minimum level of maintenance and avoid the deterioration of habitats	• Minimum livestock stocking rates or/and appropriate regimes	+ (N)[114]	+ (P)		+ (P)	[115]	[116]
	• Protection of permanent pasture	+ (P)[117]	+ (N, P)	+++ (N)[118]	(P)	++ (P)	+ (N)
	• Retention of landscape features	+ (N)[119]	+ (N, P)	++ (N)[120]	(P)	[121]	+ (N)
	• Avoiding the encroachment of unwanted vegetation on agricultural land	+ (N) (P)	[122]	+ (P)	(N)	[123]	++ (N)[124]

Table 3.23: Cost implications on pigs/poultry sector implementing GAEC standards

GAEC Issue	GAEC standard	EN	DE	IT	SP	NL	PL
Soil erosion: Protect soil	• Minimum soil cover	+ (N)	+ (N, P)		(P)[125]	(P)	[126]

[114] Previous requirement under GFP. Overgrazing and unsuitable supplementary feeding. Applies only to natural and semi-natural grasslands, mainly beef and sheep farming.
[115] Not applied since no fear for land abandonment due to high land scarcity.
[116] Lack of requirements.
[117] Requirement for EIA on uncultivated and semi-natural areas. Unclear what impact this has on farmers in practice.
[118] Rather strong cost implications in mountain farming.
[119] Main impacts are hedge cutting dates and protection of hedges and watercourses – both N.
[120] The national standard is called “Retain terraces”. Relevant only for fruits, permanent grass and olive trees grown on terraces.
[121] Has low relevance.
[122] Not defined by the national legislation.
[123] Has low relevance.
[124] Relevant for dairy and beef sectors as most of the farms in Poland with those animal production produce as well cereals and other arable crops on farm.
[125] In previous Agri-Environmental programme, voluntary.
[126] Lack of requirements.

GAEC Issue	GAEC standard	EN	DE	IT	SP	NL	PL
through appropriate measures	• Minimum land management reflecting site-specific conditions	+ (N)	(P)	++ (N)[127]	(P)[128]	(P)	+ (N)
	• Retain terraces	[129]	(N)		(P)	[130]	(N)
Soil organic matter: Maintain soil organic matter levels through appropriate practices	• Standards for crop rotations where applicable	[131]	(N, P)		(N)	(P)	[132]
	• Arable stubble management	(P)	(N, P)	+ (N)[133]	(P)	(P)	(N)
Soil structure: Maintain soil structure through appropriate measures	• Appropriate machinery use	(N)	(P)	+ (N)[134]	(N)	(P)	+ (N)
Minimum level of maintenance: Ensure a minimum level of maintenance and	• Minimum livestock stocking rates or/and appropriate regimes	+ (N)[135]	(P)		+ (P)	[136]	[137]

[127] The national standard is called "Appropriate measures against water runoff on slopes" and is prescribed to the GAEC standard "minimum land requirements reflecting site-specific conditions" on the issue "Soil erosion". Relevant for dairy, beef, pigs and poultry too as often these farms produce cereals and other arable crops on farm.
[128] In certain areas of protection of bird species, SPAs.
[129] Not relevant to England.
[130] Not relevant.
[131] No corresponding GAEC standard implemented in England.
[132] Lack of requirements.
[133] Relevant for dairy, beef, pigs and poultry too as often these farms produce cereals and other arable crops on farm.
[134] The national standard is called "Maintenance of draining network efficiency". Relevant for all sectors but with low cost implications.
[135] Previous requirement under GFP. Overgrazing and unsuitable supplementary feeding. Applies only to natural and semi-natural grasslands.
[136] Not applied since no fear for land abandonment due to high land scarcity.
[137] Lack of requirements.

GAEC Issue	GAEC standard	EN	DE	IT	SP	NL	PL
avoid the deterioration of habitats	• Protection of permanent pasture	+ (P)[138]	(N, P)	(N)	+ (P)	(P)	(N)
	• Retention of landscape features	+ (N)[139]	(N, P)	(N)[140]	(P)	[141]	(N)
	• Avoiding the encroachment of unwanted vegetation on agricultural land	+ (N) (P)	[142]	+ (P)	(N)	[143]	(N)

Table 3.24: Cost implications on fruits sector implementing GAEC standards

GAEC Issue	GAEC standard	EN	DE	IT	SP	NL	PL
Soil erosion: Protect soil through appropriate measures	• Minimum soil cover	+ (N)	+ (N, P)		+ (P)[144]	(P)	[145]
	• Minimum land management reflecting site-specific conditions	+ (N)	(P)	(N)[146]	+ (P)[147]	(P)	+ (N)
	• Retain terraces	[148]	+ (N)		+ (P)	[149]	++ (N)

138 Requirement for EIA on uncultivated and semi-natural areas.
139 Main impacts are hedge cutting dates and protection of hedges and watercourses – both N.
140 The national standard is called “Retain terraces”. Relevant only for fruits, permanent grass and olive trees grown on terraces.
141 Has low relevance.
142 Not defined by the national legislation.
143 Has low relevance.
144 In previous Agri-Environmental programme, voluntary.
145 Lack of requirements.
146 The national standard is called “Appropriate measures against water runoff on slopes” and is prescribed to the GAEC standard “minimum land requirements reflecting site-specific conditions” on the issue “Soil erosion”. Relevant for dairy, beef, pigs and poultry too as often these farms produce cereals and other arable crops on farm.
147 In certain areas of protection of bird species, SPAs.
148 Not relevant to England.
149 Not relevant.

GAEC Issue	GAEC standard	EN	DE	IT	SP	NL	PL
Soil organic matter: Maintain soil organic matter levels through appropriate practices	• Standards for crop rotations where applicable	[150]	(N, P)		+ (N)	(P)	[151]
	• Arable stubble management	(P)	(N, P)	(N)[152]	+ (P)	(P)	(N)
Soil structure: Maintain soil structure through appropriate measures	• Appropriate machinery use	+ (N)[153]	+ (P)	+ (N)[154]	+ (N)	(P)	+ (N)
Minimum level of maintenance: Ensure a minimum level of maintenance and avoid the deterioration of habitats	• Minimum livestock stocking rates or/and appropriate regimes	(N)[155]	(P)		(P)	[156]	[157]
	• Protection of permanent pasture	+ (P)[158]	(N, P)	(N)[159]	(P)	(P)	+ (N)
	• Retention of landscape features	+ (N)[160]	+ (N, P)	++ (N)[161]	++ (P)	[162]	+ (N)

150 No corresponding GAEC standard implemented in England.
151 Lack of requirements.
152 Relevant for dairy, beef, pigs and poultry too as often these farms produce cereals and other arable crops on farm.
153 Applies to harvesting of fruit & veg. Main impact on potatoes and root crops.
154 The national standard is called “Maintenance of draining network efficiency”. Relevant for all sectors but with low cost implications.
155 Previous requirement under GFP. Overgrazing and unsuitable supplementary feeding. Applies only to natural and semi-natural grasslands.
156 Not applied since no fear for land abandonment due to high land scarcity.
157 Lack of requirements.
158 Requirement for EIA on uncultivated and semi-natural areas.
159 Rather strong cost implications in mountain farming.
160 Main impacts are hedge cutting dates and protection of hedges and watercourses – both N.
161 The national standard is called “Retain terraces”. Relevant only for fruits, permanent grass and olive trees grown on terraces.
162 Has low relevance.

GAEC Issue	GAEC standard	EN	DE	IT	SP	NL	PL
	• Avoiding the encroachment of unwanted vegetation on agricultural land	+ (N) (P)	[163]	(P)	+ (N)	[164]	++ (N)

Table 3.25: Cost implications on olives (oil) sector implementing GAEC standards

GAEC Issue	GAEC standard	EN	DE	IT	SP	NL	PL
Soil erosion: Protect soil through appropriate measures	• Minimum soil cover	(N)	(N, P)		++ (P)[165]	(P)	[166]
	• Minimum land management reflecting site-specific conditions	(N)	(P)	(N)[167]	++ (P)[168]	(P)	(N)
	• Retain terraces	[169]	(N)		++ (P)	[170]	(N)
Soil organic matter: Maintain soil organic matter levels through appropriate practices	• Standards for crop rotations where applicable	[171]	(N, P)		+ (N)	(P)	[172]
	• Arable stubble management	(P)	(N, P)	(N)[173]	++ (P)	(P)	(N)

[163] Not defined by the national legislation.
[164] Has low relevance.
[165] In previous Agri-Environmental programme, voluntary.
[166] Lack of requirements.
[167] The national standard is called “Appropriate measures against water runoff on slopes” and is not prescribed to any one GAEC standard on “Soil erosion”. Relevant for dairy, beef, pigs and poultry too as often these farms produce cereals and other arable crops on farm.
[168] In certain areas of protection of bird species, SPAs.
[169] Not relevant to England.
[170] Not relevant.
[171] No corresponding GAEC standard implemented in England.
[172] Lack of requirements.
[173] Relevant for dairy, beef, pigs and poultry too as often these farms produce cereals and other arable crops on farm.

GAEC Issue	GAEC standard	EN	DE	IT	SP	NL	PL
Soil structure: Maintain soil structure through appropriate measures	• Appropriate machinery use	(N)[174]	(P)	+ (N)[175]	++ (N)	(P)	(N)
Minimum level of maintenance: Ensure a minimum level of maintenance and avoid the deterioration of habitats	• Minimum livestock stocking rates or/and appropriate regimes	(N)[176]	(P)		(P)	[177]	[178]
	• Protection of permanent pasture	(P)[179]	(N, P)	(N)[180]	(P)	(P)	(N)
	• Retention of landscape features	(N)[181]	(N, P)	++ (N)[182]	++ (P)	[183]	(N)
	• Avoiding the encroachment of unwanted vegetation on agricultural land	(N) (P)	[184]	(P)	+ (N)	[185]	(N)

The Member States evaluate the costs implications in a different fashion. While some countries (e.g. Italy) give comprehensive calculation, majority of countries give general assumptions. For example, Italy assesses that the cross compliance costs represent around 680 millions Euro per year or 1.5% of the agricultural production value in Italy. On the other end of scales is Poland that assesses the impact on the costs as limited, even if all the GAEC standards are defined as new requirements. In the Netherlands, all GAEC requirements

174 Applies to harvesting of fruit & veg. Main impact on potatoes and root crops.
175 The national standard is called "Maintenance of draining network efficiency". Relevant for all sectors but with low cost implications.
176 Previous requirement under GFP. Overgrazing and unsuitable supplementary feeding. Applies only to natural and semi-natural grasslands, mainly beef and sheep farming.
177 Not applied since no fear for land abandonment due to high land scarcity.
178 Lack of requirements.
179 Requirement for EIA on uncultivated and semi-natural areas.
180 Rather strong cost implications in mountain farming.
181 Main impacts are hedge cutting dates and protection of hedges and watercourses – both N.
182 The national standard is called "Retain terraces". Relevant only for fruits, permanent grass and olive trees grown on terraces.
183 Has low relevance.
184 Not defined by the national legislation.
185 Has low relevance.

specified reflect pre-existing national legislation, therefore it is assumed that cross compliance will hardly introduce new costs, with the exception of some additional administrative efforts. In Germany, the previously existing legislation overlaps in large parts with the new GAEC standards, the latter being more specific and detailed. Against this background, much higher costs are not expected introducing the GAEC standards, with the exception of some additional administrative costs. England assumes that all newly introduced GAEC requirements will impose costs on each sector of interest to this study; the greatest costs implications expecting for cereal farmers. Spain does not expect additional costs for the implementation of the new GAEC measures related to water consumption by the agricultural sector. This measure is regarded as a synergy measure of the already existing water abstraction limitations under the direct responsibility of water authority.

The Netherlands evaluates that the GAEC measures will particularly affect the arable (cereals) sector. Spain expects the strongest effect on the olives sector and evaluate that erosion requirements will have the highest cost implications. On the one hand, Italy estimates the highest costs implementing the soil structure requirement, since this standard applies to any agricultural land eligible for single farm payments. On the other hand, the protection of permanent pastures standard will have a strong effect on dairy and beef sectors in Italy. Germany assumes that the requirements for minimum soil cover, crop rotation and protection of permanent pasture will particularly affect the cereals sector, since they are specific and going beyond the principles of GAP defined in the pre-existing legislation. England assumes that soil erosion measures will have an effect on all sectors with exception of olives sector; The strongest effect expected on cereals sector. Poland expects constrains in cereals and dairy sectors.

The following Table 3.26 shows the range of country evaluations given in Table 3.20 to Table 3.25. It gives an overview of which GAEC standards are likely to have cost implications on the examined sectors.

Considering potential cost implications due the introduction of GAEC, it needs to be noted that implementation of GAEC standards varies considerably between Member States. For example, some countries have very detailed and different requirements for crop rotation (e.g. Germany, Slovenia), whereas others have not implemented crop rotation requirements into national GAECs (e.g. Austria). The range of country evaluations presented in Table 3.26 can therefore only serve as preliminary assessments, which need to be seen against the background of the national legislation (see chapter above).

Table 3.26: Range of cost implications on examined sectors implementing GAEC standards

GAEC Issue	GAEC standard	Cereals	Dairy	Beef	Pigs/ poultry	Fruits	Olives (oil)
Soil erosion:	• Minimum soil cover	n.r./++	n.r./++ [186]	n.r./+ [187]	n.r./+	n.r./+	n.r./++

[186] In particular, if farm combines activity with fodder crop growing, e.g. silage maize.
[187] In particular, if farm combines activity with fodder crop growing, e.g. silage maize.

GAEC Issue	GAEC standard	Cereals	Dairy	Beef	Pigs/ poultry	Fruits	Olives (oil)
Protect soil through appropriate measures	• Minimum land management reflecting site-specific conditions	n.r./++	n.r./++	n.r./++	n.r./++	n.r./+	n.r./++
	• Retain terraces	n.r./++	n.r.	n.r.	n.r.	n.r./++	n.r./++
Soil organic matter: Maintain soil organic matter levels through appropriate practices	• Standards for crop rotations where applicable	n.r./++	n.r./+ [188]	n.r./+ [189]	n.r.	n.r./+	n.r./+
	• Arable stubble management	+/++	n.r./++	n.r./++	n.r./+	n.r./+	n.r./++
Soil structure: Maintain soil structure through appropriate measures	• Appropriate machinery use	n.r./++	n.r./+	n.r./+	n.r./+	n.r./+	n.r./++
Minimum level of maintenance: Ensure a minimum level of maintenance and avoid the deterioration of habitats	• Minimum livestock stocking rates or/and appropriate regimes	n.r.	n.r./+	n.r./+	n.r./+	n.r.	n.r.
	• Protection of permanent pasture	n.r./+	n.r./+++	n.r./+++	n.r./+	n.r./+	n.r.
	• Retention of landscape features	n.r./+	n.r./++	n.r./++	n.r./+	n.r./++	n.r./++
	• Avoiding the encroachment of unwanted vegetation on agricultural land	n.r./++	n.r./++	n.r./++	n.r./+	n.r./++	n.r./+

n.r. – not relevant (an empty cell was left by evaluation of cost implications).

[188] In particular, if farm combines activity with fodder crop growing, e.g. silage maize.
[189] In particular, if farm combines activity with fodder crop growing, e.g. silage maize.

3.6 Summary

To analyse cost of compliance and cost of cross compliance on different farm sectors both impacts of SMRs and GAEC have been analysed. In this regard a clear distinction of both concepts ("costs of compliance" versus "cost of cross compliance") is crucial to correctly interpret the project's results. As SMRs refer to previously existing requirements costs for farmers for reaching standards pre-existing to the introduction of cross compliance cannot be considered as due to cross compliance.

In order to analyse the costs of compliance to SMR requirements the analysis therefore refered to an assumed situation of introducing standards that have not yet been implemented. The analysis shows that the requirements have different impacts in different sectors. The sectors that are mostly affected are the beef and dairy sector. As for specific SMR requirements the nitrates directive and food safety requirements concern most sectors.

When considering the additional costs of cross compliance at farm level, one has mainly to consider the costs derived from meeting the standards of GAEC. Unlike the SMRs, the standards in Annex IV of Regulation 1782/2003 are not based on pre-existing EU legislation.

However, also costs resulting from pre-existing requirements comparable to GAEC can not be attributed to cross compliance. It is therefore crucial for the evaluation of cost implications to see which standards have been newly introduced. Several Member States have included new standards within the national GAEC framework, and it is these standards that may result in a cost that the farmer did not have to meet before the introduction of cross compliance.

With regard to the selected EU Member States it became apparent that some Member States have used cross compliance to compensate for gaps in their existing national legislation (e.g. Poland defines the GAEC standards solely as new requirements and Italy has just one pre-existing standard), while other Member States already had a legislative framework in place and merely adopted that framework for cross compliance (e.g. the Netherlands, where requirements are based just on pre-existing legislation).

As for the additional costs of cross compliance no significant costs could be analysed, however constraints on farming and marginal costs on farm level may apply. While there is a significant range between Member States evaluations on cost relevance of certain standards (due to different implementations of GAEC), evaluations on impacts on different sectors are relatively homogenous.

4 The impact of standards on the competitiveness of the EU with respect to dairy

4.1 Introduction

This chapter provides a comparative overview of the competitive assessment of CC-requirements in dairy production. The focus is on five EU Member States (the Netherlands, France, United Kingdom, Germany and Italy) and on two key competitors to the EU (United States and New Zealand).

As Chapter 2 notes, competitiveness has many aspects which relate to the four sets of conditions:

- Initial conditions: farm type, farm size, farming intensity, farm localisation (field topology, soil, agro-climatic conditions, proximity to water sources, local environmental pressure, …)
- Industry conditions: industry competences (e.g., logistics), rivalry, supplier relations, customer relations, substitutes, voluntary standards
- Institutional conditions: implementation and enforcement of legislation
- Macro-economic conditions: interest rate, exchange rate

Cross-compliance includes a large set of requirements (19 SMRs and 9 GAECs), which potentially all might affect the costs of production and thus competitiveness. However, as argued in Chapter 2 of this report most requirements introduce low or negligible costs. In this assessment therefore only a limited subset of the total number of measures is evaluated. The main focus will be on the Nitrate Directive, the Identification and Registration requirements and the food safety issue (in particular the impact of prohibited use of milk yield growth promoters in the EU).

In this Chapter, before presenting the main results of simulated impacts on competitiveness at farm and country level, the first section – Introduction – focuses on initial conditions (sector structure, depicted in degree of specialization, herd size, milk yield, milk output per hectare, grassland share), institutional conditions (legislations) and macro-economic (depicted through milk prices, trade patterns).

4.1.1 Trade patterns

This section provides overview of trade patterns and specific characteristics of dairy sector of Europe, U.S. and New Zealand. When possible, a special focus is paid to national case studies in Europe: the Netherlands, France, United Kingdom, Germany and Italy. Dairy products range from fairly standardized goods, such as milk, butter, and nonfat dry milk powder, to multivariety, multiflavored products, such as specialty cheeses, fermented drinks, and milk protein fractions used in food and beverage items. Some dairy product markets are local or national, while others are global (Table 4.1). Products such as fresh milk, yogurt, and cheese are intended for direct consumption. Dairy products are also consumed indirectly as ingredients in other foods, such as pizza, snack bars, and bakery products. Nonfood uses range from nutriceuticals to industrial applications.

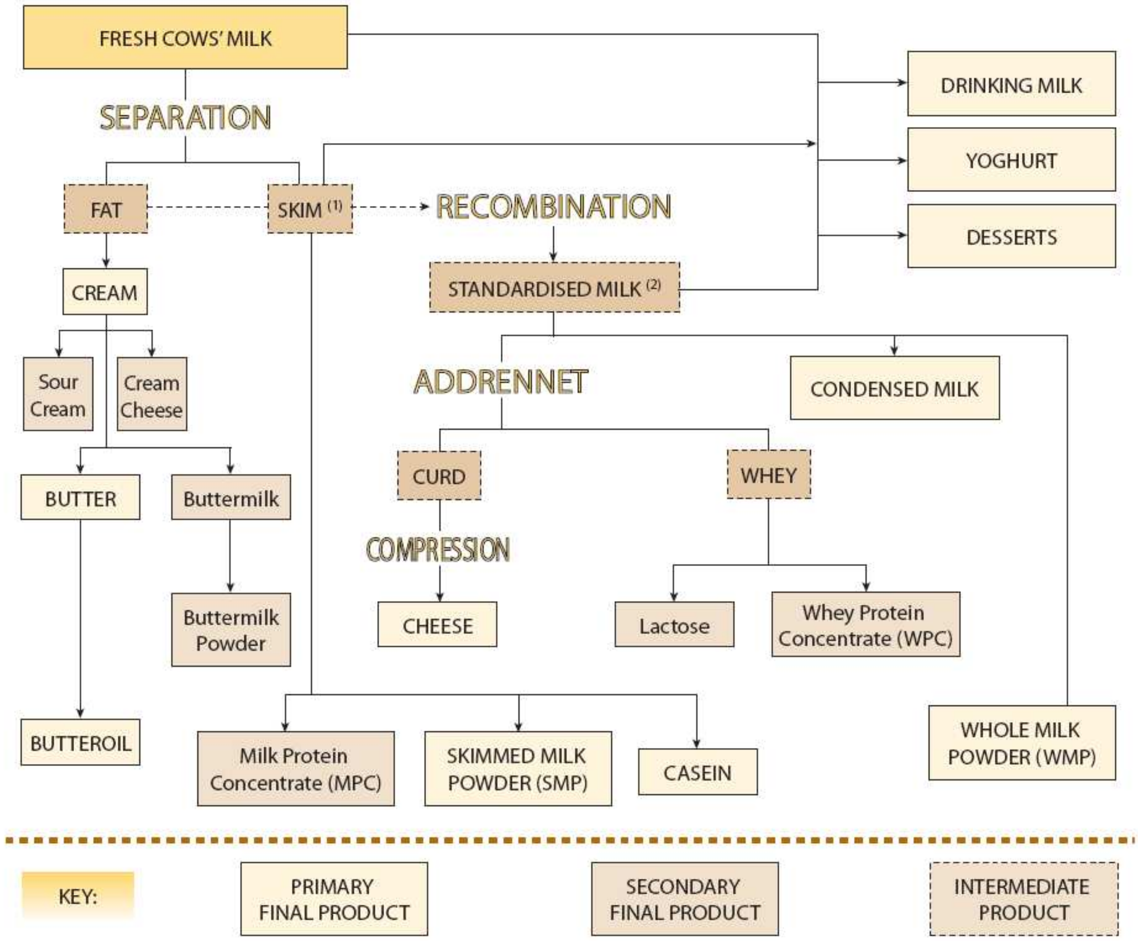
Table 4.1: Dairy products and their characteristics

General category	Specific products	Geographic market	Consumption/primary use	Quality attributes
Fluid milk	Fresh whole milk UHT milk	Local or national (rarely traded) Regional	Direct consumption	Freshness Shelf stability
Fresh milk products	Cultured milk Yogurt	National or regional	Direct consumption	Freshness
Ice cream	Artisanal / bulk	National or regional		Flavor/texture
Milk powders	Whole milk powders Nonfat dry milk	Global (heavily traded)	Direct consumption Food or feed ingredient	Reconstituted milk flavor Shelf stability
Butter fats	Cream	National or regional (small trade)	Direct consumption or ingredient	Shelf stability Freshness
	Butter Butter oil	Global (heavily traded)		
		National or regional	Direct consumption	
Nonfat component	Milk protein concentrates Whey proteins Lactose Casein	Global	Food ingredient Pharmaceutical use	Functionality
Cheese	Fresh cheese Processed cheese Natural aged cheese	National or regional (traded among high-income countries)	Direct consumption	Freshness Shelf stability Flavor/aroma/texture

Source: Blayney *et al.*, 2006

Processed-food manufacturers have shown renewed interest in using dairy derived ingredients in their products in recent years. Milkfat, skim solids, whey proteins, and lactose have emerged as important food ingredients mostly due to desirable taste, nutritional, and functional characteristics—but partly also due to cost advantages (Miller and Blayney, 2006). New markets are expected to emerge for milk-based fractions but the net addition to milk demand is unclear. The breakdown of fresh milk into dairy products is presented in Figure 4.1. As Figure 4.1 shows a host of dairy products is produced using different combinations of raw milk ingredients, such as fat, protein, and others. Two important observations can be made from this: 1) Because of the competition for ingredients the quantities produced of various dairy products are highly interrelated (milk balance consistency). 2) As regards the demand side dairy products are highly differentiated, among them high value added products as well as commodity-like base products (SMP and butter). Whereas economic models usually treat dairy products in a highly aggregated way, depending on the actual product mix in a certain export market, price-sensitivity might significantly vary (and deviate from the average aggregate).

Figure 4.1: Products made from dairy cow's milk

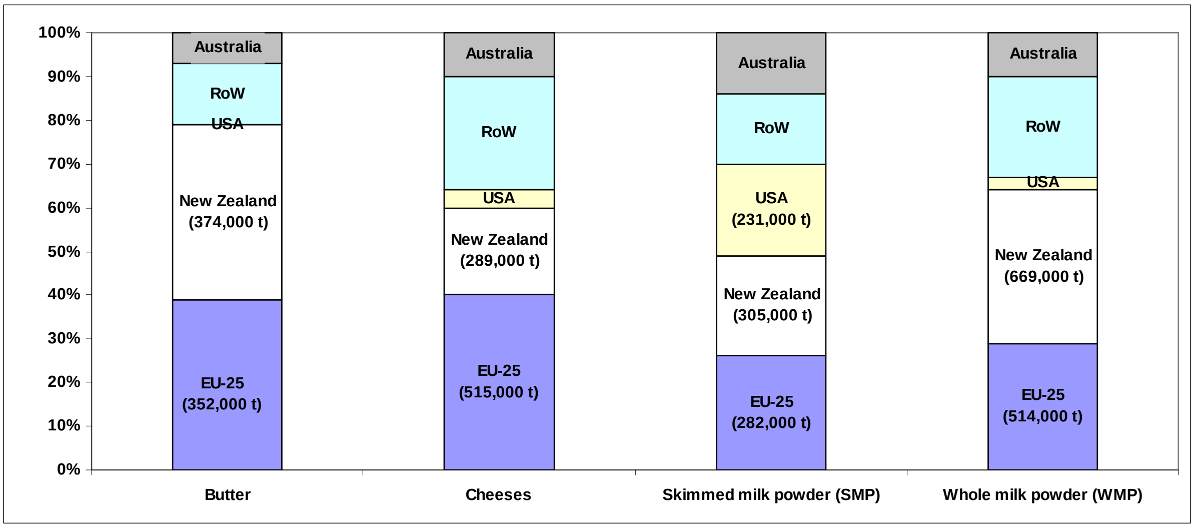


Source: Comission, 2006

Global milk production is largely from cows (84 percent), but a growing share of milk is produced from other animals, such as buffaloes, goats, and sheep. The quantity of milk produced by animals other than cows is not large, but cheese varieties produced from sheep and goats are traded internationally, and their overall share of production has increased slightly since 2000. From 2000 to 2004, global milk production grew about 6 percent, while cow's milk production grew somewhat less (Blayney *et al.*, 2006).

The focus of assessment is on five EU Member States (the Netherlands, France, United Kingdom, Germany and Italy) and on two key competitors to the EU (United States and New Zealand). The EU's presence on the world market is strong for all the major dairy products (see Figure 4.1). In 2005, the value of total dairy exports out of the EU was EUR 5.4 billion – for 2,5 million tonnes of products.

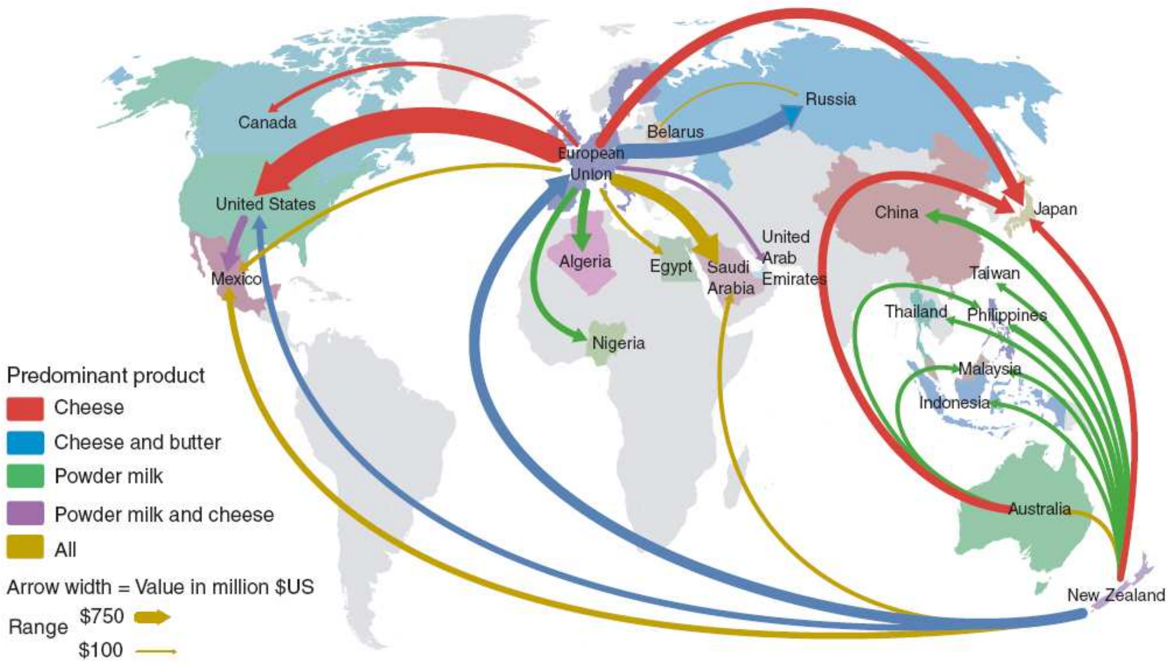
Figure 4.2: EU-25 shares in World Exports in 2004 (quantities in tonnes in parentheses)



Source: EC, 2006 and Blayney *et al.*, 2006

In the previous two decades, the EU was the dominant supplier of dairy products worldwide. From EU-15, three selected case study countries (Germany, France and The Netherlands) are remarkable players adding up to 55% of the EU export share. With the enlargement of the European Union in 2007, the dairy industry in the EU-27 becomes very large with estimated 24 million dairy cows in comparison with 9.1, and 4.1 million dairy cows in the United States, and New Zealand, respectively (OECD,). Milk production in the EU-27 in 2006 is almost twice as much as that of the US and about ten times larger than in New Zealand. Quotas and environmental restrictions, however, have limited the EU's dairy production; moreover, its dairy manufacturing sector has tended to focus on specialty cheeses exported and sold at premium prices. Australia and New Zealand now control a growing share of world trade in dairy products as presented in Figure 4.2. Exports from the European Union (34%), New Zealand (33%), and Australia (13%) provide over 80% of dairy products traded worldwide. New Zealand's share of world dairy trade is significant making it the world's largest exporter of butter, skim milk powder and casein, and the second largest exporter of cheese and whole milk powder (excluding intra-EU trade).

Figure 4.3: Major global trade flows of dairy products in 2004



Source: Blayney *et al.*, 2006

In the EU the dairy production represents the first largest agricultural sector (EC, 2006), whereas in the US this is the second largest sector in terms of cash receipts at the farm level (Miller and Blayney, 2006). Milk production has been controlled under a system of milk quotas, which explains why the collection of cow's milk in the EU-15 has remained relatively steady (Feith *et al.*, 2007). Over the past several decades, the U.S. dairy sector has undergone significant changes both in scale and structure. As with most agricultural industries, there have been movements to large-scale, specialized production units including fewer, yet larger farms (see Isik, 2004). Over the past fifteen years the New Zealand dairy industry has grown steadily. The number of dairy farms has fallen, but average farm and herd sizes have increased, while productivity, both per hectare and per cow, has substantially improved. The dairy industry is expected to expand, but at a slower rate than in the past few years. The increasing environmental concerns about intensive dairying required dairy farmers to move toward land-based effluent disposal systems in order to reduce these nitrate levels (ABARE and MAF, 2006).

One would expect traded dairy products to flow from low-cost production regions to higher cost regions. However, product differentiation and consumer preferences play major roles in shaping dairy product demand and trade flows. All high-income countries, including major dairy producers like New Zealand, import EU cheese. The largest dairy trade flow worldwide is cheese from the EU to the United States, even though milk production costs in the EU are higher than in the United States. Consumer preferences for differentiated products provide suppliers incentives to make such generally higher priced products available even in markets where lower cost alternatives exist (Blayney *et al.*, 2006).

The growing demand for milk in developing countries has affected trade patterns. For example, in 1980, the EU was the single largest importer of New Zealand dairy products, accounting for 30 percent of the country's exports; by 2004, that share had declined to 8 percent. Over the period, exports to the EU remained nearly unchanged, while exports to China and other developing countries spiked. In many of the countries triggering New Zealand's shift in dairy trade, the storyline is the same: demand for milk is outstripping the capacity of producers and processors to manufacture and transport finished products to fast-growing urban populations (Blayney *et al.*, 2006).

As a result of New Zealand's relatively small population and small domestic market for dairy products, 95 per cent of manufactured dairy products are exported. New Zealand's share of world dairy trade is significant. Approximately 5 per cent of world dairy production is traded (excluding trade within the European Union) and, of this 5 per cent, exports from New Zealand provide 33 per cent. In fact, exports from New Zealand, the European Union (34 per cent) and Australia (13 per cent) provide over 80 per cent of dairy products traded worldwide. New Zealand is the world's largest exporter of butter, skim milk powder and casein, and the second largest exporter of cheese and whole milk powder (excluding intra-EU trade). New Zealand has achieved this position without reliance on production or export subsidies, and without protecting its domestic market from overseas competition. New Zealand's overall share of world dairy product exports continues to increase as its dairy industry develops to suit the needs of diverse markets. Between 1989-90 and 2005-06 the largest growth in dairy exports occurred in whole milk powder and cheese. The top five countries importing New Zealand dairy products in 2005-06 were the United States (12.2 per cent), Japan (6.3 per cent) China (5.6 per cent) Mexico (5.3 per cent) and the Philippines (5.1 per cent).

4.1.2 Sector structure

This section provides overview of the dairy farming structures, with a focus on farming intensity, farm scale, etc.

With the enlargement of the European Union in 2007, the dairy industry in the EU is very large with (estimated) 24 million dairy cows in 2006 in comparison with 9.1, and 4.1 million dairy cows in the United States, and New Zealand, respectively (OECD). Milk production in the EU-27 in 2006 is almost twice as much as that of the US and about ten times larger than in New Zealand (OECD, see Table 4.2).

Table 4.2: Milk production and dairy cows inventory in selected countries, 2007(1)

	Milk production, 1,000 metric tons	cows, 1,000 heads
EU-27	146171 (23%)	24285 (5%)
United States	82509 (13%)	9105 (2%)
New Zealand	14199 (2%)	4106 (1%)
World	639761 (100%)	518321 (100%)

(1)Projected values

Source: OECD, 2007.

In the EU the dairy production represents the first largest agricultural sector (Comission, 2006), whereas in the US this is the second largest sector in terms of cash receipts at the farm level (Miller and Blayney, 2006). Milk production has been controlled under a system of milk quotas, which explains why the collection of cow's milk in the EU-15 has remained relatively steady (M. Feith, 2007).

Dairy production is much more dispersed across the US. In recent years, western states such as California, Idaho, and New Mexico have greatly increased their milk production. The top 10 dairy states are listed in Table 4 in Annex (separate document to this report). Over the past several decades, The U.S. dairy sector has undergone significant changes both in scale and structure. As with most agricultural industries, there have been movements to large-scale, specialized production units including fewer, yet larger farms (see Isik, 2004).

Since 1980, the number of milk cows on farms in the U.S. has declined by about 16.5 percent and the number of dairy farms (operations) has fallen almost 75 percent. As a result, the average operation has more than tripled in size, from 32 to 111 cows. Output per cow and total milk production have moved upward, driven by genetic, technological, and production management improvements. Milk per cow in 2004 was 8600 kg, almost 60 percent above 1980, and total production increased by nearly one third over the same period, to about 7.7 million tons. Technological advances in dairy facilities and equipment, better understanding of animal breeding, health, nutrition, and improved input management have all contributed to milk production increases (Miller and Blayney, 2006).

Aggregate farm number and milk production data mask significant structural changes in dairy farming in the United States. The smallest dairy operations have declined the most, while large operations have increased. Very large operations (500 or more milk cows) represented 3.7 percent of all dairy farms in 2004 but they produced over 47 percent of the milk.

The top 10 milk-producing States in 2004—California, Wisconsin, New York, Pennsylvania, Idaho, Minnesota, New Mexico, Michigan, Texas, and Washington—accounted for over 71 percent of total U.S. output (Table 4 in Annex), up modestly from 66 percent in 1980. Two noteworthy facets of this production growth emerge. First, the 71 percent of output in 2004 represents almost 122 billion pounds of milk compared to the almost 38.6 million tons produced by the top 10 States in 1980 (Miller and Blayney, 2006).

California has overtaken Wisconsin, the historical hub of US dairying, to be the largest producer. Average herd sizes in the western states are vastly greater than those in the traditional Dairybelt (the northern tier, from Maine to Minnesota). The larger herd sizes are the object of recently enforced Clean Water Act and Clean Air Act regulations, making some western states, particularly California a logical choice for analysis of the dairy sector.

Map 1 in Annex shows the concentration of dairy cattle at the county level as of 1997. The USDA report that these maps are taken from shows significant changes in the geography of production and frequency of farms with greater than 1,000 animal units. Such farms that feed animals primarily in confinement are designated by Clean Water Act rules as Concentrated Animal Feeding Operations (CAFOs) and are the focus of water quality regulations at the federal and state levels.

In New Zealand farming is a significant part of society. For more than 100 years, farming has been considered the 'backbone' of the economy. Physically, farming dominates New Zealand's landscape. To the outside world, New Zealand's first introduction is that of "a land where there are more sheep than human's" and our famous "Clean and Green" image[190] (Meister & Shakur, 2003 Meister and Shakur, 2003). Currently, although more than 85 percent of the population now lives in urban areas, the agriculture and forestry sectors continue to play a vital role in New Zealand's economy (Meister, 2002; PCE, 2004). Over the past fifteen years the New Zealand dairy industry has grown steadily. Dairy farming extends over a further 2 million hectares with about 12,000 dairy farms (Stringleman, 2006). Its contribution to agricultural gross revenue and agricultural exports has expanded and pastoral land has been converted to dairy farms, while dairy cow numbers, herd sizes and productivity have all increased. Maintaining production growth is a challenge for the dairy industry for several reasons. These include environment concerns (for example, limitations on water for irrigation in Canterbury and concerns about nitrates), greater competition for land, and weaker international dairy prices. The dairy industry is working with other pastoral sectors, and local and central government on initiatives for sustainable freshwater management.

The dairy industry is expected to expand, but at a slower rate than in the past few years. The expansion will be at the expense of beef, deer and, to a lesser extent, sheep operations in areas that are suitable for dairy farming. More recently, there have been some spectacular rises (and falls) in farmer incomes. The large rise in 2000-01 for dairying triggered more major conversions of sheep farms to dairy farms (ABARE and MAF, 2006). At the same time the increasing environmental concerns about intensive dairying required dairy farmers to move toward land-based effluent disposal systems in order to reduce these nitrate levels. Fonterra, twice the size of any other New Zealand company, is the world's largest dairy ingredients company and is responsible for around 40 percent of world cross-border dairy trade in 2005 - New Zealand's only truly global business (Meister, 2002 ; MAF, 2005).

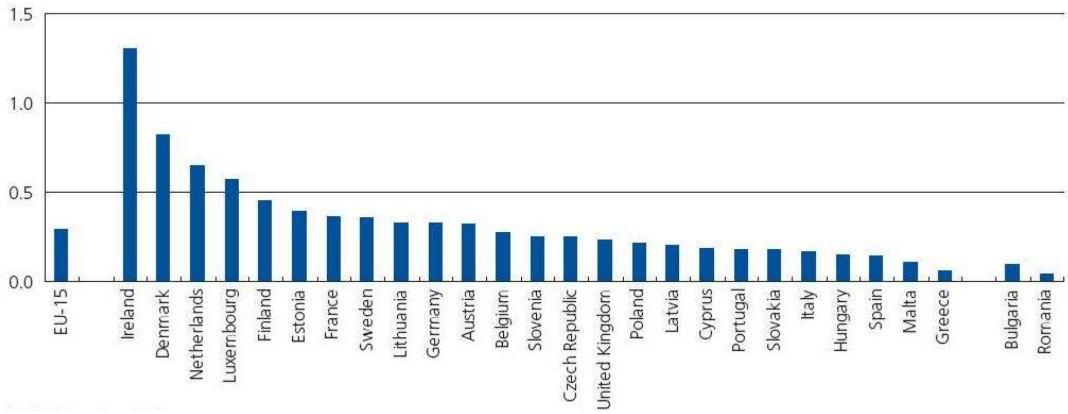
In New Zealand, dairy revenue in 2005-6 was about 34% and is projected to reach 35 per cent of total agricultural gross revenue in 2009-10. The industry had approximately 12,000 herds as at June 2005, with 4.1 million in-calf cows and heifers (49 per cent Holstein–Friesian and 28 per cent Friesian–Jersey cross), producing over 1.2 billion kilograms of milk solids. The 'average' New Zealand dairy farm in 2004-05 was 115 hectares in size, and milked 315 cows to produce 1.15 million litres of milk containing 98 800 kilograms of milk solids. In the past twenty years, the number of dairy farms has fallen, but average farm and herd sizes have increased, while productivity, both per hectare and per cow, has substantially improved. Continued gains in milk production per cow are expected from better farm management practices and genetic improvements. The seasonal milk production system relies predominantly on highly productive, rotationally grazed pasture and herds of high genetic merit. It is this system that enables farmers to produce milk substantially below average world costs, giving New Zealand its advantage over competitors world-wide. The warm climate and productive pastures enable herds to graze in pasture year-round, thus avoiding the need for indoor housing and expensive feed supplements.

Worldwide, the EU is both the biggest producer and consumer of milk, with a share of 21% in both world production and consumption. However, the share of milk in total milk output of

[190] 'Clean and Green' is an image New Zealand attempts to project of the environment in which agriculture is conducted. It was based on its clean water, air and soil (low use of fertilisers and pesticides and it reliance on all year outside grass feeding), low population density and wide open spaces. This chapter demonstrates that relative to many other countries, New Zealand is greener and cleaner but that it needs to work hard at being able to preserve that image.

the EU varies widely between member states. According to Wieck and Heckelei, 2007, with 14% of the total value of agricultural production in 2000, milk production is the most important activity both in the EU as a whole and for a majority of the member states. In 2000, the most important producer (according to total produced milk quantity) in the EU-15 was Germany, with a share of 23.7%, followed by France (20.6%), the United Kingdom (12.4%), and the Netherlands (9.4%). The next five countries (Italy, Spain, Ireland, Denmark, Sweden) together account for a quarter of total EU-15 production. The remaining six countries contribute only a minor part (around 10%) to overall production.

Figure 4.4: Collection of cow's milk per capita, 2004 (1)

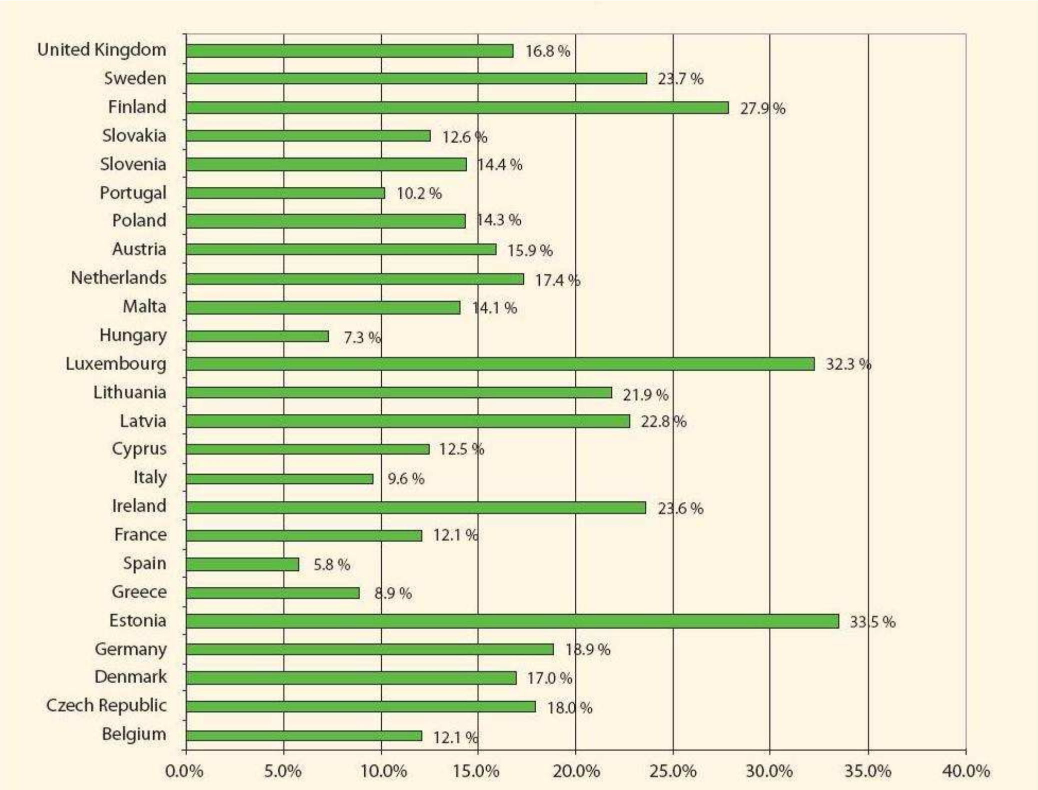


Source: M. Feith, 2007

(1) EU-25 not available

In May 2004, eight Central and Eastern European countries (Poland, Hungary, Czech Republic, Slovakia, Slovenia, Estonia, Latvia, and Lithuania), Malta, and Cyprus joined the EU-15 to form the EU-25. With the addition of the 10 new member states, the EU increased its population by nearly 30 percent and its arable land by nearly 40 percent (Blayney *et al.*, 2006). The next phase of EU enlargement is scheduled to bring membership to Bulgaria and Romania in January 2007. They too have significant dairy industries, even though their state of development is different from that of the EU-25. They together brought about 1.3 million dairy farms (with 1-2 cows) yielding annually 6.4 million tons of milk production (Comission, 2006).

Figure 4.5: Milk share of Member States' agricultural production (by value) in 2004



Source: (Comission, 2006).

In the EU-25, the share of milk in total production varies between Member states from 5.8% (Spain) to 33.5% (Estonia)(Comission, 2006). The share tends to be higher in northern Europe and lower in Mediterranean countries (see Figure 4.5).

Dairy farming is structured differently from Member State to Member State. Farm and dairy herd sizes vary enormously, as do yields (particularly following the May 2004 EU enlargement that brought ten new Member States into the EU). However, as the dairy sector develops throughout the EU, so variations in yield and other technical factors are being reduced – less developed dairy producers are rapidly catching up with those who had restructured and modernised first (Comission, 2006).

The size of a farm is an important dimension in relation to economic as well as social aspects of farming. Small farms, with or without additional income from other sources than farming, often react differently to policy measures and/or market changes than larger farms and might, in many cases, contribute to the viability of rural areas in other ways than the larger farms. In the agricultural statistics the Standard Gross Margin is calculated by the national statistical bureaus based on regional standard values for each crop and livestock item based on 3 years averages. This again is summarised per farm and expressed in terms of European Size Units (ESU), where 1 ESU corresponds to 1,200 Euro. It might be argued that the calculated SGMs do not reflect the diversity in output of the farms as this is blurred by using standard values in the calculations.

The intensity of farming is an important dimension in relation to both the economic output and, especially, the environmental performance of a farm. Farms farming at a low intensity level – low input and normally low yields – are generally likely to have a lower pressure on the environment, than farms farming at a high intensity level. In case of dairy farming it might even be that the maintenance of important farmland habitats through extensive farming practices is a pre-condition for the conservation of landscape values and biodiversity. In this overview we refer to stocking density as a measure of intensity. Table 4.3 presents farm structure characteristics for the five European case countries derived on the basis of year 2003 from FADN data. The numbers are given for specialized dairy farms for which the milk revenue accounts more than 2/3 of total revenue. The EU farms are distinguished by classes: small and large. For reasons of comparison also information on some typical dairy farms in the US and New Zealand was added. Although the numbers between the EU countries, the US and New Zealand are not directly comparable, Table 4.3 indicates that specialized dairy farms in the EU are substantially smaller than typical dairy farms in the US or New Zealand. There are big differences between the average and large sized farms in Germany and USA. The establishment of large scale dairy farming (>800 cows/ farm) in Australia and New Zealand widens the size range significantly (Hemme, 2002).

Wieck and Heckelei, 2007) study competitiveness of dairy farms in important production regions of the EU – Germany, France, The Netherlands, Denmark, England – by focussing on cost estimations as a measure of competitiveness. Wieck and Heckelei, 2007 conclude that a higher degree of specialisation, larger herd size, higher milk yield and higher milk output per hectare are associated with lower marginal costs in most regions, whereas higher farm-specific milk prices, and a higher grassland share are associated in most regions with higher marginal costs.

Considerable structural differences were observed between the member states of the EU-15. Among the case countries, in 2003, the largest number of dairy farmers was located in Germany, followed by France, the Netherlands, United Kingdom, and Denmark. Wieck and Heckelei, 2007) refer to the annual rates of change over the period 1991–1999 showing that Denmark (−7.7%) faced the sharpest decrease in number of farms, followed by Germany (−7.1%). France and the Netherlands recorded more moderate annual declines of −4.9% and −3.9%, respectively, whereas in the United Kingdom, the farm decline was much slower at −2.6% annually. Structural differences among the member states related to farm size are even more pronounced. In 2003, the average herd size in the EU-15 was 44 dairy cows (see Table 4.3). The member states considered here all lie above the average but still vary between Germany (31) and France (33) at the lower end and the United Kingdom (72) at the upper end. In 1991, this herd size difference increased to about 48 cows. Considerable structural development in the Netherlands and Denmark resulted in average herd sizes of 47 and 57 cows in 2003, respectively (European Commission, various years).

With the new member states, the variation in farming structures has increased in the EU-25. From the 8-CEECs (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak, and Slovenia), Poland is by far the largest cow milk producer (12.4 million ton in 2004 or 10 per cent of the total production in the EU-15) (Jongeneel, 2005, EDIMA report). Czech Republic and Hungary are respectively the second and third most important cow milk producers in the 8-CEECs.

Table 4.3: Farm structure of specialized typical dairy farms in the case study countries by size categories, 2001

Case country(1)	Size classes(2)	Number of dairy cows per holding	Stocking rate, cows per ha	Utilised Agricultural Land, ha	Share grassland, %	Milk production, kg	Milk production per cow, kg	Milk produced per hectare, tons
US (Wisconsin)	Small	70.0	0.74	95	54.0	693000	9900	7.2
US (Wisconsin)	Large	2100	13.4	227	29.0	20790000	9900	91.5
New Zealand (Waikato)	Small	229.0	2.20	104	100.0	961800	4200	9.3
New Zealand (Central South Island)	Large	835.0	2.21	378	100.0	3507000	4200	9.4
EU-15	All	44.5	0.92	48.44	81.3	289040	6498	6.0
Germany	All	42.4	0.80	52.72	76.4	280620	6617	5.3
Germany	< 1	36.8	0.46	79.74	73.2	232400	6310	2.9
Germany	≥2	48.7	1.52	31.97	87.5	340040	6982	10.6
France	All	41.2	0.61	67.08	80.5	244830	5947	3.6
France	<1	39.8	0.53	75.12	82.3	229330	5766	3.1
France	≥1 - <2	43.7	0.82	53.14	75.8	273510	6257	5.1
Italy	All	50.6	1.68	30.11	76.6	329660	6518	10.9
Italy	<1	16.7	0.33	50.64	93.7	76070	4555	1.5
Italy	≥2	75.6	2.51	30.15	67.3	511700	6771	17.0
Netherlands	All	72.7	1.61	45.1	93.9	535500	7367	11.9
Netherlands	≥1 - <2	51.2	0.94	54.3	84.2	328260	6418	6.0
Netherlands	≥2	74.2	1.67	44.45	94.7	550090	7414	12.4
United Kingdom	All	95.0	1.07	88.53	90.6	648120	6822	7.3
United Kingdom	<1	57.3	0.53	108.07	93.6	349920	6108	3.2
United Kingdom	≥2	139.0	2.11	65.75	94.2	976190	7021	14.8

(1) Data for the EU countries are obtained from EU-FADN, DG AGRI G3 (averages per group, year 2001). Data for other countries are obtained from the dairy network (observed farm data, year 2001, see Hemme, 2002). (2) Size classes for the EU countries are given in Economic Size Units per hectare of utilised agricultural area. In the agricultural statistics the Standard Gross Margin is calculated by the national statistical bureaus based on regional standard values for each crop and livestock item based on 3 years averages. This again is summarised per farm and expressed in terms of European Size Units (ESU), where 1 ESU corresponds to 1,200 Euro.

Assuming that farms are significantly affected by the environmental regulations only if they rely on an intensive way of production. Table 4.4 presents the percentage of farms in the selected EU countries for which the criterion of intensity expressed in livestock density per hectare is ≥2. As can be seen, especially the farms in the Netherlands can potentially be affected by regulations.

Table 4.4: Percentage of specialised dairy farms with the stocking density ≥2 (livestock per hectare) in selected EU countries, 2003

	Percentage of dairy farms	Percentage to EU-15 dairy farms
Germany	20%	4%
France	5%	1%
Italy	57%	6%
Netherlands	76%	5%
United Kingdom	41%	2%

Source: EU-FADN, DG AGRI G3

4.2 Legal structures

In Europe the main producers of milk are family farms. In the US milk production decisions are firmly in the hands of individuals and families. In 2002, almost 85 percent of dairy farms were either individual or family-operated businesses or family-held corporations. Many partnerships are also restricted to family members. Dairy farms, overwhelmingly family-owned and managed regardless of size, are generally members of producer cooperatives.

The New Zealand dairy sector, like its overseas counterparts, is dominated by cooperatives, reflecting the perishable nature of milk, the sector's relative homogeneity and economies of scale in processing, market and distribution. Agricultural land is predominantly privately owned, and generally farmed by the landowner as a commercial operation (Anon, 2002). New Zealand dairy farmers face additional exposure, compared with their overseas counterparts, from New Zealand's remoteness from its key export markets and high shipping costs. Cooperatives help to protect small producers from downstream market power and allow for better coordination of production, distribution, processing and marketing.

4.2.1 Institutional factors

Almost all countries acting in the world dairy market have tariffs or tariff-rate quota (TRQ) systems in place and at least two countries have both. Four countries with significant institutional structures, other than tariffs and TRQs, in place to provide domestic dairy industry support are the EU, Canada, Japan, and the United States. With the exception of the EU, the four countries/regions where significant domestic support for dairy is prevalent are not dominant players in international dairy product markets.

The EU dairy regime has undergone significant change over its near 40-year life. The most significant of these changes were the introduction of milk quotas in 1984 and the 2003 CAP reform, which both accelerated developments in the dairy sector (Comission, 2006). The fundamental dairy policy components of the current CAP include a milk production quota and intervention programs for butter and nonfat dry milk, both aimed at price reductions. The EU will make direct payments, which may be coupled to milk production or not, to cover lost revenues due to price reductions (Comission, 2006.). A central element of the 2003 CAP reform is the introduction of the ‘Single Payment Scheme’ (SPS) – a decoupled aid payment. Dairy farmers are eligible to receive SPS payments – the payments are conditional on the fulfillment of ‘Cross Compliance’ requirements whereby farmers receive payments provided they comply with environmental, health and welfare standards (Comission, 2006).

U.S. milk producers have received government support since the 1930s. Current domestic programs include milk price support, the Federal milk marketing order system, and direct payments under the Milk Income Loss Contract (MILC) program. Dairy policies and programs have been modified to meet changing economic relationships over time, but underlying general objectives remain the same: ensure the orderly marketing of an adequate supply of fresh wholesome milk to meet consumer demands at reasonable prices and provide adequate returns to milk producers (Manchester and Blayney, 2001).

If compliance to standards affects production costs at the farm-level, aggregate agricultural production is affected, shifting production from the most affected farm groups to the least affected ones (D12). Study of Isik, 2004 analyses geographical shifts in supply response of US dairy production to environmental regulation. The added costs associated with compliance to environmental regulations are often factored into the choice of firm location (Bartik, 1998). In the US, the environmental regulation affects the dairy cow inventories, the per-farm dairy inventories, and the absolute and relative changes in the dairy inventories. Dairy farm concentrations shift to the states with less stringent environmental regulations (Isik, 2004).

Unlike most of its OECD partners, New Zealand has a large agricultural sector that is thriving with almost no government support. Whatever meagre government support there is, is restricted to agricultural research, extension and pest control activities. It is concluded in the project report (Jongeneel *et al.*, 2007) that none of the EU’s key competitors (Canada, the United States and New Zealand) has a system of requirements comparable to the EU’s one. A comparative analysis covering all the themes addressed in the SMRs and GAECs shows that in general the intensity of regulation is less in these countries as compared to the EU. However, similar issues play a role and although the policy-approaches currently rely more on voluntary actions, more stringent forms of regulation might be introduced in the future. As such as part of this competitiveness assessment not only the impacts of selected EU requirements will be evaluated, but also some scenario’s will consider changes in regulations for key competitor countries.

4.3 Evaluated measures

4.3.1 Nitrate Directive

From the first part of the project in became clear that the Nitrate Directive is one of the most serious ones facing EU dairy farmers. Although it became clear that there are potentially significant cost impacts, the information in the Country Reports (D5) was in general rather fragmentised and showed a lot of variation over member states. Therefore a further research effort was done to improve on the cost estimates, as well as on the estimates of the (effectively) affected area and/or number of farms. Moreover, in order to obtain an estimate for the EU as a whole, in principle an aggregation step including the impacts in all EU member states is necessary. However, in the previous phase of this project only a subset of the member states was taken into account. Where possible and relevant supplementary information for other member states was gathered.

The Nitrate Directive (91/676/EEC) was adopted in 1991 by the Council of Ministers aiming at the protection of waters against pollution by nitrate form agricultural sources. The Directive had to be transposed in national law of the member states by 1993. The directive includes various provisions, among which the identification of nitrate vulnerable zones (NVZs) (either where 50 mg/l drinking water standard for nitrate is exceeded or may be exceeded in the near future if no measures are taken or where eutrophication exists); the establishment of a code of good agricultural practice (by the end of 1993) to be implemented on a voluntary basis on the whole territory; and action programmes formulated by the end of 1995 and implemented by 1999 for designated zones based on standards contained in the code of practices, which then become binding for farmers in NVZ-areas. Included in the action plans must be a maximum per hectare application rate for nitrate from animal manure (210kgN/ha before 1999, and 170kgN/ha after 1999). The code of good practice had to include measures on when and where manure fertilizer and chemical fertilizer should be applied, as well as measures on the proper storage of manure (capacity and construction) (see Annexes II and III of the Directive). Whereas Austria, Denmark, Germany, Luxembourg and The Netherlands designated their whole territories as NVZ-area, other countries designated more limited zones (Ireland even imposed no NVZ area at all).

In order to comply, farmers can respond in various ways to the Directive. Examples of farmer’s actions are: reduced fertilizer application; changed application practices, creating sufficient livestock manure storage capacity; emission control measures for storage plant; changes in crop rotation system; vegetation cover during raining periods; development and implementation of farm fertilizer plans; changing the composition of animal feedstuffs; changing animal feed practices (limiting outdoor grazing of dairy cows); etc.

4.3.2 Identification and registration

From the previous research in the project it became obvious that identification and registration of animals has significant degree of non-compliance, with 30% non-compliance not being an exception (D9). A large part of the lack of compliance appeared to be due to the loss of eartags, which are inherent to the EU’s current system. From survey information it also appeared that identification and registration of animals is one of the most frustrating requirements to the farmers. Besides, the inclusion of animal identification and registration results in very high effort for controlling agencies (about 36 hours per farm for the RPA in England or 40 hours for the AID in the Netherlands, who controls most SMRs and soil organic matter). By far most time consuming is the check of animal identification especially in extensive farms or in cattle breeding, as animals are often outside and in different fields and sometimes difficult to approach, compared to dairy cows kept indoors (Nietsch and Osterburg, 2007 , D18).

The EU Directives on Identification and Registration of animals (92/102/EEG, and Regulations 911/2004, 1760/2000, and 21/2004) imply:

a. Eartags:

1. Calves born on the holding (or imported from outside the EC) must be tagged

with approved eartags with the same unique identification code.

2. Calves must be tagged within 20 days of birth, or before they leave the holding, if this is sooner. Dairy calves must be tagged with one eartag within 36 hours and the other eartag within 20 days.
3. Eartags must not be removed or replaced without permission. Illegible or lost tags must be replaced within 28 days.

b. Cattle passports:

1. An application must be made for a cattle passport within seven days of a calf being tagged (that is, no more than 27 days after birth).
2. When cattle are moved, you must ensure that they are accompanied by their cattle passports, which must be completed and signed.

c. Notification:

1. Births must be notified to the responsible authorities by an application for a cattle passport within seven days of tagging (that is, no more than 27 days after birth).
2. Deaths must be notified to the registration authorities within seven days.
3. Movements of cattle on and off a holding must be notified within three days.

d. On-farm registers:

1. Up-to-date on-farm registers must be kept with the required information ,including births and deaths of cattle and movements of cattle on and off your holding. The dates of these events must also be recorded.
2. For movements, the details of keepers who sent the cattle and to whom cattle are consigned must be recorded.
3. The register must be completed within 36 hours of a movement, within seven days of a death and within seven days of a birth in a dairy herd (or within 30 days of the birth of any other calf).
4. The register must be kept for ten years and be available to the authorities on request.

4.3.3 Food safety (hormone use)

Consumer concerns as regards food safety have led to hormone use prohibition in the EU. In the U.S. a recombinant bovine somatotropin (rBST), a growth hormone that stimulates milk production has been approved for use in dairy cows since 1994. Alongside the US BST (or rBST) is at least used by 16 other dairy producing countries (Jarvis, 2002). The EU, Canada and Japan rejected legal BST use, and also within the US the technique was (and still is) controversial, at least within certain groups and regions. See Jarvis (2002, 103) for further details.

From the literature (Tauer and Knolbach, 1997; Knoblauch and Putnam, 1998; Stefanides and Tauer, 1999, and Tauer, 2002) it appears that there is a production increase effect (Table 4.5).

Table 4.5: Impact of bST on average herd milk yields (kg/animal.year) *

Application time	1 st year 296	medium 486	4 years (continuous) 689
Milk yield level	low 419	middle 575	high -

Source: Based on Tauer (2002).

*) Only significant numbers are presented

The history effect suggest that there is a clear learning effect: when longer using it farmers are better able to exploit the milk enhancing advantage of bST. Late adopters appeared to be able to directly realize a milk yield increase of about 480kg/animal.year (not reported in Table).

It should be noted that the yield increases are changes in herd averages. bST might have been applied to some but not all cows within the herd. More detailed information about the application rate was lacking, which complicates easy generalizations form these findings beyond the sample population[191].

The results found with respect to milk yield variation (low, middle, high) fit in with the experimental results reported by Patton and Head (1992), which also show that in particular low producing cows respond to bST.

However, from the literature no statistically significant profit increase effect was found. It is suggested that applicant farms may sometimes loose and sometimes gain from the use of bST. It is suggested that middle production per cow-farms (which often are located at larger farms) and well-managed farms[192] belong to the gainers. In one case for large farms a significant profit increase per cow of US$229 was found.

From these findings (a significant yield effect and non-significant profit effects) it can be concluded that whereas bST will increase yields and thus revenues it simultaneously increases input use (feed) and thus costs (including the costs/fee for bST use farmers have to pay). A possibility might be that Monsanto succeeds in exploiting its monopoly power in such a way to more or less exactly extract the rent from the use of this milk output enhancing innovation[193].

Monsanto – the monopoly-supplier of the product (brand name: POSILAC) – reports that in 1999 about 13.000 US dairy farms were using BST, applying it to 9 million dairy cows (approximately 30% of the cows in supplemented herds). The use of this hormone leads to production increases. Tauer (2002) shows that application of rBST in the first year may increase an average herd's milk yield by 419-575 kg, whereas late adopters are able to directly realize a milk yield increase of about 480kg/animal.year. Jarvis (2002) who analyzed

[191] Henriques and Butler (2002) state that experimental results indicate that for individual cows milk yield increases in the range of 10-20% are found. This is significantly higher that the numbers reported in Table 1. In general no more tan 65% of the herds will be available for bST application since cows are generally treated only the last 215 days of their 305 day lactation, while during the firs 60 days of the lactation cycle the response to bST is not strong. Moreover, always some cows cease treatment because of poor condition or health problems (Jarvis, 2002, 104).

[192] Animal science studies of Coppock (1992) and Shaver (1998) have shown that 'profitable' bST use requires consistency and improvement of management and production (well-balanced diets) technologies.

[193] There is similar evidence for exploitation of market power by Monsanto for GMO soybeans (see Moschini and Lapan, 2002).

the potential effects of BST on world dairy markets estimates that the total US milk supply increased by 3% due to the (pure) BST application[194].

Whereas BST will increase yields and thus revenues it simultaneously also increases input use (feed) and thus costs (including the costs/fee for BST use farmers have to pay). In an ex-ante analysis Perrin (1991) estimated per unit cost savings varying from 0.5 to 4.4 percent, although milk yields were increasing by approximately 15% (note the simultaneous cost increase effect). Jarvis (2002, 109) using a slightly different approach provides a maximum per unit cost decline of 5% (per unit average). When simulating the trade impact of hormone use ban in the U.S. this translates into 5% cost increase imposed on the U.S.

4.4 Estimating regulatory costs of Nitrate Directive in EU-countries

As regards the costs of the Nitrate Directive for the EU member states the work of Andrews et al (2000) and Kuik (2006) was scrutiny analyzed. As regards the costs associated with similar standards in non-EU countries, we rely on the estimates provided by Cassels and Meister (2001), as well as on their degree of compliance-corrections (See subsection 3.3.4 for more details).

The studies provide insight into both ex-ante (Andrews, Cassels and Meister) and ex-post costs of regulation estimates. Moreover, alongside their own analysis they summarize a number of national estimates. Table 4.6 provides a comparative overview of the cost estimates associated with the Nitrate Directive for selected EU member states as obtained by Andrews et al (2000) and Kuik (2006), with a specific focus on the dairy sector.

Table 4.6: Ex-ante and ex-post estimates of compliance costs associated with the Nitrate Directive (prices of '97/98)

		1	2	3	4	5	6	7	8	9
	Unit	Belgium	Denmark	**France**	**Germany**	**Italy**	**Nether-lands**	**Spain**	**United Kingdom**	EU-15
Ex ante estimates										
Andrews et al (2000)	€ mio.y-1		63	78			215		125	
Dairy	€.ha-1.y-1	45	45			45	129	45	45	
Total/ha	€.ha-1.y-1	58	79	93	64	75	129	70	44	75
National estimates	€.ha-1.y-1		103	25-61			236		6	
Ex-post estimates										
Kuik (2006)	€.ha-1.y-1		62				174			
ex-post/ex-ante ratio			0.60				0.74			

Source: based on Andrews, 2000

As Table 4.6 shows Andrews et al (2000) average per hectare compliance cost estimates vary from €44/ha (United Kingdom) to €129/ha (Netherlands). However, these estimates, which are based on the calculated costs aggregated over all agricultural sectors divided by the affected area. These averages of total costs hide a lot of variation over farms. As can be seen from the line on dairy farms, they are estimated to face lower costs than the calculated national average cost impacts. Farms facing higher than the national) average costs will be

[194] For comparative reasons note that the autonomous (genetic) milk yield increase is about 2% per annum. Where bST application creates a one-shot increase, genetic progress creates a continuous milk yield increase.

mainly intensive livestock farms. For Denmark, France, The Netherlands and the UK also some national estimates are given. For Denmark and The Netherlands these are substantially higher than those obtained by Andrews et al, whereas for France and the UK they are substantially lower. For Denmark and The Netherlands Kuik (2006) comes up with ex-post estimates of €62 and €174 per hectare affected land respectively. As compared to the national ex-ante estimates the ex-post estimates (which include the impact of all kinds of mitigation measures taken at the farms) for Denmark and the Netherlands are respectively 40% and 26% lower. As compared to the estimates of Andrews et al, Kuik's ex-post deviation can be calculated to be 22% lower for Denmark, but 35% higher for the Netherlands. In particular the higher estimate for The Netherlands is not expected, since in general ex-post estimates are expected to be lower than ex-ante ones. However, the estimates in Andrews et al are based on previous studies, that include substitutability possibilities and as such some impacts of farm mitigation strategies to reduce the cost impacts.

The bottom-up procedure as outlined in Chapter 2 was followed to assess the costs estimates starting from identifying the relevant number of dairy farms affected by the regulation (with a livestock density per hectare ≥ 2). Next, initial compliance levels, costs of compliance with the regulation for affected farms and the expected final degree of compliance are defined. As regards the cost measures for the selected EU countries we relied on per hectare cost estimates based on the Kuik (2006). The only exception to this is that the requirement to keep record of manure applications are (to our information) not yet included in the Kuik estimates. These are estimated to be €150 per (dairy) farm in a NVZ-area, and are added separately. To translate the percentage of additional costs of compliance to total costs at the sector level, both affected and non-affected farms are accounted for.

The additional costs depend on the final rate of compliance assumed. Several scenario's are possible here and reported below. As an example, if the final rate of compliance is full compliance and the base year rate of compliance is 80 percent, the additional costs are equal to (1.00-0.80)*total costs associated with full compliance. In order to determine the percentage cost increase associated with the improvement in the compliance rate, the estimated additional costs of the Nitrate Directive are related to the costs of production and multiplied with 100%. The percentage costs increase for the dairy sector as a whole was determined by a production weighted share of the dairy farms which faced a cost increase and the dairy farms which do not face a costs increase (extensive dairy production).

The exception to the above procedure concerns the estimates for Italy. The costs of compliance to the Nitrate directive are based on a case study of CRPA (De Roest *et al.*, 2007), see also section 4.8.2. The costs per farm with 100-cows are estimated at the level of €11045.7, thereby leading to €8836.6 additional costs per farm (associated with achieving full compliance) as reported in Table 4.7.

The obtained results are presented in Table 4.7 along the three scenarios [195]:

1) The first one, labelled as FULL COMPLIANCE, gives the additional costs (as a percentage of total costs) assuming all farms improve their degree of compliance in such a way that they all achieve full compliance.

2) The second one assumes that all affected farms improve heir degree of compliance with 20% as compared to the base year level (prevailing degree of compliance)[196].

[195] Other scenarios are also possible. Since the estimated initial levels of compliance are uncertain, also some scenario's could be done in order to analyse the sensitivity for different initial compliance levels.

3) The third scenario assumes that the degree of compliance is increased in general with 10% (as compared to base year level), and additionally that no country will have a degree of compliance less than 75%. So countries performing poorly in the base year are assumed to do additional efforts.

As Table 4.7 shows for the FULL COMPLIANCE scenario the percentage increase in total production associated wit the additional costs necessary to be made to achieve full compliance, varies between 0.06 till 0.58 percent of the total production costs. Here it is assumed that at specialized dairy farms all production costs can be related to dairy production. So no attempt was made to decompose and attribute costs to specific outputs even if farms had multiple outputs (often dairy farm output includes some beef meat output). Moreover, it should be noted that a lot of the less intensive specialised dairy farms, as well as the non-specialized dairy farms are assumed to have zero compliance costs. The low cost increase at sector level as such does not exclude more significant percentage cost of production increases at specific farms. For the intensive specialized dairy farms (>2LU/ha) percentage cost increases varying from 0.16 till 3.63 percent were found. The absolute cost increases for this group varied from €83 per farm to €3798 per farm[197]. For the alternative scenario's (2, and 3) the percentage increase in production costs are lower. However, the distribution of the costs might be different since in particular in scenario 3 a non-proportional factor in the calculation of the improved compliance rate is used (each country should obtain at least a degree of compliance of 75%).

Care should be taken with respect to interpreting the most right column of Table 4.7. The impact at EU-15 level is based on averaging farm data of all dairy farms with LU/ha greater or equal than 2. When the aim is to calculate a cost impact at EU-15 level, it will be better to create a weighted aggregate (weighting the cost increases obtained at member state level with their shares in total milk production). For this some further assumptions have to be made with respect to the member states which are currently omitted from Table 4.7 (notably Greece, Ireland, Portugal, Luxembourg, Austria, Sweden and Finland). From the inspection of the (specialized) dairy farm sample data for these latter countries it appeared that dairy farms with production intensities of 2LU/ha or more, where hardly occurring in these countries. There will be dairy farms there, located in NVZ areas which face record keeping costs. However, it might be assumed that the costs associated with specific actions necessary in order to comply with the Nitrate Directive are negligible.

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[196] Taking into account that at a factor of 1 (full compliance) is the maximum which no country can go beyond.

[197] The order of magnitude of these numbers fit in with the specific cost estimates that were obtained earlier in the specific country assessments (e.g. D5 Netherlands). For further elaboration see the separate section on the farm approach to competitiveness assessment.

Table 4.7: Calculated cost of production increases due to compliance with the Nitrate Directive standard

	Belgium	Denmark	France	Germany	Italy	Nether-lands	Spain	United Kingdom	EU-15
Revised cost estimate €/ha dairy farms (using all previous studies)	45.0	45.0	45.0	45.0	45.0	94.5	45.0	99.3	45.0
Idem (but now updated for inflation)	50.0	50.0	50.0	50.0	50.0	105.0	50.0	110.3	50.0
Per annum record keeping costs (€ per farm)	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0
Nitrate directive costs € per farm	1826.9	3261.5	6330.0	2119.0	11045.7	4694.4	838.5	8380.9	1883.0
Total costs (per farm) as in FADN database 2003	95454.4	241366.4	121197.1	112586.4	184095.6	177804.9	52283.6	219474.3	131911.1
Estimated prevailing degree of compliance	0.80	0.80	0.40	0.60	0.20	0.75	0.90	0.95	0.8
% Nitrate directive costs/ 'corrected' total farm costs	1.53	1.08	2.09	1.13	1.20	1.98	1.44	3.63	1.14
Share of specialized dairy farms in total milk production (based on output value)	0.44	0.23	0.05	0.23	0.85	0.79	0.75	0.52	0.43
Scenario 1: FULL COMPLIANCE									
Final level of compliance	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Calculated additional costs per farm (associated with achieving full compliance)	365.4	652.3	3798.0	847.6	8836.6	1173.6	83.8	419.0	376.6
% Additional costs associated with full compliance to Nitrate Directive	0.383	0.270	3.134	0.753	4.800	0.660	0.160	0.191	0.285
Approximated additional total sector cost % increase (full compliance)	0.169	0.062	0.166	0.171	4.090	0.522	0.121	0.099	0.124
Scenario 2: 20% INCREASE IN COMPLIANCE									
Final level of compliance	0.96	0.96	0.48	0.72	0.24	0.90	1.00	1.00	0.96
Calculated additional costs per farm (associated with +20% compliance)	292.3	521.8	506.4	254.3	441.8	704.2	83.8	419.0	301.3
% Additional costs associated with +20% compliance to Nitrate Directive	0.306	0.216	0.418	0.226	0.240	0.396	0.160	0.191	0.228
Approximated additional total sector cost % increase (increased compliance)	0.135	0.050	0.022	0.051	0.204	0.313	0.121	0.099	0.099
Scenario 3: 10% INCREASE IN COMPLIANCE and COMPLIANCE >75%									
Final level of compliance	0.88	0.88	0.75	0.75	0.75	0.825	0.99	1.00	0.88
Calculated additional costs per farm (associated compliance assumption made)	146.15	260.92	2215.49	317.85	6075.14	352.08	75.46	419.04	150.64
% Additional costs associated with compliance assumption to Nitrate Directive	0.153	0.108	1.828	0.282	3.300	0.198	0.144	0.191	0.114
Approximated additional total sector cost % increase (increased compliance)	0.068	0.025	0.097	0.064	2.812	0.157	0.109	0.099	0.049

Source: own calculations following the procedure described above. The Estimates for Italy are those from the CRPA study (De Roest *et al.*, 2007)(see section 0).

4.5 Compliance costs of Nitrate regulations in non-EU countries

As regards the costs associated with similar standards in New Zealand, the estimates from Cassells and Meister, 2001) were updated (see Meister, 2006). An exception is the US, where (partly) own calculations were made. Their estimates are in Table 4.8.

Table 4.8: Costs of compliance for non-EU countries

Country	Best estimate of % costs increase at farm level	Estimated degree of compliance	Best estimate of additional costs (% cost increase) at sector level
New Zealand	3.2	85%	0.5
Australia	3.2	85%	0.5
USA	2 - 4	50%	0.02
EU (own estimate)	Own estimates in Table 4.7	Own estimates in Table 4.7	Own estimates in Table 4.7

Source: Based on Cassels and Meister (2001) and Winsten (2007).

*the estimate is based on case study, see section 4.5.2.

4.5.1 Cost of Compliance with Environmental Regulations: the New Zealand case study

A number of environmental issues have been raised over the past century by the development of New Zealand's agriculture. Although farming in New Zealand is generally much less intensive than in other countries, nevertheless, in some areas of New Zealand significant soil erosion problems have resulted from removal of the natural forest cover for pastoral farming. The resulting sediment along with nutrient run-off and discharge of agricultural wastes has also contributed to water quality concerns in some areas. The removal of indigenous vegetation raised the issue of protecting biodiversity. The continual conversion of land to horticultural and dairy production has made water allocation, water quality and minimum stream flow, all issues of importance.

In many cases, environmental problems associated with agriculture can be attributed to government policies. Until the mid-1980s, for example, agricultural support programmes encouraged over-intensive use of chemical inputs and other physical resources. Following the removal of subsidies, the number of sheep in New Zealand declined by well over 35 percent (Statistics New Zealand, 1998). Well over half a million hectares of pasture have been converted to exotic pine forests over the same period. An even larger area of marginal pasture on steep erodible slopes has been left to regenerate in scrub and native forest (Ministry for the Environment, 1997). While the decline in sheep numbers has continued, this has been partially offset by an increase in the number of dairy cows and other livestock. Fertilizer and pesticide use, which significantly decreased after the economic reforms of the 80s, increased again when farm incomes started to rise (MAF, 1997).

The key environmental issue associated with dairy farming is that of water quality, which is compromised by excessive levels of nitrate. With increasing herd sizes and stocking densities, growing pasture cannot always absorb the increasing quantities of nitrate that are delivered to the soil. The result is excess nutrient levels in water leading to eutrophication and concerns regarding livestock and human health (Cassells & Meister, 2000).

This analysis has estimated the costs of compliance with regulations concerning water quality.

Water quality regulations

In New Zealand there is one overriding piece of legislation, the Resource Management Act, 1991 (RMA 1991) that deals with the management of natural resources, including the quality of surface and ground water. Prior to the RMA 1991, most discharge of dairy effluent was to water, the control of which was the responsibility of Catchment Boards, under the Water and Soil Conservation Act, 1967. However local government reform in the late 1980's shifted this responsibility to the Regional Councils. Since 1991, discharges to water or land have become subject to the requirements of the RMA 1991. Under the Act discharges to water are not allowed unless they are specifically permitted in a regional plan, or allowed by a consent issued by the relevant Regional Council. In most regions discharges of effluent to land require a consent. Several Regional Councils, however, have made discharge of effluent to land a permitted activity, done as of right provided they do not contravene the provisions allowed for in the regional plan (Cassells & Meister, 2000).

Policy DL 3: Restrictions on nitrogen loadings from wastewater discharges

The loading of nitrogen in discharges of wastewater to grazed pasture should not exceed 150kgN/ha in any 12-month period and should not exceed 50kgN/ha in any 24-hour period, unless it can be demonstrated that increased application is safe. This policy does not restrict the application of fertiliser. Fertiliser is applied to pasture and crops specifically to promote plant growth, not to dispose of an unwanted product (i.e. animal effluent). For some industries the over application of crop fertiliser would be uneconomic and inefficient, and would represent a cost to the farmer. Regional Councils actively promote the adherence to the Code of Practice for Fertiliser Use, developed by the New Zealand Fertiliser Manufacturers' Research Association. The rules in this Plan therefore differentiate between nitrate applications that need to remain regulated and those that can be left to the discretion of those applying the fertiliser.

Councils are not satisfied that regulating fertiliser use is the most effective way to avoid or mitigate the effects of the activity. Some improvement in groundwater quality should be achievable through controls imposed on other sources of nitrate, such as sewage and agricultural effluent, which are regulated to control the effects from organic and microbial contaminants. In areas where fertiliser application could cause adverse effects, councils will provide users with information about more efficient and effective means of using fertiliser (LM Method 1).

DL Rule 4: Discharges of agricultural effluent

Any discharge onto or into land, of

a. wastewater and/or sludge from dairysheds, piggeries, or feedlots, or
b. sludge from agricultural waste water treatment ponds; or

c. poultry farm litter or wastewater.

is a **Controlled Activity.**

The Activity shall comply with the following standards

these standards refer to buffer zones (to separate from rivers, lakes, houses); rates of application (150kgN/has/year or not to exceed 50kg/N/24 hour period); ponding.

Applications for controlled activities must provide information on proof that standards are achieved, loading rates, and areas to be used. N-loading rate calculations are based on 20g of N/cow/day x 270 days/year. A rate of 150kgN/year requires an area of 6.35ha per 100 cows for the spread of dairy shed effluent.

Beyond the context of specific regulatory approaches under the RMA (largely confined to effluent disposal and water takes and discharges), remedial strategies for mitigating adverse environmental effects in the dairy sector have tended to be voluntary and focused on good practice, that is, "education is more appropriate than legislation." By way of example, fertiliser use is not regulated as occurs in some European countries. Rather nutrient budgeting is encouraged as good practice through the provision of tools such as the *Code of Practice* and OVERSEER (computer software to do nutrient budgeting; provided freely). The *Dairying and Clean Streams Accord* signals a more comprehensive approach using a suite of tools including improved treatment, protection of sensitive environment and reduction of fertiliser inputs through efficiency (Parliamentary Commission for the Environment, 2004, 136). This approach, managed by Fonterra (the Dairy Company) and the Regional Councils is still voluntary, however, in the future it may become a condition of being able to supply to Fonterra.

Currently, in the large dairy regions of New Zealand almost 80 percent of dairy farmers are applying effluent to land. In spite of this there is concern in New Zealand that what is being done in terms of managing nutrients (especially nitrogen) is not enough. There are major concerns about New Zealand's waterways and lakes becoming nutrient enriched and degraded. The lag time for nutrients to enter these water bodies suggests that any problems will get worse before they eventually improve. In one region the Regional Council is implementing a trading system for nitrogen emissions from a major catchment, due to the grave concern for water quality in one of New Zealand's most valuable lakes.

Compliance costs for water quality regulations

Environmental regulations, as stipulated in the RMA 1991 have on the whole, required dairy farms to cease discharging their effluent directly to waterways in favour of a land-based effluent treatment system. In several regions there remains some consent for discharge of treated dairy effluent to water, monitored annually, however, this will eventually be phased out. There is also a move away from the system whereby dairy effluent is stored in ponds and spread onto pasture two or three times per year. This is being replaced by the daily irrigation of effluent to pasture. A storage facility or sump allows the effluent to be held for a number of days, when soil conditions are not suitable for effluent irrigation.

In order to estimate the cost to the New Zealand dairy industry of complying with current water quality regulations, it has been assumed that all dairy farms will dispose of their dairy shed effluent by daily irrigation onto pasture. Compliance costs include construction costs, annual operating costs, consent and monitoring costs. Herd sizes vary considerably in different parts of the country and so for this reason construction and operating costs are estimated for three different herd sizes, a 150 – 249 cow herd, a 250 – 449 cow herd and a 450+ cow herd. The costs of Land Disposal Effluent treatment facilities using either a Travelling Irrigator or a pond system are assessed for for two farm sizes (150-249 cows, and 250-549 cows). Estimated construction costs are presented in Table 4.9 and annual operating costs in Table 4.10.[198] A travelling irrigator system could be expected to last about 15 years before the pump, irrigator, hydrants and piping need replacing, therefore construction costs (and consent costs) are financed through a 15-year loan.

Table 4.9: Construction costs for a travelling irrigator system

	150 – 249 cow herd	250 – 449 cow herd	450 + cow herd
Fibreglass/concrete sump	$ 2,500	$ 5,500	$10,000 – 30,000
Motor	$ 2,500	$ 4,500	$8,000 – 9,500
Pipeline, fittings	$ 4,300	$10,000	$15,000 – 20,000
Hydrants	$ 1,000	$ 2,000	$4,500 – 6,000
Irrigator	$ 4,000	$ 5,500	$25,000 – 30,000
Labour to install	$ 3,000	$ 4,500	$10,000
Electrical (wiring/fittings)	$ 3,000	$ 3,000	$12,000 – 14,000
Shed			$1,500
Total	$20,500	$35,000	$86,000 -121,000

Note 1: Costs are based on 2005 estimates from the Waikato, which is New Zealand's largest dairy region. Totals are rounded to the nearest $500.

Note 2: In the 450 + herd category, there is quite a variation in herd sizes with some dairy units milking more than 1500 cows. As a consequence there is marked variation in costs.

Source: Irrigationworks Ltd (data obtained via interview).

Table 4.10: Annual running cost estimates for a travelling irrigator system

	150 – 249 cow herd	250 – 449 cow herd	450 + cow herd
Repairs and maintenance[1]	$325	$500	$1,400 – 1,975
Labour[2] @ $15 – 20/hr (turning & moving irrigator)	$490 – 660	$860 – 1,150	$3,040 – 8,400
Motorbike running @ $10/hr	$330	$570	$2,030 – 4,200
Electricity[3]	$610	$810	$5,670 – 24,090
Total annual running costs	$1,755 – 1,925	$2,740 – 3,030	$12,140 – 38,665

[1] Repairs and maintenance are estimated at 5% of capital cost of pump and irrigator.

[2] Labour costs: for 150 – 249 cow herd, turning every 4 days taking 15 mins per turn and changing paddocks every 16 days, with time per shift, 30 mins. Total time estimated for labour (incl. motorbike running) is 33 hours for a 270-day season. For a large herd the time taken may be 0.75 - 1.5 hrs/day.

[3] A smaller herd size may require an 11kw pump running at 70 percent capacity, at a cost of 0.75c/hr, 3 hours per day, for a 270 day season. A herd of approximately 500 cows may require a pump operating at capacity, at

[198] There is likely to be some increase in both construction costs and operating costs where the irrigator has to operate on steeper farmland. This has not been factored into the analysis as the number of farms on such terrain is not known.

$1.50/hr, 14 hours/day for 270 days, and for the very large herds (approximately 1600 cows) two 11kw pumps may be operating at $1.50/hr each, 22 hours/day, 365 days per year.

Source: Irrigationworks Ltd (data obtained via interview by the author).

The RMA 1991 provides Regional Councils with some flexibility in how they administer and enforce the Act. Thus differences have been observed between regions as to how strongly the discharge of dairy effluent to water is discouraged. Regional variations in consent and monitoring costs are presented in detail in Table 4.11.

Table 4.11: Consent and monitoring charges for discharge of dairy effluent to land:

Region	Consent required	Cost of Consent	Annual charge	Monitoring & Inspection
Northland	permitted	-	included in inspection	$90
Waikato	permitted	-	-	~$200 every 1.5-2yr (permitted/consent)
Bay of Plenty	consent	$427.50 +	$120 – compliant $160 – less compliant	included in annual charge
Taranaki	consent	$350	-	$100 - $150
Lower North Island	consent	$500	$30	$230 – compliant (every 2yrs) $345 + non-compliant
West Coast	consent	$200 +	-	$50
Canterbury	consent	$1000	included in inspection	$250 + for non-compliance
Southland	consent >50 cows	$400 +	$90	$240 <600 cows $480 >600 cows

Notes:

1) The addition of + to costs indicates that the fee quoted is the base fee and additional costs may be incurred for extra officer time, travel, etc.

2) Northland: Discharge to land is a permitted activity requiring a visual inspection 2 years out of 3 (where there is compliance). Average cost of inspection is $90. Three-quarters of dairy farms discharge treated effluent to water which requires a consent (application cost is $450) and an annual inspection where water quality is tested upstream, at the point of discharge, and downstream. Annual cost (including annual administration charge) is $350.

3) Waikato: Discharge to land is a permitted activity with no annual charge. One-third of dairy farms discharge treated effluent to water, requiring a consent at a cost of around $700 and an annual charge of $243. All farms are monitored every 18 months to 2 years and the average cost of inspection is around $200.

4) Bay of Plenty: Discharge of treated effluent to water requires a consent with a deposit of $675 and possible further costs. Monitoring of land-based disposal may be as infrequently as once every 3 years for a good operation, otherwise annually for those requiring further monitoring (this is the case for discharge to water). Monitoring costs are converted to an annual fee, which is less for compliant operations. Further monitoring may incur actual costs additional to the $160 per year.

5) Manawatu-Wanganui: Fees for this regional council have been used for the Lower North Island. There is a fixed inspection fee of $230 for operations which are compliant, but once inspected it may 2 – 3 years before the next inspection. For an operation which is not compliant the inspection fee is $345. A further inspection is carried out within 2 – 4 weeks and if there is compliance the second inspection costs $230, if not the cost is $345, with further inspection. Regardless of the outcome of the second visit, this farm will be inspected the following year.

6) Canterbury: Dairy operations that are non-compliant require further inspection and so incur additional monitoring costs.

7) Southland: Discharge to land is a permitted activity for a herd of less than 50 cows. Inspection is carried out annually at a cost of $240, but for herds of over 600 cows there is a second inspection in the year.

Source: Data obtained through interview of the respective Regional Council officers)

The cost of consent application and the on-going cost of monitoring vary from region to region, depending on whether land-based effluent treatment is given permitted activity status with no initial consent cost, as a compliance incentive to the farmer. Minimum application fees for a resource consent vary from $200 to $1000 with actual costs for officer time, travel and administration being added to this in some regions. Some regions require annual inspection and the monitoring of farm dairy effluent disposal systems. Others reduce this to every second year (or even less frequently) where a farmer is operating a good effective system. In general, where the effluent disposal system is not up to standard, a further inspection is undertaken within two to four weeks at a higher cost to the farmer (Table 4.11). If there is no improvement the farmer is served with an abatement notice (at a cost of $200), which requires compliance within seven days. Failure to do so incurs an infringement notice (at a cost of $750) and a court case. Regional Councils report that approximately 85 – 90 percent of dairy farms operate a system which complies with the requirements. In the analysis it has been assumed that all dairy farms operate a compliant land-based effluent disposal system.

There is indirect benefit to society from the disposal of dairy effluent to land in terms of water protection for both surface and ground water. There is, however, uncertainty regarding the fertiliser value and possible increase in productivity attributable to land-based disposal of dairy shed effluent. Both the volume generated and the nutrient content of effluent is variable and is dependent on feed quality and quantity, the amount of water used for washing down, and the handling of cows in the farm dairy (Parminter, 1998). The application of effluent to land, however, has the potential to reduce the amount of fertiliser required.[199] The value of the equivalent quantity of fertiliser has been estimated at $218/ha.[200] To achieve the acceptable level of 150 kg of nitrogen per hectare in a season, an area of 6.35 hectare would need to be irrigated with effluent (ibid).[201] There is also the possibility that land application of farm dairy effluent may improve grass production since it applies a greater quantity of some nutrients than the standard fertiliser programme used. This in turn could improve dairy production and returns. Details on how the annual benefit figures have been estimated are presented in Table 4.12.

[199] Raw effluent has been estimated to contain 10.4g/cow/day of nitrogen, 1.76g/cow/day of phosphorus, and 8g/cow/day of potassium (Vanderholm, 1984).

[200] The Value of the fertiliser equivalent was estimated at $290/ha based on the assumption of 0.04%, 0.008% and 0.03% contents of nitrogen, phosphorus and potassium respectively (Waikato Regional Council, 1997). However, Parminter (1998) reduces this estimate for a number of reasons. Firstly, not all the nutrients in raw effluent are able to be utilised, and volatilisation of ammonia-N from the ground's surface reduces the amount available to plants by 10 – 30% (Cameron and Rate, 1992; Lincoln Environmental, 1997). Secondly, where effluent application rates are too high, nutrients may flow through the soil and be lost to groundwater (Singleton, 1995). Alternatively, they may build up in the soil in forms not immediately available to plants.

[201] Again this is for the model farm. These figures have assumed a 270 day season and an average washdown volume of 50 litres/cow/day to achieve the 150kg N/ha/season.

Table 4.12: Fertiliser and production benefits of applied effluent (150-249 cow herd in 1997/1998 season)

	1. Total applied nutrient approach	2. Adjusted standard fertiliser	3. Standard fertiliser
Saved fertiliser costs ($)	1,390	1,390	0
Production benefits ($)	313 - 938	313 - 938	606 - 1,817
Total annual benefits ($)	1,703 - 2,328	1,703 - 2,328	606 - 1,817

Source: Parminter 1998.

It cannot be assumed that all farmers would alter the fertiliser regime on the land to which the effluent is applied to compensate exactly for the nutrients from the effluent. Therefore three approaches have been assumed:

Total applied nutrient approach. Here the farmer tailors the fertiliser on the effluent-treated land to apply exactly the same nutrients in total as on the rest of the farm. The saved fertiliser costs are a measure of the dollar value of the benefits of the land-based effluent treatment.

Adjusted standard fertiliser regime approach. The farmer adjusts the fertilisers applied on the treated block, while minimising the complication to fertiliser management of the farm.

Standard fertiliser approach. The standard fertiliser programme is applied uniformly to the whole farm, including the block already treated with effluent.

It is then assumed that one-third of farmers follow each strategy, and that the "average" farmer gains half the maximum potential gains from the production effects. This means that the total annual benefits per farm are approximately $1,800 for systems which apply fresh farm dairy effluent to the land.

The farm monitoring data (MAF) providing data on categories of total costs (in terms of $/head of cow) are used for each of the 21 dairy regions in New Zealand in year 2005. The combined annual benefit of saved fertiliser costs and suggested production benefits have been estimated for a 150 – 249 cow herd, in the 1997/1998 season at approximately $1,800.[202] This has been converted to a value of $2,050 for a 150 – 249 cow herd, $3,600 for a 250 – 449 cow herd and $6,300 for a 450+ cow herd for the 2004/2005 season. To summarise, compliance costs relating to water quality regulations are calculated at the farm level for the land-based disposal of dairy shed effluent. The percentage of farms that still had to comply is assessed for the period 2000/2001. Regional differences in average herd sizes and in consent and monitoring costs are incorporated into the analysis. Compliance costs at the farm level are then aggregated to obtain a total cost for the New Zealand dairy industry to comply with water quality regulations. From this total cost an estimate is made of the compliance costs per kilogram of Milk Solids produced. In addition, several sensitivity analyses are conducted. The first includes loan calculations for interest rates of both 8 percent and 10 percent. Due to the uncertainty regarding the fertiliser value and possible increased productivity of the application of dairy effluent to land, the second sensitivity analysis includes estimations with, and without, the inclusion of annual benefit estimates. The results of these analyses are presented in Table 4.14 with the detailed analyses given in Table 4.15 and Table 4.16.

[202] Calculations were done for the MAF Farm Monitoring Waikato/South Auckland model dairy farm which milks 196 cows (MAF, 1997), though the model has recently been adjusted to more closely reflect the mean size of dairy farms in the Waikato region.

Table 4.13: Capital, annual opertaing costs and benefits per farm of different size group

	Capital cost	Annual operating costs	Annual benefit
150 - 249 herd	20500	1755	2050
250 - 449 herd	35000	2740	3600
450 - 649 herd	86000	12140	6300

Table 4.14: Overview of costs of regulatory compliance at various interest rates

Compliance Costs	Interest rate = 8%	Interest rate = 10%
Cost in cents per kilogram of Milk Solids *- fertiliser and productivity benefits included*	4.92	5.50
Cost in cents per kilogram of Milk Solids *- excluding fertiliser and productivity benefits*	8.66	9.25

Table 4.15: Calculating compliance costs for land-based discharge of dairyshed effluent (without on-farm benefits included)

Region	No. herds	Av. herd size	Av.Milk Solid/hd (kg)	Regional output (kg milk solids)	Capital cost	Consent cost	Annual loan pmt	Monitor*& annual costs	Total annual costs/farm	Total Regional cost	Regional cost (c/kg MS)
Northland	1118	255	67366	75315188	35000	0	$4,089	2830	$6,919	$7,735,480	10.3
Waikato	5038	288	88230	444502740	35000	0	$4,089	2840	$6,929	$34,908,474	7.9
Bay of Plenty	647	292	88300	57130100	35000	427.5	$4,139	2860	$6,999	$4,528,339	7.9
Taranaki	2006	246	74943	150335658	20500	350	$2,436	1905	$4,341	$8,707,837	5.8
Lower Nth Island	1201	324	101523	121929123	35000	500	$4,147	2885	$7,032	$8,445,971	6.9
West Coast	657	318	95311	62619327	35000	200	$4,112	2790	$6,902	$4,534,877	7.2
Canterbury	654	615	221622	144940788	86000	1000	$10,164	12390	$22,554	$14,750,427	10.2
Southland	950	477	164118	155912100	86000	400	$10,094	12470	$22,564	$21,435,869	13.7
National total				1212685024						$105,047,275	**8.66**

*monitoring costs are for compliant operations, since Regional Councils say that at least 85% of dairy farms comply with the regulations

Notes: interest rate is 0.08; term of loan is 15 years

Table 4.16: Calculating compliance costs for land-based discharge of dairyshed effluent (including on-farm benefits)

Region	No. herds	Av. herd size	Av. Milk Solid/hd (kg)	Regional output	Capital cost	Consent cost	Annual loan pmt	Monitor* & annual costs	Annual benefit/ farm	Total annual costs/farm	Total Regional cost	Regional cost (c/kg MS)
Northland	1118	255	67366	75315188	35000	0	$4,089	2830	3600	$3,319	$3,710,680	4.9
Waikato	5038	288	88230	444502740	35000	0	$4,089	2840	3600	$3,329	$16,771,674	3.8
Bay of Plenty	647	292	88300	57130100	35000	427.5	$4,139	2860	3600	$3,399	$2,199,139	3.8
Taranaki	2006	246	74943	150335658	20500	350	$2,436	1905	2050	$2,291	$4,595,537	3.1
Lower Nth Island	1201	324	101523	121929123	35000	500	$4,147	2885	3600	$3,432	$4,122,371	3.4
West Coast	657	318	95311	62619327	35000	200	$4,112	2790	3600	$3,302	$2,169,677	3.5
Canterbury	654	615	221622	144940788	86000	1000	$10,164	12390	6300	$16,254	$10,630,227	7.3
Southland	950	477	164118	155912100	86000	400	$10,094	12470	6300	$16,264	$15,450,869	9.9
National total				1212685024							$59,650,175	**4.92**

* monitoring costs are for compliant operations, since Regional Councils say that at least 85% of dairy farms comply with the regulations

Notes: interest rate is 0.08; term of loan is 15 years

From Table 4.17 it can be seen that the inclusion of reduced fertiliser expenditure and farm productivity makes a measurable difference to the regulatory compliance costs expressed per kilogram of Milk Solids produced. The overall estimate of farm compliance with water quality regulations is estimated at between 4.92 and 9.25 cents/kg Milk Solids.

Table 4.17: Net national cost (% total farm cost) of Regulatory compliance*

	Travelling Irrigator		Pond Storage	If we assume 60% of farms in NZ will use storage and 40% travel irrg. Then the weighted cost increases are
Fertiliser ben included	0.78% (0.92%)	0.78% is the average of 0.51 and 1.05%	3.05% (3.11%)	2.14%(2.23%)
Fertiliser ben excluded	1.61% (1.75%)	Same average	4.14% (4.19%)	3.12%(3.2%)

*Numbers in brackers are the costs increase when we use a 10% discount rate).

So total increase in annual cost due to the remainder of the farmers having to comply lies beween 2.14 – 3.2% depending on the assumptions. The percentage of farms that still had to comply for the period 2005/2006 is assessed to be 15%. For the industry as a whole the percentage costs increase is 0.5%, given that 85% of farms are already compliant.

4.5.2 Cost of Compliance with Environmental Regulations: the U.S. case study

This analysis has estimated the costs of compliance with regulations concerning water quality for dairy farms typical of Wisconsin and California. These two states were chosen not only because they are the top two dairy states, but also because they represent two distinct milk production systems. Wisconsin dairy farming is typical of the traditional, smaller dairy farm, with an average herd size of 92 cows per farm in 2006. California dairy farming is typical of the modern, expanded confinement feeding systems found in increasing numbers in various locations throughout the western states, with an average herd size of 980 cows per farm. Obviously, the relative burden of complying with environmental regulations is expected to be markedly different between these two types of farms.

The Clean Water Act and the Clean Air Act

As described above, the primary manifestation of environmental regulations for livestock agriculture in the U.S. is the requirement to develop and follow a Comprehensive Nutrient Management Plan (CNMP) in order to comply with the Environmental Protection Agency's Clean Water Act regulatory requirements. These mandatory regulations apply in Wisconsin and California. With regard to the Clean Air Act regulations, Wisconsin does not have any non-attainment areas for PM10 or PM2.5, hence is not required to develop an EPA mitigation plan. Therefore farmers in this area do not have to apply additional measures to comply with the Clean Air Act. As described below, however, California does have non-attainment areas in dairy producing regions, so the regulations do apply.

The United States Department of Agriculture (USDA) has estimated the costs for developing and implementing a successful CNMP. Documentation of these costs can be found in USDA's "Costs Associated with Development and Implementation of Comprehensive Nutrient Management Plans. Part 1 - Nutrient Management, Land Treatment, Manure and Wastewater Handling and Storage, and Recordkeeping".

Table 4.18, presented below, provides the typical costs of the various components required in a CNMP by animal sector and farm size in the United States. These costs are the basis for calculating the CNMP costs of the dairy, hog and beef operations described in this document. The dairy costs presented in Table 4.18 are an average cost of all dairy farms in the U.S. and are presented per-1,000 lb animal unit (AU). Because many of the costs associated with compliance require capital investments in farm infrastructure (e.g. manure storage facilities), herd size and additional factors will impact individual farm costs. In order to account for these variations, more specific actual cost information was obtained for the Wisconsin example. Unfortunately, similar state-level cost information, based on actual data, was not available for California. Therefore, the USDA national compliance costs were modified to reflect the much larger dairy farms found in that state. The costs per AU for larger farms were used to construct farm-level costs for the average California herd size of 980 cows. These numbers were adjusted from a per-animal unit basis to a per-cow basis (using 1.4 animal units per dairy cow), to be consistent with the ERS ARMS financial data. Then, a CNMP cost per-hundred weight of milk was estimated from the CNMP cost per-cow estimate. The procedure used to estimate typical California dairy CNMP costs are discussed in more detail below.

Table 4.18: Costs per farm for Comprehensive Nutrient Management Planning (CNMP) requirement

								Total CNMP implementation costs per farm			
Dominant Livestock Type	Number of farms	Animal units per farm**	Record-keeping costs per farm	Nutrient management costs per farm	Off-farm transport costs per farm	Land treatment costs per farm	Manure costs per farm	Average	Low***	High***	Per animal unit
			($/yr)	($/yr)	($/yr)	($/yr)	($/yr)	($/yr)	($/yr)	($/yr)	($/yr)
Fattened cattle	10,159	1,298	142	1,655	4,646	2,613	9,112	18,167	1,026	308,005	14
Dairy	79,318	195	160	2,101	1,619	2,660	3,249	9,788	2,362	97,013	50
Swine	32,955	276	224	1,601	2,450	3,615	4,139	12,029	2,060	75,159	44
Broilers	16,251	183	90	248	1,667	1,220	2,351	5,576	1,128	36,187	30
Farm Size											
Large	19,746	1,419	168	1,526	9,679	3,925	15,167	30,465	2,199	252,014	21
Medium	39,437	252	150	1,085	2,281	2,897	3,397	9,809	1,210	64,426	39
Small	198,018	80	106	987	345	1,267	1,070	3,773	161	25,298	47
All Farms	257,201	210	117	1,043	1,358	1,721	2,509	6,748	195	67,429	32

Source: "Costs Associated With Development and Implementation of Comprehensive Nutrient Management Plans. Part 1 - Nutrient Management, Land Treatment, Manure and Wastewater Handling and Storage, and Recordkeeping." USDA NRCS. June 2003. Table 38. pg. 105

** Represents **all** animal units on the farm, but does not include animal units for specialty livestock types, which were not estimated.

*** The **low** estimate corresponds to the one-percentile value for the farms in each group, and the **high** estimate corresponds to the 99th-percentile value.

Wisconsin

The Wisconsin office of the USDA provided data for 3 years (2003, 2005 & 2006) of Environmental Quality Incentives Program (EQIP) applications for Wisconsin dairies needing to upgrade their facilities in order to comply with CNMP regulations. These data include the type of practices needed, total cost to implement those practices, and the number of animal units to be treated, as well as other variables. On average, the farms applying for EQIP funds in Wisconsin were larger than the average Wisconsin dairy farm. Because larger farms have the ability to spread investment costs over a larger number of AUs, the average costs of compliance per AU from this sample of dairies would most likely underestimate the true cost of an average dairy in Wisconsin. As described below, costs of compliance for the average Wisconsin dairy farm were calculated from these data by using a subset of the EQIP diary farm data. This subset was used to create estimates of compliance costs in order to determine the costs of a farm that is more representative of a typical size dairy farm in Wisconsin.

A total of 263 dairy farms applied for EQIP assistance in the 3 years of data obtained. The distribution of herd sizes across these farms was heavily skewed toward larger herd sizes. This is demonstrated by the fact that the average (mean) number of animal units for the 263 Wisconsin farms applying for EQIP assistance was 402, while the median number was 246. The average Wisconsin dairy farm has 92 dairy cows or 129 animal units. Therefore, to develop a CNMP cost estimate that is representative of Wisconsin dairy farms, we used a subset of the data from the 263 farms that applied for EQIP funding to comply with the Clean Water Act regulations. Of the 263 farms, 111 had 200 or less animal units. Of these 111 farms, the average (mean) number of animal units was 122, which is close to the Wisconsin average of 129.

The total costs for CNMP implementation for the smaller farms over the 3 year period is US$10,685,406, which would provide compliance for a total of 13,702 animal units. Therefore, the average total cost can be calculated to be $780 per animal unit ($10,685,406 total cost/13,702 animal units) or $1,092 per dairy cow (1 dairy cow = 1.4 animal units).

The USDA CNMP analysis assumes that a typical structural life of a full CNMP is 10 years and an 8% interest rate was used in the annual cost calculations. Therefore, to remain consistent, the same assumptions were used in this analysis. Table 4.18 shows the average annual cost estimate per animal unit (10 year, 8% interest) for all U.S. dairy farms is $50 (or $70 per dairy cow). The three years of EQIP data shows an average CNMP costs for all Wisconsin dairies that applied for EQIP assistance $48 per animal unit. However, the impact of compliance costs on smaller farms is illustrated by comparing the average costs of the 111 smaller farms (200 or less AUs) with the average costs of the larger (>200 AUs) dairy farms requesting EQIP funding in Wisconsin. The average annual cost (10 year, 8% interest) for smaller farms is $163 per animal unit, while larger farms is significantly less at $43 per animal unit. The difference between these two estimates (smaller EQIP farm applications vs larger EQIP farm applications) highlights the impact that farm size can have on total farm CNMP costs.

These data lead to the conclusion that compliance with CNMP requirements costs the typical Wisconsin dairy farm $0.83 per cwt of milk produced. As shown in Table

4.13, this translates into an increase of 4.19% in total production costs and 7.46% of direct costs.

California

Since no actual California-specific CNMP cost data are available for this analysis, the national USDA estimates were used. As illustrated in the Wisconsin EQIP data, the CNMP-related costs per animal unit significantly decrease as farm size increases. Table 4.18 does provide average costs per animal unit for large, medium and small farms for all livestock types, as well as average per animal unit costs for all dairies. Data from USDA indicate that the average U.S. dairy herd is 155 cows. Therefore, a typical California dairy with 980 cows would be considered a large dairy on a national scale.

Table 4.18 illustrates that dairies have the greatest per animal unit CNMP implementation costs of all livestock farms. Additionally, Table 4.18 illustrates that for all U.S. livestock farms, the average costs per animal unit decrease as farm size increases. The estimated CNMP implementation for all U.S. livestock farms, by farm size would, therefore, underestimate the total costs for dairy farms. To account for the higher CNMP costs associated with dairies, an adjustment factor was calculated. To estimate the decreasing costs on large dairy farms the adjustment factor was obtained by dividing the $21/AU average annual costs for all U.S. large livestock farms by the $39 average annual costs for all U.S. medium livestock farms in Table 4.18. The resulting adjustment factor of .538 was then applied to the $50/AU cost for a typical US dairy to estimate the per-animal unit costs of $26.90/AU (or $37.69 /dairy cow) for a typical California dairy to comply with CNMP regulations.

Based on the average milk production per cow on California farms (19,973 lbs.), the $37.69 CNMP compliance costs result in a cost per cwt of milk produced of $0.19 (Table 4.13). This translates into an increase of 2.00% of total production costs and 3.33% of direct costs. Due to the much larger scale of the California dairy farms, the burden of the CNMP requirements less than 25% of that on average Wisconsin farm.

California dairies must also comply with various air quality regulations, which are determined by Air Quality Districts. California's San Joaquin Valley is a high dairy production region. This area is a designated air quality non-attainment region for PM $_{2.5,10}$, and ozone. Therefore, all farms within these areas must submit plans to their local Air Quality District. Currently, plans must be developed for PM10, documenting dust control practices, and Ozone plans documenting a 20% reduction in nitrogen oxide and volatile organic compounds. By June 2008, these farms will also be required to have completed a PM 2.5 plan.

Agriculture within the San Joaquin valley has recently been determined to be compliant with EPA's PM_{10} standards. To be compliant with these standards every farm must have developed and met a dust reduction (conservation management) plan, which addresses all on-field activities (pre and post harvest) and "other" activities which include dust control on roads, wind erosion control, equipment yards and staging areas, and diesel engine replacement or conversion. The local Air Districts do random spot-checks to assure that every farm is in compliance with its dust reduction plan.

Table 4.19: Wisconsin Dairy Farms Requesting EQIP Funds For CNMP Implementation (3 years)

Farm Size	No Farms	No. AUS	Total Cost	Cost Share Requested	% C/S Requested	Avg. Total Cost/AU[1]	Average Annual Total Cost/AU[2]
200 or less AUs	111	13,702	$10,685,406	$6,554,998	61%	$780	$163
>200 AUs	151	105,769	$36,975,779	$13,422,866	36%	$451	$43
Total EQIP Applications	262	119471	$47,661,184	$19,977,864	42%	$402	$48

[1] If funded for cost share, producer cost would be the difference between Total Cost and Cost Share Requested. Not all applications were funded, therefore for unfunded applications the producer may either reapply for c/s funds in later years, or pay total CNMP costs without assistance.

[2] Based on total cost, 10 years, 8% interest.

EPA mandates that there must be separate plans for each principal pollutant not meeting standards within an area. That includes ozone in the San Joaquin Valley. Therefore, farms within this area must also complete an 8-hour Ozone plan by June of 2007 and are required to comply with Tier 3 EPA/ARB off-road engine standards by the year 2015. All farms with calculated NOx and VOC emissions from the agricultural operation that is equal to or greater than 12.5 tons/year (about 350 or more contiguous acres or more than 1,900 milk cows) are required to have an air permit[203]. The San Joaquin Valley Air Pollution Control District provides a calculator on its website for each producer to self-determine whether they would need to comply with these regulations. Also known as Rule 4550, it requires owners/operators of dairy and feedlot facilities with population equal to or more than 500 mature dairy cows (whether milked or dry) to provide a Conservation Management Practices (CMP) Plan to control dust. Additionally, operators who also grow field crops on land greater than 100 acres contiguous or adjacent farmland are required to submit CMP applications for their field crops.

The CMP plan is designed to document reductions in PM_{10} emissions. In order to comply, operators must:

- Select one CMP for implementation from each of the specified categories,
- Implement the selected CMPs starting July 1, 2004 and keep a record of the implementation of CMPs to be available upon request by the District representative,
- Complete the applications and submit them to the District by December 31, 2004 for approval. The submitted applications constitute a CMP Plan once approved by the District, and
- Keep a copy of each submitted applications and each CMP Plan to be available upon request by the District representative.

Dust control, especially on farm and field roads, can be a large expense item for a typical San Joaquin Valley dairy producer to comply with EPA's Clean Air Act PM_{10} regulations. Treatment measures range from daily spraying with water, to spraying a sealant every other year. Both treatments can be expensive, running about $2/foot, or $10,000 per treated mile of road[204].

Draft Rule 4570 would provide Confined Animal Feeding operators with the flexibility to comply with the Volatile Organic Compound control requirements by choosing any mitigation measures from a list of multiple measures listed by the air district or by implementing district-approved alternative mitigation measures that would achieve equivalent emissions reductions as those listed in the rule. The rule impacts dairies within the San Joachuin Valley with 1,000 or more milk cows (not including dry cows). This rule is believed to only impact in a limited number of

[203] San Joaquin Valley Air Pollution Control District Requirements for Agricultural Operations. http://www.valleyair.org/General_Info/AGLoader.htm
[204] Phone conversation with John Beyer, NRCS California State Air Quality Specialist. 8/27/2007.

dairies (233 dairies out of a total of 1,500 in the region), requiring them to implement additional mitigation measures not already used on the facility[205].

For those dairies that are required to comply with rule 4570, the costs of compliance are estimated to be $18/cow. Since our example dairy in below the threshold, no additional compliance costs are assigned for this rule[206].

Based on the cost specification (see Table 4.20), this translates into an increase of 4.19% in total production costs and 7.46% of direct costs (1.84% and 3.33% for California). Given the low percentage of farms which are subject to CAFO's and that about 44% of farms are already compliant, the percentage costs increase at the national level averages to 0.02%.

[205] Appendix D: Socioeconomic Analysis for Rule 4570 June 15, 2006, Pg. 8. http://www.valleyair.org/workshops/postings/2006/06-15-06-4/r4570_appd_phrev%20.pdf

[206] APPENDIX C: COST EFFECTIVENESS ANALYSIS FOR PROPOSED RULE 4570 (CONFINED ANIMAL FACILITIES) June 15, 2006, pgs C-3:C-5. http://www.valleyair.org/workshops/postings/2006/06-15-06-4/r4570_appc_phrev.pdf

Table 4.20: Milk production costs and returns per 45.4 kg sold, 2005 1/

Item	Wisconsin	California	All U.S. farms
Direct (Operating) costs:			
Purchased feed	3.60	6.61	5.03
Homegrown harvested feed	4.32	1.51	3.02
Grazed feed	0.10	0.05	0.09
Total, feed costs	8.02	8.17	8.14
Other--			
Veterinary and medicine	0.94	0.54	0.78
Bedding and litter	0.23	0.04	0.22
Marketing	0.20	0.28	0.26
Custom services	0.37	0.31	0.41
Fuel, lube, and electricity	0.56	0.41	0.55
Repairs	0.62	0.33	0.56
Other operating costs 3/	0.00	0.00	0.00
Interest on operating capital	0.18	0.17	0.18
Total, Direct Cost	11.12	10.25	11.10
Allocated Overhead Costs:			
Hired labor	1.40	1.41	1.47
Opportunity cost of unpaid labor	3.30	0.39	2.30
Capital recovery of machinery and equipment 4/	2.97	1.74	2.83
Opportunity cost of land (rental rate)	0.03	0.00	0.03
Taxes and insurance	0.29	0.14	0.21
General farm overhead	0.69	0.23	0.52
Total, allocated overhead	8.68	3.91	7.36
Total costs listed	19.80	14.16	18.46
Total costs (per 45.4 kg milk) due to CNMP requirement 5/	0.83	0.19	0.37
Percentage of Direct Costs	7.47%	1.84%	3.33%
Percentage of Total Costs	4.20%	1.33%	2.00%

1/ Developed from the 2005 Agricultural Resource Management Survey of dairy operations. 2/ Income from renting or leasing dairy stock to other operations; renting space to other dairy operations; co-op patronage dividends associated with the dairy; assessment rebates, refunds, and other dairy-related resources; and the fertilizer value of manure production. 3/ Costs for third party organic certification. 4/ Machinery and equipment, and housing, manure handling, and feed storage structures, and dairy breeding herd. 5/ Per cow CNMP costs estimated by pro-rating average dairy CNMP/cow costs by large farm CNMP/AU costs ($70 * .538 = 37.68) - see Table 4.18.

4.6 Costs of Identification and Registration

For the Council Directives related to the identification of animals the ordinary costs are constructed as follows. First the total number of animals per farm is determined. It is assumed that per dairy cow about 0.8 number of other animals (heifers/bulls) is present at the farm. Moreover it is assumed that 95% of the dairy cows give birth to a calve, which has to be registered. In addition it is assumed that there is an eartag loss rate of 15%, which requires a proper and timely eartag replacement. The costs consist of the eartag costs and the labor costs (time a farmer has to spend on registration). Based on the survey in the first phase of the project the labour costs per animal that has to be registered are estimated. When relevant also fixed costs per farm are included (see €9/farm for France).

The total costs per farm are calculated as the sum of the eartag costs, labour costs[207] and fixed costs. This total cost is related to the total farm costs (as obtained from the FADN data). It is taken into account that a certain amount of these costs (depending on the prevailing degree of compliance) is already included in the reported total costs. A correction is made for this, taking into account the estimated degree of compliance. The estimates for the degree of compliance were based on a previous assessment as done in the first phase of this CC project. The additional costs that have to be made in order to achieve full compliance with the regulation is equal to 1 minus the rate of compliance times the total cost of compliance per farm. This amount is related to the farms (corrected) total costs and expressed in terms of a percentage cost increase.

The obtained results for six selected member states are presented in Table 4.21, which also gives an estimate for the EU-15 average dairy farm. As the able shows for the EU the percentage costs increase is estimated to be 0.04%. There is some variation, in particular due to the estimated labour time and the estimated varying labour costs per hour. Also the variation in the estimated degree of (non-)compliance affects the height of the additional costs.
In all cases the estimated cost are below 0.2%. Since the percentage cost increases related to the I&R directive are relatively marginal, it seems not useful to distinguish several scenario's characterized by different degree's of compliance (increase). In the simulation therefore only the impact of achieving full compliance is estimated.

If less that full compliance is realized the cost increase numbers as provided in Table 4.21, have to be downwardly adjusted.

[207] For the UK no specific labour costs were distinguished. They are included in the costs per animal.

Table 4.21: Costs of I&R for the dairy sector: estimates for selected member states

Unit	France	Germany	Italy	Nether-lands	Spain	United Kingdom	EU-15
Number of specialized dairy farms (all included) (*1000)	63.68	73.55	40.82	21.70	29.36	21.60	356.79
Average farm size specialized dairy farms (all farms)	67.08	52.72	30.11	45.10	18.62	88.53	48.44
Ave # of animals/farm	76.46	77.73	81.82	114.19	41.66	158.58	76.35
Estimated # calves born	40.35	41.02	43.18	60.27	21.99	83.70	40.30
Estimated # eartag loss (15% loss rate)	11.47	11.66	12.27	17.13	6.25	23.79	11.45
Labour costs per animal (€*h*wage/h)	1.75	1.75	12.00	1.75	12.00		2.50
I&R costs per animal (costs tags)	1.80	2.92	3.00	2.75	2.50	4.20	2.00
Fixed per farm costs (€, when relevant)	9.00						
Total I&R costs per farm	192.97	246.03	831.84	348.28	409.43	451.42	232.87
Total costs (per farm) as in FADN database 2003	121197.1	112586.4	184095.6	177804.9	52283.59	219474.3	131911.1
(Specialised costs (per farm) as in FADN database 2003	41656	46144	128038	65691	39093	109607	70700
Estimated prevailing degree of compliance	0.9	0.65	0.7	0.9	0.9	0.7	0.8
'Corrected' costs per farm (excluding impl. Nitrate costs)	121023	112426	183513	177491	51915	219158	131725
% additional costs I&R/ 'corrected' total farm costs	0.02	0.08	0.14	0.02	0.08	0.06	0.04

4.7 Costs of hormone use

Alongside the US bST (or rbST) is at least used by 16 other dairy producing countries (Jarvis, 2002) The EU, Canada and Japan rejected legal bST use, and also within the US the technique was (and still is) controversial, at least within certain groups and regions[208].

Jarvis (2002) who analyzed the potential effects of bST on world dairy markets, estimates that the total US milk supply increased by 3 percent due to the (pure) bST application[209].

For the US economies of scale effects were found. It is more attractive to apply bST on the larger farms. In the EU the farm structure differs from that in the US (much higher frequency of relatively small farms). This implies that when bST use would be permitted in the EU the application rates are likely to be different (lower) from those in the US (c.p. bST costs).

The impact of bST application on yields seems to be rather similar for the developed Western dairy producing countries (like EU, Canada, Japan, etc.). The impact of bST on dairy production in developing countries, usually characterized by a much less favorable production environment, are likely to be rather marginal. This will be in particular so if other production yield limiting factors are not at the same time remedied.

When accounting for costs of hormone use at the sector level, one option is to take the bST issue into account by only changing the allowance in the US (making their situation more restrictive, rather than soften EU standards. Following this procedure might be attractive from an EU policy perspective, and assuming others should do like us. It also gives meaningful insight into trade aspects. Of course it does lead us away form the opportunity cost interpretation of (specific) CC constraints, which cannot properly be derived in that way.

For the GTAP simulation we are interested to translate the impact in terms of a percentage costs reduction (or its equivalent). In an ex-ante analysis Perrin (1991) estimated per unit cost savings varying from 0.5 to 4.4 percent, although milk yields were increasing by approximately 15% (note the simultaneous cost increase effect)[210]. Jarvis (2002, 109) using a slightly different approach provides a maximum per unit cost decline of 5%. This percentage of costs reduction (per unit average) is taken in follow up analysis.

For the GTAP simulation, a point for discussion is whether the estimate of 5% cost reduction applies to a combination of production expansion (a movement along the cost curve) and the innovation-shift (a shift of the supply curve), as it is assumed. For the GTAP percentage cost increase it seems important to isolate the pure costs reduction percentage rather than the cost change associated with the combined effect. The latter is likely to lead to an underestimation.

[208] The EU's Committee for Veterinary Medicinal Products did not fear direct health effects but pointed to a potential indirect health effect by affecting the human growth hormone. Health Canada pointed to an impact on animal welfare (udder infections, shortened productive life, burn-out). The FDA scientifically examined these claims and refuted their validity. See Jarvis (2002, 103) for further details.

[209] For comparative reasons note that the autonomous (genetic) milk yield increase is about 2% per annum. Where bST application creates a one-shot increase, genetic progress creates a continuous milk yield increase.

[210] When implementing a bST scenario in GTAP we have to check whether the costs reduction percentage is adequate in this case. We primarily in our analysis focus on a supply response effect which is much more significant than the cost reduction equivalent. (Needs maybe further discussion).

4.8 Farm competitiveness analysis: Nitrate Directive case

4.8.1 Farm level competitiveness: typical dairy farm data of EU an non-EU farms

In the project the main emphasis is on external competitiveness. In that the GTAP trade-impact analysis plays a key-role. The farm level competitiveness analysis will also be mainly focused on external competitiveness (comparing of farm level/impact results of the EU with key trading partners). Moreover, the farm level competitiveness analysis might be used to give some in-depth insights with respect to specific issues.

The farm level competitiveness analysis summarised below gives some in-depth insights with respect to Nitrate Directive (Table 4.22). Two typical farms from the countries under investigation were selected from the IFCN publication (Hemme, 2002) to represent different size (small and large) and structure. The percentage rates of cost increase presented in Table 4.7 are applied.

The costs and revenue data have been harmonized prior to analysis by the IFCN (measured in US $). The lowest line of Table 4.22 shows the impact of (full) compliance with the Nitrate Directive (or similar regulations outside the EU) on farm profitability and gross margin, both are recalculated in EU €. As the table shows, small changes in costs can significantly affect gross margin and (even more so) profitability. The results for Italy are not presented in Table 4.22 since the data for Italian specialized farms are not in the IFCN network before 2005. As follows from the study of De Roest *et al.*, 2007 (see also section 4.8.2) performed in two Nothern regions Lombardy and Emilia-Romagna, milk production cost will due to the effects of the Nitrate Directive, increase by 8.4% in farms with 100 cows and by 6.7% in the larger ones (with 350 cows). Costs om farms in Emilia-Romagna increase less than in Lombardy (per 100 kg from € 35.74 to € 38.42 per 100 kg in Lombardy) since the number of animals in the area is significantly lower that makes it possible to spreading excess manure for agronomic purpose on additional sites which are closer than in Lombardy. In the short run, application of the Nitrates Directive regulations to farms in Lombardy and Emilia-Romagna may entail, in areas with a high animal concentration, the closure of less efficient or smaller farms. This will allow other farmers to use nearby lands suitable for manure and sludge spreading with reduced cost compared to use of farther lands. The fact that these farms produce less slurry and more manure will certainly help dairy farmers to dispose of waste more easily than pig farmers.

Table 4.22: Farm structure and level of competitiveness in selected countries in 2001

Codes as in Hemme, 2002)	NZ-229	NZ-835	US-70WI	US-2100ID	DE-68	DE-650	FR-30	FR-70	NL-51	NL-90	UK-100h
Number of dairy cows, LU	229	835	70	2100	68	650	30	70	51	90	100
Share grassland, %	100	100	54	62	40	32	80	26	95	81	100
Milk production per cow, kg FCM	4200	4200	9900	9500	8049	8250	5863	7527	8326	8645	7531
Costs per 100 kg FCM, US $											
costs for means of production	7.60	9.54	22.91	18.48	22.44	20.36	17.99	20.71	19.20	18.12	18.78
labour costs	2.82	2.70	12.60	3.30	10.20	8.40	15.00	9.30	13.50	9.60	8.70
land costs	1.74	1.44	1.80	0.18	1.80	2.00	3.00	1.44	3.12	2.52	2.88
capital costs	1.75	1.54	1.96	2.59	2.38	1.96	2.06	2.10	1.82	1.26	1.96
total costs	13.91	15.22	39.27	24.55	36.82	32.73	38.05	33.55	37.64	31.50	32.32
variable costs	9.00	12.68	24.55	22.91	20.45	28.64	17.18	18.82	13.09	11.45	18.41
fixed costs	4.91	2.54	14.73	1.64	16.36	4.09	20.86	14.73	24.55	20.05	13.91
Revenue per 100 kg FCM, US $											
milk price	16.82	16.82	35.91	32.27	29.09	29.09	28.18	29.09	28.18	28.64	26.59
other returns	2.27	1.64	3.68	3.20	2.69	2.67	3.60	2.43	3.78	3.64	1.42
direct payments	0.00	0.00	0.82	0.16	1.31	1.96	1.31	2.21	0.49	0.82	2.54
total revenue	19.09	18.45	40.41	35.64	33.09	33.73	33.09	33.73	32.45	33.09	30.55
Results per 100 kg FCM in €											
gross margin (revenue – var.costs)	9.01	5.15	14.16	11.36	11.28	4.55	14.20	13.31	17.29	19.32	10.84
profitability (gross margin – fix. costs)	4.63	2.89	1.01	9.90	-3.33	0.89	-4.42	0.16	-4.63	1.42	-1.58
Additional costs of compliance to Nitrate Directive (see Table 4.7 for prevailing degree of compliance and further details)											
% Additional costs associated with full compliance to Nitrate Directive	3.2	3.2	4.20	2.00	0.75	0.75	3.13	3.13	0.66	0.66	0.19
profitability at full compliance, €/100kg	4.23	2.45	-0.46	9.46	-3.58	0.67	-5.49	-0.78	-4.85	1.23	-1.64
% in profitability	-8.6	-15.1	-144.7	-4.4	-7.4	-24.6	-24.1	-578.2	-4.8	-13.1	-3.5
gross margin, €/100kg	8.75	4.79	13.24	10.96	11.15	4.35	13.73	12.79	17.21	19.25	10.81
% in gross margin	-2.85	-7.03	-6.50	-3.60	-1.21	-4.22	-3.38	-3.95	-0.45	-0.35	-0.29

Note: FCM is milk adjusted for fat content. Source: based on data from Hemme, 2002) and Table 4.7.

4.8.2 Farm level competitiveness: Nitrate Directive case for 2 Nothern regions in Italy

The survey area is composed of the plain area of the nothern provinces of Brescia, Mantova, Cremona Parma and Reggio Emilia, which rank among the first ten provinces in Italy in terms of animal density. Part of the study area is in Lombardy and the other in Emilia-Romagna.

Costs of adjustement to Nitrate Directive are calculated for farms of different size: 100 cows and 350 cows at different level of the maximum doze of nitrogen and various storage scenarios. The amounts of nitrogen produced, net of volatilisation losses, have been calculated at municipality level by applying the specific conversion parameters to the number of cattle, pigs and poultry listed in the 2006 census of the veterinarian authorities, which contains a yearly municipal animal inventory. First, a baseline situation is presented followed by two scenarios for each farm. In the baseline situation a farm is allowed to spread 340 kg of nitrogen per hectare. Scenario 1 in both cases refers to allowing to spread only 170 kg of nitrogen per hectare. In addition to the maximum dose of nitrogen (170 kg/ha/year) the April 2006 decree introduced new values for the allowed nitrogen per cow, which was raised from 43 kg to 83 kg per cow. This means that many intensive farmers now must find a way to dispose of the sludge outside of their farm. Thus, adaptation to regulation requirements is done through increasing available land for spreading. Next, different manure and sludge management techniques are assumed in Scenario 1 and Scenario 2. Manure treatment assumes use of manure for agronomic purposes after 90 days storage and sludge treatment assumes use of manure for agronomic purposes after 120 days storage and separation of solid fraction with sieve and further aeration of liquid fraction prior to storage. Scenario 1 allows for manure management and Scenario 2 allows for sludge management.

Table 4.23: Manure management situation on a farm with 100 cows

	Baseline: spreading kg 340/hectare of nitrogen in ordinary zone	Scenario 1: spreading only of 170 kg of nitrogen per hectare in vulnerable zone after 90 days storage for manure and 120 days for sludge	Scenario 2: same as Scenario 1 with adapting to regulation requirements by reducing nitrogen in sludge by 20% and increasing available land for spreading
Size	100 dairy cows and 80 replacement cows		
Shed	With stalls, deployed back-to-back, straw in resting zone		
Milk production	Kg 850,000		
Sludge and manure production	Manure m3 1,596 – nitrogen kg 3,024		
	Sludge cub.m. 1,680 – nitrogen kg 4,872		
Manure treatment	Use for agronomic purposes after 90 days storage		
Sludge treatment	Use for agronomic purposes after 90 days storage	Use for agronomic purposes after 120 days storage	Use for agronomic purposes after 120 days storage and separation of solid fraction with separator and further aeration of liquid fraction. Reduction of nitrogen by 20%
Available land Land needed to comply requirement Land that must be acquired	23 hectares, enough to use kg 340 N / ha	23 hectares 66 hectares 43 hectares in vulnerable zone 21 hectares in ordinary zone	23 hectares 58 hectares 35 hectares in vulnerable zone 17.5 hectares in ordinary zone

Table 4.24: Sludge processing (baseline) and sludge management (Scenario 1 and 2) costs on a farm with 100 cows

	Technical data units				Economic data, €		
		Baseline	**Scenario 1**	**Scenario 2**	**Baseline**	**Scenario 1**	**Scenario 2**
Manure yard	Sq. m.	131	131	137	8,000	8,000	8,000
Storage tank	Cub. m.	414	552	530	15,000	20,000	20,000
Manure spreading truck	Cub. m.	6	6	6	8,000	8,000	8,000
Tanker truck	Cub. m.	10	10	10	17,000	17,000	17,000
Separator							20,000
manure storage shelf	Sq. m.			22			3,000
Aeration tank	Cub. m.			76			5,000
Aerator							2,000
INVESTMENTS TOTAL					**51,000**	**53,000**	**83,000**
Management costs							
Manure and sludge storage (in yard and tank respectively)					513	513	503
Manure transportation and spreading					696		
Sludge transportation and spreading			1,001		610	376	
Sludge transportation and spreading 30 km away			679			6,113	
Manure transportation and spreading 30 km away			1,596			11,970	
Solid fraction separation							1,344
Liquid fraction separation in farm	Cub. m.			1,492			537
Liquid fraction transportation and spreading 30 km away	Cub. m.			121			1,649
Solid fraction transportation and spreading 30 km away	Cub. m.			1665			11,642
Depreciations					4,160	4,415	6,789
Interests on costs and investments					1,743	2,170	3,171
Purchase of right to spread on new land						2,985	2,445
Production loss due to decreased amount of nitrogen spread						2,087	2,087
TOTAL COSTS					**7,722**	**30,629**	**30,167**
COST PER kg OF MILK PRODUCED					**0.009**	**0.036**	**0.035**

Table 4.25: Sludge management situation on a farm with 350 cows

	Baseline: spreading kg 340/hectare of nitrogen in ordinary zone	Scenario 1: spreading only of 170 kg of nitrogen per hectare in vulnerable zone after 90 days storage for manure and 120 days for sludge	Scenario 2: same as Scenario 1 with adapting to regulation requirements by reducing nitrogen in sludge by 20% and increasing available land for spreading
Size	350 dairy cows and 280 replacement cows		
Shed	With stalls, deployed back-to-back, no straw		
Milk production	Kg 2,975,000		
Sludge and manure production	Manure cub. m. 0 – nitrogen kg 0		
	Sludge cub. m. 9,702 – nitrogen kg 27,636		
Sludge treatment	Use for agronomic purposes after 90 days storage	Use for agronomic purposes after 120 days storage	Use for agronomic purposes after 120 days storage and separation of solid fraction with separator and further aeration of liquid fraction. Reduction of nitrogen by 20%
Available land	81 hectares, enough to use 340 kg N / ha	81 hectares	131 hectares
Land needed to comply requirement		230 hectares	81 hectares
Land that must be acquired		149 hectares in vulnerable zone 74.5 hectares in ordinary zone	50 hectares in vulnerable zone 25 hectares in ordinary zone

Table 4.26: Sludge processing (baseline) and sludge management (Scenario 1 and 2) costs on a farm with 350 cows

	Technical data				Economic data, €		
	units	**Baseline**	**Scenario 1**	**Scenario 2**	**Baseline**	**Scenario 1**	**Scenario 2**
Storage tank	Cub. m.	2,392	3,190	3,676	79,000	105,000	134,000
Manure spreading truck	Cub. m.						
Tanker truck	Cub. m.	10	10	15	17,000	17,000	23,000
Separator							75,000
manure storage shelf	Sq. m.			400			60,000
Aeration tank	Cub. m.			391			20,000
Aerator							10,000
INVESTMENTS TOTAL					**96,000**	**122,000**	**322,000**
Management costs							
Manure and sludge storage (in yard and tank respectively)					1,458	1,458	1,004
Manure transportation and spreading							7,762
Sludge transportation and spreading			3,420		4,902	1,726	
Sludge transportation and spreading 30 km away			6,282			56,535	
Manure transportation and spreading 30 km away							
Solid fraction separation	Cub. m.						4,287
Liquid fraction separation in farm	Cub. m.			8,247			2,474
Liquid fraction transportation and spreading 30 km away	Cub. m.			1,455			22,647
Solid fraction transportation and spreading 30 km away	Cub. m.						11,653
Depreciations					5,987	7,303	3,498
Interests on costs and investments					3,492	5,189	7,348
Purchase of right to spread on new land						10,414	3,498
Production loss due to decreased amount of nitrogen spread						7,348	7,348
TOTAL COSTS					**15,839**	**89,973**	**60,673**
COST PER kg OF MILK PRODUCED					**0.005**	**0.030**	**0.020**

According to calculations in Table 4.23, the management cost for sludge and manure amounts to 0.009 Euro per Kg of produced milk. In Scenario 1 and 2, the significant land increase is required due to the new land classification (vulnerable/non vulnerable) but also due to the significant increase of the Ministry parameters used to calculate nitrogen produced by cattle, which increased from 94 kg per ton (live weight) for all cattle to 138 kg per ton (live weight) for dairy cows and 120 kg for replacement animals. In this case the farmer will have to search for land in ordinary zone if we assume that no land in vulnerable zone is available. Therefore in Scenario 1 we will assume that the farmer shall use a 21 hectare site 30 km away from the farm, paying the manure spreading fee. In Scenario 2 the adaptation to regulation requirements by reducing nitrogen in sludge by 20% and increasing available land for spreading requires the farmer to search for a land in an ordinary zone. Assuming that no nearby land in the vulnerable zone is available, the farmer shall use a 17.5 hectare site 30 km away from the farm, paying the manure spreading fee (Table 4.23).
What concerns the costs the change of the zone classification in the area where the farm is located raises sludge management cost from € 0.009 per kg of milk produced to € 0.036 (Scenario 1), four times higher, moreover there is the need for further investments to adapt the tanks to the new regulations, total cost € 10,000. The technique in Scenario 2 does not yield any significant economic advantage with respect to the solution proposed in Scenario 1 and, in addition to that, sludge management cost increases significantly compared to the original cost (from € 0.009 per kg of milk produced up to € 0.035). However this technique may be profitable for farmers in that it requires less additional land, therefore simplifying the whole process. A drawback to this technique is that it requires additional investments worth € 32,000.

According to the calculations (see Table 4.26), the management cost for sludge and manure on these large dairy farms amounts to 0.005 Euro per Kg of produced milk for the baseline Scenario. By adapting to regulation requirements by increasing available land for spreading (Scenario 1), the farmer will have to search for land in an ordinary zone if we assume that no land in vulnerable zone is available. Therefore we will assume that the farmer shall use a 74.5 hectare site 30 km away from the farm, paying the manure spreading fee. By adapting to regulation requirements by reducing nitrogen in sludge by 43% and increasing available land for spreading (Scenario 2), the farmer has to search for a land in an ordinary zone, assuming that no nearby land in the vulnerable zone is available. Therefore we will assume that the farmer shall use a 25 hectare site 30 km away from the farm, paying the manure spreading fee. With respect to costs, changing of zone classification in the area where the farm is located raises sludge management cost from € 0.005 per kg of milk produced to € 0.030, six times higher, moreover there is the need for further investments to adapt the tanks to the new regulations with a total cost € 52,000. The techniques in Scenario 2 yields a significant economic advantage with respect to the solution proposed in Scenario 1 since sludge management cost per kg of milk decreases by one third. Nonetheless, sludge management cost remains significantly higher compared to the original cost (from € 0.005 per kg of milk produced up to € 0.020), however this technique may be profitable for farmers in that it requires less additional land, therefore simplifying the whole process. A substantial drawback to this technique is that it requires additional investments worth € 226,000.

Next, before concluding on the impact of Nitrate Directive on farm compeptitiveness in Italy, the year 2005 production costs of 100 kg of milk for two regions are presented: for a dairy farm with on average 83 dairy cows in Parmigiano-Reggiano and a dairy farm with on average 133 dairy cows in Lombardy (Table 4.27). The overall cost to produce milk and meat has slightly increased with respect to 2005 (1.1%), but, thanks to higher larger CAP refunds and higher turnover from meat the net production costs of Parmigiano-Reggiano milk have decreased by 2.4%. The production cost gap between Parmigiano-Reggiano milk and industrial milk has reached 19.1%. Most of the difference in production costs is first of all due to higher cow feeding costs and also to labour/processing costs as Parmigiano-Reggiano dairy farmers have to comply with strict production regulations. Despite the drop in milk price, extra refunds received by farmers from the CMO milk has made it possible to improve returns to per hour which is 7.51 €/h for Parmigiano-Reggiano workers versus 14.00 € in farms that produce milk for Grana Padano and for consumption.

Table 4.27: Production costs for Parmigiano-Reggiano milk and Grana Padano / industry milk

	Parmigiano-Reggiano				Grana Padano / industry milk			
	2004		2005		2004		2005	
	€/100kg	%	€/100kg	%	€/100kg	%	€/100kg	%
Feeding	16.04	33.38	14.23	29.30	13.31	32.33	11.10	26.18
Processing	11.47	23.86	11.98	24.67	10.74	26.08	10.69	25.22
Miscellaneous	12.79	26.61	13.84	28.49	11.08	26.90	13.38	31.57
Direct costs total	**40.30**	**83.85**	**40.05**	**82.46**	**35.13**	**85.31**	**35.17**	**82.97**
Interests and depreciations	7.76	16.15	8.52	17.54	6.05	14.69	7.22	17.03
Gross cost total	**48.06**	**100.00**	**48.57**	**100.00**	**41.18**	**100.00**	**42.39**	**100.00**
Meat profit (gross) + funds	2.72	5.67	4.37	9.00	4.80	11.68	6.65	15.69
Net cost	**45.34**	**94.33**	**44.20**	**91.00**	**36.38**	**88.32**	**35.74**	**84.31**

Source: CRPA study.

Taking into account the increase of production costs per kg milk due to the Nitrate Directive and the total production costs exposed in the previous paragraph the following conclusions can be drawn. Milk production cost will, due to the effects of the Nitrate Directive, increase by 8.4% in farms with 100 cows and 6.7% in the larger ones, raising the cost per 100 kg from € 35.74 to € 38.42 per 100 kg in Lombardy farms with 100 dairy cows. Milk for Parmigiano-Reggiano's cost will increase less since the number of animals in the area is significantly lower, a fact which makes it possible to carry out spreading for agronomic purpose on additional sites which are closer than in Lombardy.

The Table 4.28 shows that the distance from available lands is essential in choosing the strategy. Indeed, if lands are closer (15 km as opposed to 30 km) overall increase in production costs can amount to +6.8 %.

On the short run, application of the Nitrates Directive may entail, in areas with a high animal concentration, the closure of less efficient or smaller farms. This will allow other farmers to use nearby lands suitable for manure and sludge spreading with reduced cost compared to use of farther lands. The fact that these farms produce less slurry and more manure will certainly help dairy farmers to dispose of waste more easily than pig farmers.

Table 4.28: Comparison between current status and proposed solutions

		Farm with 350 cows			Farm with 100 cows		
		Current status	Transport and land licence costs	Nitrogen reduction	Current status	Transport and land licence costs	Nitrogen reduction
		AVAILABLE LANDS 30 km AWAY					
Milk production cost	€/kg	0.295	0.295	0.295	0.348	0.348	0.348
Manure costs€/kg	€/kg	**0.005**	**0.030**	**0.020**	**0.009**	**0.036**	**0.035**
Total production costs with sites **30 km**	€/kg	0.300	0.325	0.315	0.357	0.384	0.383
		AVAILABLE LANDS 15 km AWAY					
Milk cost	€/kg	0.295	0.295	0.295	0.348	0.348	0.348
Manure costs€/kg	€/kg	**0.005**	**0.020**	**0.020**	**0.009**	**0.024**	**0.027**
Total production costs with sites at 15 **km**	€/kg	0.300	0.315	0.315	0.357	0.372	0.375

4.9 Simulated impact on external competitiveness

This section presents the results of modelling assessment. The framework as described in detail in D11 in used. The percentage change in sectoral production costs is introduced in the GTAP model as a decrease in total factor productivity (variable AO) to investigate the effect of standards on the export volumes and shares. Only Member States which have an EU export share of more than 5% are made compliant to the standards. Other countries are too small to have an effect on the European competitiveness. For one of these countries (Ireland) no data are available which made us choose to introduce Spain (4% export share) ni the model instead. The represented countries (Belgium, Denmark, France, Germany, the UK, Spain, Italy and the Netherlands) make up 88% of the European export of dairy products. Detailed results are reported in Table 4.29 - Table 4.36 and a summarising Table 4.37can be found at the end of the section. The following trading partners are displayed in Tables: EU-15, USA, Rest of OECD countries, Rest of the world countries.

The costs of compliance with the EU nitrate directive allow assessing the competitiveness of the EU dairy sector under standards, the N-directive in this particular case. The first scenario simulates full compliance to the N-directive in EU Member States. The results of this first simulation can be seen in Table 4.29.

Table 4.29: Scenario 1 - Effect of full compliance in the EU-15 to the N-directive

	Export to:				Total Export
	EU15	USA	ROECD	ROW	
Australia	0.75%	0.13%	0.10%	0.12%	0.15%
New Zealand	0.68%	0.07%	0.05%	0.07%	0.13%
EU15	0.00%	-0.70%	-0.77%	-0.70%	-0.71%
USA	0.72%	0.00%	0.11%	0.14%	0.16%
ROECD	0.89%	0.13%	0.00%	0.13%	0.41%
ROW	0.79%	0.13%	0.10%	0.09%	0.34%

	Export to:				Total Export
	EU15	USA	ROECD	ROW	
Total Import	0.80%	-0.13%	-0.11%	-0.18%	-0.05%

Table 4.30 and
Table 4.31 present the results of a sensitivity change on the percentage of compliance, as was discussed in section 4.4. Figure 4.6 graphically illustrates the effects of varying the degree of compliance to the Nitrate directive on exports and imports in the EU.

Table 4.30: Scenario 2 - Effect of 20% increase in compliance in the EU-15 for the N-directive

	Export to:				Total Export
	EU15	USA	ROECD	ROW	
Australia	0.42%	0.08%	0.06%	0.07%	0.08%
New Zealand	0.42%	0.05%	0.03%	0.04%	0.08%
EU15	0.00%	-0.45%	-0.46%	-0.40%	-0.42%
USA	0.47%	0.00%	0.07%	0.08%	0.10%
ROECD	0.58%	0.09%	0.00%	0.07%	0.26%
ROW	0.49%	0.08%	0.06%	0.04%	0.21%
Total Import	0.51%	-0.08%	-0.06%	-0.11%	-0.02%

Table 4.31: Scenario 3 - Effect of an 10% increase (75%minimum) in compliance to the N-directive in EU-15

	EU15	USA	ROECD	ROW	Total Export
Australia	0.35%	0.06%	0.05%	0.05%	0.07%
NewZealand	0.34%	0.04%	0.02%	0.03%	0.06%
EU15	0.00%	-0.37%	-0.37%	-0.31%	-0.33%
USA	0.40%	0.00%	0.05%	0.06%	0.08%
ROECD	0.46%	0.07%	0.00%	0.06%	0.21%
ROW	0.38%	0.07%	0.05%	0.00%	0.16%
Total Import	0.40%	-0.07%	-0.05%	-0.08%	-0.02%

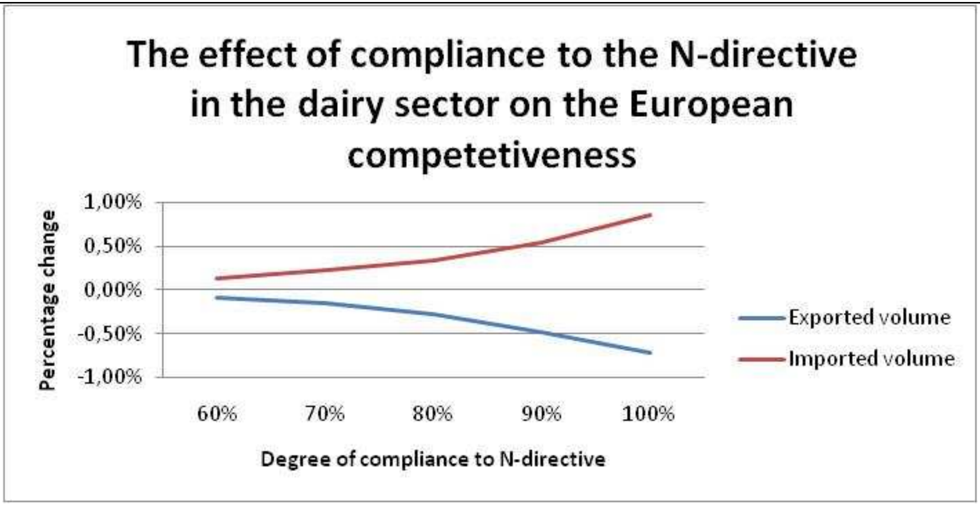

Figure 4.6: Sensitivity analysis of the effects of compliance to the N-Directive

Table 4.32: Scenario 4 - Effect of full compliance in the EU-15 to the N-directive and similar measures abroad

	Export to:				Total Export
	EU15	USA	ROECD	ROW	
Australia	-3.17%	-3.90%	-3.52%	-3.51%	-3.50%
New Zealand	-2.54%	-3.27%	-3.01%	-2.85%	-2.87%
EU15	0.00%	-0.63%	-0.44%	-0.38%	-0.41%
USA	1.23%	0.00%	0.85%	0.93%	0.91%
ROECD	1.52%	0.78%	0.00%	1.09%	1.19%
ROW	1.47%	0.75%	1.00%	3.68%	1.16%
Total Import	0.30%	-0.57%	-1.04%	-1.42%	-1.07%

Table 4.33: Scenario 5 - Effect of Identification and registration in the EU-15

	Export to:				Total Export
	EU15	USA	ROECD	ROW	
Australia	0.18%	0.02%	0.02%	0.02%	0.03%
New Zealand	0.16%	0.02%	0.01%	0.01%	0.03%
EU15	0.00%	-0.18%	-0.18%	-0.14%	-0.15%
USA	0.21%	0.00%	0.02%	0.03%	0.04%
ROECD	0.24%	0.03%	0.00%	0.03%	0.10%
ROW	0.20%	0.03%	0.02%	0.00%	0.08%
Total Import	0.21%	-0.03%	-0.03%	-0.04%	-0.01%

Table 4.34: Scenario 6 - Effect of full compliance to N-directive and identification

	Export to:				Total Export
	EU15	USA	ROECD	ROW	
Australia	0.93%	0.15%	0.12%	0.14%	0.18%
New Zealand	0.84%	0.10%	0.06%	0.08%	0.15%
EU15	0.00%	-0.89%	-0.95%	-0.85%	-0.87%
USA	0.93%	0.00%	0.13%	0.16%	0.20%
ROECD	1.14%	0.17%	0.00%	0.16%	0.51%
ROW	0.98%	0.16%	0.12%	0.13%	0.42%
Total Import	1.01%	-0.16%	-0.13%	-0.22%	-0.06%

Table 4.35: Scenario 7 - Effect of full compliance to N-directive and identification standards in dairy sector and in all other analysed sectors (beef, pig&poultry, cereals)

	Export to:				Total Export
	EU15	USA	ROECD	ROW	
Australia	0.75%	0.10%	0.00%	0.11%	0.15%
New Zealand	0.55%	-0.07%	0.00%	-0.08%	-0.01%
EU15	0.00%	-0.62%	-0.65%	-0.62%	-0.62%
USA	0.77%	0.00%	0.20%	0.14%	0.17%
ROECD	0.94%	0.11%	0.23%	0.11%	0.46%
ROW	0.80%	0.13%	0.00%	0.12%	0.21%
Total Import	0.80%	-0.13%	-0.37%	-0.10%	-0.03%

Table 4.36: Scenario 8 - Ban on BSTr hormone use in the U.S.

	Export to:				Total Export
	EU15	USA	ROECD	ROW	
Australia	1.97%	30.45%	4.73%	1.37%	2.92%
New Zealand	0.96%	29.13%	3.65%	0.31%	2.65%
EU15	0.00%	27.57%	2.52%	-0.80%	2.44%
USA	-40.08%	0.00%	-38.76%	-40.14%	-39.42%
ROECD	2.00%	30.53%	0.00%	1.41%	6.24%
ROW	2.11%	30.63%	4.86%	1.52%	11.15%
Total Import	-0.25%	29.42%	-6.20%	-2.11%	0.24%

For the case of full compliance to Nitrate Directive in EU countries (scenario 1), the European dairy sector loses 0.71% of its export mainly to the rest of OECD and USA. Moreover, it increases its imports by 0.80%. As was already noted in the introduction, EU imports are playing a very limited role, and the main impact will be thus on exports. Since the GTAP model does not distinguish disaggregated dairy product markets, it is impossible to indicate how various product markets (e.g. butter, skimmed milk powder, whole milk powder, hard and soft cheeses, casein, etc.) will be affected. For example, the EU is known to export various speciality cheeses tot the US market. The exports of such high value-added products are likely to be less affected than the 'average' dairy export product simulated within GTAP.

The predicted export reduction of 0.70% of the EU to the US is therefore likely to be an upper bound. The extra imports may be an overestimation due to the way tariff rate quotas (TRQ) are modelled in GTAP. All TRQs in the dairy sector are modelled as a bilateral TRQs and an arrhythmic mean tariff is calculated from the in- and out-quota tariff. However, for the dairy sector this representation is acceptable because of the fixed nature of the global TRQ in the sector (based on historic trade volumes). The other countries will increase their export in order to fill the gap the EU leaves. However, the total traded volume decreases with 0.05%, which is quite small.

Table 4.37: Percentage changes in trade due to compliance to various standards

	Scenario	EU Import: total	EU Export: total	Exports of which to…			Total Trade
				USA	Rest of OECD	Rest of World	
1	Nitrate EU: 100%	0.80	-0.71	-0.70	-0.77	-0.70	-0.05
2	Nitrate EU: +20%	0.51	-0.42	-0.45	-0.46	-0.40	-0.02
3	Nitrate EU: +10%, minimum 75%	0.40	-0.33	-0.37	-0.37	-0.31	-0.02
4	Nitrate EU and non-EU: 100%	0.30	-0.41	-0.63	-0.44	-0.38	-1.07
5	I&R EU : 100%	0.21	-0.15	-0.18	-0.18	-0.14	-0.01
6	I&R EU : 100% and Nitrate EU : 100%	1.08	-0.82	-0.89	-0.95	-0.85	-0.06
7	Like scenario 6 but also full compliance to selected standards in all other analyzed sectors	0.82	-0.62	-0.62	-0.65	-0.62	-0.03
8	Ban on hormone use in US: 100%	-0.25	2.44	27.57	2.52	-0.80	0.24

Notes: Regional impacts are presented for the situation of EU being a net exporter.

Source: GTAP calculations.

Because of the lower costs for European farmers in Scenario 2 and 3 compared to the first scenario (see also Table 4.7) there is a smaller effect on the competitiveness of the European dairy sector. The decrease in export volume is 0.4% and 0.33% respectively. Because of the smaller price effect on the world market the total traded volume only reduces with 0.02%. The rest of the OECD and the rest of the world fill most of the reduced European export. In scenario 4, when next to the EU countries also their competitors fully comply with nitrate measures, the results do not change substantially when compared to scenario 1: total trade reduces by a higher percent (1.07) whereas the total export of the EU still decreases (by 0.41%). This is not surprising given quite low percentage cost increase at sector level in the non-EU countries.

Scenarios 5 and 6 report the simulation results of compliance of EU countries to the Identification & Registration standards. There are no costs for non-EU countries and slightly increased costs for EU countries resulting in the smallest of all the scenarios trade decline of 0.01%. A combined effect of full compliance of EU countries to Nitrate Directive and I&R leads to 0.6% loss of EU exports.

Scenario 7 simulates the impact of full compliance with the Nitrate, identification and registration requirements in the dairy sector as well in all other sectors (beef, pigs & poultry, cereals) involved in the quantitative external competitiveness assessment with the GTAP tool. As such it takes into account feedbacks to and spill-overs from other markets. A comparison of scenario 6 (isolated standard introduction in dairy and not simultaneously in all other sectors) with scenario 7 makes clear, these interaction effects have a tendency to dampen the effects as compared to when these measure are introduced to an isolated sector.

The last scenario 8 is different from the previous ones in that it takes the EU standard not to use the BsT milk yield enhancing hormone as given and simulates the impact when the US would apply to a similar standard (which it currently does not). As such it provides some insight into the ‘opportunity costs’ to the EU of the US not adopting a similar standard. As turns out a hormone ban in the US mainly affects U.S. trade and profits the EU dairy sector with an increase of export by 2.4%.

4.10 Conclusion

In this chapter the impact of compliance to standards on the cost of production in the Dairy sector is estimated, using a farm level analysis and taking into account actual farm accountancy data. Representative farm studies were done and used as a basis for the cost increase calculations. Best-estimates of compliance are used, but these still contain a certain degree of uncertainty. In a number of cases alternative approaches and the different sources were used to cross-check both cost of production and degree of compliance estimates in order to test for the robustness in terms of order of magnitude.

As regards the impact of the Nitrate and Identification and registration standards on production, clearly the Nitrate standard has the most impact. At farm level, the percentage cost increase varies from 0.19% to 6.8% within the selected Member States, from 2% to 4.2% for the US farms and is about 2% in New Zealand. Profitability and gross-margin of farms with lower degree of compliance (France, for example) is affected substantially. At sector level full compliance to the nitrates standard for all affected farmers would involve a percentage cost of production increase of 0.1 to 0.6 percent, with rates varying between Member States. The estimated percentage cost increase associated with full compliance with the Identification and Registration standard for all affected farmers would be less than 0.15 percent and thus rather marginal. As shown in Table 4.37 the negative impact of these measures (for nitrates, and animal identification and registration) on EU imports and exports are less than 3 percent. If a smaller increase in compliance takes place, these already relatively small trade impacts will be further diminished. When the standards for nitrate pollution taken by the US and New Zealand are taken into account along with full compliance assumption in all countries analysed, this would impact the trade balance by 1.07% (the highest rate of all the scenarios) and will result in projecting slightly lower decline in EU exports at 0.41%. In other words, the international competitiveness of the EU does not win substantially in this situation and therefore improvements in the internal farm competitiveness (higher gross margin and profitability) should remain under the concern of farm management. The trade impacts obtained when no changes are assumed to happen in key competitor countries can thus be argued as providing the upper bound of the likely trade impacts.

As regards the impact of the Nitrate and Identification and registration standards on production, clearly the Nitrate standard has the most impact. At sectoral level for nitrate percentage cost of production increases of 0.1 till 0.6 percent were found, with rates varying over countries and with respect to variations in the prevailing degree of compliance, as well as the assumed improvement in compliance. At farm level the nitrate standard might have even much stronger impacts than at sector level. As compared to the Nitrate standard the estimated percentage costs increases associated with full compliance to the Identification and Registration standard was less than 0.15 percent and thus rather marginal.

The combined impact of the Nitrate and Identification and Registration standards on EU dairy exports and imports is estimated to be -0.87% and +1.01% respectively (given no changes in standards or compliance for other trade partners).

The allowance of bST hormone use affects trade patterns creating currently a relative disadvantage for the EU's dairy export position. A ban on bST hormone use in the US is argued to lead to a 5% percentage costs increase for US farmers, which appears to lead to a potential improvement of EU dairy exports with nearly 2.5 percent. Alternatively, the EU food safety standard prohibiting the use of bST can be stated to have an opportunity cost in terms of forgone trade opportunities.

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5 The impact of standards on the competitiveness of the EU with respect to beef

5.1 Introduction

This chapter provides a comparative overview of the competitive assessment of CC requirement in beef production. We will focus here on the EU Member States and the US as one of the main key competitors of the EU.

Not all regulations and directives of Annex III will generate significant cost increases as many will exert only marginal constraints on beef farming. Here we will concentrate our attention on the Nitrate Directive, Identification and Registration and the use of Hormones. As this last item is concerned we will assess the cost advantage of US beef producers having the possibility to use growth hormones. In particular of interest will be to investigate what effect a prohibition of the use of growth hormones in the US might have on the international trade of beef.

Before presenting the cost analyses and their impact on competitiveness a literature review is useful as an introduction on how previous CAP reforms have affected trade in beef and to which extent non-tariff trade barriers can have a disruptive effect on world trade in beef. This literature review will be used as background material for the interpretation of the simulation results to be carried out at the end of this chapter. Subsequently a description will be given of the major trade flows of beef in the world and their rapid change in direction when non trade barriers interfere. An analysis of the sector structure creates basic knowledge for the cost impact of the CC requirements, which will be treated in the paragraphs thereafter. The effect of the changes in production costs due to the Nitrate Directive, Identification and Registration and the prohibition of hormones on the competitiveness of EU beef production will be evaluated with the GTAP model.

5.2 Literature review

During the last century, agricultural productivity has risen dramatically in several areas of the world, however, sometimes partly to the detriment of the environment. Governments currently try to limit the negative external environmental effects by imposing an extensive set of standards on agricultural production. On the one hand, standards create environmental benefits by limiting overexploitation or pollution of scarce environmental resources. On the other hand, they may translate into opportunity costs for farmers who are forced to switch to suboptimal farming practices. At the national level, production costs may rise, affecting external competitiveness. Several authors take notice of problems rising with introduction of different set of standards, including those on beef.

Several economic analyses have been carried out to find out the market, environment and welfare impact of the recent EU policy reforms. In 2000, Weyerbrock and Xia discussed the impact of technical trade barriers on trade in agricultural and food products between US and Europe. Under the technical barrier they imply "internationally divergent regulations and standards governing the sale of the sale of products in national markets". Authors discussed several regulations among US and Europe which become serious obstacles for international trade. Among other regulations (such as GMO regulations, organic foods regulations, veterinary regulations) these authors discussed also the impact of hormone regulations on trade between US and EU. In 1985, the EU banned the use of three naturally produced hormones (estradiol, testosterone, and progesterone) and two synthetically produced hormones (trenbolone acetate and melengstrol) in domestic meat production. In 1989, EU banned import of the hormone-treated meat from US. Since 1989, this restriction hindered US beef exports valued at about $100 million per year. The authors concluded that technical trade barriers hamper trade between the USA and EU. Most of the technical barriers in US/EU affect trade of animal and meat products. Peterson et al. (1988) used partial equilibrium model in studying the price and welfare effect of EU ban on hormones on market for edible offal. Authors assumed that domestic supply of edible offal is perfectly elastic. They found that the EU's ban increases the EU price for edible offal by 34%-45% and decreases the world price by 35%. Because of the lack of alternative markets, US exports of edible offal decrease by 56%.

In 2000 Guyomard et al.(2000) expected that the US would attempt to ensure that trade barriers with EU and subsidized competition from the EU in third markets would be kept to a minimum. This expectation was based on the new American agricultural legislation FAIR (US Federal Agricultural Improvement and Reform), which according to authors would force the EU to reform its agricultural policy (i.e. CAP) so that compensatory payments for support price cuts would be included in the green box, or would be much more decoupled than it was at that time. Authors argued that the 1999 EU proposals for a new reform of the CAP represent a big step in the right direction, but they are likely to be insufficient to comply with future WTO (i.e. World Trade Organizations agricultural negotiations) commitments, predominantly with regards to the decoupling of direct aid payments. Authors concluded that the Agenda 2000 package does not go far enough in terms of achieving greater decoupling of internal support measures. Guyomard et al. proposed that the long-run objective of further decoupling EU direct payments from production incentives should be pursed in order to promote agricultural trade on a more competitive basis.

In 2002, van Meijl and van Tongeren examined the compatibility of the Agenda 2000 reform of the CAP with the EU's commitments to reduce export subsidies. Authors used a multi-region applied general equilibrium model, which includes relevant CAP measures (e.g. in beef sector the intervention price for beef and veal was to be reduced by 20% in three steps over 2000-2002). The model was used to analyze the effect of alternative market price changes on fulfillment of EU commitments. The results revealed that Agenda 2000 helps the EU to remain within its export subsidy commitments, however successful reduction in export subsidies depends mainly on world market and exchange rate development.

Gohin (2006) has carried out analysis on new 2003 CAP reform. According to Gohin, available impact studies found that 2003 CAP reform reduces production incentives substantially for beef and to a lesser arable crops. However, these studies assumed that the previous reform under Agenda 2000, already decoupled arable crop direct payments, while beef premiums were coupled to the production. Gohin questioned the decoupled nature of Agenda 2000 arable crops direct payments and beef premiums (premiums were granted to farmers subject to many eligibility rules, which reduced their degree of coupling). Gohin used Computable General Equilibrium (CGE) to examine the sensitivity of CAP reform impacts on the modeling of Agenda 2000 direct payments. This author found that the negative impacts of the CAP reform on the arable crop and beef production are not sensitive to the modeling of Agenda 2000 direct payments, while the positive impact of this reform on extensification of beef production found to be robust.

5.3 Trade patterns and the effect of non-tariff trade barriers

World trade in beef is representing a significant share of world beef production and this share is increasing year by year, mainly due to gradual progress in trade liberalisation. The international market relationships for beef remain however very much affected by institutional factors and in particular by *non-tariff trade barriers* which create sudden shocks in the trade flows between the different continents. Although their use is permitted in some limited circumstances, non-tariff trade barriers tend to increase in the last years as the different WTO agreements have reduced the use of tariffs. Before entereing into the details of world trade in beef some of the origins of non-tariff trade barriers are mentioned here.

Growth promotants

Some special regulations are required for meat exported to EU, which interfere in particular with the trade relationship between the EU and the US: all bovine meat exported to the European Union must originate from animals that have never been treated with hormonal growth promotants. There must be assurances (i.e. certificates) that there are effective controls in all phases of production, from birth to slaughter, and subsequent processing and final packaging activities. Antimicrobial treatments (for example, hyperchlorination, organic acids, etc) are not allowed for treatment of red meat or poultry carcasses, parts or viscera. Only the application of water or steam is permitted.

Islamic restrictions

The world meat export can be affected by other factors than general institutional regulations. One of this factors is religion. For instance, the United States exports cattle beef all over the world. Today, according to USDA (2006), the Federation of Malaysia is one of the large importers of the US beef. However, here are strong cultural factors affecting the beef trade between these two countries, and they function as a kind of regulations against the tendency toward liberalisation. This cultural factor is Islam and Islamic restrictions on food in Malaysia. The following entails official requirements for cattle beef trade between Malaysia and the US, that is the unique relation between the beef trade and Halal-Islamic restrictions on food (USDA, 2006). In this case there are special slaughter requirements. Slaughter must be performed without stunning; however, use of mushroom stunning devices is acceptable provided the brain is not penetrated. (Animals will be rejected if brain is penetrated.)

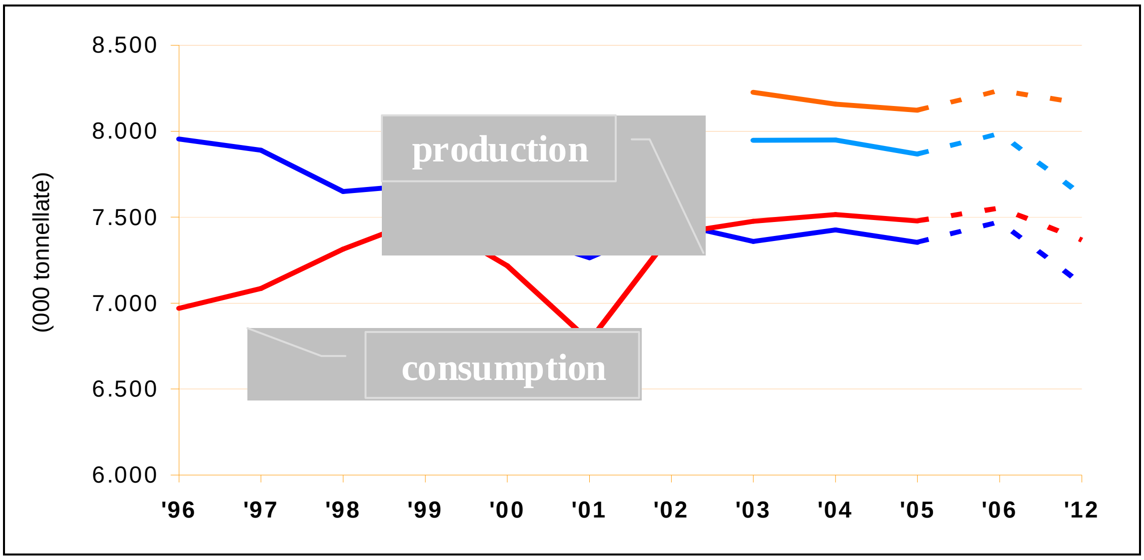
Trade of live animals and risk of diseases

Since beef sectors entails import and export of not only beef meet, but also live animals, it bears the risk of transmitting animal diseases from the country of the origin to people or animals in the importing country. There are several regulations concerning the import and export of live animals: 1) hygiene of transport (carriers must comply with rules regarding hygiene); 2) animal identification and registration number (within EU availability of animal passport as a vehicle that allows trace animals to their origin), 3) veterinary inspection (checks before transport in the country of origin and upon arrival to the country of destination).

World trade flows in beef

A first consideration is that the European Union has become a net importer of beef in the year 2003, when for decades the EU was able to export significant quantities of beef due to the strong and expensive CMO beef which allowed abundant use of export restitutions. The gradual break down of this policy has opened the EU market for imports, in particular for South America. US beef is however not able to enter the European market because of their use of growth hormones, which are forbidden in the EU. The EU market still is protected by relevant import tariffs and the outcome of the Doha round may cause their further reduction. As a consequence it is possible to foresee a further deterioration of the competitive position of the EU beef industry in the future, as low cost producers of South America (Brasil, Argentina and Uruguay) will gain a larger access to the EU market.

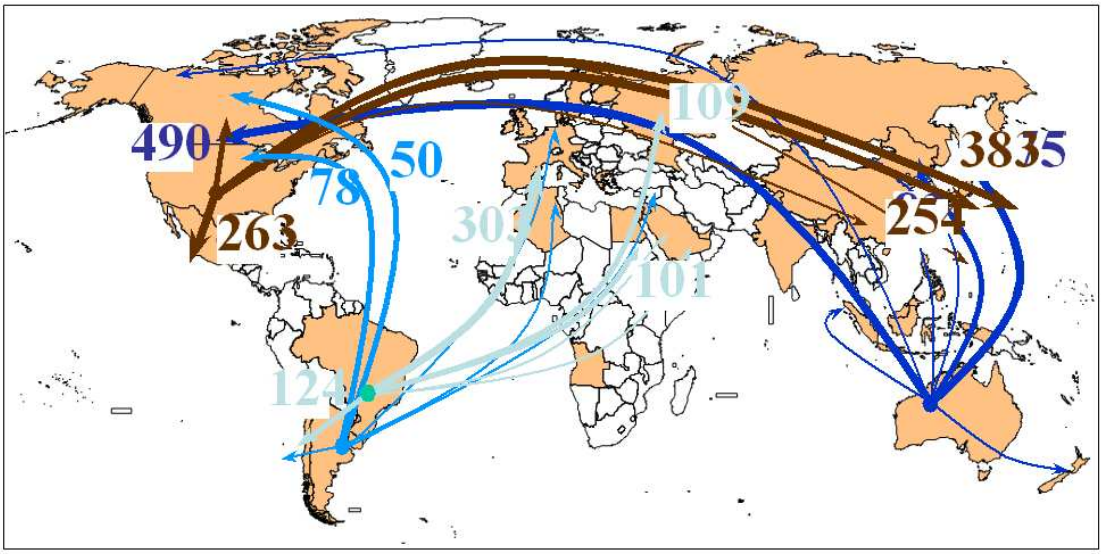
Figure 5.1: Domestic consumption and production of beef and veal in the EU (1996 – 2006)



Source: Elaborated by ISMEA

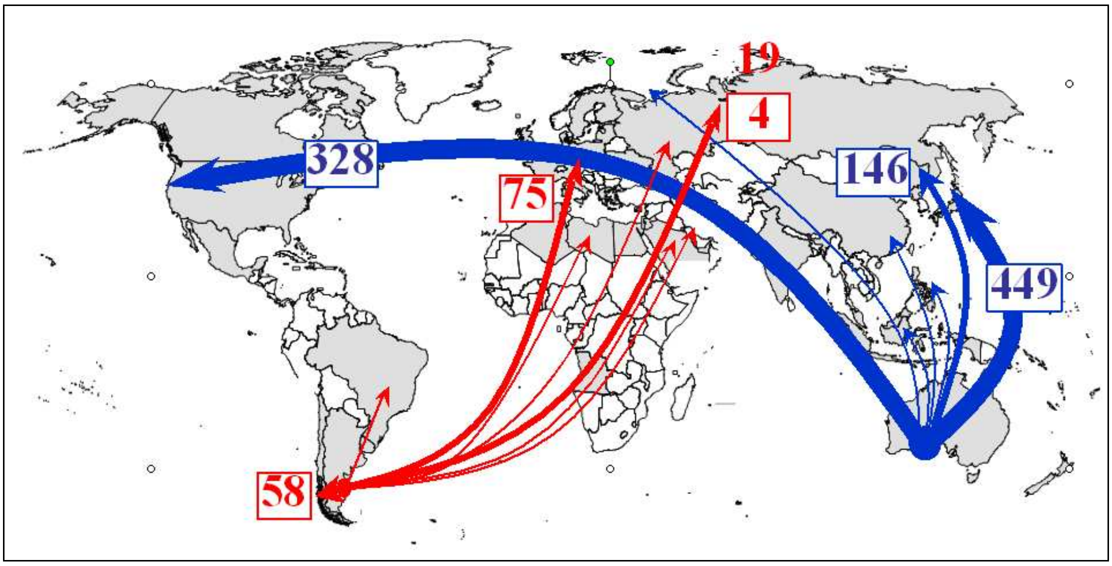
As the other continents are concerned important is the strong export potential of Australia on the world market with strong exports of beef to the USA and Japan. The USA at the same time exports significant quantities of beef to Mexico, Japan and China. Major beef exporting countries in South America are Argentina, with considerable export quantities in particular to the US and Canada, and Brasil which delivers primarily the Russian market and the European Union. Instability in market flows are however significant. The market flow pattern of 2003 is completely disrupted by the BSE crisis in the US in 2005 which provoked a Japanese import ban on US beef. This Japanese import gap has been filled with extra deliveries of Australian beef. In the same year Argentinian exports of beef to North America stopped due to foot-and-mouth disease. This comparison between 2003 and 2005 illustrates the very high instability in the world trade of beef, where the sudden break out of diseases can change significantly the direction of exports flows between the different continents in the world.

Figure 5.2: Major exports flow of beef on the world market in 2003



Source: Beef Report 2006, Agribenchmark

Figure 5.3: Major exports flow of beef on the world market in 2005



Source: Beef Report 2006, Agribenchmark

In the present chapter of this report we will examine the effect of the application of some of the 19 directives and regulations of Annex III of Regulation 1782/83 on the competitiveness of beef production in the EU. The simulations will be carried out using the GTAP model. It should be stressed however that the model does not distinguish explicitly beef, but next to beef and veal the product category includes also sheep, goats and horse meat. Pigmeat is treated separately in the model. The bias is however rather limited knowing that within this composite product category the non-beef meats represent only a minor part of the total import and export flows in the world. The only country where sheep meat tends to dominate this category of meat exports is New Zealand.

From Table 5.1 derived from the GTAP model it turns out that the major players in the export of cattle, sheep, goat and horse meat in the world market are the USA and Australia. The major importing country from USA is Japan, where in 2001 the export from the USA constitutes about 47%. The greater part of the remaining beef exports from USA is directed to the countries in the group "Rest of the World"(ROW). USA is not only a major exporter of beef products, but also one of the biggest importers in the world market sharing import shares equally with Japan. The key suppliers for USA are Canada and Australia. These two countries together supply 68 % of total imported beef products in USA. New Zealand is the third biggest exporter in the world market. As has been stated previously the export value of New Zealand is constituted primarily of sheep meat and in the present analysis is of minor interest.

Analysing the single EU countries the role of the Netherlands is remarkable in the world exports of this group of meat products. The overwhelming majority of Dutch exports concerns veal from veal calves and sheep meat and for the present analysis is therefore less comparable to the mature red beef exported by the other major players on the world market. The Dutch share in the world market of cattle, sheep, goats and horse meat is 10% of the total world export value and 28% of EU-15 export value.

The second largest world exporter in the EU-15 is Germany with a share of 7% of world exports and 20% of EU-15 export value.

According to the GTAP data France is a major importer of this composite group of meat products. We should remember here that this has primarily to be attributed to the imports of sheep meat, as France is a net exporter of beef and bovine live animals. Italy instead is of high interest for our analysis, as this EU country imports significant quantities of bovine live animals and beef, next to minor quantities of sheep meat.

Table 5.1: Global bilateral exports of cattle, sheep, goat and horse meat at world prices in 2001 (million USD)

VXWD	Importers								
Exporters	Japan	USA	FR	UK	Italy	NL	ROW	Total	Export share
Australia	1,050	1,098	20	57	1	1	1,157	3,384	18%
New Zealand	97	602	103	228	26	30	897	1,983	11%
Canada	147	1,173	21	1	9	5	305	1,661	9%
USA	1,861	0	26	16	8	33	2,053	3,997	22%
Brazil	6	100	21	154	84	191	622	1,178	6%
Germany	2	5	207	30	226	331	568	1,369	7%
Netherlands	3	4	422	114	456	0	888	1,887	10%
ROW	102	349	685	677	547	557	0	2,917	16%
Total	3,268	3,331	1,505	1,277	1,357	1,148	6,490	18,376	100%
Import share	18%	18%	8%	7%	7%	6%	35%	100%	

Notes: Only trade partners that represent at least 5% of global exports or imports are tabulated. FR: France, NL: The Netherlands, ROW: rest of the world. The figures of the aggregated ROW region have been corrected for internal trade. Source: GTAP calculations

Table 5.2: Global bilateral exports of cattle, sheep, goat and horse meat at world prices in 2001 (million USD), EU-15 aggregated

	Importers					
Exporters	Japan	USA	EU-15	ROW	Total	Export share
Australia	1,050	1,098	110	1,124	3,382	23%
New Zealand	97	602	678	605	1,982	14%
Canada	147	1,173	56	285	1,661	11%
USA	1,861	0	130	2,006	3,997	28%
Brazil	6	100	603	469	1,178	8%
EU-15	32	78	0	933	1,043	7%
ROW	75	279	732	184	1,270	9%
Total	3,268	3,330	2,309	5,606	14,513	100%
Import share	23%	23%	16%	33%	100%	

Notes: Only trade partners that represent at least 5% of global exports or imports are tabulated. ROW: rest of the world. The figures of the aggregated EU-15 and ROW regions have been corrected for internal trade. Source: GTAP calculations

Table 5.3: EU-15 Member States' exports of cattle, sheep, goat and horse meat at world prices in 2001 (million USD)

	Importers			
Exporters	EU-15	ROW	Total	Export share
Austria	138	53	191	3%
Belgium	449	29	478	7%
Denmark	223	73	296	4%
Finland	11	6	18	0%
France	506	99	606	9%
Germany	1,060	312	1,369	20%
UK	296	54	351	5%
Greece	29	35	65	1%
Ireland	825	73	898	13%
Italy	162	92	255	4%
Luxembourg	9	1	10	0%
Netherlands	1,793	95	1,887	28%
Portugal	12	14	26	0%
Spain	276	94	371	5%
Sweden	19	14	35	1%
EU-15	5,808	1,044	6,856	100%

Notes: Only trade partners that represent at least 5% of EU-15 exports are tabulated. ROW: rest of the world. Source: GTAP calculations

5.4 Sector structure

In the EU the beef producing farms represent 7% of all agricultural farms, 18% of the Utilised Agricultural Area and 35% of the forage crop area (Chatellier et.al 2005). These figures differ substantially from country to country, varying from a share of 47% of beef farms in the North of the UK down to only a 1% share in Greece. In the EU beef is produced in production systems, which differ considerably from country to country. A first distinction has to made between countries which rely for their beef production primarily on the dairy herd and other EU countries where a strong presence of specialised beef breeds allow for the production of beef derived from bullocks and heifers. The Scandinavian countries, Germany, the Netherlands and Belgium primarily produce beef based on the dairy herd. As such beef production in these countries will heavily depend on EU dairy policy. The UK, France and Spain have however very important specialised beef cow herds and in these countries the CMO beef of the EU can have a stronger impact on the evolution of beef production. Italy is a special case, as in this country more than 50% of beef production is derived from the fattening of bullocks imported from France, whereas the other 50% comes from cull dairy cows and national bullocks either of the relatively small beef cow herd or of the dairy herd.

This strong differentiation in the origin of beef strongly exerts its effects on the production systems to be found in the EU.

A first classification of beef farms is the following:

1. Cow calf farms
2. Finishing farms
3. Dairy and beef
4. Small farms

Out of the 491,000 farms engaged in beef production about 50% are cow calf farmers, over one quarter (27%) are specialised in fattening and 20% have a coupled production of dairy and beef (Sarzeaud et.al, 2007).

The following Table 5.4 contains a more detailed differentiation of beef farms in beef farming systems proposed by Sarzeaud et. al. (2007).

Table 5.4: Criteria to differentiate beef farms

Base	Production	Farming systems	Criteria
FADN farms > 1 LU All OTEX	Small farms		< 5 dairy cows, < 5 suckler cows, < 8 LU
			> 5 dairy cows
	Dairy farms	Dairy and beef (intensive)	(With bulls, with or without suckler cows) > 0.2 male (> 1year old)/Dairy cow And < 1 male (>2 year old)
		Dairy and beef (extensive)	(With steers, with or without suckler cows) > 0.2 male (> 1year old)/Dairy cow And > 1 male (>2 year old)
		Dairy pure	Others > 5 dairy cows
			> 5 suckler cows, < 5 dairy cows, LU/(SC+DC)<8
	Cow Calf farms	Cow Calf pure	< 0.2 male (1 to 2 year old)/Suckler cow
		Cow Calf and bull	> 0.2 male (1 to 2 year old)/Suckler cow
		Cow calf and sheep (goat)	> 20% sheep and goat LU
			Others > 8 LU
	Fattener Farms	Professional Fatteners	> 50 male or females > 1-2 year old
		Others fatteners	< 50 male or females > 1-2 year old
		Fatteners and sheep	> 20% sheep and goat LU

Source: Sarzeaud et al.2007

These beef farming systems represent different shares in EU beef production. Striking to note is that 44% of beef production originates on farms where dairy is the main livestock activity, another 14% is produced in fattening farms and 35% in cow calf farms. Extensive production systems tend to predominate in the EU as on 47% of the cattle farms the stocking rate does not exceed 1.4 LU per ha. Typically extensive are the cow calf farms, whereas the pure fattening farms often exceed a stocking rate of 1.8 LU per ha.

Table 5.5: Breakdown of cattle farms in beef farming systems in the EU

Production	Cow calf (CC)			Fattening (F.H)			Dairy		Small farms	Total
BFS (Beef Farming Systems	CC+ Sheep	CC+ fatt	Pure CC	Fatt.+ sheep	Pure fatt	small fatt.	Dairy+ Beef	Pure dairy		
Enterprises (farms)	49,889	65,100	171,388	9,202	12,656	58,763	123,788	338,725	91,404	920,916
Acreage (ha)	151.9	73.3	69.7	87.9	94.0	45.9	81.5	56.9	19.8	63
% grass on total acreage	88%	63%	69%	68%	45%	42%	62%	61%	33%	62%
Livestock unit	52.5	61.4	47.4	39.5	127.2	31.6	93.6	66.7	3.8	58.1
% BFS farms	5%	7%	19%	1%	1%	6%	14%	37%	10%	100%
% Beef Production (in value)	6%	11%	24%	1%	6%	7%	20%	24%	1%	100%
Stocking rate (LU/ha)										
<1.4 LU/ha	65%	50%	72%	29%	15%	56%	31%	34%	60%	47%
1.4 – 1.8 LU/ha	23%	27%	15%	48%	28%	19%	32%	29%	13%	25%
>1.8 LU/ha	12%	23%	13%	23%	57%	25%	34%	37%	27%	28%
Stocking rate (LU/ha)	Number of farms									
<1.4 LU/ha	32.428	32.550	123.399	2.669	1.898	32.907	38.374	115.167	54.842	432.831
1.4 – 1.8 LU/ha	11.474	17.577	25.708	4.417	3.544	11.165	39.612	98.230	11.883	230.229
>1.8 LU/ha	5.987	14.973	22.280	2.116	7.214	14.691	42.088	125.328	24.679	257.856

Source: Sarzeaud et al 2007

Most of the cow calf farms are in particular concentrated in the UK, France, Spain and Ireland, whereas the beef finishing farms are located in majority in Italy, Ireland, Germany and the UK. In the other EU member states beef production is a secondary branch of the dairy enterprise. We should remember here that in Ireland beef finishers are primarily small part time farmers (Keane, 2007), but in Italy it concerns large scale operations with full time hired labourers (CRPA, 2007). The Italian beef finishers are specialised in the fattening of Charolais and Limousine bullocks imported from France. In Germany the majority of beef production takes place on dairy farms, although also specialised finishing farms play a significant role. Often these farms will be specialised either in the fattening of double purpose Simmenthal bullocks or of dairy crossbreds.

The typical beef breed orientation in the UK is revealed by the high number of cow calf farms at one hand and the specialised beef finishers at the other hand. Hereford, Aberdeen Angus and Highland Cattle are the main beef breed present in the country. Only a limited number of dairy farms in the UK is involved in beef production.

Table 5.6: Location of the EU BFS per country

BFS (Beef Farming Systems	Cow calf (C.C)			Finishing (F.H.)			Dairy		Small farms	Total
Countries	CC+ Sheep	CC+ Fin.	Pure CC	Fin.+ sheep	Spec. Finish.	small fin.	Dairy+ Beef	Pure dairy		
Enterprises (farms)	49,889	65,100	171,388	9,202	12,656	58,763	123,788	338,725	91,404	
Belgium	-	4%	3%	-	-	-	5%	3%	-	24,375
Denmark	-	-	2%	-	-	3%	-	2%	2%	16,509
Germany	-	9%	4%	-	31%	21%	21%	21%	4%	131,398
Greece	-	-	-	-	-	-	-	-	3%	11,646
Spain	8%	-	19%	-	-	8%	2%	8%	4%	76,182
France	16%	20%	33%	-	4%	4%	30%	20%	4%	192,326
Ireland	27%	27%	15%	30%	-	20%	12%	3%	4%	103,122
Italy	11%	12%	8%	-	21%	14%	7%	12%	34%	116,931
Luxembourg	-	-	-	-	-	-	-	-	-	1,400
Netherlands	-	-	-	-	-	2%	-	7%	-	31,567
Austria	-	-	2%	-	-	7%	9%	8%	2%	51,565
Portugal	-	-	5%	-	-	4%	-	3%	34%	55,716
Finland	-	-	-	-	-	2%	-	4%	-	21,310
Sweden	-	3%	2%	-	-	2%	2%	2%	-	17,957
United Kingdom	33%	15%	4%	48%	22%	6%	5%	5%	-	68,910
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	920,916

Source: Sarzeaud et 2007

The enormous heterogeneity in beef production systems in the EU is emerging from this description and has a decisive impact on the beef production costs. The Spanish and Italian beef finishing farms exploit their economies of scale and intensive daily gain performance and reach relatively low production costs. The French cow-calf farmers and German bullock fatteners are in an intermediate position in the EU, whereas the Irish, Austrian and UK beef farmers sustain on average higher production costs.

Compared to the rest of the world, EU producers are high cost producers, when the US is able to produce at 35% lower costs and South America has a cost difference with the EU equal to 55% (Agribenchmark, 2007). In the US large to very large feedlots prevail with daily weight gains similar to the EU beef finishers. These systems reaches extremely high levels of labour productivity, which reduces production costs significantly. The South American beef production system is based on a moderate herd size and a very extensive way of fattening. Here daily weight gain oscillate between 300 – 500 grams a day against 1.3 – 1.6 kg per day in the EU and in the US. Combined with the low labour costs the South American beef production systems are able to produce at the lowest cost in the world.

5.5 Brief discussion of the regulations analysed

As have been stated at the beginning of this chapter only some of the CC regulations and directives may potentially create costs for the beef farmers in the EU. Among the environmental regulations of Annex III only the Nitrate Directive can generate a cost burden for some of the beef farmers in the EU. The standards for the identification and registration of animals has been primarily set up for the cattle sector and as such will of course be treated in this chapter. The same holds for the prohibition of hormones in the EU which in comparison to the US creates an extra cost for EU beef producers, or in other terms represents a cost advantage for the US beef producers. The only disease among the animal health regulation which interferes with cattle is the foot and mouth disease, but its prevention does not create significant cost. Finally, the animal welfare regulations for calves are in particular relevant for veal calves. France, the Netherlands and Italy are the only relevant producers of veal in the EU. The standards for the protection of calves impose special requirements for calf housing, minimum space allowance and condition for calf feeding. These standards may cause substantial cost increases for existing veal calf producers who did not comply with the regulation.

5.5.1 Nitrate Directive

The main requirements established by the Nitrate directive is the respect of the limit of 170 N kg/ha[211]which may generate extra-costs for a correct manure disposal. In Nitrate Vulnerable Zones (NVZ) farms exceeding maximum limit have to find extra land to spread excess manure, either by buying or renting land or paying a license to

[211] Or 250 kg N/ha on grassland in Germany and the Netherlands.

spread manure on land of nearby farmers. Moreover, they are obliged to invest in manure storage facilities due to the prohibition to spread manure in winter time.

The evaluation of the impact deriving from a full application of Nitrate directive requires a preliminary analysis of the data of the structure of the prevailing beef farming systems in the EU, in order to detect the share of farms and the share of beef cattle which may be affected by the Nitrate Directive.

5.5.1.1 Affected beef production

From the sector structure description it turns out clear that not all beef production systems will be affected by the Nitrate Directive. The beef farms having a stocking rate of less than 1.8 LU per ha will have no problems to comply with this directive. In terms of farm numbers this means that 72% of the beef farmers in the EU are not affected. From the remaining 28% of beef farms part of the beef finishing farms and a small minority of cow calf farms will eventually face costs to comply with the Nitrate Directive, as these farms exceed 1.8 LU per ha. It should be remembered that not all beef farms exceeding the upper limit of 1.8 LU per ha have to transport manure outside their farms. In the Table 5.7 below this stocking rate has been compared to the maximum stocking rate allowed for beef farms within the Nitrate Vulnerable Zones. For beef finishing farms the 1.8 LU per hectare underscores the maximum stocking rate in NVZ by 13% and in cow calf farms by 38%.

Table 5.7: Comparison of 1.8 LU per hectare with maximum stocking rate allowed in Nitrate Vulnerable Zones

	Heads per hectare	N in manure	Max. stocking rate in NVZ	% underscoring of 1.8 LU limit
Beef bullocks 1 – 2 year	2.6	58	2.93	13%
Suckler cows	1.8	68.5	2.48	38%

Source: Elaborated by CRPA on ERM/AB-DLO (1999)

If we presume a proportional distribution of the intensive beef farms above and below the maximum allowed stocking rate we can conclude that 87% of the intensive beef finishing farms and 62% of the intensive cow calf farms will have to face costs in order to comply with the Nitrate Directive. The Table 5.8 below translates these figures in number of farms. The outcome of this analysis reveals that in 50,301 beef farms (5,4% of the total number of cattle farms) in the EU-15 a cost increase can be expected due to the application of the Nitrate Directive.

Table 5.8: Number of beef farms affect by the Nitrate Directive

	Cow calf farms			Beef fattening farms		
	N. of farms	% affected	Affected farms	N. of farms	% affected	Affected farms
<1.4 LU/ha	188.377	0%	0	37.474	0%	0
1.4 – 1.8 LU/ha	54.760	0%	0	19.126	0%	0
>1.8 LU/ha	43.240	68%	29.403	24.021	87%	20.898

However these percentages are still overestimated, because here we presume that the whole territory of the EU is declared as a Nitrate Vulnerable Zone. The Table 5.9 below reports the number of beef cattle in NVZs. In Member States where only part of the country is designated as NVZ by means of the REGIO data bank of Eurostat it has been possible to estimate the number of heads of beef cattle in NVZs. According to this analysis 39% of suckler cows in the EU and 64% of beef fattening calves are raised in NVZs.

Table 5.9: Percentage of suckler cows and of male fattening calves in the NVZs of the EU

	Suckler cows		Male fattening calves	
	Heads	% in NVZ	Heads	% in NVZ
France	4,148,410	23.5	1,082	53.5
Spain	1,563,980	25.8	134	16.9
United Kingdom	1,764,770	20.3	1,120	24.9
Ireland	1,167,630	100.0	813	100.0
Germany	746,800	100.0	1,242	100.0
Belgium	534,080	37.6	175	59.2
Italy	609,140	25.8	690	53.5
Other EU countries	1,273,410	47.5	762	58.3
EU-15	11,808,220	**39.1**	6,017	**64.0**

Source: Elaborated by CRPA on Eurostat- Regio databank

Table 5.10: Share of beef farms in the EU affected by the Nitrate Directive

	Cow calve farms		Beef fattening farms		EU
	N. of farms	%	N. of farms	% affected	N. of farms
Farms >1.8 LU/ha	43,240	100.0	24,021	100.0	67,261
Farms exceeding 170 N kg/Ha	29,403	68.0	20,898	87.0	50,301
Exceeding farms in NVZ	11.467	39.1	13.375	64.0	24,842
	Cow calve farms		Beef fattening farms		EU
Total EU farms	286,377		80,621		366,998
Total farms exceeding 170 N kg/Ha in NVZ	11.467		13.375		24,842
% farms exceeding 170 N kg/Ha in NVZ	**4.0**		**16.5**		**6.7**

Source: Elaborated by CRPA on Sarzeaud et al 2007

The Table 5.10 translates these figures in number of farms. The outcome of this analysis reveals that 24,842 beef farms (6.7% of the total number of cattle farms) in the EU-15 will face a cost increase due to the application of the Nitrate Directive.

5.5.1.2 Impact of improved compliance with Nitrate Directive on beef farm costs (a case study)

The calculation of the cost of compliance with the Nitrate Directive was carried out considering a typical beef finishing farm producing young bulls. The related technical and economic data has been drawn from the sample of beef farms built up by CRPA for the yearly monitoring of beef farms production costs in Italy (Ismea/CRPA, 2006).

The yearly slurry production of this average beef finishing farm is equal to 15,756 m^3 corresponding to a nitrogen content of 50,904 kg. Currently the farms dispose of 151 hectares of agricultural land available for cattle slurry spreading.

Table 5.11: Sample beef finishing farm characteristics

TECHNICAL DATA ELEMENTS		
Finishing beef farm		
No. of young bulls present	no.	1,200
Starting weight	kg/head	370
Final weight	kg/head	640
Finishing period	days/head	210
Net production	kg	538,000
Agricultural land at disposal	hectares	151

Source: CRPA

Table 5.12: Slurry production and land required for spreading

TECHNICAL ELEMENTS		
Slurry production after storage	m^3/year	15,756
Nitrogen production	kg/N	50,904
Slurry treatment	Spreading on land	
UAA available	Hectares	151
UAA to be reclaimed	Hectares	75
UAA needed for effluents disposal	Hectares	226

Source: CRPA

Supposing first that this area is recognised as an ordinary zone, the only cost deriving from the current situation is given by storage and slurry distribution on own farmland. Now the area where the farm is located is declared as a NVZ and therefore it will be necessary to add farm land (75 ha) in order to respect the maximum allowed limit of 170 kg N per hectare. This entails an extra-cost for acquiring the right of spreading on lands owned by others and to transport the excess manure to these farmlands that are supposed to be situated 15 kilometres from the beef farm. Furthermore, the size of basins for storing slurry must be increased up to the minimum capacity required, corresponding to 180 storage days.

Table 5.13: Slurry storage and distribution costs in ordinary Zone and in VNZ (increase of land availability)

COSTS		In Ordinary Zone	In Vulnerable Zone
Tank size	m^3	5,698	8,547
Tank cost (31 € for m^3)	€	199,432	299,148
Deprec. & Maintenance (5% of tank cost)	€	9,972	14,957
Tank load (0,11 € for m^3 of slurry produced)	€	1,800	1,800
Investment interests (3,5% on tank cost)	€	6.980	10,470
Operating interests (2,9%)	€	97	133
Average storage cost	€/kg	**0.035**	**0.051**
Average distance for distribution	m	700	7.800
Cask wagon (capacity of 15 $m^{3)}$)	€	23,000	23,000
Deprec.+ maintenance(12% of cask wagon cost)	€	2,760	2,760
Distribution cost in the farm land (0.55 €/m^3)	€	8,618	4,331
Distribution cost in land far from the farm (7.00 €/m^3)	€	_	54,869
Investment interests (3% on cask wagon cost)	€	805	805
Operating interests (2,9%)	€	143	869
Rights of spreading (130 €/ha)	€	_	9,731
Crop yield loss	€	_	13,718
Average spreading cost	€/kg	**0.023**	**0.162**
TOTAL AVERAGE COST for slurry management	€/kg	**0.058**	**0.213**

Source: CRPA

Table 5.13 reports the comparison between the slurry management cost in the two different situations (in ordinary zone vs. vulnerable zone) and under the hypothesis that compliance with the Nitrate Directive is fulfilled through the increase of land availability. The total average cost is expressed per kg of live weight.

The option to spread manure on neighbouring land may not be feasible when in the surrounding area the land supply is scarce and livestock farming density is high. In this case manure treatment systems would be needed. The treatment equipment is designed for reducing Nitrogen content in animal slurry (centrifuge for the solid fraction separation and aerator for the liquid fraction), allowing to reduce the need for land outside the farms from 75 to 21 hectares. Contemporarily the sale of compost produced through the composting of the solid fraction (separated from the liquid one) represents an extra revenue that in part compensates the operating costs of the treatment process, as presented in Table 5.14.

This latter option does not involve significant differences with respect to the first (acquire spreading rights from other farmers). The average costs entailed by the two solutions can be compared to the total production costs as calculated by CRPA (Ismea/CRPA, 2006) based on a samples of typical Italian beef farms. Considering that the total cost in 2006 was equal to 2.57 €/kg l.w. (including the purchasing cost of weaners), the percentage cost increase entailed by both options can be estimated in 5.8%.

Table 5.14: Slurry storage, treatment and distribution costs in NVZ (investment in treatment equipment)

COSTS		**In Nitrate Vulnerable Zone**
Tank size	m^3	7,265
Tank cost (31 € for m^3)	€	254,276
Deprec. & Maintenance (5% of tank cost)	€	12,714
Tank load (0,11 € for m^3 of slurry produced)	€	1,740
Investment interests (3,5% on tank cost)	€	8,900
Operating interests (2,9%)	€	116
Average storage cost	€/kg	**0.044**
Centrifuge cost	€	75,000
Storage platform cost (650 m^3 for separated solid fraction)	€	97,490
Airing basin cost	€	31,740
Aerator cost	€	16,454
Shovel tractor cost	€	63,000
Total investment cost for treatment equipment	€	283,684
Deprec.+ maintenance (8% of equipment cost)	€	22,695
Operating costs (composting; electricity, etc.)	€	36,239
Investment interests (3% on cask wagon cost)	€	9,929
Operating interests (2,9%)	€	683

COSTS		**In Nitrate Vulnerable Zone**
Average effluents treatment cost	€/kg	**0.129**
Average distance for distribution	m	741
Cask wagon (capacity of 15 m3))	€	23,000
Deprec.+ maintenance(12% of cask wagon cost)	€	2,760
Cost for liquid fraction Distribution (0.55 €/m^3)	€	7,293
Cost for solid fraction Distribution (1.70 €/m^3)	€	4,018
Investment interests (3% on cask wagon cost)	€	805
Operating interests (2,9%)	€	182
Rights of spreading (160 €/ha)	€	3,387
Crop yield loss	€	13,718
Average spreading cost	€/kg	**0.060**
TOTAL AVERAGE COST for slurry management	€/kg	**0.233**
Compost sale	€/kg	0.018
Net AVERAGE COST for slurry management	€/kg	**0.215**

Source: CRPA

5.5.1.3 Impact of improved compliance with Nitrates Directive on the EU beef sector

According to the analysis of the structure and the regional distribution of cow calf and beef fattening farms, 3.0% of beef produced in cow calf farms and 4.2% of beef cattle in the finishing farms would be affected by Nitrate Directive and subjected to an increase of production costs. If we assume that 50% of the beef farms is already complying with the Nitrate Directive 1.49% of beef produced in cow calf farms and 2.10 % of beef produced in beef fattening farms will effectively face a cost increase in order to attain a 100% compliance at EU level (Table 5.15).

Table 5.15: Cost increase for EU beef sector due to compliance with Nitrates Directive

	Cow calf	Beef fattening	Total
Total farms exceeding 170 N kg/Ha in NVZ	11.467	13.375	24.842
% of beef value*	74,5	25,5	100
% of farms affected by nitrate directive	4,0	16,5	7,2
% of beef affected	3,0	4,2	3,3
degree of compliance	50,0	50,0	50
% of affected beef	1,49	2,10	1.7

* excluding beef value produced in dairy farms

Source: CRPA

The cost increase for these farms has been estimated in 0.155€ per kg beef. In order to estimate the impact on EU beef sector, the production cost analysis of the Agribenchmark coordinated by the Federal Institute for Agriculture (FAL) has been used. A weighted average of Agribenchmark beef farms network generates an average production cost of beef of € 2.67/kg in the EU. The increase for those farms located in NVZ which exceed the limit of 170 kg N per hectare would then be equal to 5.8%. The Table 5.15 shows that it interests only 1.7% of EU beef production. The sector cost increase will then be limited to 0.095%.

5.5.1.4 Impact of regulations against water pollution (Clean Water Act) on the cattle feedlot farming in US

In the U.S the Clean Water Act (CWA) is the primary law for the protection of the surface water quality. Among the other mandatory standards imposed upon US farmers, the regulatory tools employed by the CWA can be compared to the requirements established by Nitrate Directive in EU.

Feedlot beef farming has been considered in order to estimate the costs of compliance with US regulations concerning water quality. Cost of compliance is related to the implementation of the CNMP that is required for all livestock farms recognized as CAFO. In case of beef farms, CAFO are feeding operations with more than 1,000 beef cows.

The United States Department of Agriculture (USDA) has estimated at $14 per AU (Animal Unit) the average costs for developing and implementing a successful CNMP in specialised feedlots farms, considering an average size of 1,300 heads per operation. These figures are the basis for calculating the average costs of CNMP implementation in a typical cattle feedlot in Texas, that is the leading beef producing state in the U.S accounting for 27% of total beef production. For this analysis, the CNMP compliance costs per AU were constructed for the average size of Texas feedlots with more than 1,000 heads, equal to 22,462 head per farm.

Initially, the primary focus of CWA was on point sources of pollution from industry and wastewater treatment plants, but in recent years it has been expanded to include farming activities. Until December 15th, 2002 the federal government issued specific rules governing **Concentrated Animal Feeding Operations** (CAFOs), defined as animal feeding operations with greater than 1,000 animal units (700 dairy cows, 1,000 beef cows, 2,500 hogs, or 100,000 chickens).

Under the recent rule, all farms designated as CAFOs are required to obtain a permit under the National Pollution Discharge Elimination System (NPDES) that entails the implementation of a **comprehensive nutrient management plan** (CNMP). The CNMP must be specific for the operation and detail the proper management of all animal manure produced. It must address the assimilative capacity of the farm's land for the manure and other nutrients applied to the land. The implementation of CNMPs often result in operations seeking additional land on which to spread manure and/or the use of alternative nutrient control strategies for manure.

Table 5.16: Estimated expenses and CWA compliance costs for Texas feedlot, 2007

Expenses:	$ per head	%
750 lb. feeder steer	814.73	72.0
Total feed, handling, and management charge	257.52	22.8
Interest on feeder and 1/2 feed	44.63	3.9
Death loss (1% of purchase)	8.15	0.7
Total Expenses	**1,125.03**	**99.5**
CAFO CNMP costs	6.21	0.5
TOTAL COSTS	**1,131.24**	**100.0**

Because the average CNMP costs decrease as farm size increases, the USDA estimated costs per AU (14$) for all U.S. feedlots would overestimate the total costs for the larger feedlots. To account for the lower CNMP costs associated with larger feedlots, an adjustment factor was calculated. When applied to the $14 per AU cost for a typical US fattened cattle operation, the resulting CNMP compliance cost is estimated to be $7.53 per AU, or $6.21 per head. Based on the average feeder cattle production estimates on Texas feedlot (50,000 heads, assumed 450 pound increase in finishing size), the $6.21 CNMP compliance costs per head result in an estimated 0.55% increase in total feedlot production costs, as compared to a 5.8% cost increase in a large feedlot in Italy which has to comply with the Nitrate Directive.

5.5.2 Identification and Registration Directive

From the previous research in the project it turns out that identification and registration of animals has a significant degree of non-compliance, with 30% non-compliance not being an exception. A large part of the lack of compliance appeared to be due to the loss of eartags, which are inherent to the EU's current system. From surveys it appeared that identification and registration of animals is one of the most frustrating requirements to the farmers. In general non-compliance with the ovine and caprine animals identification and registration requirements is much higher than for bovine animals (based on information from France, Germany, Italy, and The Netherlands). Besides, the inclusion of animal identification and registration results in very high effort for controlling agencies (about 36 hours per farm for the RPA in England or 40 hours for the AID in the Netherlands, who controls most SMRs and soil organic matter). By far most time consuming is the check of animal identification especially in extensive farms or in cattle breeding, as animals are often outside and in different fields and sometimes difficult to approach, compared to dairy cows kept indoors (Nietsch and Osterburg, 2007 , D18).

The SMR standard

The EU Directives on Identification and Registration of animals (92/102/EEG, and Regulations 911/2004, 1760/2000, and 21/2004) imply:

a. Eartags:

4. Calves born on the holding (or imported from outside the EC) must be tagged with approved eartags with the same unique identification code.
5. Calves must be tagged within 20 days of birth, or before they leave the holding, if this is sooner. Dairy calves must be tagged with one eartag within 36 hours and the other eartag within 20 days.
6. Eartags must not be removed or replaced without permission. Illegible or lost tags must be replaced within 28 days.

b. Cattle passports:

3. An application must be made for a cattle passport within seven days of a calf being tagged (that is, no more than 27 days after birth).
4. When cattle are moved, you must ensure that they are accompanied by their cattle passports, which must be completed and signed.

c. Notification:

4. Births must be notified to the responsible authorities by an application for a cattle passport within seven days of tagging (that is, no more than 27 days after birth).
5. Deaths must be notified to the registration authorities within seven days.
6. Movements of cattle on and off a holding must be notified within three days.

d. On-farm registers:

5. Up-to-date on-farm registers must be kept with the required information ,including births and deaths of cattle and movements of cattle on and off your holding. The dates of these events must also be recorded.
6. For movements, the details of keepers who sent the cattle and to whom cattle are consigned must be recorded.
7. The register must be completed within 36 hours of a movement, within seven days of a death and within seven days of a birth in a dairy herd (or within 30 days of the birth of any other calf).
8. The register must be kept for ten years and be available to the authorities on request.

Identification and registration of animals costs

For the Council Directives related to the identification of animals the ordinary and cross compliance costs will be the same, hence no distinction will be made between them here. Essentially a farm in order to comply with the Directives will have *to update registers and eartags* continuously otherwise he will either be fined (ordinary compliance) and/or his single farm payment will be cut (cross compliance). The costs generated by the mandatory part of these directives have essentially an administrative nature. They are related to the time necessary to update the registers and to the purchase of eartags for new born calves and imported calves.

The calculations presented here are performed by Jongeneel (2007) using a bottom-up approach. This approach starts at farm level (e.g. farm type, production intensity and a list of specific measures with the attached standardized per unit costs. Table 5.17 provides illustrative example of this approach. The first 5 lines of the table represent farms' classification according to their main conditions. Lines 7-11 identify the measures (which consist of different requirements) included in specification of I&R regulation.

Table 5.17: Bottom-up approach to costing the Identification and Registration of animals

	Costs(€/head. Year or €/farm)
1. Conditions	
2. Farm type	Beef (bovine animals)
3. Land base	25 ha (fictive)
4. Number of animals	50 head (fictive)
5. Cost of production	€80000 (fictive)
6. Specific measures	
7. Registers and eartags	€5.00/animal (D 9, T.21, the Netherlands)
8. Animal passports	No information
9. Administrative costs	
10. Record keeping	60€/farm (fictive)
11. Strategy	
12. Selection of measures	(€5.00*50 heads)+ 60=€310/farm
13. Cost impact	
14. Estimated degree of compliance (before 2005)	75.2% (D 9, T.20)
15. Estimated degree of compliance (after 2005)	93.6% (Increase 25%, D.9. T.20)
16. % production cost increase before 2005	0.752(€310/€80000*100%)= +0.29%
17. % production cost increase after 2005	0.25(€310/€80000*100%)=+0.1%

We assume that all costs adjusted for inflation to 2005. Since the animal Registration and Identification (R&I) was introduced before 2005, the 2005 data should already include the costs impact of the regulation. This can be done in two ways:

1) By subtracting from 2005 costs of production the estimated costs for the I&R Directive multiplied by the degree of compliance before 2005

and from "corrected" costs of production to derive a percentage cost increase impact of the standard

2) By calculating total costs associated with implementation of different measures for R&I Directive and based on these costs to derive a percentage cost increase impact of the standard before 2005 and after 2005 (See Lines 12-17 in Table 5.17)

From Table 5.17 we can see that estimated degree of compliance has increased by 25% after 2005 compared to before 2005 situation. Therefore, the costs of production after 2005 increased by 0.1%, while in the whole period (before 2005 and after) costs increased by 0.39%.

Extending this methodology to the other member states we obtain the following overview. The costs per head of Identification and registration include in all countries the time of registration, the costs of lost eartags and the update of animal passports. The cost between the countries vary from 1.80€ per head in France up to €5.00 per head in the Netherlands.

In order to estimate the increase in production costs due to the identification and registration of beef cattle the production cost analysis of the Agribenchmark coordinated by the Federal Institute for Agriculture (FAL) has been used. [212] This world network calculates the production costs for beef based on typical farms in each of the 36 countries of the world who participate in the network. Using the total production costs per farm it is possible to calculate the percentage cost increase per kg beef to be attributed I&R of beef cattle. The seven countries listed in the Table 5.18 represent almost 90% of beef production of the EU-15.

Table 5.18: Production costs increase per kg beef related to the identification and registration of beef cattle

	France	Germany	Italy	Netherlands	United Kingdom	Spain	Ireland
Cost I&R per head 1)	1,80	2,92	2,20	5,00	4,20	2,20	4,20
Production cost US$ per kg 2)	6,17	5,59	4,83	6,40	8,54	5,21	6,80
Production cost € per kg slaughterweight	4,47	4,05	3,50	4,64	6,19	3,78	4,93
Production cost € per kg liveweight	2,63	2,27	2,17	2,60	3,40	2,07	2,66
No. of beef cattle sold per year	75	394	1.825	50	48	2.901	80
Beef production per head	248	263	177	143	143	188	96
Carcass yield	59%	56%	62%	56%	55%	55%	54%
Beef production farm	18.500	103.592	323.362	7.150	6.887	545.373	7.690

[212] Within this network two project partners participate: CRPA (Italy) and WUR (Netherlands)

	France	Germany	Italy	Netherlands	United Kingdom	Spain	Ireland
% loss	5%	5%	5%	5%	5%	5%	5%
Cost eartags	134,10	1149,02	4013,90	250,00	201,60	6381,47	336,00
Cost of I&R per kg beef	0,007	0,011	0,012	0,035	0,029	0,012	0,044
% cost of I&R	**0,16%**	**0,27%**	**0,35%**	**0,75%**	**0,47%**	**0,31%**	**0,89%**
Beef cattle (males more than 1 year) '000	1.397	1.151	845	93	1.583	340	1.604

Presuming an almost 100% compliance with the regulations which rule the identification and registration for bovine animals in the EU we obtain an average weighted cost increase of **0.455%** for the EU-15. The variation in the cost impact of I&R is either due to the cost per head of registration or to the herd size. In countries with large herd size some economies of scale can be exploited, whereas small herds in Ireland are facing a more significant cost increase.

5.5.3 Growth promoters use (hormones)

From the beginning of 1989 the European Union implemented a ban on the imports of red meat from animal treated with six growth promotants, natural and synthetic, excluding US beef on the EU market. Unlike the continuing efforts of the US to lift this ban the EU continued to exclude this possibility stating that economic, environment and consumer concerns must be considered in addition to the scientific evidence.

Council Directive 96/22/EC of 1996 is one of the 19 Directives of the CC policy. This directive concerns the prohibition on the use in livestockfarming of substances having a hormonal or thyrostatic action and of beta-agonists. In a comparative analysis with the US beef cattle industry at this point it is interesting to know which cost advantage the US beef industry enjoys using these substances, as in this country their use is allowed.

It is quite clear that the use of hormones in beef fattening cattle increases average daily gain and improves feed efficiency. There is also evidence of drawbacks which hormones may cause to the carcass and eating quality, but there are growth implant strategies available which can considerably alleviate these concerns (Montgomery T.H. et.al. 2001). Hence, the positive cost decreasing impact of the use of growth hormones is overwhelmingly compensating the eventual negative effect on carcass quality.

In a meta analysis combining information from more than 170 research trials carried out in the last forty years the economic impacts of pharmaceutical technologies in cow-calf and beef fattening farms has been assessed (Lawrence et.al. 2006?). This analysis was not limited only to the effect of growth hormones, but extended its sphere of interest to parasite control, antibiotics and ionophores. Nevertheless, the results of the analysis allows to isolate the effect of growth hormones on feed efficiency, average daily gain and production costs. Obviously, the larger the effect of growth hormones on production efficiency, the larger will be its effect on cost of production. The effect on technical efficiency has been distinguished separately in beef cow herds and beef fattening farms as is shown in the Table 5.19.

Table 5.19: Impact of a ban on the use of growth promotants on the technical efficiency in beef cow herds and beef fattening farms

	Beef cow herds		Feedlot
Wean rate	2.54%	Average daily gain	14.13%
Wean weight	3.07%	Feed to gain (lbs feed/ lbs weight gain)	-8.79%
Overall impact on production costs	7.14%		

Source: Lawrence & Ibarburu (2006)

Taking into account the adoption rate of growth promotants which in the US is high, an overall impact on the production costs of a ban on growth promotants has been estimated in 7.14%. In other words, a ban would increase the production costs of beef in the US by this percentage, as the wean rate would decrease by 2.54%, the average daily gain would deteriorate by 14.13% and the feed conversion rate by 8.79%.

Evidently such an increase of production costs will have severe consequences for the competitiveness of US beef production.

5.6 Simulated impact on competitiveness

5.6.1 Nitrate Directive

The impact of full compliance with Nitrate directive have been simulated with the GTAP model in order to assess its effect on the competitiveness of EU beef production on the world market. The previous analysis has pointed out a quite limited impact on EU beef farms (an increase of costs 0,095%), primarily due to the low share of farms that would be affected. The effects on EU beef export could be a 0.7% decrease in quantity, while import would raise by 0.5%. The shares on global export and import are expected to change respectively at the same extent. Considering the indirect effects on beef traded by the other exporting countries, the main advantage would be taken by Brazil with an increase of 0.3%. For Australia; the US and Canada no significant changes would occur.

According to the previous calculations the EU-15 is facing a cost increase of 0.455% per kg beef for maintaining a system of identification and registration of beef cattle. Between EU Member States it varies from 0.16% in France up to 0.89% in Ireland.

Table 5.20: Effect of N-Directive on global bilateral beef export (var. % on quantities)

	Importers						
Exporter	EU15	Japan	USA	ROECD	ROW	Total	%X
Australia	0,53%	0,00%	0,01%	0,03%	0,08%	0,04%	0,03%
NewZealand	0,51%	-0,02%	-0,02%	-0,01%	0,04%	0,18%	0,16%
EU-15	0,00%	-0,75%	-0,77%	-0,71%	-0,65%	-0,67%	-0,68%
Canada	0,61%	0,01%	0,01%	0,02%	0,09%	0,04%	0,02%
Brazil	0,52%	0,00%	0,00%	0,00%	0,09%	0,30%	0,28%
USA	0,54%	0,01%	0,00%	0,03%	0,06%	0,04%	0,03%
ROW	0,55%	0,00%	0,01%	0,02%	0,05%	0,30%	0,28%
Total	0,53%	-0,01%	-0,03%	-0,03%	-0,18%	0,01%	0,00%
%M	0,51%	-0,02%	-0,04%	-0,04%	-0,20%	0,00%	

5.6.2 I& R regulations

As it is shown by the Table 5.21, a costs increase due to I&R regulations entails an increase of EU trade deficit in quantity: a 2.2% growth of beef imports and a decline of the same extent in exports. UE share on world export market would decline by 2.2%, while a 2% increase of the share on global import is foreseen. Negative impact on EU beef competitiveness entails positive changes in the market share by some of the main beef exporting competitors.

In particular Brazil would gain 1.1% expanding its exports by 1.2%. The performances of the other competitors on the world market would be affected to a smaller extent by the EU decline. The share gains of Canada, theUSand Australia are expected to be negligible. The increase of beef traded by this countries should be limited to less than 0,2%, due to the fact they compete on different markets than those where EU is engaged. Benefits would be higher for the export from the rest of the world, that on the whole should raise by 1.2%

Combining the effects of both standards (Nitrate Directive and I%R) , an overall decrease of 3.7% would affect EU export. The loss in quantity on the Japanese market would be equal to 2.64% while export towards other OECD would decrease by 2.54%. On the whole Brazil would gain 1.4% of his global market share, while in terms of share gains the advantages for other main world competitors, such as Australia, Canada and USA would be negligible.

Table 5.21: Effects of I&R of beef cattle on global bilateral beef export (var. % on quantities)

Exporter	EU15	Japan	USA	ROECD	ROW	Total Export
Australia	2,44%	0,00%	0,03%	0,06%	0,25%	0,16%
New Zealand	2,17%	-0,11%	-0,09%	-0,06%	0,11%	0,74%
EU-15	0,00%	-2,00%	-2,01%	-1,86%	-2,15%	-2,12%
Canada	2,28%	0,01%	0,04%	0,07%	0,31%	0,13%
Brazil	2,18%	0,00%	0,01%	0,04%	0,28%	1,22%
USA	2,14%	0,02%	0,00%	0,07%	0,21%	0,14%
ROW	2,25%	0,01%	0,03%	0,05%	0,16%	1,21%
Total Import	2,21%	-0,03%	-0,08%	-0,07%	-0,61%	0,12%

Table 5.22: Effects of Nitrate Directive + I&R of beef cattle on global bilateral beef export (var. % on quantities)

	Importers					
Exporter	EU15	Japan	USA	ROECD	ROW	Total
Australia	2,95%	0,01%	0,04%	0,08%	0,33%	0,20%
New Zealand	2,67%	-0,14%	-0,11%	-0,07%	0,14%	0,91%
EU-15	0,00%	-2,67%	-2,73%	-2,54%	-2,74%	-2,73%
Canada	2,81%	0,02%	0,05%	0,09%	0,39%	0,17%
Brazil	2,67%	-0,02%	0,02%	0,07%	0,36%	1,51%
USA	2,66%	0,02%	0,00%	0,09%	0,26%	0,18%
ROW	2,77%	0,01%	0,04%	0,08%	0,20%	1,50%
Total	2,72%	-0,03%	-0,10%	-0,10%	-0,78%	0,13%

5.6.3 Growth promoters use (hormones)

As has been analysed in the previous paragraph dedicated to the use of growth promoters in the US a ban on its use would provoke an increase of production costs of 7.14%. Evidently such an increase of production costs will have severe consequences for the competitiveness of US beef production on the world market.

According to the simulations carried out with the GTAP model a ban on growth promotants would cause an increase of imports of beef in the US of 32%, whereas exports of US beef would decline by 36%. It is important to stress that the production of beef in the US would decline by 5%. The gap left by the US on the Japanese import market will by filled by primarily by Australia.

The decline of American beef production will create increased imports from Australia and Canada. Also the rest of the OECD countries will import more as the US will loose 41% of its exports on these markets.

Table 5.23: Effect hormone ban in the US, percentage change

	EU-15	Japan	USA	ROECD	ROW	Total
Australia	-1%	20%	32%	23%	4%	19%
NewZealand	-1%	19%	31%	22%	5%	12%
EU-15	0%	22%	34%	25%	4%	8%
Canada	0%	20%	32%	23%	2%	27%
Brazil	1%	21%	34%	25%	3%	5%
USA	-45%	-33%	0%	-32%	-41%	-35%
ROW	1%	21%	34%	24%	8%	11%
Total	-3%	-10%	32%	-12%	-3%	2%

Focusing the attention only on the EU-15 one notices an increase of exports of the EU of 6% on the world market and a decrease of imports of 3%. In this new situation the EU-15 will remain a net importer of beef but will slightly improve its competitive position.

5.6.4 Combined effect of standards on external competitiveness

Four scenarios, all targeting at full compliance, are summarised in Table 5.24. Only the effects on EU-15 are emphasised, presenting the total EU import and export, which is further detailed by countries receiving imports from the EU-15. (Note that the EU-15 impact is based on the costs increases as calculated for the selected member states, which comprise the main part of EU dairy production).

Table 5.24: Percentage changes in trade due to full compliance to various standards

	Scenario	**EU Import**	**EU Export**	exports of which to…				Total world trade
				Japan	USA	Rest of OECD	Rest of World	
1	Nitrate EU: 100%	0.53	-0.67	-0.75	-0.77	-0.71	-0.65	0.01
2	I&R EU: 100%	2.21	-2.12	-2.00	-2.01	-1.86	-2.15	0.12
3	Nitrate EU: 100% and I&R EU: 100%	2.72	-2.73	-2.67	-2.73	-2.54	-2.74	0.13

The previous analysis on the impact of Nitrate Directive (see scenario 1) has pointed out a quite limited impact on EU beef farms (an increase of costs 0.095%), primarily due to the low share of farms that would be affected. The effects on EU beef export could be a 0.7% decrease in quantity, while import would raise by 0.5%. The shares on global export and import are expected to change respectively at the same extent. Considering the indirect effects on beef traded by the other exporting countries, the main advantage would be taken by Brazil with an increase of 0.3%. For Australia; the

US and Canada no significant changes would occur. According to the previous calculations the EU-15 is facing a cost increase of 0.455% per kg beef for maintaining a system of identification and registration of beef cattle. Between EU Member States it varies from 0.16% in France up to 0.89% in Ireland.

As it is shown by Scenario 2, costs increase due to I&R regulations entails an increase of EU trade deficit in quantity: a 2.2% growth of beef imports and a decline of the same extent in exports. EU share on world export market would decline by 2.2%, while a 2% increase of the share on global import is foreseen. Negative impact on EU beef competitiveness entails positive changes in the market share by some of the main beef exporting competitors. Going further into details it can be concluded that in particular Brazil would gain 1.1% expanding its exports by 1.2%. The performances of the other competitors on the world market would be affected to a smaller extent by the EU decline. The share gains of Canada, the US and Australia are expected to be negligible. The increase of beef traded by this countries should be limited to less than 0,2%, due to the fact they compete on different markets than those where EU is engaged. Benefits would be higher for the export from the rest of the world, that on the whole should raise by 1.2%

Combining the effects of both standards in Scenario 3 (Nitrate Directive and I&R), an overall decrease of 3.7% would affect EU export. The loss in quantity on the Japanese market would be equal to 2.64% while export towards other OECD would decrease by 2.54%. On the whole Brazil would gain 1.4% of his global market share, while in terms of share gains a the advantages for other main world competitors, such as Australia, Canada and USA would be negligible.

As has been analysed in section 5.5.3 dedicated to the use of growth promoters, in the US a ban on its use would most likely provoke an increase of production costs. Evidently such an increase of production costs will have significant consequences for the competitiveness of US beef production on the world market. The work is ongoing to simulate this scenario in the GTAP model. Conceptual workaround is needed to correctly specify the model parameters.

5.7 Conclusions

Within the EU beef is produced in a wide range of farming systems, ranging for the extensive cow calf farms in Ireland, the UK and the centre of France down to the very intensive beef fattening systems located in Italy and Spain. The Nitrate Directive affects 4.2% of beef cattle raised in intensive finishing farms and 3.0% of beef produced on cow calf farms. This low percentage of farms affected by the Nitrate Directive explains the limited sector cost increase, which has been estimated in 0.095%. Evidently this relatively low cost impact does not have significant consequences for the competitive position of the EU beef production on the world market. The actual trade deficit in beef of the EU would increase, as exports would fall by 0.68% and imports would rise by 0.51%. The country which would benefit most of this situation is Brazil increasing its global exports by 0.28% and in particular to the EU (+0.52%).

More incisive for the beef farms are the regulations concerning the identification and registration of beef cattle. Implemented as a reaction to the BSE crisis the beef farmers have to register all cattle movements and make sure that all animals are correctly identified form birth up to the slaughterhouse. According to the estimates carried out these important measures generate a cost increase for the beef farms of 0.454% in the EU. Naturally this stronger rise in production costs affects EU trade more considerably. Beef imports will grow by 2.2% and exports will decline with the same percentage. Again Brazil can exploit most this decline of EU competitiveness increasing its exports to the EU with 2.18% and its global exports with 1,1%. The other competitors on the world market would benefit much less.

Finally, a ban on the use of growth hormones in the US can have a very strong effect on beef production costs which would rise by 7.14%. Such a production cost increase will have a disruptive effect on the competitiveness of US beef production on the world market. Its exports would decline by 36% to those countries which already now import American beef.

5.8 References

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6 The impact of standards on the competitiveness of the EU with respect to pigs and poultry

6.1 Introduction

This chapter is dedicated to the pigs and poultry sector and to the impact of those Directives and Regulations that, being applicable to pigs and poultry farms, may affect the competitiveness of the EU sector with respect to its main competitors in world market. As a preliminary remark, it is important to underline that only some pig and poultry farmers are involved in the CC policy, because the large majority is not eligible for a single farm payment. This is the case of those farms which did not mature any direct payment in the past due to the fact that within the poultry and pigmeat Common Market Organisation (CMO), no direct/coupled support to income were foreseen. Therefore, for this group of farmers no penalties could be imposed in terms of reduction of a single farm payment. In case of no compliance they are only subjected to fines provided by the national application of the EU directives. Hence, two groups of farms can be distinguished here:

- ✓ A minority of pig and poultry farmers in the EU which grow only forage crops or other crops which did not mature any direct farm payment in the past. As these farmers do not receive any decoupled payment, they will not be subjected to the controls put in place for the cross-compliance policy.
- ✓ The large majority of pig and poultry farmers growing arable crops or raising dairy, beef cows or sheep which have matured rights for direct income support in the past flowing into the single farm payment. These farmers are fully involved in the cross-compliance obligations.

The distinction made here does only hold for the cross compliance policy controls. Obviously all pig and poultry farmers have to comply with the regulations and directives of Annex III anyhow, as these are mandatory for many years. The only difference is that for the first group of farmers no penalty is foreseen in terms of a reduction of the single farm payment, but in case of non-compliance these farmers are subjected to national fines put in place by the national application of the directives. Therefore in the competitiveness analysis we will take account of all farmers, independently of their degree of involvement in cross-compliance.
All directives and regulations of cross-compliance can generate potentially costs to pig and poultry farmers, but compared to other production sectors only very few have significant cost implications and then almost exclusively for pig farmers. Poultry farmers are only marginally affected by cross compliance. For example the animal welfare regulations mentioned in Annex III do only refer to calves and pigs. All the specific animal welfare regulations of the EU for broilers and laying hens are outside the framework of cross-compliance. Only the Nitrate Directive may have cost implications for poultry farmers. Therefore in the following we will concentrate our analysis on pig farms in the EU.

Overlooking the list of regulations and directives considerable cost implications for pigs are foreseen for compliance with the Nitrate Directive and with the standards for Animal Welfare

(Table 3.1 of chapter 3). All other regulations have only a minor or negligible cost impact on pig farms. Hence, focus in this chapter will be on these two directives and on similar legislation in vigour in the USA and Canada.

Before presenting the cost implications and the consequences for competitiveness of compliance with the Nitrate Directive and Animal Welfare legislation, a description will be given of the major trade flows of pigmeat in the world and of the pig farm structure in the EU, the US and Canada. The analysis of the structure of pig farms already will give an indication of how many pig farms will be affected by the Nitrate Directive. After the presentation of the cost analysis, simulations will be carried out of the effect of a cost increase on competitiveness due to the compliance with the Nitrate Directive and the Animal Welfare Directive.

6.1.1 Trade patterns and the effect of non-tariff trade barriers

World trade in pigmeat is highly developed and increases significantly following the progress in trade liberalisation. The major exporting countries on the world market are the USA, Canada, the EU and Brazil. A striking feature is the significant export of pork from Canada to the US and the strong export flow of the US to Japan. These three countries are heavily interdependent on the pigmeat market and the US and Canada are particularly integrated. The major world importer of pig meat is Japan, which purchases pig meat in the US, Canada and the EU. On this important market the European and North American products compete. Russia is ranking second among the importing countries of pig meat in the world. Here the interests of the EU clash with the increasing flows of pig meat coming from Brazil. This country has a rapid growing pig meat industry and is able to export a significant share of its production.
Within the EU the most important exporter on the world market is Denmark which alone accounts for over 40% of EU-15 exports. This country is followed by exporting countries like France, Germany and the Netherlands, which primarily are involved in intra-EU trade. Italy is a strong pig meat importing country, as its self sufficiency rate is just 60%.

The information on import and export flows does not distinguish between fresh and processed meat. For most of the countries trade in pig meat refers to the fresh or refrigerated product, but countries as Spain and Italy, although being net importers, contemporarily are relevant export countries of processed pig meat products such as cured and cooked hams and salamis.

Figure 6.1: World trade flows in pigmeat 2006 Source: GIRAFOOD, 2006

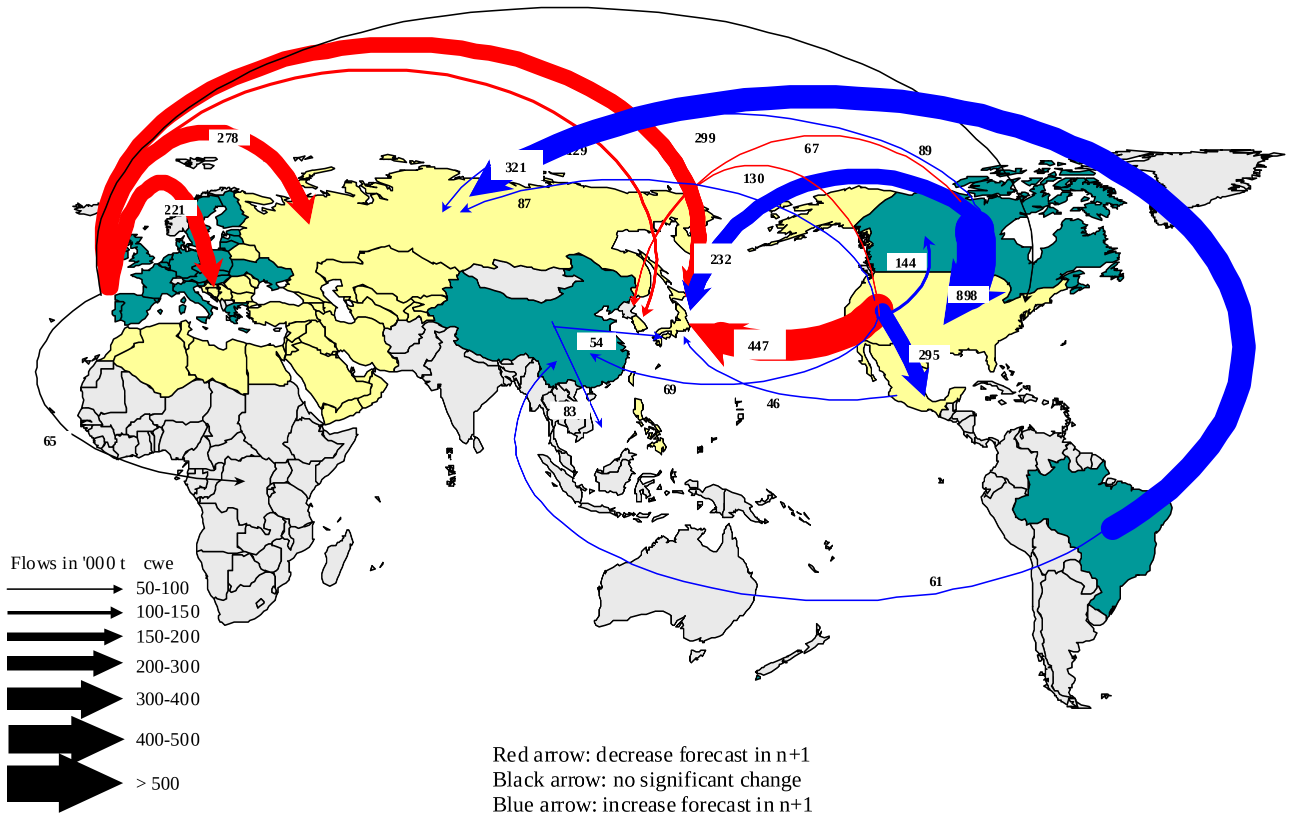
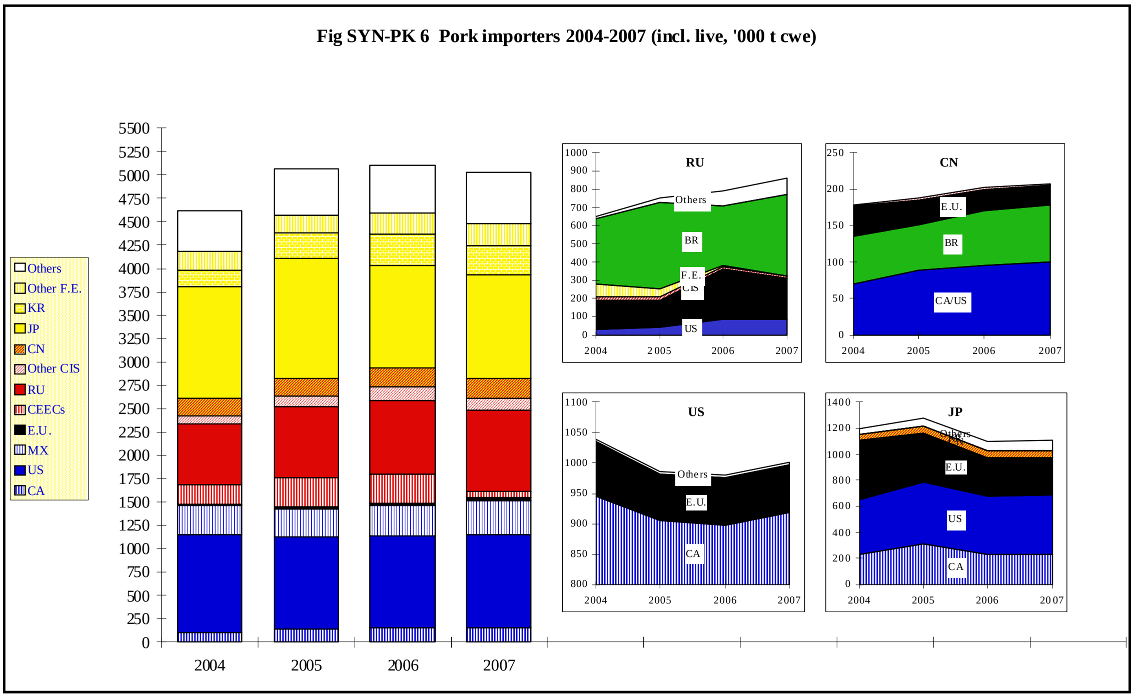


Figure 6.2: World pork imports 2004-2007



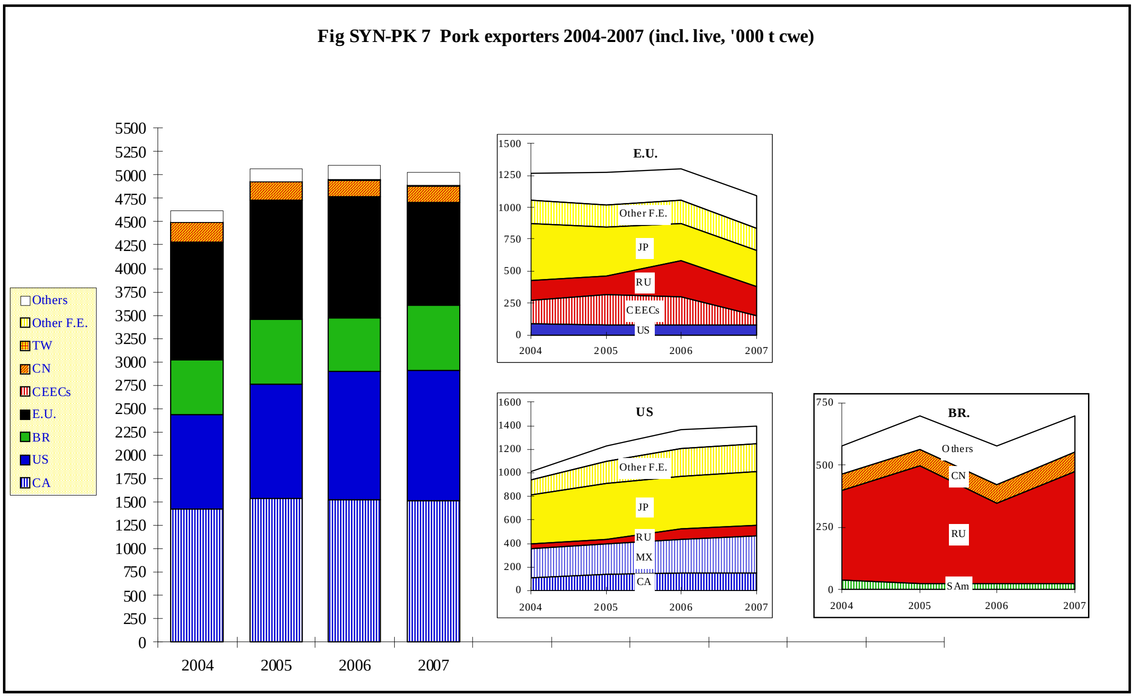
Source: GIRAFOOD, 2006

As the dynamics of world trade is concerned a continuous increase is to be noticed on the Russian market with Brazil capturing a growing share in Russian imports. A second growing import market is China, although this country represents only 25% of the import quantity of Russia. The growing demand for pigmeat in this country is satisfied for a great deal by an rise in domestic production. As has already been mentioned Japan ranks first in the world among the pig meat importing countries, but in the last two years imports declined slightly.

Exports of pig meat in 2007 will reach about 5 million tons increasing by about 9% compared to 2004. Interesting to note is that in the last four years the US has outstripped the EU in export volume, growing from 1 million to 1.4 million tons in 2007. In the same period the EU exports of pigmeat remained stable around 1.25 million tons. The increased competitive advantage of the American pig meat industry can be attributed to the declining value of the dollar with respect to the Euro. Brazilian exports tend to increase year by year. In 2006 the growth has been interrupted by an outbreak of Foot and Mouth disease which blocked their exports to Russia. In that year the EU took over the Brazilian share on the Russian market reducing the exports to Japan leaving more market space for the US and Canada.

From this overview it becomes clear that although there is an underlying structure in world trade of pigmeat trade flows can be redirected as a consequence of the outbreak of diseases in some parts of the world. Similar observations have been done when commenting the world trade in beef.

Figure 6.3: World pork exports 2004-2007

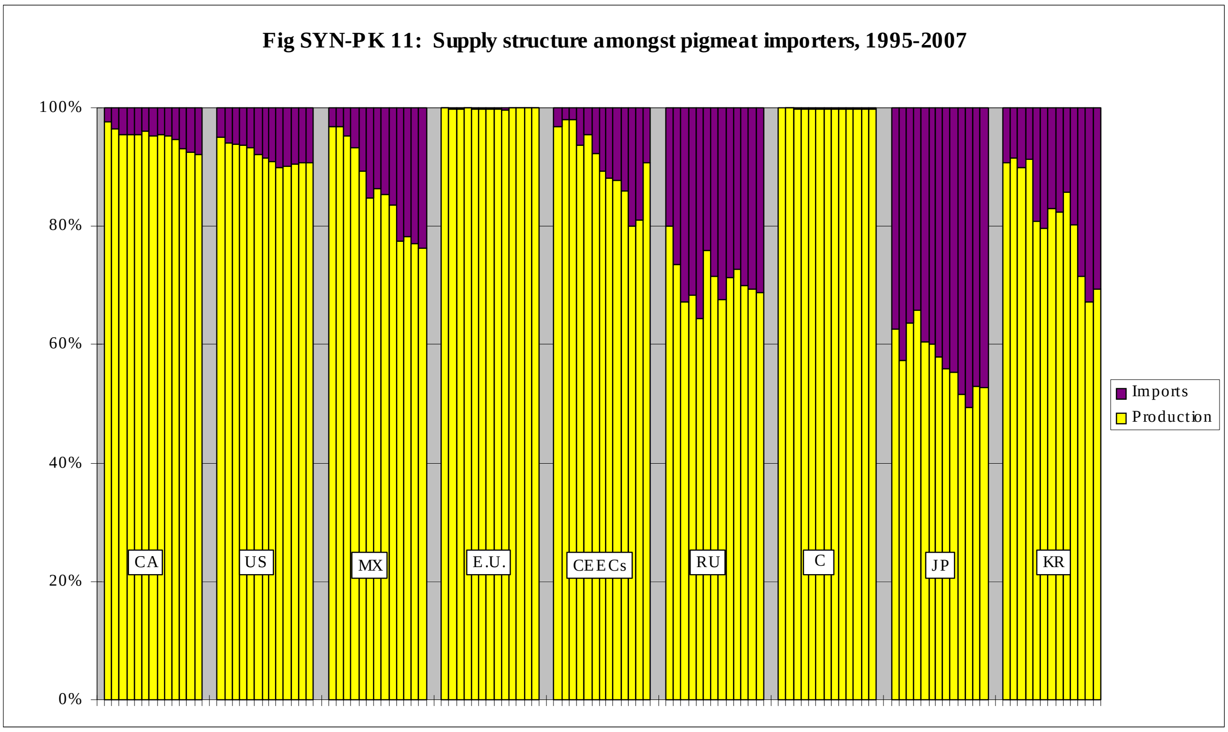


Source: GIRAFOOD, 2006

Finally of interest is the weight of imports and exports on the total national availability of pigmeat in the single competing countries. As the importing countries are concerned in period 1995 – 2007 the Eastern European countries (CEECs) had to cover their needs with increasing imports of pigmeat. A similar development took place in Japan where imports represent almost 50% of total consumption. The US is gradually importing more pigmeat and in particular from Canada.

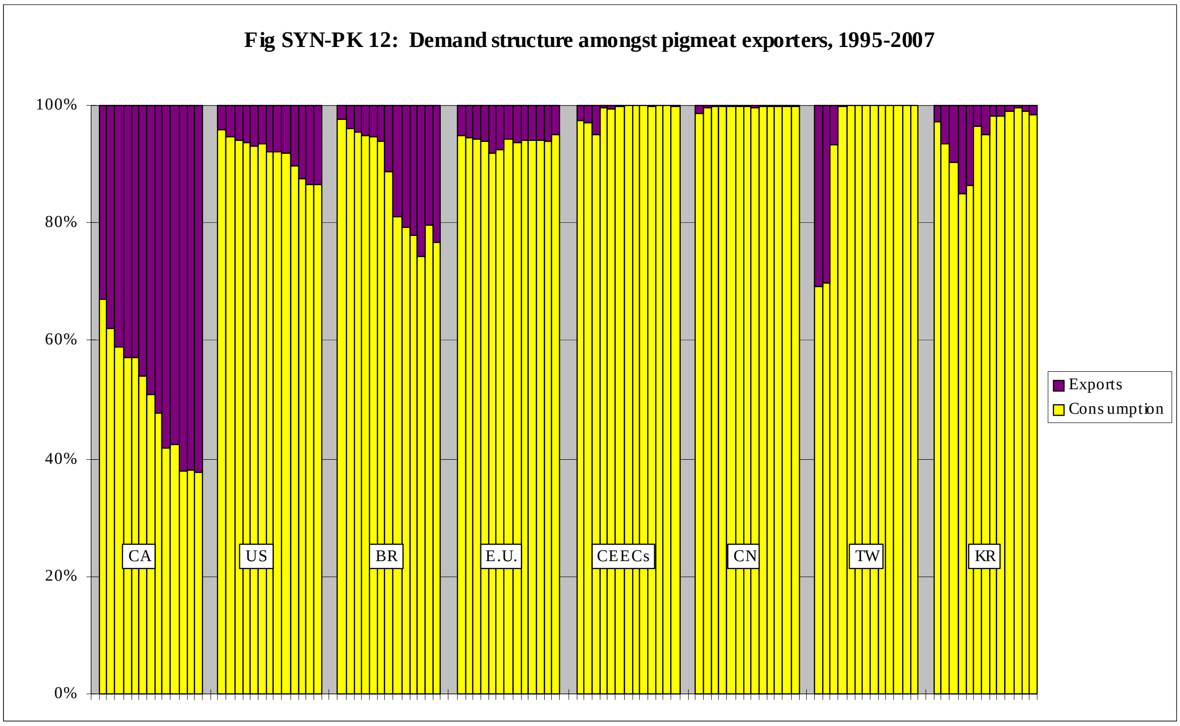
For the same period exports shares have been analysed. Striking to this respect is the growing exports of Canada which exceeds in 2006 60% of its total availability. EU export demand is very small compared to domestic EU demand not accounting for more than 5%, with Denmark being in the major exporter. Nevertheless the temporary closure of an export market due to non-tariff trade barriers related to diseases or other disrupting factors immediately can have severe consequences for the internal EU market as pigmeat prices react very rapidly to such an oversupply of pigmeat on the domestic market.

Figure 6.4: Supply structure of pigmeat importing countries



Source: GIRAFOOD, 2006

Figure 6.5: Demand structure of pigmeat exporting countries



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Source: GIRAFOOD, 2006

6.1.2 Sector structure

6.1.2.1 Pig farms in the EU

A common characteristic of pig production in many countries is its high concentration near urban agglomerations and the predominance of medium to large pig farms. Nevertheless significant differences among EU countries can be noted, but also between the EU, the US and Canada. In some countries medium sized family farms prevail, but in others large highly concentrated industry-like enterprises dominate the scene. In the Table 6.1 information is provided about pig farm structure of the first eleven pig producing countries in the EU. These eleven countries represent 84% of total pig population of the EU-25.

The strongest farm structure with a high percentage of pigs raised on farms with more than 1,000 heads is to be found in Italy (75%), Denmark (71%), the United Kingdom (62%), Hungary (58%) and Spain (56%). In this first group of countries hired labour will prevail on the pig farms and often the farm is run by companies. The large farm structure gives the opportunity at one side to exploit economies of scale, but at the other side environmental problems may arise which may generate costs for manure disposal.

A second group is composed of countries having a strong presence of pigs raised in the middle size class of 500 – 1,000 pigs per farm. Here the family farm type predominates. The reduced presence of scale economies is often compensated in these pig farms by a high technical efficiency. Countries belonging to this group are Germany (31%), France (39%), Belgium (41%) and the Netherlands (22%).

At the lower end of the size scale we can find Poland and Austria where the large majority of pigs are produced on small farms of 500 pigs and less. This size class has a share on total pig population of 84% and 75% respectively.

Table 6.1: Number of pigs in the first eleven EU countries

		Heads	less than 499	499 to 999	more than 1,000
1	Germany	26.857.820	9.981.250	8.222.820	8.653.750
2	Spain	22.776.700	6.585.220	3.357.720	12.833.760
3	Poland	17.716.940	14.812.200	942.800	1.961.940
4	France	14.792.820	2.985.200	5.737.100	6.070.520
5	Denmark	13.466.280	1.080.140	2.843.930	9.542.210
6	Netherlands	11.311.560	3.947.640	2.498.110	4.865.810
7	Italy	8.757.640	1.351.920	838.730	6.566.990
8	Belgium	6.318.210	1.115.680	2.580.930	2.621.600
9	United Kingdom	4.860.410	941.180	913.540	3.005.690
10	Hungary	3.859.720	1.462.350	139.640	2.257.730
11	Austria	3.147.230	2.363.520	695.090	88.620

		%	%	%	%
1	Germany	100	37	31	32
2	Spain	100	29	15	56
3	Poland	100	84	5	11
4	France	100	20	39	41
5	Denmark	100	8	21	71
6	Netherlands	100	35	22	43
7	Italy	100	15	10	75
8	Belgium	100	18	41	41
9	United Kingdom	100	19	19	62
10	Hungary	100	38	4	58
11	Austria	100	75	22	3

Source: Elaborated by CRPA on Eurostat data – Farm Structure Survey 2005

6.1.2.2 Structure of US pig farms

The structure of the U.S. pork industry has changed markedly in the last several years. Although inventory dropped in the late 1990's, it has risen steadily to its present level of almost 63 million head since then. What is most remarkable is the steady decrease in the number of farms, which has decreased to roughly one tenth the number of farms twenty-five years ago. Compared to pig farm structure in the EU the US has the largest pig farms concentrating 90% of pigs on farms having more than 1,000 pigs and 54% of pigs on farms with more than 5,000 pigs. These last types of farms account for only 2.5% of the farms. At the same time almost 40% of U.S. pig farms have less than 99 pigs, but these farms only account for 1% of the pig population.

Vertical integration is common in the US pig industry, which has had the fastest rate of growth of CAFOs. Graph 5.7 shows that the greatest concentration of pigs exist in the Northcentral states, lead by Iowa and Minnesota, as well as in North Carolina, where recent breaches of large manure lagoons have caused serious environmental concerns. Air quality and odour control have become important issues facing large-scale pig production in many regions of the country. The top five pork producing states produce more than 60% of the nation's pork supply. Iowa ranks number one in pork production in the United States with a total of 17.8 million pigs, or 22% of U.S. production in 2004. In 2005 Iowa's pigmeat production represented about $4.3 billion in cash receipts 213.

[213] 2005 Livestock Summary, NASS Statistical Bulletin. http://www.nass.usda.gov/Statistics_by_State/Iowa/Publications/Annual_Statistical_Bulletin/2006/06_76.pdf

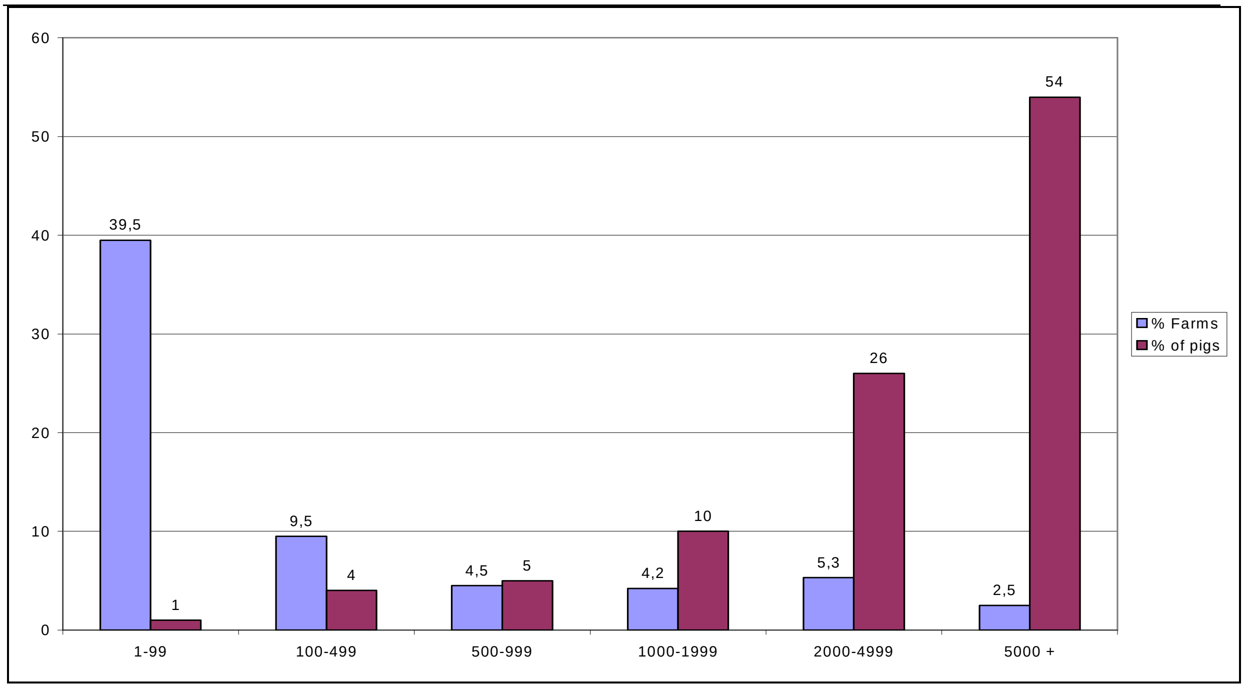


Figure 6.6: Structure of US pig farms

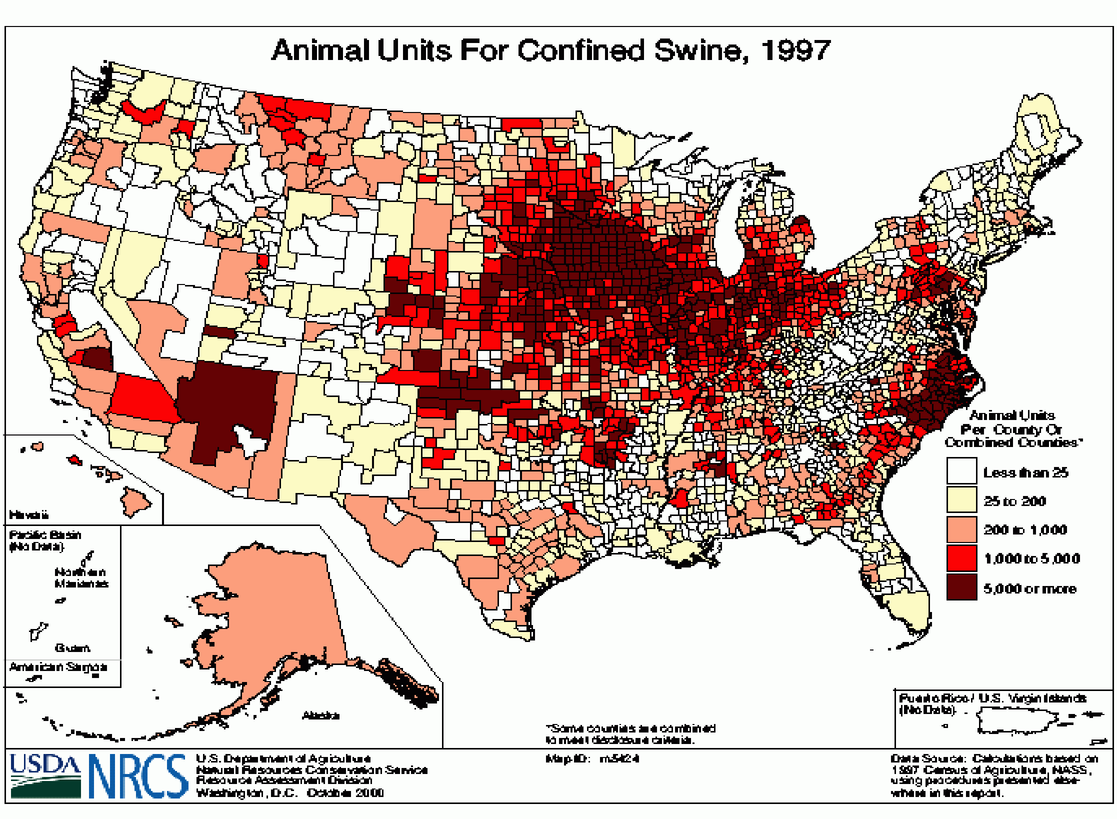
Source: USDA-NASS 2-2-2007

Table 6.2: Numbers of pigs marketed in the first 10 states of the USA

State	Head Marketed (1000)	% of total
Iowa	22,223	21.91%
North Carolina	13,295	13.71%
Minnesota	9,201	9.49%
Illinois	8,300	8.56%
Indiana	6,906	7.12%
Nebraska	6,397	6.60%
Missouri	5,934	6.12%
Ohio	3,238	3.34%
South Dakota	2,260	2.33%
Kansas	2,404	2.07%

Source: USDA National Agricultural Statistics Service database.

Figure 6.7: Spatial distribution of pig production in the USA



6.2 Nitrate directive

The main requirements established by the Nitrate directive is the respect of the limit of 170 N kg/ha[214]which may generate extra-costs for a correct manure disposal. In Nitrate Vulnerable Zones (NVZ) farms exceeding the maximum limit have to find extra land to spread excess manure, either by buying or renting land or paying a license to spread manure on land of nearby farmers. Moreover, they are obliged to invest in manure storage facilities due to the prohibition to spread manure in winter time.

The evaluation of the impact deriving from a full application of. Nitrate directive requires a preliminary analysis of the data of the structure of poultry and pig farming systems in order to detect the share of enterprises and the share of pigs and poultry affected by the SMRs, which significantly differ among European countries.

To assess how many pigs farms potentially are affected by the Nitrate Directive the following stepwise procedure has been followed:

1. calculate for the main producing countries the number of farms which have a stocking rate per hectare exceeding the limit of 170 kg N per hectare
2. estimate the number of pigs raised within Nitrate Vulnerable Zones

[214] Or 250 kg N/ha on grassland in Germany and the Netherlands.

Then, a literature inventory has enabled to establish the cost increase related to compliance with the Nitrates Directive for a typical pig farm in each of the selected countries. The degree of compliance resulting from the national analyses has permitted to estimate the percentage cost increase at sector level.

6.2.1 Affected farms

In the following an analysis will be presented containing an estimate of the pig farms in the EU which will be affected by the Nitrate Directive. In order to establish this figure we have chosen to concentrate our attention on the most important Member States in the EU-15. In the new member states the Nitrate Directive will be introduced in the next years, but it is well known that the old member states are struggling with its implementation since 1991.
The countries selected for the present analysis are listed in the Table 6.3 below, which demonstrates that together they represent 90.9 % of the pig population in the EU and 90.8% of pig production.

Table 6.3: Share in pig production and pig population of the EU-15

	t	% of pig production	n. pigs	% of pig population
Belgium	1.006.217	5,6	6.147	5,0
Denmark	1.748.576	9,7	13.613	11,0
France	2.262.789	12,5	15.009	12,1
Germany	4.662.221	25,8	26.602	21,5
Italy	1.556.059	8,6	9.281	7,5
Netherlands	1.229.813	6,8	11.220	9,1
Spain	3.229.623	17,9	26.034	21,0
United Kingdom	696.549	3,9	4.691	3,8
Other EU	1.658.112	9,2	11.326	9,1
EU 15	18.049.959	100,0	123.923	100,0

Source: Eurostat

In other to assess how many pigs farms potentially are affected by the Nitrate Directive the following stepwise procedure has been followed:

1. calculate for each of the eight countries the number of pigs on farms which have a stocking rate per hectare exceeding the limit of 170 kg N per hectare
2. estimate for each of the eight countries the number of pigs in Nitrate Vulnerable Zones

For the first step the single country data have been processed of the Farm Structure Survey (FSS), whereas the second step of the analysis has been carried out using the REGIO databank. Both the FSS and REGIO databank are made available by Eurostat. The four tables below (Table 6.4-6.7) represent the summary table of the eight EU Member States together.

Table 6.4: Number of pigs per herd size classes and per UAA classes in the first 8 EU countries , 2005

	Total	less than 50	50-99	100-199	more than 200
0 ha	11.321.500	3.732.870	149.910	534.390	6.904.330
0-2 ha	4.122.720	1.968.420	127.560	387.210	1.615.440
2-5 ha	4.638.180	1.980.760	97.120	447.530	2.093.570
5-10 ha	5.843.730	2.656.510	195.310	793.690	2.235.080
10-20 ha	9.532.370	4.241.900	575.680	1.299.310	3.398.620
20-30 ha	8.356.460	3.391.230	743.390	1.522.270	2.722.760
30-50 ha	14.312.040	5.535.380	1.560.490	3.176.080	4.039.060
50-100 ha	22.995.020	9.592.570	1.907.890	4.697.640	6.832.340
More than 100ha	28.019.390	9.450.090	783.000	2.267.640	15.518.660
Total	109.141.410	42.515.440	6.140.350	15.125.760	45.359.860
% share	100,0	39,0	5,6	13,9	41,6

Source: Elaborated by CRPA on Eurostat Farm Structure Survey 2005

From this overview it turns out that in these eight countries 39% of pigs are raised on farms with less than 50 sows, 5.6% on farms with 50-99 sows, 13.9% with 100- 199 sows and 41.6% on large farms having more than 200 sows. In the following Table 6.5 the number of farms raising pigs is indicated.

Table 6.5: Number of farms per herd size and per UAA classes in the first 8 EU countries, 2005

UAA	Total	less than 50	50-99	100-199	more than 200
0 ha	7.420	4.620	320	630	1.850
0-2 ha	52.760	51.460	260	360	680
2-5 ha	66.770	65.330	210	400	830
5-10 ha	55.490	53.460	470	750	810
10-20 ha	59.670	55.670	1.470	1.270	1.260
20-30 ha	31.810	27.390	1.630	1.700	1.090
30-50 ha	40.480	32.230	3.220	3.240	1.790
50-100 ha	44.100	33.670	3.440	4.210	2.780
more than 100ha	28.370	20.630	1.520	2.180	4.040
Total	386.870	344.460	12.540	14.740	15.130
% share	100,0	89,0	3,2	3,8	3,9
Total	282	123	490	1.026	2.998

Source: Elaborated by CRPA on Eurostat Farm Structure Survey 2005

The EU counts a huge number of farms where pigs are reared, but most of these farms (89.0) do not have more than 50 sows, whereas 3.9% of farms account for more than 40% of the pigs produced. Obviously the small farms often are mixed livestock farms and the large pig farms are specialised professional farms. The average herd size of these large farms reaches almost three 3,000 pigs per farm.

Dividing the average herd size in pigs per farm by the average size in terms of hectares of UAA we obtain the stocking rate per hectare in number of pigs per hectare for each of the herd size and UAA classes.

Table 6.6: Average number of pigs per hectare per per herd size and per UAA classes

Hectares		less than 50	50-99	100-199	more than 200
0,5	3.052	1.616	937	1.696	7.464
1	78	38	491	1.076	2.376
2,5	28	12	185	448	1.009
7,5	14	7	55	141	368
15	11	5	26	68	180
25	11	5	18	36	100
40	9	4	12	25	56
75	7	4	7	15	33
200	5	2	3	5	19

Source: Elaborated by CRPA on Eurostat Farm Structure Survey 2005

According to the nitrate excretion per pig and per sow it follows that the maximum of 170 kg N per hectare valid in the Nitrate Vulnerable Zones (NVZ) corresponds to 17 pigs per hectare. In other terms, farms having a stocking rate above 17 pigs/ha and located in NVZs will have to find extra land to spread excess manure or pig slurry, either by buying or renting land or paying a license to spread manure on land of nearby farmers. Moreover, these farmers will have to invest in manure storage facilities as in NVZ there is the prohibition to spread manure in winter time. Finally these pig farmers are obliged to present a manure management plan which details how and where the manure produced on the farms has been distributed. Evidently these obligations for pig farmers in NVZs will generate extra costs which are directly to be imputed as an effect of the implementation of the Nitrate Directive. Although there are some differences between Member States in application of the Directive, these are the three main measures livestock farmers will have to take in order to comply with the Nitrate Directive.

Turning to the tables presented above, it is possible to calculate the number of pigs which are raised on farms exceeding the maximum of 17 pigs per hectare by summing up the number of pigs reported in Table 6.5 using the grey area of Table 6.6.

This calculation has been carried out for each of the eight countries listed in Table 6.3 which represent more than 90% of pig production in the EU-15. It is interesting to note that in some countries a large majority of pigs are raised on farms exceeding the 170 kg N per hectare like the Netherlands (79%), Belgium (60%) and Italy (58%). At the opposite side we find a country like Denmark which is characterised by a large pig farm structure, but with a very low percentage of pigs (10%) on farms with a stocking rate above the limits indicated by the Nitrate Directive. This has certainly to be attributed to the more equal territorial distribution of pigs farms in Denmark and to the strict application of the Nitrate Directive which has imposed an upper limit of 140 kg N/ha and the obligation for Danish pigs farms to own of rent the land on which the slurry is to be spread.

Table 6.7: Percentage of pigs farms and percentage of pigs affect by the Nitrate Directive in case the whole country is defined as a Nitrate Vulnerable Zone, 2005

	B	DK	DE	ES
% pigs in NVZ	3.400	600	4.800	29.520
Total number of farms	7.710	8.890	88.680	115.760
% of farms affected	**44,1**	**6,7**	**5,4**	**25,5**
Number of pigs	3.809.620	1.470.300	4.558.380	7.108.630
Total number of pigs	6.318.220	13.466.290	26.857.800	22.776.690
% of pigs affected	**60,3**	**10,9**	**17,0**	**31,2**
	FR	IT	NL	UK
Number of farms	2.060	1.790	5.780	5.860
Total number of farms	41.890	102.790	9.690	11.460
% of farms affected	**4,9**	**1,7**	**59,6**	**51,1**
Number of pigs	4.663.130	5.084.480	8.978.870	1.751.360
Total number of pigs	14.792.810	8.757.640	11.311.560	4.860.400
% of pigs affected	**31,5**	**58,1**	**79,4**	**36,0**

Source: Elaborated by CRPA on Eurostat Farm Structure Survey 2005

Up till now we have presumed that the whole country is defined as Nitrate Vulnerable Zone. Although this is true for countries like Germany, the Netherlands and Denmark, in the other five countries only parts of the country are delimited as a NVZ. Therefore, in the second step of the calculations it has been necessary to estimate the number of pigs present in the NVZs of these five countries.

In France two departments are for 100% located in an NVZ (Bretagne and Pays de la Loire), others are only partially designated as a NVZ (Poitou-Charentes, Basse Normandie). The number of pigs present in NVZ in France is therefore estimated in 75%.

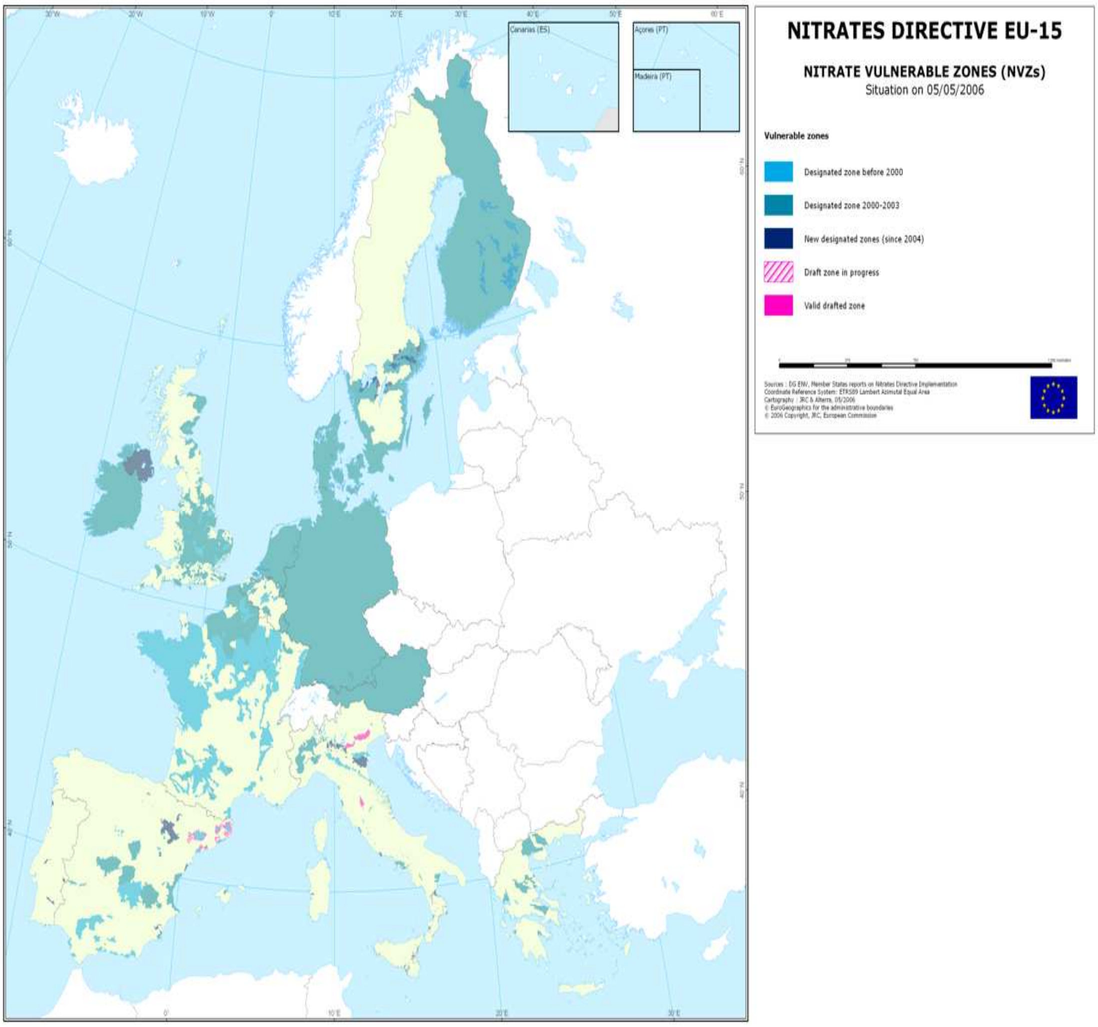
Table 6.8: Estimate of the percentage of pigs in Nitrate Vulnerable Zone in France, 2005

	n.pigs	% in NVZ	n.pigs in NVZ	% on total
France	15.123			
Haute-Normandie	154	80%	123	

	n.pigs	% in NVZ	n.pigs in NVZ	% on total
Basse-Normandie	582	80%	466	
Pays de la Loire	1.726	100%	1.726	
Bretagne	8.589	100%	8.589	
Poitou-Charentes	398	90%	358	
Total	11.449		11.262	74,5

Source: REGIO databank Eurostat

In Spain a scattered pattern of NVZs is found where several Comunidads are only partially designated as a NVZ. The estimate for this country of pigs in NVZs is 24%. In Italy the most recent delimitation of NVZs interests Lombardy, Veneto, Piemonte and Emilia-Romagna, the northern regions where most of the pigs are produced of the country. Here about 64% of pigs is estimated to be located in NVZs.



For the UK the estimate of pigs in NVZs is 66% and in Belgium 100%. As has already been stated the Netherlands, Germany and Denmark are fully designated as Nitrate Vulnerable

Zones. Multiplying the previous percentages of affected pigs (under hypothesis whole country is an NVZ) with the estimated percentage of pigs in the effective NVZs one obtains the share of pigs on the total population which are raised on farms which exceed the limit of 170 kg N per hectare.

Table 6.9: Share of pigs affected by the Nitrate Directive in selected countries (2005)

	BE	DK	DE	ES
Total pigs (heads)	6,318,220	13,466,290	26,857,800	22,776,690
% pigs raised in NVZ	100.0	100.0	100.0	24.3
% of pigs affected	60.3	10.9	17.0	7,6
Pigs affected (heads)	3,809,620	1,470,300	4,558,380	1,727,397
	FR	**IT**	**NL**	**UK**
Total pigs (heads)	14,792,810	8,757,640	11,311,560	4,860,400
% pigs raised in NVZ	74.5	64.2	100.0	66.1
% of pigs affected	23.5	37.2	79.4	23.8
Pigs affected (heads)	3,474,032	3,264,236	8,978,870	1,157,649

Source: Elaborated by CRPA on Eurostat Farm Structure Survey and REGIO databank 2005

6.3 Calculation of impact of improved compliance on costs

6.3.1 Sector cost increase due to Nitrate Directive in the EU

In several countries the costs have been calculated of pig farmers which have to face in order to comply with the Nitrate Directive. A literature inventory has enabled to establish the cost increase related to compliance with the Nitrate Directive in each of the eight countries. Aggregating these cost estimates to the pig production cost calculations of Interpig, a network of European research institutes coordinated by the Meat and Livestock Commission and the British Pig Executive, it is possible to calculate the percentage cost increase per kg pigmeat.

Table 6.10: Production costs of pigmeat and percentage cost increase

	BE	DK	DE	ES	FR	IT	NL	UK
Feed	0,685	0,680	0,696	0,852	0,730	0,994	0,693	0,814
Breeding, vet/med and energy	0,094	0,105	0,159	0,122	0,109	0,115	0,143	0,109
Labour	0,125	0,165	0,200	0,124	0,177	0,137	0,174	0,199
Building, finance and misc	0,342	0,468	0,475	0,409	0,397	0,367	0,452	0,617
Total costs	1,245	1,418	1,530	1,508	1,413	1,613	1,461	1,740
Compliance costs with Nitrate Directive (€/kg)	0,076	0,046	0,059	0,076	0,087	0,134	0,044	0,090

	BE	DK	DE	ES	FR	IT	NL	UK
% cost increase	**3,500**	**3,212**	**3,856**	**8,871**	**6,156**	**8,295**	**2,981**	**5,179**

Sources: - total pig production costs: BPEX, Pig Production Costs in Europe, 2005- the compliance costs are derived for Denmark: M.G. Christiansen, Danish Meat, 2007 Germany: Landwirtschaftliches Wochenblatt 7/2003 France : Gourmelen & Rieu (2006) Italy: De Roest, Montanari & Corradini (2007) Netherlands: De Hoop et.al. LEI (2004) UK: Penlington, MLC (2007)

The presented cost increases are valid for those pig farms which do not yet comply with the Nitrate Directive. Of course the degree of compliance among the different Member States differ significantly. In Italy where only recently an acceleration of the implementation is taking place the degree of compliance can be estimated in only 20%, but in Denmark where since a longer time a rather strict application has been imposed on livestock farmers the degree of compliance is very high. According to the assessments carried out in the country reports other countries reach degrees of compliance in between these two extreme values. In the Netherlands f.e. a manure agreement is underway to be implemented (De Hoop *et.al.*, 2004)

In order to obtain a percentage cost increase at sector level for each country the percentage cost increase of the affected pig farms has been multiplied with:

1. the degree of compliance with the Nitrate Directive
2. with the percentage share of affected pigs on the total number of pigs in the country

This calculation procedures have generated the percentage cost increase at sector level indicated in the Table 6.11. It turns out that Italy, the Netherlands and Belgium will still have to face a cost increase which varies from 1.1% to 2.5%. Other countries show limited cost increases, because of a limited number of affected pigs (Denmark), or a relatively small number of pigs present in NVZs (Spain) or a high degree of compliance (United Kingdom).

Table 6.11: Percentage cost increase on affected pig farms and percentage cost increase for the pig sector due to the application of the Nitrate Directive , 2005

	B	**DK**	**DE**	**ES**
% of pigs in NVZ	100,0	100,0	100,0	24,3
% of pigs affected by cost increase	60,3	10,9	17,0	7,6
% degree of compliance	0,50	0,80	0,85	0,20
% cost increase per kg meat for affected farms	3,5%	3,2%	3,9%	8,9%
% cost increase for sector	1,1%	0,1%	0,1%	0,5%
	FR	**IT**	**NL**	**UK**
% of pigs in NVZ	74,5	64,2	100,0	66,1
% of pigs affected by cost increase	23,5	37,3	79,4	23,8
% degree of compliance	0,70	0,20	0,50	0,90
% cost increase per kg meat for affected farms	6,2%	8,3%	3,0%	5,2%
% cost increase for sector	0,4%	2,5%	1,2%	0,1%

Finally it is possible to aggregate the country cost increases to EU-15 level, where for the other seven Member States a zero cost increase has been hypothesized. According to the calculations pig sector of the EU will have to face an additional cost increase due to the compliance with the Nitrate Directive of 0.545%

6.3.2 Sector cost increase due to Clean Water Act in the US

This analysis has estimated the costs of compliance with regulations concerning water quality for pig farms typical of Iowa. This state was chosen because it is the leading pig producing state in the U.S. Iowa's pig farms represent a more modern, confined feeding operation found in increasing numbers in the top pig producing states. The average pig operation size in this region of the country is approximately 4,300 head. This is well above the threshold size to be considered a Concentrated Animal Feeding Operation (CAFO) according to the Clean Water Act.

The primary manifestation of environmental regulations for livestock agriculture in the U.S. is the requirement to develop and follow a Comprehensive Nutrient Management Plan (CNMP) in order to comply with the Environmental Protection Agency's Clean Water Act regulatory requirements. The United States Department of Agriculture (USDA) has estimated the costs for developing and implementing a successful CNMP. Documentation of these costs is shown in Table 6.12.

The CNMP costs associated with swine operations, presented in Table 6.12, are an average cost of all swine farms in the U.S. and are presented per animal unit (AU), which is equivalent to 454 kgs of live weight. Because many of the costs associated with CNMP compliance require capital investments in farm infrastructure (e.g. manure storage facilities), the number of AUs over which such investment costs can be spread will have an important impact the compliance costs incurred by individual farms.

This analysis attempted to secure actual CNMP cost data specific to Iowa, but this was not available. Therefore, the national estimates for the CNMP cost for swine operations were adjusted from a per AU basis (US$44) to a per 45.4 kg of gain basis (US$1.57) to be consistent with the available financial data for swine operations.

A typical Iowa swine operation produces two cycles of market pigs, or 'turns', per year. This implies that, on average, it takes 6 months to raise a typical market pig from feeder pig to market. Therefore, at any one time there is only half the number of a farm's total marketed pig capacity on the farm. Feeder pigs generally enter the operation at 50 pounds in weight and leave the operation at 250 pounds. Therefore, over the life of the pig the average weight is 150 pounds and 1 AU equals 6.67 pigs.

Using the national average cost per AU for CNMP implementation of US$44, the average cost per 45.4 kgs of gain is estimated to be US$1.65. This is calculated by multiplying the average weight gain per pig of 90.9 kgs by 6.67 pigs by 2 turns per year, which results in a weight gain of 1,210 kgs (or 2,666 lbs) of gain per AU. This cost of compliance translates into a 3.54% increase in total production costs or a 4.23% increase in direct costs.

Table 6.12: Production costs for a swine operation typical of the Heartland region, 2005

Direct operating costs	**US $ per 45.4 kg of gain**
Grain	1,73
Protein sources	1,34
Complete mixes	10,8
Other feed items	0,07
Feeder Pigs	21,32
Hired labour	0,52
Vet and Med	0,58
Bedding and litter	0,01
Marketing	0,47
Custom services	0,25
Fule, lube and electricity	0,82
Repairs	0,48
Interest on operating capital	0,64
Total operating costs	**39,03**
Allocated overhead costs	
Opportunity cost of unpaid labour	2,19
Capital recovery of machinery and equipment	4,27
Opportunity cost of land (rental rate)	0,02
Taxes and insurances	0,38
General farm overhead	0,78
Total overhead costs	7,64
Total costs	**46,67**
Annual CNMP cost	**1,65**
Percentage of direct costs	**4,23%**
Percentage of total costs	**3,54%**

Source: USDA – ARMS

As 54% of the US pig population are raised in farms with more than 5,000 pigs and the degree of compliance equals 43.6% the total sector cost increase for pigs in the USA to be attributed to the Clean Water Act is 1.08%. If we compare this to the cost increase of full compliance with the Nitrate Directive in the EU which has been calculated in 0.454%, we notice that the CWA obligations in the US have a stronger economic impact on the pig sector.

6.3.3 Impact of Nitrates Directive on EU laying hen farms costs

On the majority of the laying hen farms in the EU the manure production exceeds the limit of 170 kg per hectare and has to sustain costs to get rid of the excess manure. As the dry matter content of the hen manure is significantly higher than pig or cattle slurry it is possible to carry out transport at long distances. The areas of the EU with the highest concentration of laying hen farms (Netherlands, Belgium and Bretagne) contemporarily are characterised by a high density of pig and cattle farms. The consequence is that pig and cattle manure will be spread locally, but hen and broiler manure will have to be placed at longer distance. As the Nitrates Directive is reaching higher degrees of compliance the cost of placing poultry manure increases considerably.

In the following an analysis will be presented containing an estimate of the number of laying hens in the most producers States in the EU which will be affected by the Nitrate Directive (Table 6.13). The countries selected represent 86.5 % of the laying hen population in the EU-15.

Table 6.13: Share of laying hens affected by the Nitrates Directive in selected countries

	Laying hen population	Laying hens on farms exceeding 170 kg/ha	% laying hens exceeding 170 kg N/ha in VNZ	% Laying hens in NVZs	Laying hens in NVZs
France	77.210	54.380	70,4	63,4	24.272
Spain	59.980	55.040	91,8	24,8	12.531
Germany	50.500	39.260	77,7	100,0	30.505
United Kingdom	49.010	39.700	81,0	59,5	19.133
Netherlands	48.420	45.040	93,0	100,0	41.887
Italy	36.120	32.810	90,8	50,2	14.955
Other EU countries	45.290	38.104	84,1	66,3	21.251
Total population	366.530	304.334	83,0	44,9	164.535

Source: elaborated by CRPA on Eurostat data

Considering an nitrogen excretion figure of 0.56 kg per animal place per year (ERM/AB-DLO, 1999) the maximum allowed density of laying hens is 303 animals per hectare. Comparing the farm structure of laying hen farms both by flock size and by acreage size it is possible to estimate the percentage of laying hens which exceed the limit of 170 kg N /ha. As in several member states only part of the territory has been declared as nitrate vulnerable zone, we have to adjust the figures and estimate the hen population in NVZs using the Eurostat REGIO databank. The result of these calculations are presented in the Table 6.13 above, indicating that 44.9% of laying hen in the EU are raising on farms exceeding the maximum limit of 170 kg N/ha.

In order to comply with the Nitrate directive hen farms pay companies specialised in long distance transport. These expenses include the costs of spreading hen manure on distant farm land. The differences between EU member states regarding the costs of manure disposal are significant as presented in Table 6.14. In 2004 these costs were equal to 17 € per ton in the

Netherlands, 6 € per ton in Germany and 9 € per ton in Italy, but were negligible in France and Spain (Van Horne & Bondt, 2006).

Table 6.14: Production costs of shell eggs in 2004

	DE	NL	FR	ES	IT
Hen	16.1	15.6	17.2	15.2	15.3
Feed	36.7	36.2	39.0	40.3	40.2
Labour	5.3	5.1	4.4	3.6	4.2
Energy costs	1.0	1.4	0.5	0.5	0.6
Manure disposal costs	0.9	2.5	-	-	2.3
Other direct costs	3.3	3.5	3.1	2.8	3.2
Depr.+interests	6.7	7.1	5.7	5.7	6.3
Total costs	70.5	72.0	70.4	68.5	72.1

Source: Van Horne & Bondt (2006)

From Table 6.14 it becomes clear that manure disposal costs vary between zero in France and Spain up to 3.5% of production costs in the Netherlands.

As have been already stated, only the Nitrate Directive may create cost implications for the laying hen farms, as the animal welfare directives mentioned in Annex III are specifically focused on calves and pigs. Of course this does not mean that the laying hen sector is not affected by EU animal welfare regulations. As this is going beyond the scope of this study mention should be made only of the regulations which impose the use of enriched cages for laying hens before 2012. This change over will generate considerable costs for the egg production sector in the EU and may affect significantly the competitive position of EU egg production on the world market (Van Horne & Bondt, 2006). It should however be stated that world trade in eggs and egg products is still very limited and has been estimated in 1.8% (Windhorst, 2006). The large majority of eggs are traded between EU countries and among some Asian countries, but very small to negligible quantities of eggs are traded between continents. The only relevant trade which may increase in the future is the trade in egg powder, where countries like Ukraine, Brazil and India may create a competitive advantage in future.

6.3.4 Animal Welfare: evaluated standards and cost implications

Actually, the pig sector is completely ruled at EU by the directives 91/630/CEE, 2001/88/CE and 2001/93/CE, which are part of the Cross-Compliance policy being inserted in Annex III of Regulation 1782/03.

The main aspects of these directives are: prohibition to (a) tie sows and gilts; (b) use a complete slatted floor for sows and gilts; (c) isolate the sow during the period between 4 weeks after insemination and the week before farrowing with a minimum space allowance of 2.25 per m2 for sows and 1.64 m2 for gilt; (d) maximum stocking rates for different pig categories and (e) minimum standards for slatted floors. Of all above mentioned measures the most incisive cost increase may be caused by the obligatory group housing of sows. The reason is that all other measures already have a high rate of compliance in the EU (Enting, 2006).

Therefore, in the following an analysis will be presented of the possible cost increase per kg pig meat of the switch over of individual crates of sows to the group housing, taking also into account the minimum space per head required by the EU regulation.

Two practical examples below illustrate the consequences for a closed cycle pig farm. First, a comparison between the old conventional housing system with sows housed in individual crates with an investment in a new pig farm where pigs are housed in groups 4 weeks after insemination. Second, an adjustment of an existing pig farm to the new housing requirements for sows.

Technical details are presented in Table 6.15 and the economic effects are seen in Table 6.16. The new requirements would cause an increase of the investments in the two pregnancy phases of the sows of 12% per sow place, but as these two phases are representing only 10.8% of the total investment of a new closed cycle pig farm the total investments rise by only 1.3%. The expected increase in total production costs (per kg pig meat) is limited to 0.1%.

Table 6.15: Investments cost for close cycle pig housing

		Housing system with individual crates for sows		Group housing of sows after four weeks of insemination	
	n. places	€/place	Investment €	€/place	Investment €
Insemination 1st phase	46	1,884	86,664	2,025	93,150
Pregnancy 2nd phase	61	1,027	62,647	1,257	76,677
Farrowing	30	3,684	110,520	3,684	110,520
Weaning	285	259	73,815	259	73,815
Gilts in first phase	24	600	14,400	600	14,400
Growing up to 50 kg	368	320	117,760	320	117,760
1st phase fattening	450	480	216,000	480	216,000
2nd phase fattening	720	700	504,000	700	504,000
Other investments			370,862		370,862
Total investment			1,556,668		1,577,184

Source: CRPA

Table 6.16: Difference in production costs by two adjustment strategies

	(1) Investment in a new pig farm which comply with the group housing requirements for sows		(2) Adjustment of an existing pig farm to the new animal welfare requirements of sows	
	Before	**After**	Before	**After**
	€/kg	€/kg	€/kg	€/kg
Feed	0.687	0.687	0.687	0.687
Labour	0.217	0.217	0.217	0.217
Other variable costs	0.254	0.254	0.254	0.254
Total monetary costs	1.158	1.158	1.158	1.158
Interests on ant. Capital	0.014	0.014	0.014	0.014

	(1) Investment in a new pig farm which comply with the group housing requirements for sows		(2) Adjustment of an existing pig farm to the new animal welfare requirements of sows	
	Before	**After**	Before	**After**
	€/kg	€/kg	€/kg	€/kg
Interests and depreciation,	0.162	0.164	0.162	0.172
Total costs of production	1.335	1.337	1.335	1.344

Source: CRPA

An adjustment of an existing pig farm to the new requirements has a more incisive impact on the economy of the farm, as the end solution is not as optimal compared to a new building. The production capacity has been presumed to be unchanged and the pig farmer is only adjusting the pregnancy parts of the farm building. Although the cost increase is higher, the cost impact also in this remains rather limited and well below 1%. The animal welfare directives which are an integral part of the cross-compliance policy does not have a significant impact on production costs.

Considering the pig production cost calculations carried out by Interpig, and the different degrees of compliance among the main EU producing countries, a 0.11% increase has been estimated for the EU pig sector (Table 6.17).

Table 6.17: Production costs of pigmeat and percentage cost increase due to compliance with Animal Welfare Directive

	BE	**DK**	**DE**	**ES**	**FR**	**IT**	**NL**	**UK**
Feed	0,685	0,680	0,696	0,852	0,730	0,994	0,693	0,814
Breeding, vet/med and energy	0,094	0,105	0,159	0,122	0,109	0,115	0,143	0,109
Labour	0,125	0,165	0,200	0,124	0,177	0,137	0,174	0,199
Building, finance and misc	0,342	0,468	0,475	0,409	0,397	0,367	0,452	0,617
6.3.5 Total costs	**1,245**	**1,418**	**1,530**	**1,508**	**1,413**	**1,613**	**1,461**	**1,740**
cost increase €/kg	0,011	0,011	0,011	0,011	0,011	0,011	0,011	0,011
Cost increase	0,90%	0,79%	0,74%	0,75%	0,80%	0,70%	0,77%	0,65%
degree of compliance	80%	90%	80%	50%	50%	50%	50%	95%
% cost increase sector	0,09%	0,04%	0,07%	0,19%	0,20%	0,17%	0,19%	0,02%

Source: Elaborated by CRPA, own calculations and Interpig data

6.4 Simulated impact on competitiveness

This section summarises the trade effects simulated along four scenarios by the GTAP model in response to full compliance in the EU to Nitrate Directive, Animal Welfare and a combined effect of these (scenario 1-3), as well as the effect of compliance to the Clear Water Act in the US (Scenario 4). As the Nitrate Directive is concerned the results are summarised in Table 6.18, whereas the combined effects are reported in Table 6.19.

Increasing costs induced by a full Nitrate Directive compliance in the EU, certainly may affect international trade flows in pig meat and the market shares held by the main exporter countries. These effects have been simulated with the GTAP model.

Table 6.18: Effect of N-Directive on the competitiveness of the pigsector of the EU

	USA	EU15	Japan	ROECD	ROW	Total Export
Canada	0,41%	5,06%	0,27%	0,98%	0,64%	0,46%
USA	0,00%	4,14%	0,27%	0,99%	0,52%	0,69%
Brazil	0,35%	4,34%	0,25%	1,00%	0,63%	1,03%
EU15	-3,10%	0,00%	-1,15%	-3,83%	-3,64%	-3,03%
ROECD	0,39%	4,65%	0,25%	0,00%	0,62%	2,25%
ROW	0,40%	4,25%	0,26%	0,97%	0,57%	1,90%
Total Import	-0,40%	4,37%	-0,05%	-0,71%	-0,86%	0,14%

Table 6.19: Percentage changes in pig meat sector trade due to full compliance to various standards

	Scenario	EU Import	EU Export	exports of which to…				Total world trade
				USA	Japan	Rest of OECD	Rest of World	
1	Nitrate EU: 100%	4,37	-3,03	-3,10	-1,15	-3,83	-3,64	0,14
2	Animal Welfare EU: 100%	0,83	-0,69	-0,60	-0,38	-0,71	-0,83	0,01
3	Nitrate EU: 100% and Animal Welfare EU: 100%	5,24	-3,70	-3,66	-1,53	-4,51	-4,44	0,16
4	Clear Water Act in US: 100%	-0,69	1,85	4,47	2,12	2,06	1,25	-0,65

As follows from the results of Scenario 1, a full compliance with the Nitrate Directive leads to a 3% decrease of both market share and exported volumes of the EU, while the effect on the level of production could feed a 4.4% higher demand for imported pigmeat. In the Japanese market, which is the first world export market, the loss of about 1.15% in the quantities traded by EU would stimulate a increase of the demand for pigmeat coming from Brazil, the US, Canada and other countries at a rate of 0.27% each. In the other OECD countries the decrease of UE export has been estimated in 3.8%, which favours the competitive position of Brazil, Canada and the USA in these countries by about 1% each.

On the whole Brazil's export share gain would be higher than those of the other two main competitors. The gains of the three top exporters range from a maximum of 1% in the case of Brazil to a minimum of 0.3% of Canada. Increases in volume traded by these countries range within the same limits.

Following the results of Scenario 2, Animal Welfare regulations should affect EU competitiveness at a lower extent since its effect on pig farms production cost has been estimated to be limited to only a 0.1% increase. This would entail a 0.8% growth of EU imports and a decrease of exports equal to 0.7%.

Summing up the effects of both standards requirements (Scenario 3), an overall decrease of 3.7% would affect EU export. The loss in quantity on the Japanese market would be equal to 1.5% while export towards other OECD would decrease by 4.5%. As imports are concerned, a 5.24% growth of import is expected in large part due to the higher import flows coming from Brazil (+5.2%). On the whole Brazil would gain 1.2% of his global market share, while a 0.4 and 0.8% increase have been respectively estimated in favour of Canada and the USA.

The previous analysis in paragraph in 5.2.3 has pointed out that the full implementation of the Clear Water Act requirements by the US pig sector would produce higher impacts than those expected in EU due to full compliance with the standards with the Nitrate directive. The different effects are due first to the high share of the US pig herd raised in farms that are eligible to be classified as CAFOs and secondly by the rather new implementation of the CWA which generates a relatively low degree of compliance. The simulation results are presented under Scenario 4. The highest costs of full compliance with CWA regulations by most intensive pig farms, would affect the competitiveness of US on the beef world market entailing a 7.3% decreases of its pig meat exports. This gap left will be covered by the EU (+1.85%) and Brazil (+1.18%), which both would gain market share in particular on the Japanese market. Higher gains in market share are foreseen in the case of Canada, whose export would be stimulated by the increasing demand coming from USA.

6.5 Conclusions

As the pig and poultry sector are most intensive livestock activities in the EU it is quite comprehensible that these sectors are the most affected by the Nitrate Directive. In the present analysis the effects have been quantified only for the pig sector, as poultry farms are very marginally touched by cross-compliance.

The extent to which the Nitrate Directive may create extra costs to the pig sector depends on the pig density per hectare in each Member State, on the percentage of pigs present in Nitrate Vulnerable Zones and on the degree of compliance of pig farmers to the Nitrate Directive. These three data differ very much from country to country and explain primarily the very different sector cost increases for the pig sectors of EU Member States. The overall EU cost increase to be attributed to the pig sector due to attain full compliance with the Nitrate Directive has been estimated at 0.55%.

Such a cost increase has a significant impact on the EU trade balance of pigmeat. Total EU exports will decline by 3% and imports will increase by 4.4 %. This decline of EU competitiveness will favour the exports of Brazil (1%), the US (0.7%) and Canada (0.3%) on the world market. EU imports will increase in particular from Brazil (+4,3%), Canada (+4.1%) and the US (4,1%).

From a comparison with the impact of the Clean Water Act in the US it turns out that this act raises the cost for the American pig sector with 1.08%, an almost double cost effect compared to the impact of the Nitrate Directive in the EU. The reason for this substantial rise of costs has to be attributed to the large percentage of pig affected by this measure and its rather recent application to US pig farms, which still implies a rather low degree of compliance. This rise of costs will cause a fall in US exports of pigmeat of 7.3% and a decline of exports of 4.5%. Canada would gain the most of this situation increasing its exports by 4% on the world market, of which 4.5% more to the US and a 2.1% increase on the Japanese market.

A calculation of the animal welfare regulations for pig farmers in the EU shows, that the cost increase is very limited. The reasons for this minor cost impact are a high degree of compliance with the standards and the limited rise of costs for farmers which still have to adapt their farm to the new legislation. At farm level the cost increase is well below 1% and this generates a rise of costs at sector level of 0.11%. This cost impact evidently causes a growth of imports of only 0.8% and a decline of exports of 0,7%.

As has been expected the Nitrate Directive for the pig farms creates the most substantial burden of costs, in particular in EU Member States with a high pig density and a low degree of compliance.

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7 The impact of cross compliance on the competitiveness of the EU with respect to cereals

7.1 Introduction

When considering the relative share of production traded on the world's market, the cereals sector — namely, for the EU27 mainly wheat and corn as will be discussed below — is one of the most open markets. This implies that the competitiveness issue is particularly crucial in this sector.

Cereals are the basis of the human diet in many ways: directly consumed (e.g. through products cereals based such as bread, pastas and processed food based on starch) or indirectly consumed through animal food (i.e. humans eating animals fed under a cereal diet i.e. granivorous animals such as pigs, poultry). For such reasons, the cereals are recognised as being a "strategic" commodity. Their price is an upstream driver for other products which are in competition with them (i.e. potatoes for starch or the tubers produced by farmers in the Third World).

In this context, this chapter is devoted to the question of the potential impacts on competitiveness of the cereals sector caused by the standards related to cross-compliance since 2005. Whereas a lot of these standards were already pre-existing legal requirement, this was less so for the GAEC requirements, which were part of the cross compliance package as introduced in 2005. Whereas in the previous chapters (which focused on animal productions) the focus was on the impact of the pre-existing SMRs, in this chapter the focus is in particular on the newly introduced GAECs.

As regards competitiveness, the main focus will be on the EU's external competitiveness. Although this is mainly about a comparative analysis between the EU and its key trading partners, within the project also attention is paid to differences between EU member states and differences between farms within member states. Also in this chapter therefore some background information about the heterogeneity in member states and farm types will be given. Moreover, it will be described how the representative farm case for the EU is constructed.

In the trade simulation analysis a host of countries will be considered (often in an implicit way as they are aggregated or covered in the GTAP trade model). This chapter starts with a general description of the main trade patterns in the world cereals market as well as providing an overview of the key countries involved. From the perspective of this project special attention will be given on Canada as a non-EU country for which an extended comparative analysis was made. A detailed annex on Canadian cereals production and the impact of different types of standards on production, revenues, costs, the environment and biodiversity is included in this report (see Part II in Annex) Some insights about the benefits of the changes in standards introduced, or resulting from (improved) compliance to these standards will also be discussed.

This chapter is strongly based on Poux (2007). It is organised as follows: Section 7.2 provides a general description of the world situation for cereals. It also discusses the functioning of the price mechanism and the observed recent price increase (shock). Section 7.3 focuses on worldwide production of cereals and its evolution in the past, with a focus on the EU. Section 7.4 proposes a survey of the CC requirements with regards to their potential impacts on the competitiveness of the sector, applying a broad framework for analyzing competitiveness. Section 5.5 focuses on competitiveness indicators for primary production both for the EU in comparison with its main competitors as well as differences in competitiveness between specialized cereal producing farms in EU-15 member states. Sections 7.6, 7.7 and 7.8 identify and discuss the costs of cross compliance standards (both the SMRs as well as the GEACs) for different farm types in France. Section 7.9 provides the best-estimates of the percentage costs increases in the EU cereals sector, taking into account the specific characteristics of selected main EU cereal producing member states. This section also provides a summary of a more detailed analysis of costs and other impacts of standards similar to the EU's GAEC for Canada. Section 7.10 represents the EU's external competitiveness assessment and reports on three scenario's analysed with the GTAP trade impact simulation model. Section 7.11 closes this chapter with summarizing the main conclusions and implications from the analysis. It also mentions some qualifications to the analysis.

7.2 Description of the cereals sector at World level

7.2.1 The World production of cereals

The word "cereals" comprises a large set of products. The following Table 7.1 indicates the world production for the main grains produced.

In 2003, the overall production of cereals was 2,068 M tons ; Maize, wheat and rice between them, accounted for 87% of all grain production, and 43% of all food calories. While, in 1961 rice was the first cereal cultivated – due to its importance in the Asian diet. But since 1994, the overall consumption of rice remains stable in China, reflecting a qualitative change in the Chinese diet to the benefit of wheat, thus affecting the overall production (source CNUCED)[215]. Maize became the first one in 2005 mainly due to its industrial uses in both animal food (including silage) and plastic. Recently, the US strategy of ethanol produced from maize boosted the uses of this cereal.

[215] — http://www.unctad.org/infocomm/francais/riz/marche.htm

Table 7.1: World cereals production (1961 and 2005 – source FAO)

Grain	2005 (Mt)	1961 (Mt)
Maize	711,762,871	205,004,683
Wheat	630,556,602	222,357,231
Rice (paddy)	621,588,528	284,654,697
Barley	139,220,431	72,411,104
Sorghums	59,722,088	40,931,625
Millets	30,302,450	25,703,968
Oats	24,032,521	49,588,769
Rye	15,202,142	35,109,990
Triticale	12,962,777	0
Buckwheat	2,127,823	2,478,596
Fonio	284,578	178,483
Quinoa	58,443	32,435

The following Table 7.2 indicates the main producing countries, in value and M tons, for the three main cereals: wheat, maize and rice. From the EU member states France has a prominent position as a wheat and maize producer. To a lesser extent also Germany and Italy play a role. With respect to rice neither EU member states nor the EU as a whole plays a significant role.

Table 7.2: Main cereals producers in the World (source FAO, 2005 data - FAOSTAT)

Wheat : Top 10 World producers		
	(Int $1000)	Production (MT)
China	15 027 110	96 340 250
India	11 230 560	72 000 000
USA	8 907 323	57 105 550
Russia	7 425 896	47 608 000
France	5 759 093	36 922 000
Canada	3 984 806	25 546 900
Australia	3 753 970	24 067 000
Germany	3 677 696	23 578 000
Pakistan	3 367 826	21 591 400
Turkey	3 275 580	21 000 000
Maize: Top 10 World producers		

	(Int $1000)	Production (MT)
USA	32 562 540	280 228 400
China	15 396 500	132 645 000
Brazil	4 050 686	34 859 600
Mexico	2 382 100	20 500 000
Argentina	2 265 900	19 500 000
India	1 684 900	14 500 000
France	1 536 861	13 226 000
Indonesia	1 395 993	12 013 710
South Africa	1 393 935	11 996 000
Italy	1 234 276	10 622 000
Rice : Top 10 World producers		
	(Int $1000)	Production (MT)
China	39 193 840	185 454 000
India	27 478 290	129 000 000
Indonesia	11 499 260	53 984 590
Bengladesh	8 531 902	40 054 000
Vietnam	7 740 996	36 341 000
Thailand	5 751 270	27 000 000
Myanmar	5 218 745	24 500 000
Filipino	3 152 548	14 800 000
Brazil	2 799 143	13 140 900
Japan	2 340 767	10 989 000

China is the first World producing country, mainly on rice but also on wheat (1^{st} producer, before India and the USA) in clear relationship with its share in the World's population. India adopted the same strategy.

7.2.2 The World market of cereals

7.2.2.1 General view

At World level, around 277 MT of cereals are traded out of 2,068 MT produced, meaning a share of 13% of the production sold/purchased on the World market (2002/2003 data). In general terms, this means a 87% rate of domestic level production of cereals (i.e. non traded on international markets), corresponding to an overall strategy of self autonomy on this critical commodity.

The following Table 7.3: Top 10 players on the cereals World market (FAO 2002 data) shows the main exporters and importers, all cereals aggregated (in MT). The member states of the EU are considered as autonomous countries (i.e. the EU is not one producing area).

Table 7.3: Top 10 players on the cereals World market (FAO 2002 data):

Top 10 importers (MT)		**Top 10 exporters (MT)**	
Japan	26 605,4	USA	82 204,1
Mexico	14 092,1	France	27 937,0
South Korea	13 388,8	Argentina	19 583,6
Spain	12 299,7	Australia	19 343,6
Egypt	10 322,3	China	15 014,5
Italy	9 803,1	Canada	14 665,8
China	9 430,9	Russia	13 532,0
Algeria	8 610,9	Ukraine	12 175,2
Indonesia	7 927,2	Germany	10 959,3
Brazil	7 809,2	India	9 569,9

Note that China is the only country which is at the same time exporting and importing (though being a net exporter). EU member states show up as exporters as well as importers. Italy and Spain are significant importers. France and Germany are important exporters. On the export side the US (by far the main exporter), Argentina, Canada and Australia are significant players.

The exporting countries are logically characterized by the presence of large amount of arable and productive land on the one hand and are all situated in the temperate area on the other hand. It means that the natural assets are prior with regards to the commodity production. The population density is also a factor affecting the capacity to export, though India and Germany are also exporting cereals. In any case, the technological level in the agricultural sector is fairly advanced, meaning that there is no exporting country with manual agriculture.

The main importers falls in three categories:

Developed countries with a relative low share of arable land on their territory (e.g. Japan, South Korea, Spain, Italy). For such countries, the rationale of importing is simply to compensate an absence of natural asset with other traded products outside the agricultural sector. Ricardo’s theory of comparative advantages can fully be applied in this case, across sectors (agriculture vs. industry/services).

Developing countries for which the population density is simply too high compared to the producing capacity. Egypt is the most obvious example in this case, with only 3% of its territory being arable. Algeria also falls in this category. In this case, the issue is not of comparative advantages but more of structural disadvantages.

Intermediate countries, under the process of development, are adopting a comparative advantage strategy, though the would be able to produce cereals on their land (i.e. they would have enough land for such purpose); they prefer to allocate their agricultural production factors to other commodities, adopting an entire Ricardo's market strategy in the agricultural sector.

Going into further detail, one should distinguish the rationales underlying the rice market on the one hand and the wheat and corn markets on the other hand.

7.2.2.2 The rice market

The rice (paddy) market is rather limited in rough terms, as only 25-27 MT are traded in average, thus representing around 5-7% of the overall production. Note that as the rice market is mainly directly devoted to human consumption, with a high cultural value, it is not directly competing with other cereals. This characteristic differs from cereals used for animal food for which industries can jump from wheat to corn or barley or even “cereals substitutes” (e.g. manioc, dry sugar-beet by-products) with regards to the best price. It means that a Chinese or a Japanese does not really choose between rice and, say, wheat with regards to price issues (the quality of the product can be much more a driver). This being said, on the longer term, shifts on cultural diets can be observed (from rice to wheat in Asia, from tubers to wheat in tropical Africa). It does also not preclude rice and other cereals markets to indirectly interact: the products are substitutes although the degree of substitutability is depending on all kind of factors like (strong shifts in) relative scarcity, trade distortions, and cultural consumption preferences.

75% of the exporters are found in the Asian countries (Thailand, Vietnam, Pakistan, India and China). The USA are the other competitor on the World market. The importers are more displayed in the World, with three main types:

The Asian countries (representing 35% of the whole imports, i.e. a regional market), the exchanges allowing to stabilise the high level of consumptions (above 80 kg/head/year in average).

The sub-tropical countries (in Africa or South America e.g. Brazil), which are net importers at relatively high levels (40-60 kg/head/year)

The developed countries, for which rice is a complementary cereal (below 10 kg/head/year).

7.2.2.3 Wheat and maize : production and markets

The following Table 7.4 shows the share of these two cereal commodities in the whole cereal production and trade; excluding rice (i.e. mainly barley and sorghums in addition to wheat and maize).

Table 7.4: Production, trade and stocks for wheat and maize (2005-2007)

I. Whole cereals (excluding rice)						
Crop year	2005/06	% all cereals (exc. Rice) [I]	2006/07	% all cereals (exc. Rice)	Forecast 2007/08	% all cereals (exc. Rice)
Production	1601	100%	1567	100%	1666	100%
Traded	213	13%	215	14%	217	13%
Uses	1612	101%	1631	104%	1674	100%
Stock	313	20%	249	16%	242	15%
II. Wheat						
Crop year	2005/06	% all cereals (exc. Rice) [II/I]	2006/07	% all cereals (exc. Rice)	Forecast 2007/08	% all cereals (exc. Rice)
Production	620	39%	591	38%	623	37%
Traded	109	7%	107	7%	107	6%
% wheat on traded cereals		51%		50%		49%
Uses	623	39%	609	39%	622	37%
Stock	134	8%	115	7%	117	7%
III. Maize						
Crop year	2005/06	% all cereals (exc. Rice)	2006/07	% all cereals (exc. Rice)	Forecast 2007/08	% all cereals (exc. Rice)
Production	695	43%	694	44%	746	45%
Traded	78	5%	85	5%	84	5%
% maize on traded cereals		37%		40%		39%
Uses	700	44%	726	46%	755	45%
Stock	125	8%	94	6%	85	5%
IV. Wheat+Maize (II+III)						
Crop year	2005/06	% all cereals (exc. Rice)	2006/07	% all cereals (exc. Rice)	Forecast 2007/08	% all cereals (exc. Rice)
Production	1315	82%	1285	82%	1369	82%
Traded	187	12%	192	12%	191	11%
% wheat+maize traded cereals		88%		89%		88%
Uses	1323	83%	1335	85%	1377	83%
Stock	259	16%	209	13%	202	12%

All figures in MT (million tons)
Source : Conseil International des C˘r˘ales (figures on 26/04/2007)

All together, wheat and maize represent 82% of the cereals produced without rice (60% if rice is counted). Out of the 1,600 MT produced on the period studied, only 13% is traded (around 215 MT); wheat and maize represent a bit less than 90% of the traded cereals (80% if traded rice is counted), wheat being more traded than maize (respectively 50% and 40%). As a conclusion, we can consider that focusing on wheat and maize is relevant for the purpose of or analysis, as they are the key cereals traded on the world market.

The following Table 7.5 shows the main exporting countries for these two commodities. The EU-15 is now for convenience sake considered as one single entity.

Table 7.5: Main exporters for wheat and maize

Wheat			
(MT)	2004	2005	2006(*)
USA	28,2	26,9	26,2
Australia	15,8	15,2	12,9
Canada	15,4	15,5	20
European Union	13,6	14,2	15,8
Argentina	13,1	8	8,7
Total top 5	86,1	79,8	83,6
Total World	109,8	107,7	108,6
% Top 5/World	78%	74%	77%
Maize			
(MT)	2004	2005	2006(*)
USA	46,8	51,1	55,5
Argentina	12,4	11,4	11
China	5,6	5,9	4
Brazil	2,7	1,2	3
Ukraine	2,2	2,6	2,1
South Africa	1	1,8	1
Canada	0,3	0,3	0,3
European Union	0,2	0,2	0,1
Total top 5	69,7	72,2	75,6
Total World	75,8	78,5	81,5
% Top 5/World	92%	92%	93%

(*) forecast

Source : Conseil International des Cˇrˇales, figures on 24/11/06

The Table 7.5 shows that the USA dominates the market for both wheat and maize (for the latter, their share is more than 50% of the overall production). The EU is a key player only for the wheat market while it is quite marginal for the maize market (it is even a net importer). In general terms, the two markets are concentrated, the top 5 exporting countries counting for 80% for wheat and more than 90% for maize.

When comparing this Table 7.5 with the one of the main producers (see Table 7.2, one conclusion is that the main exporters are not necessarily the main producers, with the exception of the USA. For example, for wheat Australia has 12% share of the world export market but only 3% of the world production. This country exports more than 60% of its production. It means that the cereal market in a sense can be interpreted as a ‘marginal’ market rather than a ‘structural’ market: it would be generally difficult to feed the world relying only on trade (or production surpluses): the exporting countries can not supply the whole potential demand and, in any case, a more open market would not probably mean a significantly different share of traded cereals at the world level as the physical limits should be reminded.

For economic assessment, this has importance since the marginal costs might not be mixed up with the opportunity costs. As the marginal costs are dealing with those of the last producer playing on the market (for wheat, the one contributing to the most efficient 13% in terms of production cost/ton), the opportunity costs are, theoretically, those meeting a potentially increased demand at the world level, are likely to be significantly higher than the present marginal costs driving the market. Moreover, these marginal costs are may significantly change (due to for example supply, weather and demand shocks), whereas average costs of cereals production are likely to behave in a more stable way. This has led several authors to criticise the use of the world market price as an indicator of competitiveness for the whole set of farms in the world: assuming that these (marginal) farms would play a dominant role on the world market, then the world price would be much higher (e.g. the economic concept of an upward sloping aggregate supply or marginal cost curve).

As regards the price evolution of cereals recently some significant changes took place, which can be partly, but not solely explained by the strongly increased use of cereals for biofuels production. After a stabilisation following the wide price fluctuations of 2003/2004 recently the short-term developments have been marked by significant price increases. Also over the medium-term, world agricultural markets are projected to be essentially supported by rising food demand driven by an improved macro-economic environment, higher population, urbanisation and changes in dietary patterns. Combined these factors set the stage for a strengthening of world demand and maintaining a low stock-to-use ratio. Cereals trade is likely to expand, particularly in developing economies, driven by rising income, diet diversification and higher demand for livestock products and feeds, allowing for a gradual, albeit moderate, price increase over the medium term.

7.3 The EU production of cereals and market

7.3.1 Production

The production of cereals differs amongst EU country, as shown in the following Figure 7.1. Within the EU four countries dominate the production – France, Germany, Poland and Italy – representing all together 54% of the EU27 production. France alone is 22% of the production. Figure 7.1 provides an overview of the evolution of cereals production at member state level. The Figure 7.1 not only emphasises the role of France as a dominant producer, but also shows the still increasing productions in France and Germany, whereas for most other member states production seems to be roughly stable. On the long term, this share of production has been reached through a relative specialisation of producing countries (notably France).

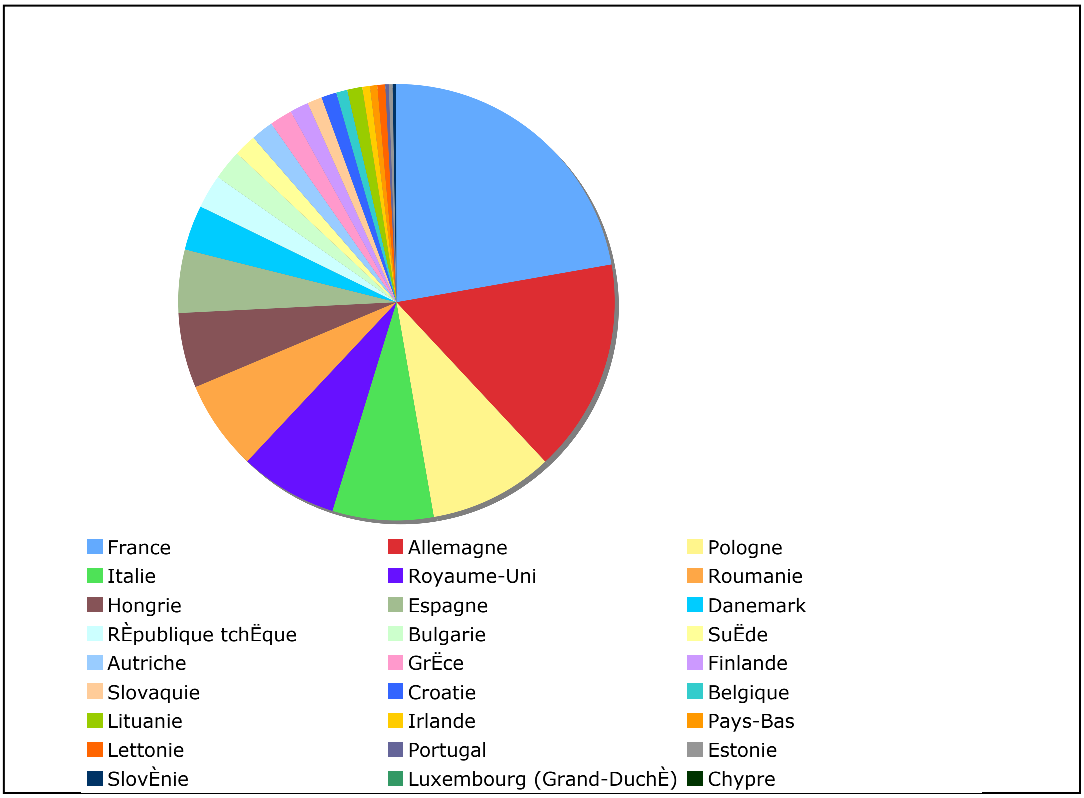


Figure 7.1: Breakdown of cereals production across EU MS in 2005

Eurostat data, no data for Malta

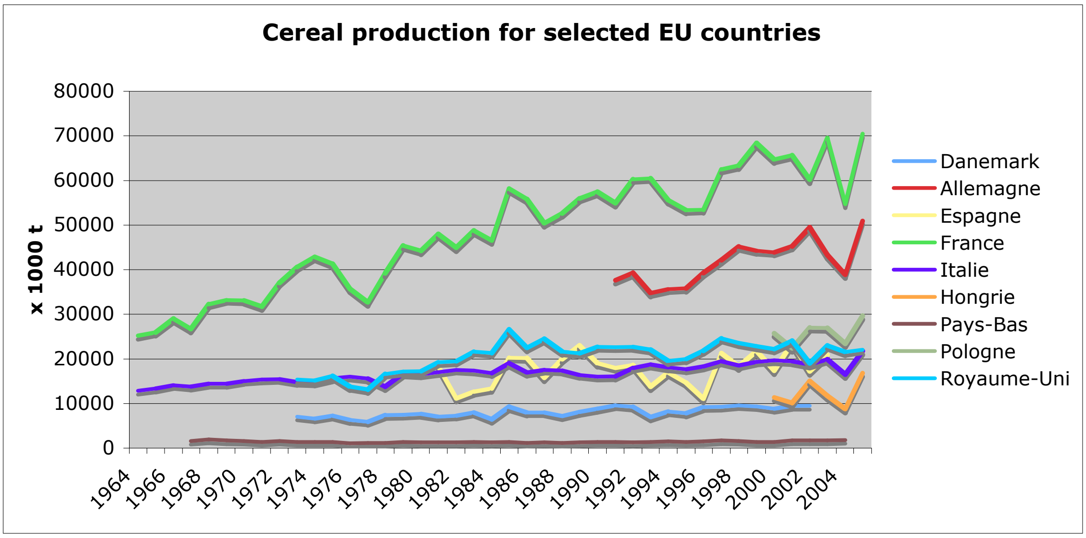


Figure 7.2: Cereal production for the main EU producers (Eurostat)

7.3.2 Uses and export/import balance

In Europe as a whole, about 60% of the cereals it produces are used for animal feeding. Figure 7.3 shows the balance of export/import of cereals as a whole:

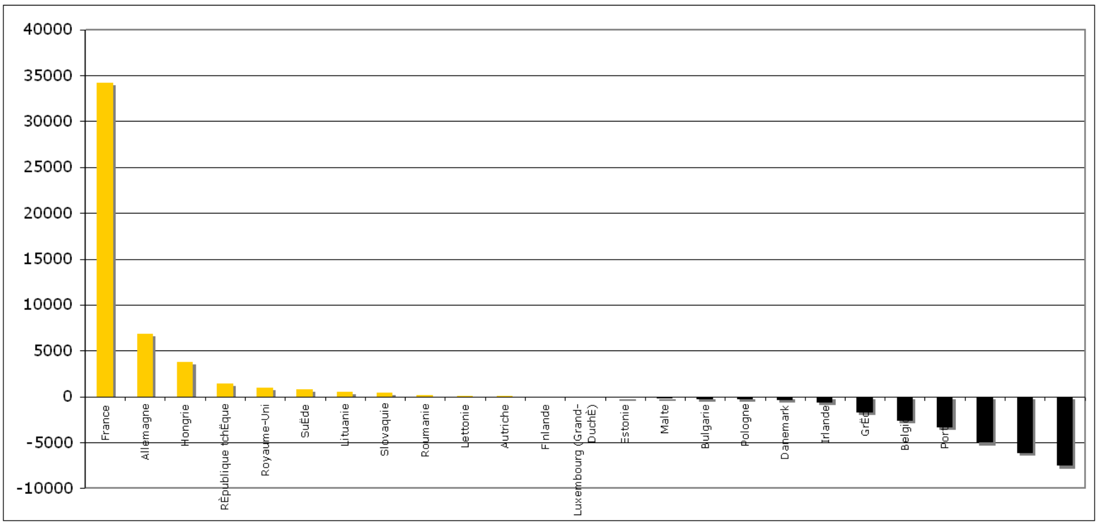


Figure 7.3: Export - import balance for EU27 x1000 tons - 2004 (2003 data for Spain and Belgium)

Source: Eurostat

The market is dominated from far by France, which represents alone 70% of all exports. Germany is the second significant player with only 13% of exports. On the other side, the importers are Spain, the Netherlands, Italy and Portugal.

7.4 Interpretation of the EU cereal sector accordingly to the conceptual competitiveness framework

The project designed a common analytical framework[216] for the sectors analysed in the study.

The following lines apply this framework to the cereals, with regards to the general overview presented in the above section. We propose a discussion briefly going through the items listed in the Figure 7.4. For practical and fundamental reasons, some items are clustered in the analysis proposed.

[216] Mathijs E. et al. (2007) Framework to analyse the impact of standards on external competitiveness of European agriculture, D12.

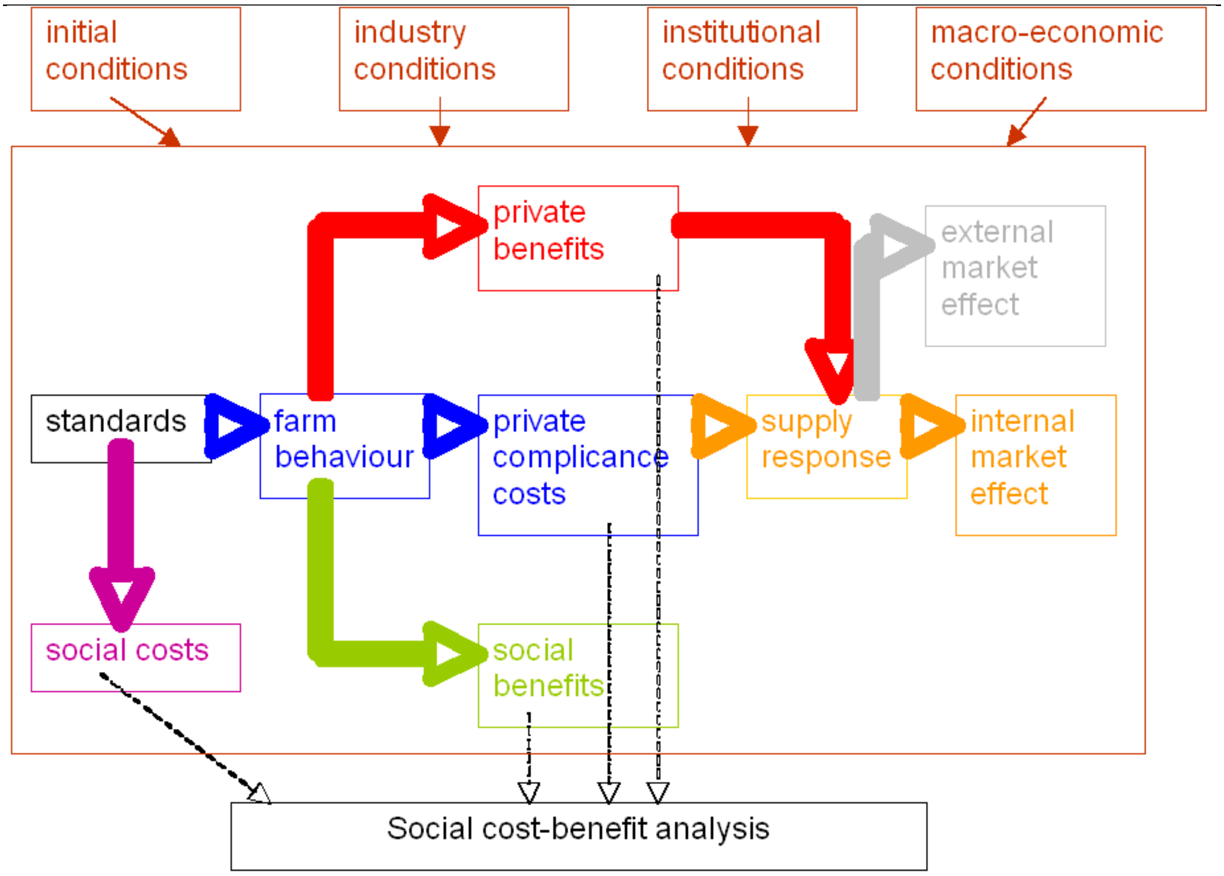


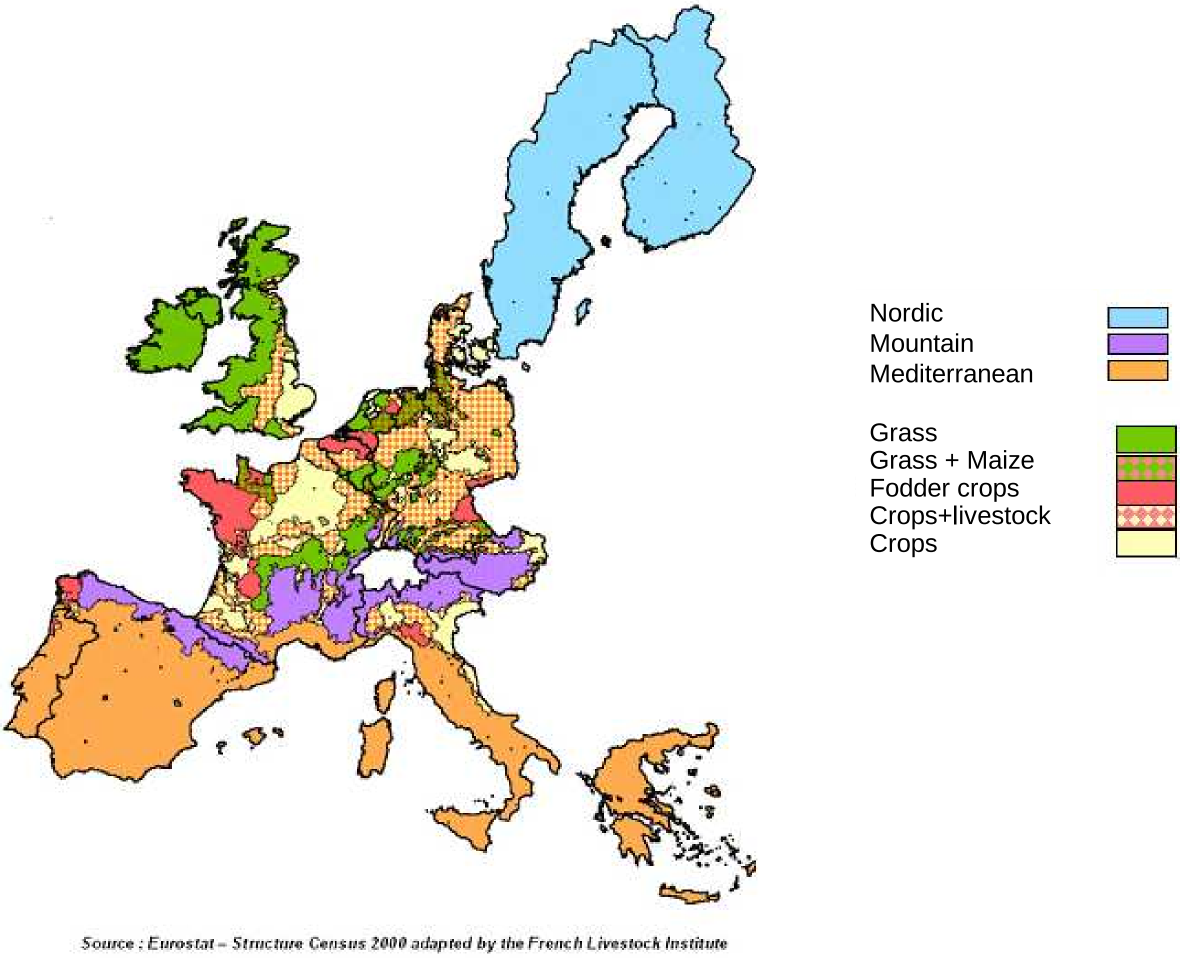
Figure 7.4: General framework for analyzing competitivenes

7.4.1.1 Initial conditions

The agronomical conditions are prior in the production of cereals. Logically, the production is concentrated in the most favoured areas of Europe, i.e. those suitable for mechanisation and with favourable climate (not too dry neither too humid). The rich plains of continental and central Europe are the typical cereals basins.

Alongside with the natural conditions, the socio-economic legacy is quite influent as the cereal production requires large land and mechanisation, generally associated to anciently specialised agrarian systems.

The following Map 7.1 from Institut de l'élevage shows that the distribution of specialised cereal systems is quite concentrated in Europe (EU 15 only available).



Map 7.1: Distribution of farm types across EU 15

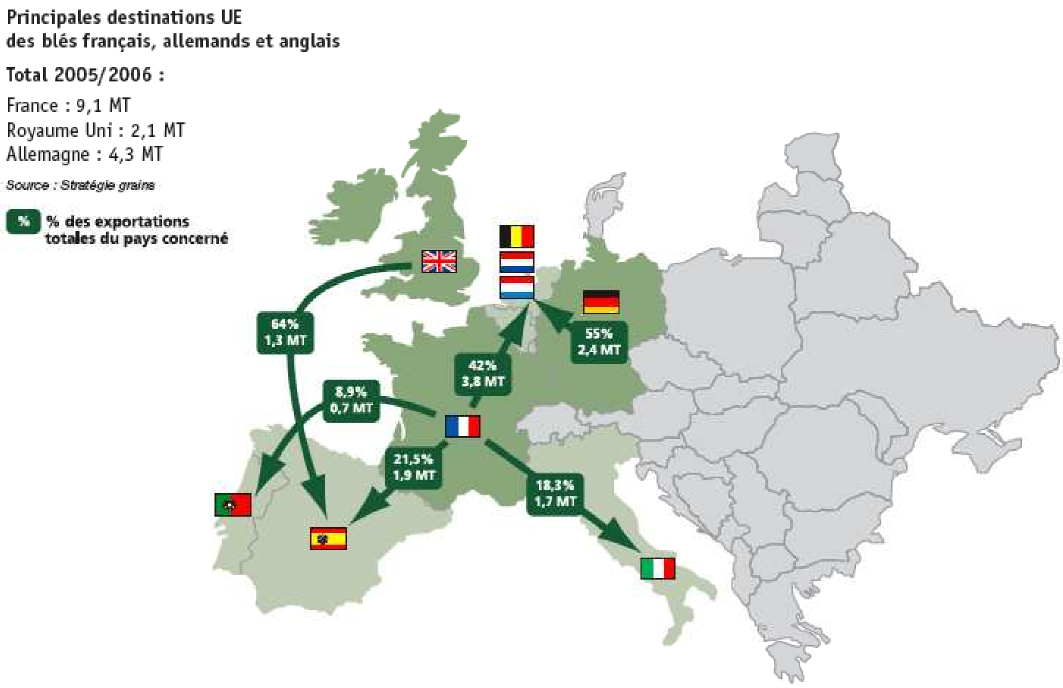
Specialised cereals-crops systems are in the yellow areas

The Map 7.1 shows how France is the country with the largest areas of specialised crops systems, notably in Bassin Parisien and South-West. Eastern Anglia, central Germany and Po Plain in Italy are the other main cereals areas in EU.

7.4.1.2 Industry conditions

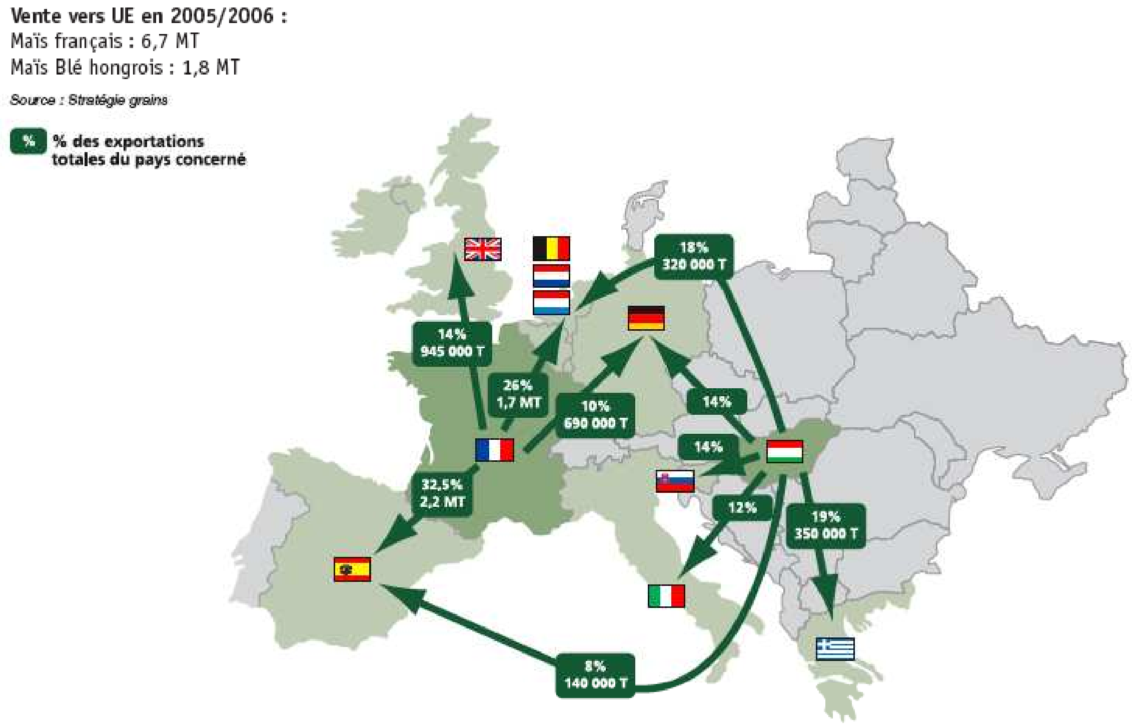
In Europe as a whole, 62% of the cereals is used for animal food. As cereals are a dry commodity, it is rather easily transported across Europe under the frame of coarse grains. Thus, the industries of cereals are frequently distributed near the main consumptions areas, which are the industrialised livestock areas in Europe. This explains why the main importers are also large livestock producers (i.e. Spain, Italy and the Netherlands).

This is reflected in the following Map 7.2.



Map 7.2: Map of export flows intra EU for wheat (2005-2006)

Source: stratégie grain



Map 7.3: Map of export flows intra EU for corn (2005-2006)

Source: stratégie grain

In the recent period, the rising issue undoubtedly is the one of biofuels, which is expected to cover 10-15% of the crop growing area.

7.4.1.3 Institutional conditions

The dominant role of France in the EU cereal market stands on strong institutional organisations such as Association Générale des Producteurs de Blé (AGPB) or Association Générale des Producteurs de Maïs (AGPM) which lobbying towards farming unions, ministry of agriculture and Europe is well organised.

The French cereal sector has strong research and technical institutes which are involved in the minimisation of production costs mainly based on the still intensive patterns, while the extensive ones can be competitive at the micro-economic level (i.e. one individual farm might favour the minimisation of production costs per ha), but not at the scale of the production basin at a whole, while a certain density of production is still looked after in order to reach scale economy. Thus, it is paramount to have in mind that the cereal competitiveness still is based on increased yields in Europe rather than on expanded surfaces.

This institutional condition is important to keep in mind in order to understand that the cereal sector in France is quite influent on the one hand and is active in maintaining the role of main producing country in Europe.

7.4.1.4 Macro-economic conditions, Internal and external market effect

It is paramount to keep in mind that the EU market is organised under the rule of the Community preference. It means that any country in European Union is obliged to buy its wheat or maize in priority to another EU member state, even if it could find cheaper commodity on the World market. This tends to consider the EU as a single market, in which the internal demand is firstly met by internal supply. This has an important consequence for our analysis, as the competition on the World market will mainly involve surplus supply.

With regards to the structure of importers / exporters EU as a whole exports around 15 MT cereals, mainly wheat (see Table 7.5). Meanwhile, the overall imports intra Europe represent around 30 MT. This correspond to an extra EU export mainly fed by the main EU producers of which is France representing alone around 35 MT exported. This can be interpreted as main EU exporters (i.e. France, Germany, Hungary – see **Map 7.3**) firstly supplying the EU market while the external market is fed by the last player able to feed it, i.e. France. This analysis supports an analysis of external EU competitiveness with a strong focus on France. Of course, this does not mean that France is the only exporter outside the EU, while the most competitive producers will be displayed in other areas in Europe (e.g. East England), but it can be assumed for the support of the analysis that the market functions ‘as if’ France was the last player on the external market.

7.4.1.5 Standards

Compared to other commodities, cereals are not consumed directly by humans, but are processed.

The standards should be examined in relationship to the main uses:

for bakery and pastry industry, the main standards are related to the protein rate (suitability for making bread), which is directly related to the fertilisation strategy (higher protein rates require sustained N fertilisation)

for animal food industry, which is dominant, the energy content is the most important standard.

The risks of mycotoxins and plant protection products residues are the main ones associated to cereals. Nevertheless, compared to other products, sanitary requirements can be interpreted as being less constraining as the dry character of the product limit the sanitary risks compared to dairy, meat or fruit and vegetable products which are much more subject to decay.

7.4.1.6 Farm behaviour, private benefits and supply response

The farm behaviour will mainly be influenced (i) by its ability to play on the EU market and (ii) the opportunity to supply on the market. On this ground, three main situations can be described:

- Competitive and specialised farms will maximise their share on the EU market, by maximising the production per labour unit. The combination of land enlargement per farm and intensification leading to increased yields seems the dominant strategy. The private benefits of these farms will be relatively dependant on the trade of cereals.

- Mixed farms might still produce cereals for self use and agronomic reasons, with regards not only to price signals, but also to the overall balance of the farm and notably its autonomy. The private benefit of such farms does not primarily rely on cereals but mainly on livestock productions (and the derived shadow price value of cereals production this generates).
- Farms ‘opting out’ for cereals production, because they are not able to compete on the market. Livestock farms in grassland regions for example and/or outdoor systems typically fall in this category. For such farms, the private benefit is maximised with low price for cereals.

The supply response is mainly driven by the specialised systems. The CAP reform of 2003, while introducing decoupled payments is likely to have further strengthened the supply response from specialised systems.

Private compliance costs will be analysed in the following section.

7.4.1.7 Social benefits and costs (qualitative analysis)

As stated in the introduction, the cereal price is an upstream driver for several socially sensitive products. Even if their share in the EU diet is decreasing, cereals based products such as bread, pasta or polenta will have a direct impact on the retail price index (‘food basket’). In addition, while the cereals are one major cost in animal food (up to 70% in outdoor systems), they also indirectly influence the price of the animal products displayed on the market.

Nevertheless, the social benefit for the consumer is not directly linked to the production price received by cereal farmers, as it has been shown that the intermediary agents might capture part of the added value. Indeed, the decrease of producers’ price on the long term is going along with an increase of the consumers’ price at end, due to extra costs / benefits in the food chain.

This statement illustrates the difficulty to simply analyse the costs / benefits independently from the agent considered: the gap between low cereals price and high price for the consumer will be a cost for this latter, but certainly a benefit for the stock holder of agri-food industries.

7.5 Farm level competitiveness: comparative analysis of cereals production costs between the EU and some selected key competitors

Trade and competitiveness are driven by differences in relative costs of production or profitability (see Jongeneel et al, 2006, Deliverable 11 of this project). Although the main focus is on the EU’s external competitiveness with key trading partners, in this section information will be provided both about competitiveness within the EU (internal competitiveness) as well as competitiveness of the EU externally. The first step is helpful in better accounting for the heterogeneity within the EU between member states as well as different farm types and farm structures (farm scale). The EU is not a monolithic whole, but comprises different member states. Even when a kind of representative country or firm approach will be used, it is recognized that this needs motivation and being put in a wider perspective in order to appropriately grasp the sensitivity of the results to the assumptions made.

In their paper Thorne (2005) examined the competitiveness of cereal production in selected EU member states, during the period 1996 – 2000. Since they mainly focused at farms their selected competitiveness indicators were profitability and costs of production. Their analysis is based on data from the Farm Accountancy Data Network (FADN). More in particular they focused on Farm Type 4310 – specialist cereal, oilseed and protein (COP) producers. According to their results productivity levels in the UK, Ireland and France were consistently higher than in competing countries Denmark, Germany and Italy.

Non-surprisingly, the opportunity cost of owned resources has a major impact on the competitiveness of cereal production within the EU[217]. Cash costs as a percentage of total output were lowest in Italy but in terms of total economic costs, including an opportunity cost for all owned resources, Italy had the highest cost structure amongst the countries examined.

These findings of Thorne imply that the competitiveness is sensitive to the time horizon chosen. Long term competitiveness scores (including the impact of imputed costs on farm profitability) might be different from short-term indicators (where profitability and cost of production only are based on variable costs and exclude fixed costs and the included imputed costs (see also Jongeneel et al 2006, Deliverable 12 of this project). Moreover it makes clear that in general it is difficult to measure crop specific competitiveness with great precision. Year to year weather fluctuations and differences in plant stress due to diseases will affect competitiveness indicators. One way to avoid or at least minimize these impacts is to normalize over years as was done in the Thorne (2005) analysis. However this does not solve for all things. Even in case of using specialized farms (as was done here), for example, there still remains the task to allocate some costs (and benefits) to a specific crop or activity, which always include some arbitrariness.

Figure 7.5 presents the comparative costs of production and returns for cereal farms measured in terms of costs as a percentage of total cereal production output and allocated direct payments. The Figure 7.5 shows the five-year (1996-2000) average cost shares for specialized cereals enterprises for six selected EU member states. The individual cost components for each of the countries is outlined in Thorne (2005). Cereal producers in Italy had the lowest cash costs as a per cent of output (Ireland is the second lowest) cash costs. Note that cash costs in France, Germany, the UK and Ireland are rather similar to each other, whereas cash costs in Denmark are higher.

When accounting also for imputed costs France appears to be the most competitive country as compared to the other member states presented. Note that in the latter case all selected member states have costs exceeding revenues from cereal production (implying a negative profitability). The specific imputed charges for owned labour and land are significantly variable between countries and alter the longer term competitive outlook.

[217] This phenomenon was also recognized and more extensively discussed in Deliverable 11 resulting from this project, which explored and devloped a general framework for competitiveness analysis.

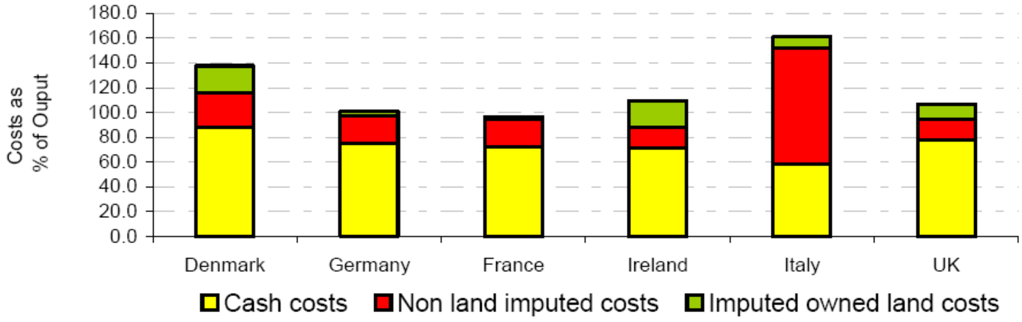


Figure 7.5: Costs as a percentage of output for selected cereals farms in six EU member states (source Thorne, 2005, 9)

As noted before France is a key surplus production area in the EU. Moreover, from the analysis of Thorne (2005) it follows that France is comparable to other key EU cereal producing member states when focusing on cash costs of production, while it has the lowest total costs (cash costs and imputed costs). For this reason it was decided in the subsequent analysis to focus on France as the representative case for the competitiveness analysis of the cross compliance standards.

Comparing the EU with its key external trade partners a comparative study on costs of cereals production by the French Association Générale des Producteurs de Blé is informative. The main producing and exporting countries have quite different yields, due to natural and socio-economic conditions (among which population density). Europe on the one hand and the "new" countries – including the USA – on the other hand show opposite strategies. While Europe competitiveness is tending to maximise the production per hectare – due to a relative scarcity of agricultural land per inhabitant – the Australian, Argentine, US and Canadian competitiveness is based on minimising the (labor) costs per hectare. The following table derived from the French study illustrates this fact (see). Yields are relatively high in France, costs per hectare are relatively low in the non-EU countries presented. The numbers in this table give an indication of cost of production differentials but that in the simulation analysis the costs of production as present in the model structure of GTAP is used, which is much more detailed.

Since in the end these countries compete on the same market, the ultimately relevant data is not the cost/ha but the costs per unit of output (costs/quintal), which are analysed in the following Figure 7.6

Table 7.6: Comparison of yields and costs/ha for the main exporting countries

	Yield (q/ha)	total costs/ha
France	83	1 183 €
Argentina	34	443 €
Australia	26	275 €
Canada	26	342 €
USA	26	391 €

Source: AGPB 1998-1999 crop year

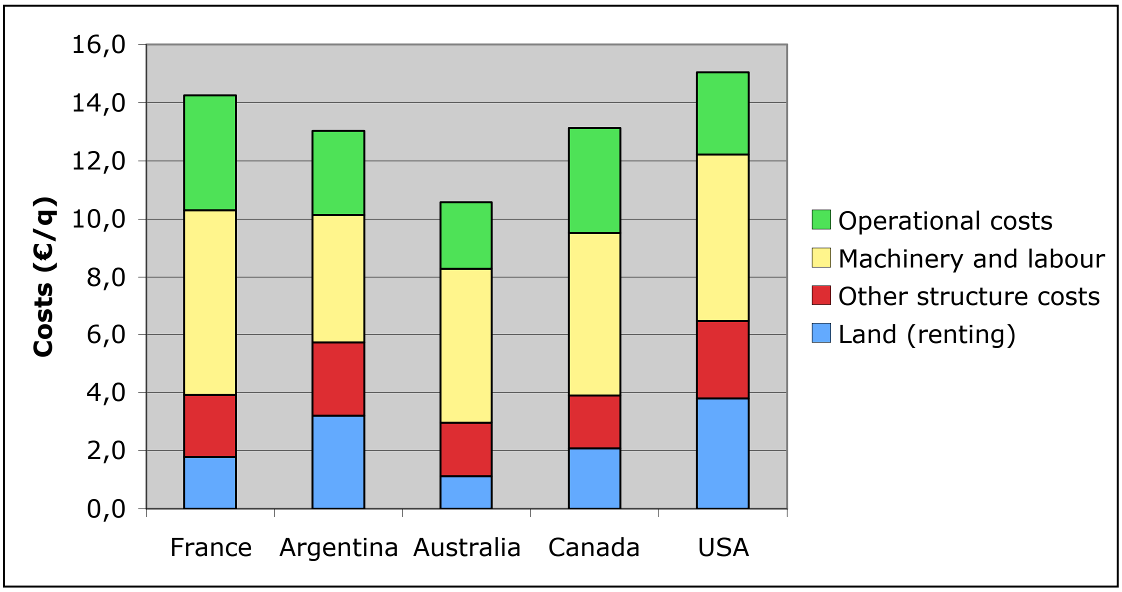


Figure 7.6: Costs structure of the cereals production

Source AGPB, 1998-19999 data

At the lower end, Australia is the most competitive country (on the year studied), with 10.6 €/q while the other countries range between 13 and 15 €/q. The Figure 7.6 shows that the relatively similar costs are reached through different costs structures. In the USA, for example, the land costs are relatively high (circa 25% of all costs), due to a high 'consumption' of land per quintal produced (another way to label the low yields) while, symmetrically, they are relatively low in France (12%). Reciprocally, the operational costs are higher in France (±30% of all costs) than in the USA (< 20%).

Meanwhile, the machinery and labour costs levels are rather similar across the countries studied, expressed in €/q. While the breakdown between the two items is not available, one can only make assumptions on how this result is obtained. While the French cereals will stand on more intensified cropping patterns (i.e. more agricultural operations and labour/ha), the higher costs are completely compensated by the higher yield. Said in other words, the machinery and labour costs are more or less fully proportionate to the yield, with linear relation.

This costs structure makes the different systems differently sensitive to variations in yields and prices. While the French (European) cereals need to cover the high costs with a high production, the new countries systems might be economically more resilient. Moreover the variation in the mix of imputed costs over countries might lead to differences in competitive behaviour over time. For example, assuming that land markets (land prices) more easily adjust than labor costs, land intensive production systems might have a higher competitive potential in the longer run.

7.6 Review of SMRs and GAECs potentially impacting the EU cereal sector: the case for France

All the previous section leads to two key conclusions for the purpose of our analysis:

- while Europe still is a market ruled by the Community preference (see *Macro-economic conditions, Internal and external market effect*), the internal competitiveness is influenced by the relative production costs of different farms, leading to contrasted strategies (see *Farm behaviour, private benefits and supply response* above)

- the external competitiveness can be analysed as a surplus market, determined by the last player, being France in that case (see *Macro-economic conditions, Internal and external market effect*).

These statements justify an analysis focused on the potential impact of cross-compliance related standards on the French cereal sector. Moreover, the allow an in depth discussion on how standards might affect production. This is in particular relevant since standards are imposed on farmers rather than countries and therefore the first are the proper entities of analysis. The impact of standards will differ depending on farm heterogeneity, as will also be made clear below[218]. The analysis and material provided in this chapter are based on those available in Deliverable 5 (Country report: France), selected, amended and organised for the cereals sector.

7.6.1 The cereal sector: a concentrated and specialised sector in France

While some directive applies to regions (e.g. nitrate or bird and habitat directives) and sectors, it is important to have a survey of the production of cereals in France in order to understand which farms will mostly be relevant for our analysis.

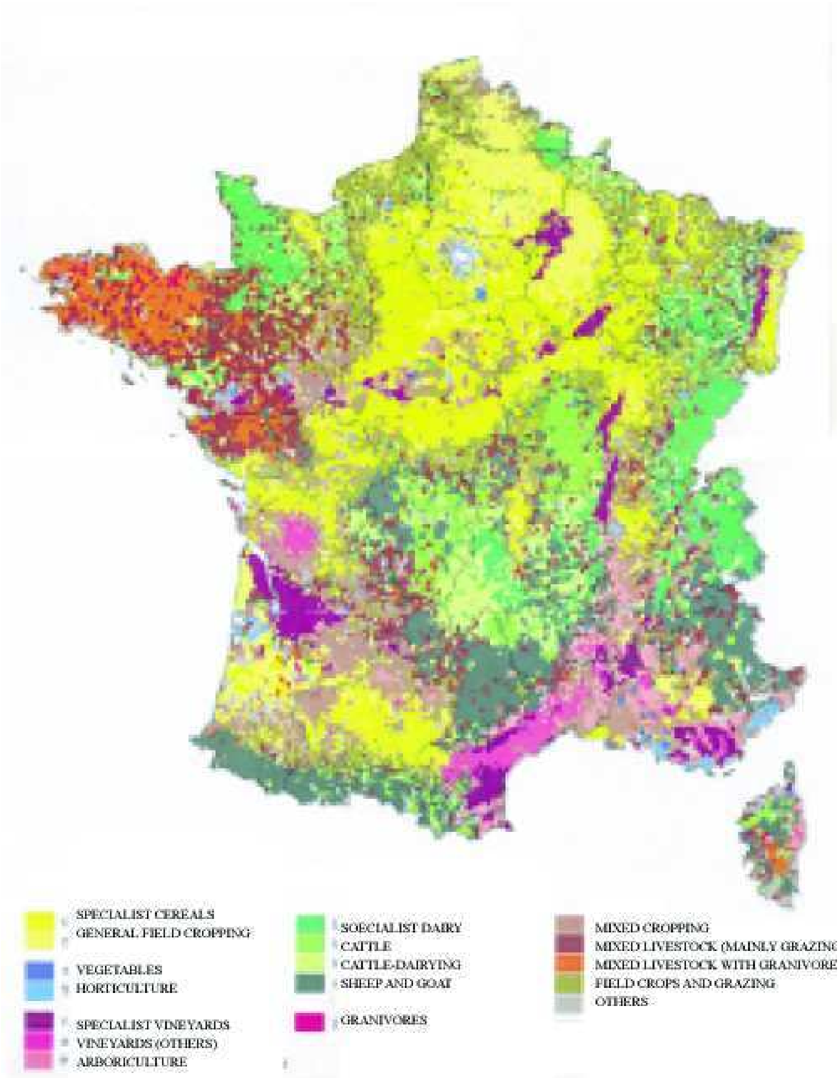
Since most of the French farms produce some cereals, the production is, indeed, concentrated in some specific farm types and regions. According to the results of French National

[218] For example, where the previously presented member state's costs of production indicators relied on specialized cereal farms, this farm type is not the only category to be considered when analysing a member state's cereal sector. A cereals sector comprises various farm types and farm scales, which should be accounted for in the determination of the final percentage costs increase estimates associated with the considered standards.

Agricultural Census 2000, more than 80% of the area devoted to cereals is found in 4 main farm types:

- 48% of UAA in cereals are run by “specialist cereals” farms;
- 14,6% of UAA in cereals are run by “field crops-grazing livestock combined” farms;
- 12,5% of UAA in cereals are run by “general field crops” farms;
- 6,6% of UAA in cereals are run by “specialist dairy” farms.

As shown on the following Map 7.4, cereal production is localised in some regions.



Map 7.4: Repartition of dominant EC farm types on the French territory 2000)

(Specialised cereals/crops farms are represented in yellow)

In terms of volume, the production is logically concentrated in the most favourable zones. In 1999, 10 departements (Nuts 3 division) out of 90, representing around 15% of UAA represented 37% of the whole wheat production and 43% of the maize production.

About three-fourth of Ile de France's UAA and two-third of Centre's one are occupied by "specialist cereals" farms. Generally speaking these farms are mainly present in the regions constituting the "Bassin Parisien" and in the Southwest of the country.

The type "general field cropping" is predominant in north-eastern regions of the country.

7.7 Identification and analysis of the SMR potentially impacting the cereal farms

SMRs can be classified in three types:

- "general" SMRs, affecting all farm, regardless of their type or location;
- "zoned" SMRs only affecting some farms in one zone, i.e. associated to a "zoned" directive (e.g. nitrate directive);
- "sectoral" SMRs only affecting one sector. This is the case for directives and regulations which, by nature, apply to animals, such as animal identification.

Table 7.7: Identification of Costs of Compliance for the selected farm types (source: Deliverable 7)

Directive	**Ha of Utilised Agricultural Area (UAA) affected**	**Farm type affected (in general)**	**Farm type involved in cereal production affected?**
Bird directive Habitat directive	UAA hectares in SPA UAA hectares in SCI	Farms with area in SPA Farms with area in SCI areas	Yes
Ground water	100% UAA	All farm types	Yes
Sewage sludge	Estimated UAA hectares	All farm types	Yes
Nitrate directive	UAA hectares in Vulnerable zones	Intensive pigs, beef, dairy and poultry farms, specialised cereal farms	No
Identification and registration of animals	Whole cattle population	Beef and dairy cattle	No

Directive	Ha of Utilised Agricultural Area (UAA) affected	Farm type affected (in general)	Farm type involved in cereal production affected?
Identification and registration of ovine and caprine animals	Whole sheep and goats population	Sheep and goats	No
Placing of plant protection products	100% of UAA	All farm types	Yes
Prohibition of hormonal substances	100% cattle and pig population	Beef, pigs, poultry	No
Food law, & procedures in matters of food safety	100% of UAA	All farm types	Yes
Spread of diseases Foot & mouth ,Swine vesicular disease Bluetongue		Beef, pigs	No
Housing of calves	Calf population	Calves	No
Housing of pigs	Pig population	Pigs	No
Protection of animals kept for farming purpose		All livestock farms	No

The farms involved in cereal production will be potentially affected by the following directive

- “general” : ground water, sewage sludge, placing of plant protection products, food law, & procedures in matters of food safety
- “zoned” : nitrate directive (VZ), bird directive (SPA), habitat directive (SCI); the two latest are now in the N2000 network
- “sectoral” : none for the cereal sector.

In general terms, the livestock sectors are much more affected by SMRs than the cereal sector.

It must be noted that, as analysed in D5 for France, the Bird and Habitat directives hardly affect the cereal systems and sector as most rich habitats and IBAs are outside the main cereals producing areas, in which habitats have been destroyed for decades. It is in extensive livestock systems areas that N2000 will be active. For this reason, the N2000 directives can be taken out of the analysis.

Identification of GAEC potentially impacting the cereal farms

The French GAECs are summarised in the following Table 7.8.

Table 7.8: French GAECs

Issue	Standards: GAEC
1. Soil erosion: protection soil through appropriate measures	Set-aside of farmland (3%) = buffer strips Obligation of land maintenance (set-aside land, grassland, non productive land)
2. Soil organic matter: maintain soil organic matter levels through appropriate practices	Interdiction of burning straw Diversity of cropping pattern
3. Soil structure: maintain soil structure through appropriate measures	Regulation of irrigation Diversity of cropping pattern
4. Minimum level of maintenance: ensure a minimum level of maintenance and avoid deterioration of habitats	Set-aside of farmland = buffer strips General regulations of land maintenance Maintenance regulations of cultivated land Maintenance regulations of set-aside land Maintenance regulations of grassland Maintenance regulations of non productive land
Permanent pasture maintenance	No obligation at farm level until now

GAECs defined by France principally concern limitation of soil erosion, buffer strips, diversity of cropping pattern, interdiction of burning straw, regulation of irrigation.

Cereals and crop systems are, in principle, largely affected by the GAECs, but some dispensations weaken the requirements (see details below).

Buffer strips

It affects all types of farming systems having less than 3 % of permanent pastures, i.e. principally types “specialist cereals” and “general field cropping”.

Diversity of cropping pattern

It affects in principle all types of farming systems. But dispensations exist for those with monocropping maize due to expected disproportionate economic impacts expected.

Interdiction of burning straw

It principally affects crop production, so farm types “specialist cereals” and “general field cropping”, situated in NUTS 3 Indre, Cher and Yonne, in north of the Massif Central (cf. enquête pratique 2002). Local dispensations are provided till now.

Regulation of irrigation

58% of national irrigated UAA are situated in regions (NUTS2) Aquitaine (17,7%), Midi-Pyrénées (17,1%), Centre (12,7%) and Poitou-Charentes (10,7%). It principally deals with some filed crops. GAECs means provision of authorisation and existence of water meters.

7.8 Cost analysis

Deliverable 5 for France has extensively described and analysed which farm types should be included in the analysis of the cereal sector. These are:

- Farming systems specialised in cereals and protein-oil crops production with no livestock (n°11) and general field cropping (cereals or other) (n°12). Localisation: Parisian basin, Pays de la Loire, Alsace
- Farming systems specialised in cereals and protein-oil crops irrigated production with no livestock (n°11). As we saw, irrigated production is almost maize. Localisation: Southwest.
- Farming systems combining cereals and protein-oil crops production with livestock production (cattle, sheep or goat farming) (n°81= field crops-grazing livestock combined). Localisation: margin of Bassin parisien and Bassin aquitain, Rhône-Alpes, Alsace.

Table 7.9 below summarizes which GAECs and general SMRs need consideration, accounting for the diversity in farm types described above.

Table 7.9: Identification of relevant SMRs and GAECs to be analysed per farm type

Farm type	Number of the farm type	Regions (NUTS2)	Specific SMRs concerned	General SMRs
Specialist cereals and general field crops	11 and 12	Ile de France, Champagne Ardennes, Picardie Pays de la Loire Alsace	GAECs (mainly buffer strips, diversity of cropping pattern)	Nitrate directive Sewage sludge Ground water Placing of plant protection products Food law Obligation of land maintenance
Specialist cereals (irrigated maize)	11	Aquitaine, Midi-Pyrénées	GAECs (mainly buffer strips, GAEC4 for maize monocropping)	
Field crops-grazing livestock combined	81	Haute-Normandie, Nord Pas de Calais, Lorraine Aquitaine, Rhône-Alpes, Alsace	GAECs (mainly buffer strips, diversity of cropping pattern) Permanent pastures maintenance all SMRs affecting grazing livestock farming	

The following pages display the costs analysis undertaken for the systems involved in cereal production. In accordance with the methodology designed in Deliverable D7 (see De Roest et al, 2006 for details), costs of complying with regulations are distinguished from costs of complying with SMRs. Subsequently representative farm cases for the specialised cereals and general field cropping farm type, the specialized cereals producing farm type and the combined field crop grazing and livestock farm type will be discussed.

7.8.1 Specialised cereals and general field cropping systems

For the following calculations it is assumed that the representative or average specialist crop farm produces 6,104 quintal of wheat [219] (95 ha average producing 71.4 q/ha/year in average [source: SAA 2001 and SCEES, average yield 2001-2004]).

7.8.1.1 Nitrate directive

Cost of compliance

Such systems are not concerned with the maximum threshold of 170kg N/ha and manure storage. Thus, the cost of compliance will potentially deal with the following items:

- times of spreading
- minimal distance from watercourses
- covering of soils during winter

[219] For reasons of comparison, it is assumed that the farm will produce 100 % wheat.

- presence and compliance of documents (fertilisation plan, recording book…)

The first item has no clear economic impact.

• The minimal distance from watercourses will have a little potential impact as the mandatory set aside of 10% will be used for this purpose.

• Covering soils is generally expressed as a minimum % of soils to be covered during winter [around 2/3]. It is decided at departemental level. In most of the cereal regions, the 2/3 of surfaces are covered with winter-crops. The items for calculation are the following:

- seeds (mustard,…): 24 €/ha
- seeding and tillage: 30 €/ha
- destruction of cover: 36 €/ha
- TOTAL: 90 €/ha (source: MAP, MEDD, CNASEA, 2001b)

With an average uncovered soils of 30% in such systems on 90% of UAA (10% for set-aside) the cost can be estimated at:

30%*95*90%*90 € = 2,308 €/farm

• Time for registration is negligible, for the reasons developed above.

TOTAL cost of compliance: winter cover 0.37 €/quintal of wheat

In 2003, 58% of the départements did not made the covering of soils mandatory under the nitrate directive (MEDD, 2004).

Cost of cross-compliance

SMRs for cropping systems mainly imply registration (covering of soils during winter is a SMR only in most intensive livestock areas).

TOTAL cost of cross compliance: 0

7.8.1.2 Sewage sludge

Cost of compliance

Sludge is mainly spread on cropping systems in France. Considering the different items of the sewage sludge:

- Purchase of sludge implies no cost for farmer in France, as the local authorities are happy to get rid of such products (60% of sludge are spread on agricultural land; the limiting factor is the acceptance by farmers [IFEN, 2001])
- Transport and spreading costs are also paid by sludge producers, for the same reason.

Nevertheless, the fertilisation value of such sludge can be estimated at 0,9 €/m3 (4.2 kgN/m3, 6% of dry matter, 40% of available N) [source: ACTA, undated]. With 37 m3/ha, the gain for the farmer is 33.3 €/ha. Considering that such sludge are only spread one year out of 4, this makes 8.32 €/ha/year.

TOTAL cost of compliance for farmer receiving sludge: -8,32 €/ha.

As only 2% of national UAA get sludge, the macro-economic impact of the sewage sludge directive can be counted as negligible.

Cost of cross-compliance

Farmer does not support any constraint from SMR (he has to produce a contract prepared by the producer of sludge).

TOTAL cost of cross compliance: 0

7.8.1.3 Ground water

Costs of compliance

Same reasoning can be made as for livestock systems described above, noting the cost is doubled at farm level when reaching a threshold of 100 ha.

TOTAL cost of compliance: 60 €/farm ; thus 0,01 €/quintal wheat

Costs of cross compliance

TOTAL cost of cross-compliance: 0 € (see above)

7.8.1.4 Placing of plant protection products and food law

Cost of compliance

The costs are related to inexpensive storage facilities and time recording, thus:

TOTAL cost of compliance: 0

Cost of cross-compliance

TOTAL cost of cross-compliance: 0

7.8.1.5 GAECs

Cost of compliance and cross compliance

Since the GAECs are considered to be newly introduced restrictions together with cross compliance, no distinction is made between costs of compliance and costs of crross compliance.

The main constraint from GAEC in such systems will deal with the requirement of 3% uncultivated land nearby the watercourses (buffer strip). As these 3% are part of the 10% of mandatory set-aside, the economic impact will be none. Actually the buffer zone constraint can be interpreted as not effectively binding, because another more binding constraint (set-aside) takes over its role. When the set-aside requirement will change this result of a zero economic impact might no longer be valid. (Since 2008 the set-aside rate is put to zero implying that farmers now face a binding constraint form the buffer zone requirements.

Diversity of cropping pattern does not affect such systems, which diversity already comply with the existing standards of the SMR (source: AScA, 2003).

7.8.2 Specialised cereals with irrigated maize

For all the following calculation it has been assumed that the representative or average specialist crop farm with irrigated maize produces 3,505 quintal of maize [220] (41 ha average producing 95 q/ha/year in average [source: SAA 2001 and SCEES, average yield 2001-2004]).

7.8.2.1 Nitrate directive

Cost of compliance

Same general reasoning as for above, except that the cover of soils affects 100% of the surface.

Thus, the costs are: 41 ha*90 €/ha*90% cultivated land (10% set aside) = 3,321 €

TOTAL cost of compliance: winter cover 0.95 €/quintal of maize

In 2003, the Map 7.4 showing the distribution of *départements* in which covering of soil is mandatory, allows to classify the degree of compliance with this measure as "medium" (30-60%) [see D4] (MEDD, 2004).

Cost of cross-compliance

Same as above.

TOTAL cost of cross compliance: 0

7.8.2.2 Sewage sludge

Costs of compliance

Cost for sewage sludge follow the same reasoning as followed above.

TOTAL cost of compliance for farmer receiving sludge: -8,32 €/ha.

As only 2% of national UAA get sludge, the macro-economic impact of the sewage sludge directive can be counted as negligible.

[220] For reasons of comparison, it is assumed that such farms will produce 100 % maize.

Costs of cross compliance

TOTAL cost of cross compliance: 0

7.8.2.3 Ground water

Costs of compliance

A similar reasoning as for livestock systems described above can be made, noting the cost is under the threshold of 50 ha.

TOTAL cost of compliance: 30 €/farm ; thus 0,009 €/quintal maize

Costs of cross compliance

TOTAL cost of cross-compliance: 0 € (see above)

7.8.2.4 Placing of plant protection products and food law

Costs of compliance

Same reasoning can be made as above:

TOTAL cost of compliance: 0

Costs of cross compliance

TOTAL cost of cross-compliance: 0

7.8.2.5 GAECs

Costs of compliance and cross compliance

As regards the costs of the GAECs the following observations can be made :

• GAEC on diversity of cropping pattern affects such monocropping systems. Nevertheless, a derogatory regime does not imply a diversity of rotation but:

- the covering of soils (see above)
- the obligation to have soil analysis.

The cost for the first item has been calculated above.

The cost of soil analysis can be calculated as follows (source: MAP, MEDD, CNASEA, 2001b). We assume 2 soil analysis/farm and/year (for a 50 ha farm)

- two analysis 26 € each * 2 = 52 €/farm
- technical advice = 170 €/farm

TOTAL cost of compliance at farm level: 222 €/farm	
	winter cover 0.95 €/quintal of maize (already counted)
	Soil analysis 0.07 €/quintal of maize

• GAEC on irrigation implies a cost on water meter: 550 €/farm, which amortisation can be estimated on 20 years [source: interview with *Chambre d'Agriculture de l'Isère*], thus 27 €/farm/year (negligible).

7.8.3 Field crops-grazing livestock combined

For all the following calculation, the representative or average field crops-grazing livestock combined farm produces 3,000 quintal of wheat and 224 tons of milk (50 ha average for crops producing 60 q/ha/year and 40 cows producing 5,600 kg in average [source: SAA 2001 and SCEES]).

7.8.3.1 Nitrate directive

Dairy production in such systems is, in average, moderately intensive (combining grassland and crops in the forage system). The stocking density will be around 1,5-1,8 LU/ha (Institut de l'élevage, 2000) and, in any case, the amount of organic nitrogen produced/ha will be over 170 kg/ha. The dairy farms in such regions are, in average, large ones (they are deriving from the restructuring of former small-medium farms that gave up with milk in the 80's). Thus, they can be assumed as complying with the nitrate directive requirements for livestock production due to the PMPOA (see above). (Le Gall, 2005).

Costs of compliance

The costs due to cropping activity will be comparable as for cereals producers, with a highest rate of spring crops in the cropping pattern, due to presence of silage maize. Uncovered soils are covering, thus, 40% of UAA. The calculation will then be:

40% [uncovered soils]*50 ha [crops] *90% [set aside factor]*90 € = 1,620 €/farm

This cost can logically be affected to crop production (and not to dairy production)

- TOTAL cost of compliance for cropping activity estimated at: 0,54 €/ quintal of wheat.

Costs of cross-compliance

The issue to deal with the compliance will be registration time, which can be assumed as negligible.

7.8.3.2 Sewage sludge

Costs of compliance and cross compliance

It is unlikely that such systems will accept sewage sludge, due to the fact that they already produce organic fertilisers.

7.8.3.3 Ground water

Costs of compliance

Same reasoning as above is followed.

TOTAL cost of compliance: 30 €/farm ; thus 0,01 €/quintal wheat

Costs of cross compliance

TOTAL cost of cross-compliance: 0 € (see above)

7.8.3.4 Placing of plant protection products and food law

Costs of compliance

Same reasoning can be made as for systems described above:

TOTAL cost of compliance: 0

Costs of cross compliance

TOTAL cost of cross-compliance: 0

7.8.3.5 Identification of cattle

Costs of compliance

Every animal is meant to have its eartag.

The calculation per farm is, annually: 9,70 € + nb cows and other animals [40 cows * 1 birth/cow * 1,8 €/animal] + 28 €/15 = 109 €/farm

TOTAL cost of compliance: 109 €/farm 0,0004 €/kg milk

Costs of cross-compliance

Most farmers in such large farms are identified as complying with the legislation today [Source: interviews with MoA].

TOTAL cost of cross-compliance: 0

7.8.3.6 GAECs

Cost of compliance and cross compliance

The mixed character of such systems (presence of grassland) results in absence of any constraint from the GAECs.

7.9 External competitiveness assessment

7.9.1 Best estimates of percentage cost increases for select EU member states

In order to evaluate the impact on competitiveness an estimate was made about the sectoral percentage cost increase of the GAEC regulations on cereals. Based on previous country studies the costs of the GAECs for cereals are estimated to be €35/ha, which includes the estimated revenue-reduction due to the need to retain more straw on the fields (organic matter) and the additional costs (tillage, ploughing, etc.). A much higher cost is taken into account for the proper management of idled land, which is estimated to create a cost of €400/ha. This latter estimate includes the costs of adequate soil cover, tillage, fuel and labor costs.

Since the estimated costs associated with the GAECs for cultivated and idled land are different, the use of set-aside land (e.g. idled or used for energy crops) and the rate of set-aside (10% for year 2005, but currently reduced to 0%) are likely to affect the cost increase associated with the GAEC standard. For this reason it was decided to simulate two scenario's: One scenario assumes the set-aside rate to be 10% and all set-aside land to be used as idled land. This scenario can be considered to be a worst case scenario with relatively high costs. The alternative scenario assumes either a 0% set-aside rate, or a situation in which all set aside land is cultivated with specific crops rather than left idled. Since the relative costs for cultivated land are lower than for idled land, this scenario leads to a relatively low cost of GAEC standard estimate. Together these scenario's provide an idea of the upper and lower bound of GAEC costs for cereals.

Table 7.3 provides a brief overview of the results, with GAEC-1 the cost increase associated with a 10% set-aside rate in place, whereas GAEC-2 accounts for the case the set-aside rate is set to zero. As the cost per hectare of land cropped with cereals are much lower than those per hectare of set-aside or idled land, the cost increase for GAEC-2 is much (almost 50%) lower than in GAEC-1. For France the buffer strips, which were previously 'included' in the set-aside requirement, in GAEC-2 become and explicit constraint, precluding the French effective set-aside to go to zero, although the formal rate would allow for this.

The final sectoral (additional) costs estimates as presented in Table 7.3 are dependent on the best estimates of compliance, which are given in the upper row of the Table 7.3 These estimated compliance rates were based on previous research (Jongeneel et al, 2007 and country reports as cited therein) and also takes into account the extent to which GAEC requirements reflect pre-existing national legislation (see Chapter 2 for more details). Moreover the calculation of cost follows the French example, using the same costs percentages over EU member states, but corrected these for country-specific characteristics, such as member state specific compliance and (total) costs of cereals production levels.

Table 7.10: Best-estimates of percentage cost increases for GAECs in cereals

	BE	DK	FR	DE	IT	NL	SP	UK
Best-estimate of degree of compliance	0.90	0.95	0.80	0.95	0.80	0.85	0.90	0.95
GAEC-1 (10% set-aside)	0.43	0.18	0.74	0.15	0.68	0.33	0.82	0.18
GAEC-2 (0% set-aside)	0.21	0.09	0.48	0.07	0.33	0.16	0.40	0.09

Underlying Table 7.3 are calculations using the 2004 FADN data taking into account several farm types (such as general field cropping, mixed crops, etc.). The differences in cost increase percentages partly reflect differences in farm structure (different farm type mixes over countries). Whereas at sectoral level the calculated cost increases always less than 1 percent, for individual farms cost increase estimates could go up to as high as 4%, depending on their degree of compliance.

As regards the new member states who adopted the Single Area Payment scheme, the also have to follow the GAEC rules, especially when land is not used for production purposes. Research done within the project on Poland suggests that the level of implementation of the GAEC standards there may be high, whereas the impact on costs is limited (although reliable estimates are currently lacking). As compared to the old member states, in Poland the distance of the 'new' GAEC requirements and pre-existing national legislation of farming practices (e.g. regular stubble and grass burning practices) seems to be relatively large.

7.9.2 Non-EU countries: the example of Canada

Alongside the EU special attention was paid to Canada as an EU competitor[221]. The compliance strategy in Canada differs from that in the EU. A general illustration of the provincial compliance strategy in Canada is given in Figure 7.7. It are the provinces who are the lead jurisdiction on environmental issues such as nutrient management, water resources protection, wildlife and habitat protection, land use and planning, soil quality, agricultural waste product management. Agriculture, including issues of plant and animal health, as well as food safety issues is a shared federal/provincial jurisdiction. The shading on the triangle (see Figure 7.7) represents how well operations are managing environment issues on-farm. The light area represents operations that are in compliance but which may benefit from additional best management practices. The grey section represents operations with relatively minor violations. The compliance program is designed to move the operations from the grey area into the lighter area (or into compliance) using a problem-solving approach. Using this approach, Agricultural Environmental Officers (AEOs) will work with farmers to achieve compliance with the legislation. The dark area represents those very few operations that refuse to comply with the law. For these operations enforcement action is an option; however, the intent of the compliance program is still to help operations move into the lighter area through a problem-solving approach.

[221] Much more detail can be found in Part II of the Annex to this report entitled "Costs of compliance to environmental regulations in CANADA; Case study on cereals".

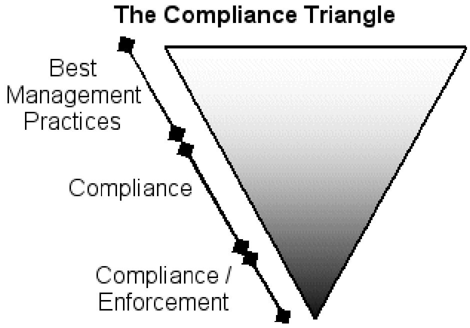


Figure 7.7: The Canadian compliance triangle-model

In Canada, management practices similar to the GAEC standards in the EU are implemented through various cost share programs. These agricultural practices are known as Beneficial Management Practices or BMPs. Agriculture and Agri-Food Canada (AAFC) (2006) defines Beneficial Management Practices (BMPs) as "farm management practices that: minimize and mitigate impacts and risks to the environment, by maintaining or improving the quality of soil, water, air and biodiversity; ensure the long term health and sustainability of natural resources used for agricultural production; and, support the long-term economic and environmental viability of the agriculture industry.

In order to help agricultural producers develop and implement Beneficial Management Practices, the Government of Canada initiated Canada's National Environmental Farm Planning Initiative through provincially delivered Environmental Farm Plan (EFP) programs. Agriculture and Agri-Food Canada (2006) states that the objectives of the National Environmental Farm Plan Initiative include helping the agriculture sector better identify its impacts on the environment; and promoting the growth of stewardship activities within the agriculture industry. At this point the program is scheduled to end with the expiration of the current Agricultural Policy Framework (APF) in 2008, but it is likely that it will be continued in a similar form in the new Agricultural Policy Framework.

As part of the program, farmers attend an Environmental Farm Plan workshop and complete a workbook designed to assess the current state of the farm and identify areas of concern. Then farmers develop an action plan for addressing the areas of concern. The action plan is confidentially reviewed by a group of locally appointed farmers. Once the Peer Review Committee approves the Action Plan, a farmer can participate in the EFP Cost-Share Program that helps cover a portion of the costs of implementing eligible projects from the action plan (Ontario Ministry of Agriculture, Food and Rural Affairs, 2006). Producers are eligible to apply for cost-share incentives through the Canada Farm Stewardship Program, Greencover Canada, and the Canada Water Supply Expansion Program.

There are 36 Best Management Practice categories, each containing several practices eligible for funding. Federal government covers up to 60% of the cost of implementing eligible practices. Many practices covered through federal cost share programs are also eligible for funding under different provincial cost share programs. As a result up to 90% of the total project cost can be covered by combining federal and provincial funds. However, the coverage varies depending on farmer eligibility, provinces and type of Best Management Practices. In Ontario, funding is available through the Nutrient Management Financial Assistance Program Wetland Farm Stewardship Incentive Program, Oak Ridges Moraine Environmental Enhancement Program and Greenbelt Farm Stewardship Program.

Despite the fact that the implementation of Best Management Practices is not mandatory, there has been a relatively high degree of participation. For example, between 2005 and 2007, more than 11,000 of 57,211 Ontario farmers implemented or were in the process of implementation of BMPs. Even though the implementation of Beneficial Management Practices is partly subsidized by the federal and provincial governments, it is not costless to the farmers. As an example, Ontario farmers bore about a third of the cost of implementation of the management practices eligible for funding. Net costs for participating farmers could amount to about €1000 per farm. Because participation is voluntary, it is assumed that farmers will only participate if the net costs they have to make are offset by gains achieved elsewhere in the farm operation. For this reason the estimated percentage cost increase is assumed to be zero.

A detailed comparative standards analysis of Canada and the EU was done. Although the Ontario region was studied in depth also a more general analyses were made for Canada as a whole, taking into account other regions and a comparative analysis at the level of the provinces. Moreover a lot of specific studies have been reviewed and sometimes been reconstructed to take advantage from them for this project. Based on that analysis the following summary Table 7.11 was made (Details can be found in the Annex to this report, Part II). It should be noted that the numbers presented in the Table 7.11 below are not yet appropriate as estimator for the costs increases at sector level. In order to obtain these a further aggregation of the results is necessary, for which more detailed information about participation rates and country coverage are necessary.

Table 7.11: Compliance costs for GAEC-equivalent measures in Canadian cereals production (measured at farm level)

EU Standard	Comparable standard (or recommended practice) in Canada	Compliance cost (% of total cost of production)		
		Low end	Most likely	High end
Conservation of Natural Habitats, wild flora and fauna	Canada Wildlife Act; Species at Risk Act	0	0.3	1.9
GAECs	**Best Management Practices**			
	Variable rate fertilization	0	0	1.1
	Buffer strips	0.2	0.3	0.9
	Other BMP's	0	1.5	3.1
Total Cost		**0.2**	**2.1**	**7.1**

Summarizing, the main conclusions from the comparative EU-Canada analysis are that, by international standards, Canada has a low-intensity agriculture. Nevertheless, most EU environmental regulations that apply to agriculture have a counterpart in Canada. At one or more of the federal, provincial or municipal levels compliance is promoted through a range of measures. Compliance costs are quite low for cereals, may be somewhat higher for hogs (which is often a production combined with cereals). Since the Best Management Practices are voluntary programs participation rates rather than compliance rates are the relevant concept to translate and aggregate costs of affected farms to cost at sector level[222].

7.10 Standards and external competitiveness

For the GAECs, only scenarios where the EU imposes standards are evaluated. In the project an extensive analysis was made about the impact of similar standards in Canada, but for reason explained above it was estimated that the net implications on costs are effectively zero, or very close to zero. Three scenario's are considered:

1. The EU imposes the GAECs and has a set-aside rate of 10% applying to cereal producers;
2. The EU imposes the GAECs and has a set-aside rate of 0% applying to cereal producers;
3. The EU imposes the GAECs and has a set-aside rate of 10% applying to cereal producers. At the same the selected standards (nitrate directive, identification and registration directive, animal welfare directive) are imposed on other sectors (dairy, beef, pigs and poultry) and fully complied with and might cause spill-over effects between sectors

Note that scenario 2 is equivalent to scenario 1, but takes into account the impacts of the standards imposed in other sectors. As such it provides a more integral analysis of the trade impacts. It should also be noted that for all scneario's it is assumed that the imposed standards are fully complied with. This could be interpreted as the leverage effect introduced by cross compliance to be maximally effective, and inducing full compliance. In reality the finally achieved degree of compliance is likely to end somewhere below 100 percent compliance (although hig degrees of compliance are expected for various countries).[223]

The GTAP trade simulations used the percentage cost increases for the EU as explained in Table 7.10 above. With respect to the non-EU countries only the Canada case was considered in detail and to be open to attach non-zero cost increases to. However, based on the analysis previously discussed (and further motivated in Annex part II) no positive cost increases have been taken into account.

As the Table 7.12 below shows the impact of the GAEC standards (assuming the EU's set-aside rate for cereal producers is set at 10%) leads to an increase of the EU-15s imports by about 2.23 percent, whereas its exports decline with 1.82 percent[224]. The EU's import increase

[222] A difference with the EU's (obligatory) cross-compliance system is that this has full coverage (cross compliance extends to all farms eligible for direct payments, and the legal standards even apply to all farms irrespective of their eligibility to direct payments. Although in Canada with voluntary participation, participation might be still high, although no precise estimates could be made. Non-affected farms might not participate in BMP-schemes, but be still implicitly compliant to the level specified in the used standards. As explained in the previous section the Canadian philosophy targets primarily at the farms causing externalities. An open question is how many farms are in the pinnacle of the reversed triangle (in need of compliance enforcement and not sufficiently sensitive to the dominating voluntary approach.

[223] See Jongeneel et al (2008).

[224] Since the GTAP model presents a lot of detailed output some aggregations have been made to avoid an overload of information. More detailed Tables are available from the authors upon request.

is rather evenly spread over the countries exporting to the EU. As regards the EU's export decline there is more variation over the countries importing from the EU. However, the results, which are all in percentage changes (to the baseline of having no GAEC standards) have to be linked to volumes to understand the absolute changes. Moreover, the GTAP trade model allows taking into account all kind of interactions between trading partners, both importers as well as exporters. It can be seen when aggregating impacts (see bottom line of the Table 7.12) the impacts of the export decline will mainly come down to the rest of the OECD and to a lesser extent to the rest of the world. The total world trade in cereals will only be marginally affected (an increase of 0.47%).

Table 7.13 below has a similar structure as Table 7.12 above, but shows the impact assuming that the initial rate of set-aside is 0 percent rather that 10 percent. The lower set aside rate reduces the trade impacts of the GAEC standards roughly with 40%. In this case the EU-15s imports are expected to increase by 1.26 percent (rather than 2.23 percent, whereas its exports are expected to decline by 1.10% (rather than by 1.82 percent as in the case of 10% set-aside). The main reason for this is that a lower rate of set-aside is estimated to reduce the compliance costs. The key variable explaining this is the average compliance cost per hectare of arable land which might be freely cropped as compared to a hectare of land subject to set-aside. In the later case the compliance costs are estimated to be higher, which cause the percentage cost increase in the 10 percent set-aside rate case to be higher than in the 0 percent set-aside rate case[225]. The impact on total world trade in cereals is negligible.

Table 7.12: The trade impacts of the GAEC standards on cereals for some selected countries (assuming a 10 percent set-aside rate in the EU) (Scenario 1)

	EU15	Japan	Korea	Mexico	ROECD	ROW	Total Export
USA	2.32%	0.00%	-0.02%	-0.02%	0.21%	0.12%	0.17%
Argentina	2.01%	-0.07%	-0.09%	-0.08%	0.15%	0.05%	0.17%
EU15	0.00%	-1.26%	-1.31%	-0.30%	-1.40%	-2.12%	-1.82%
ROECD	2.21%	-0.02%	-0.03%	-0.03%	0.00%	0.08%	0.30%
ROW	2.27%	0.04%	0.03%	0.03%	0.27%	0.09%	0.47%
Total Import	2.23%	-0.01%	0.00%	-0.02%	-0.22%	-0.21%	0.02%

Source: own calculations

Table 7.13: The trade impacts of the GAEC standards on cereals (assuming a 0 percent set-aside rate in the EU) (Scenario 2)

	EU15	Japan	Korea	Mexico	ROECD	ROW	Total Export
USA	1.30%	0.00%	-0.01%	-0.01%	0.13%	0.07%	0.10%
Argentina	1.15%	-0.04%	-0.05%	-0.05%	0.09%	0.03%	0.10%
EU15	0.00%	-0.68%	-0.72%	-0.18%	-0.82%	-1.30%	-1.10%
ROECD	1.25%	-0.01%	-0.02%	-0.02%	0.00%	0.05%	0.17%

[225] Of course not all set-aside land is really put set-aside, but may be used for growing non-food or feed crops (i.e. energy crops). In the latter case there is not much difference to be expected bwteen set-aside land and crop land. So the assumed degree to which set-aside land is used to produce alternative crops is crucial here.

	EU15	Japan	Korea	Mexico	ROECD	ROW	Total Export
ROW	1.28%	0.03%	0.02%	0.02%	0.16%	0.06%	0.27%
Total Import	1.26%	-0.01%	0.00%	-0.01%	-0.13%	-0.13%	0.01%

Source: own calculations

Table 7.14 below represents the trade impact for a simultaneous imposition of the selected standards in all selected sectors analysed in this research (Scenario 3). EU imports increase in this scenario by 1.34 percent while its cereals exports decline by 1.19 percent. When comparing scenario 1 with scenario 3, it is clear that the spill over effects from other sectors and markets tend to make the trade impacts smaller.

The simulated trade impacts for both GAEC scenarios are summarised in Table 7.15 below. For both scenario's 1 and 2 it is assumed that compliance with the regulation improves from the level as estimated to prevail early 2005 to full compliance. For the GAEC 1 scenario EU exports decline with about 2 percent whereas its imports increase with a similar percentage. In terms of volume (assuming the EU wheat exports are about 16 million tons) this implies a reduction in EU exports of about 300 thousand tons for scenario 1. For scenario GAEC-2, which has no set-aside obligation, EU exports decline and import increase are respectively about 30% and 40% lower as compared to scenario 1. The impact on total world cereals trade is negligible. Scenario 3 is similar to scenario 2, but presents the impacts, taking into account that in all other sectors (dairy, beef, pigs and poultry) considered, simultaneously the analysed selected standards are fully complied with. As can be seen in this case nearly all impacts completely vanish.

Table 7.14: The trade impacts of the GAEC standards on cereals (assuming a 10 percent set-aside rate in the EU) and a simultaneous full compliance to selected standards in other selected sectors (Scenario 3)

	EU15	Japan	Korea	Mexico	ROECD	ROW	TOTAL Export
USA	1.37	0.00	0.01	-0.01	0.25	0.10	0.12
ARG	1.26	-0.07	-0.07	-0.40	0.15	0.03	0.10
EU15	0.00	-0.77	-1.96	-0.19	-0.82	-1.52	-1.19
ROECD	1.26	0.00	0.00	0.00	0.20	0.05	0.41
ROW	1.36	0.03	0.03	0.02	0.00	0.12	0.22
TOTAL Import	1.34	-0.01	0.00	-0.01	-0.32	-0.09	0.02

Source: own calculations

Table 7.15: Percentage change in trade due to compliance to GAECs

	Scenario	**EU Import**	**EU Export**	exports of which to…			Total world trade
				Japan	South Korea	Rest of OECD	
1	GAEC-1 (10% set-aside)	2.2	-1.8	-1.3	-1.3	-1.4	0.02
2	GAEC-2 (0% set-aside)	1.3	-1.1	-0.7	-0.7	-0.8	0.01
3	Like scenario 2 but also full compliance to selected standards in all other analyzed sectors	1.3	-1.2	-0.01	-0.00	-0.32	0.02

When looking to more detailed background tables (as presented above), it becomes clear that it are the USA, Argentina and Australia who fill the gap caused by the reduction in the EU's net exports. The impact of the evaluated GAEC constraints on cereal prices is very small (negligible). As such other 'shocks' to the sector (like for example the price increases caused by the new demands for bio-fuels) easily outpace and dominate the impact of the GAEC standard, irrespective of whether one uses conservative or progressive estimates of the standard impacts.

7.11 Conclusions

Concluding it can be noted that the percentage cost increases associated with the GAECs for the cereals sector are in all cases less than 1 percent of total production costs. Several factors explain this result. The additional costs per hectare are generally low, with an exception of the costs for idled land. The best estimates of the current degree of compliance are rather high. Partly this is due to the fact that farmers have, for several reasons, already included a number of GAEC requirements into their existing farming practices. These reasons include the role of pre-existing national legislation and the internal benefits generated from preventing soil erosion and keeping up the soil condition.

This latter factor explains why farmers following their own interest may participate voluntarily in programmes reducing soil erosion and are prepared to accept some costs. The case of Canada also illustrates this. It also makes clear that rather than following a command and control approach a voluntary or self-regulation approach might be effective in particular when the government is prepared to provide education and trainings, technical assistance and cost-offsets. Since in Canada participation is voluntary farmers are not likely to be faced with net costs increases affecting their competitive position.

The use of set-aside land and/or the rate of set-aside will affect the estimated percentage costs increases (see differences between GAEC-1 and GAEC-2 scenarios): using more set-aside land for cultivating special crops or lower set-aside rates lead to lower costs. With the set-aside rate currently set to zero, the calculated percentage cost increases more or less halved as compared to the 10 percent set-aside scenario (GAEC-1). The 3% buffer strip requirement in France, whereas previously accounted for within the 10% set-aside requirement, can be interpreted as an 3% minimum effective set-aside requirement (which holds even when the formal rate goes down to zero).

The impact of the GAECs on the EU's external competitiveness varies from a 1.8 percent reduction in exports in GAEC-1 (set-aside rate 10%) to a reduction of 1.1 percent (set-aside rate 0%). EU imports increase with approximately a similar percentage as exports decline. Total world trade is hardly affected by the impact of the GAEC standard. (However, trade is likely to be affected by changes in the set-aside policy (changes in land base) that are not separately evaluated).

If a scenario is considered in which standards in other sectors (dairy, beef, pigs and poultry) are simultaneous complied with (and set-aside rate equal to 10 percent), the trade impacts on the cereals market due to the introduction (and full compliance with) the GAEC standards diminish. EU imports then increase by 1.34 percent while its cereals exports decline by 1.19 percent. When comparing scenario 1 with scenario 3, it is clear that the spill over effects from other sectors and markets tend to make the trade impacts smaller.

In broad terms, this limited impacts on the EU's external competitiveness is due to the nature of the regulations which are, in general, predominantly directed towards livestock issues per nature or *de facto*[226]. Secondly, it is due to the fact that the implementation rules are not constraining at end, but are more playing as a safeguard or stand on derogation which weaken them (see the crop rotation GAEC).

The buffer strip is a kind of requirement that in principle impact the cereals farm economy, but when coupled with a set-aside regime imposing set aside rates of 3 percent or higher, it does not imply any extra-cost. It's kind of win-win – or better said win-no loss – situation as this buffer strip might bring further benefits for biodiversity, soil erosion and water quality with hardly no costs (or limited ones). This shows that benefits are not necessarily associated to costs but more to better use of existing knowledge and regulations.

In terms of geographical coverage, if the above analysis clearly does not cover the whole set of cereal systems in Europe, it can be assumed that the weight of France in this sector and the approximations made to determine the cost impacts in a number of other important cereal producing EU-15 member states are such that the other not analysed member states are not able to significantly change the conclusions from this research.

It must be reminded that the analysis undertaken here is subject to be outweighed by the biofuels strategy, which impact on the cereal market is paramount. The case for US corn price, boosted by the government strategy on ethanol clearly illustrates this issue on the recent period. For Europe, while we are the edge of this biofuels development, the magnitude of the effects is still open, but there are little doubts that it will change the whole sector significantly.

7.12 References

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[226] — As evoked above, the cereal areas in France are not those in which one can find most birds or interesting habitats; thus the bird and habitat directives are not playing strongly in such zones.

8 The impact of standards on the competitiveness of the EU with respect to fruits and vegetables

8.1 Introduction

8.1.1 Scope and Contents

This report focuses on the analysis and assessment of the effects that cross compliance programs have on the fruits and vegetables (F&V) sector. The analysis is centered on Spain's agriculture as the main producer and exporter of the EU of fruits and vegetables. This sector is a key agricultural production sector in the Mediterranean region and complements the analysis carried out for other farm and livestock productions, such as the olive sector, cereals, dairy, beef, pigs and poultry in other member states. However, as the F&V sector is considered subject to different agricultural policy regulations, the analysis is mainly related to the assessment of the effects of compliance in its broad sense. In fact, fruits and vegetables are not fully under the CAP cross compliance regulations and only specific crops intended to industrial transformation are included in a direct payment scheme. In consequence, this report includes different methodologies to evaluate the cost of compliance in selected regions and products.

The report is divided into three parts. The first part includes an introduction with a brief summary of the methodology used and the selection of regions, products and policy measures that have been analyzed. This introduction follows with the two main parts dedicated, respectively, to the fruits and vegetables sector its structure and main characteristics, and to the assessment of the cost of compliance and its impact on competitiveness.

The review of the fruits and vegetables sector begins with a general overview of the fruits and vegetables production and trade and focuses on Spain's position in the sector's trading and international markets, main products and regional distribution. The selection of regions, types of products and policy measures (SMR and GAECs) that will be the basis of the analysis, is followed by the selection of representative farms in the two study regions (Valencia in the Mediterranean littoral and Castilla-La Mancha in the inland southern plateau). The next sections are devoted, to the cost structure and assessment of the cost of compliance in the region of Valencia (for citrus production) and the region of Castilla-La Mancha (for vegetables). In this latter region, a specific model-based methodology has been used and it is explained in detail. The following section intends to provide some insights into the links between cross compliance measures and competitiveness in the fruits and vegetable sector, following the framework developed in D12. Last section gives a brief comparative overview with the United States fruits and vegetable sector and the last two sections are devoted, respectively, to some concluding reflections and bibliographical references.

8.1.2 Compliance and competitiveness

The analysis in this chapter is ultimately intended to link the costs of compliance with competitiveness of the fruits and vegetables sector on the world market. Different methodological approaches have been used to address this issue across the various production sectors considered in this research (see D12). The selection of methods has been determined by the type of product and hence by the type and volume traded in the world markets, as in the case of cereals and dairy. These products represent a large share of agricultural trade worldwide and are, consequently, basic commodities in aggregated world trade models (such as GTAP) and competitiveness can then be assessed in an integrated international trade perspective. However, other productions, such as fruits and vegetables, have time and space commercial constraints and the overall volume traded is more limited to region specific sites. These characteristics and the wide range of products included in this sector make the fruits and vegetables sector not appropriated to be analyzed with GTAP, which in addition, is not specifically adapted or designed for analyzing the fruits and vegetables market. In consequence, other methodological approaches that are closer to the farm-level structure have been used to address competitiveness issues.

As a reference baseline, competitiveness has been analyzed in D12 underlying its different aspects and methodologies. Following this report, the sets of conditions that are key to address competitiveness are, namely, initial, industry, institutional and macroeconomic conditions. The analysis of the fruits and vegetables sector has been based mainly on the two following conditions:

- *Initial conditions: farm type, farm size, farming intensity, farm localization, (field topology, soil, agro-climatic conditions, proximity to water sources, local environment pressure, etc.).*
- *Institutional conditions: implementation and enforcement of legislation*

8.1.3 General Methodological Framework

The basic methodology developed in this study can be summarized as follows:

(i) Selection of the regions, sub-regions, agronomic areas and municipalities (counties) that represent the agricultural production systems of the products considered among the fruits and vegetables sector.
(ii) Selection of the most relevant cross-compliance policy measures, SMR and GAECs, in each of the regions and products considered.
(iii) Selection of representative farms within the study regions that will allow the analysis of cost structure at farm level
(iv) Assessment of compliance costs in the pre- and post establishment of the selected SMR and GAECs regulations
(v) Development of a model-based analysis integrating an economic (mathematical programming model) and agronomic model (Cropsyst) for policy simulations and assessment of the cost of selected cross compliance measures (nitrates directive and water use)
(vi) Analysis of competitiveness and policy standards at farm level

Following the criteria exposed in D5 on the selection of representative regions, sub-regions, municipalities and farm-types, the regions and products selected are: the region of Valencia for citrus productions and the region of Castilla-La Mancha that features a mixed vegetable-cereal-vine production system characteristic of many inland regions in southern EU countries, different from the highly specialized farming system of the latter regions. In this case we have used a model-based approach developed in the area for policy simulations that provides a deeper insight of the cost of compliance with SMR (nitrates directive) and GAECs (water use in Spain's transposition of the cross compliance basic regulations).

The following Table 8.1 summarizes the regions selected, products and policy measures as well as the methodology considered in the analysis:

Table 8.1: Selection of regions, products, Cross Compliance policy issues and methodology

REGION	PRODUCT	CC POLICY ISSUE	METHODOLOGY
Region of Valencia	Citrus	SMR Nitrates Directive Pesticides Use	Representative farms Cost structure
Region of Castilla La Mancha	Vegetables: melon, potato, pepper, garlic	SMR Nitrates Directive GAECs water control measures for overexploited aquifers	Representative farms Cost structure + Economic and Agronomic Model Policy simulations

The detailed description of the selection of representative farms, the different levels of aggregation and the data and information base used in the analysis is shown in Figure 8.1 below.

The assessment of the cost of compliance in the citrus fruit farms in the region of Valencia is based on evaluating, at farm level, the costs derived from compliance with policy measures (such as pesticide regulations) and its impact on the farm's gross margin. Data and information were obtained from interviews with experts and data from the Ministry of Agriculture and the Regional Government of Valencia as well as various available studies and literature review.

The analysis of the cost of compliance in the mixed farms of the region of Castilla-La Mancha has been carried out using the simulations results of the integrated economic-agronomic mode developed in this area. The selected policy measures for this area are, for the SMR, the Nitrates Directive, considering that this area is a nitrate vulnerable zone. For the GAECs we have selected a specific measure that Spain has introduced in the national legislation that refers to water use limitations in areas of overexploited aquifers, such as the area considered in this study (the upper Guadiana basin of the region of Castilla-La Mancha). Both measures are of major importance in Mediterranean countries and regions where ground water is the major source of water for irrigation agriculture. It is also worth noting that water is a limiting factor in the production horticulture crops and thus water use limitations affect farm productivity and competitiveness.

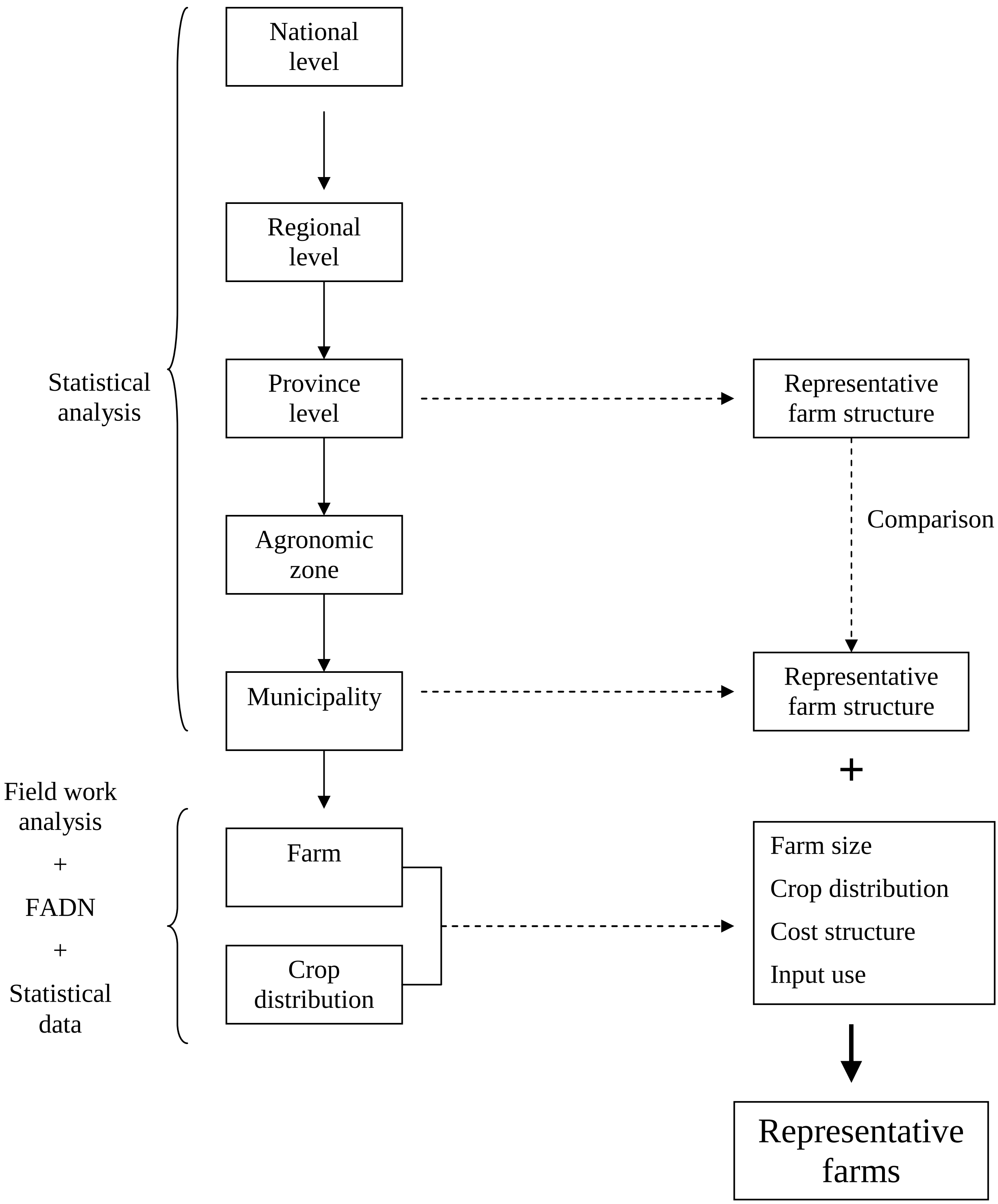
The approach taken in this chapter differs from the others, as for crops, some measures such as the Nitrates Directive, do not produces any extra administrative or input cost. In this case, the cost of compliance with the Nitrates Directive and with the GAECs water use control, is not a direct cost to farmers but rather a reduction in yields (due to a limitation in the use of nitrate fertilizers and water) and consequently a reduction in the farm gross margin. Therefore, the cost of compliance analyzed for this area refers to the foregone income faced by farmers when complying with the required standards.

8.1.4 United States F&V approach compared to the Spanish case studies

In Annex (Part I), the US case studies on F&V describe regulations affecting citrus in southern Florida and tomatoes in California. While Spain has used a methodology based on the selection of representative farms of selected regions, subregions and municipalities, the US study used a different approach. In the case of tomatoes, the study was based on a single farm budget of the cooperative extension service of the University of California[227], and the cost of compliance was calculated for related environmental measures. In the case of Florida citrus, the estimation of compliance was based on a panel of growers in the region using also secondary information. However, it is possible to do a brief comparison of both US and Spanish F&V sectors in order to understand the main differences and effects of compliance between them. We will integrate this information along this report.

[227] University of California Cooperative Extension 2000 Sample Costs to Producer Fresh Tomatoes, San Joaquin Valley. http://www.agecon.ucdavis.edu/outreach/crop/cost-studies/2000FreshToms.pdf

Figure 8.1: General methodology used to determine representative farm types



8.2 The Fruits and vegetables sector

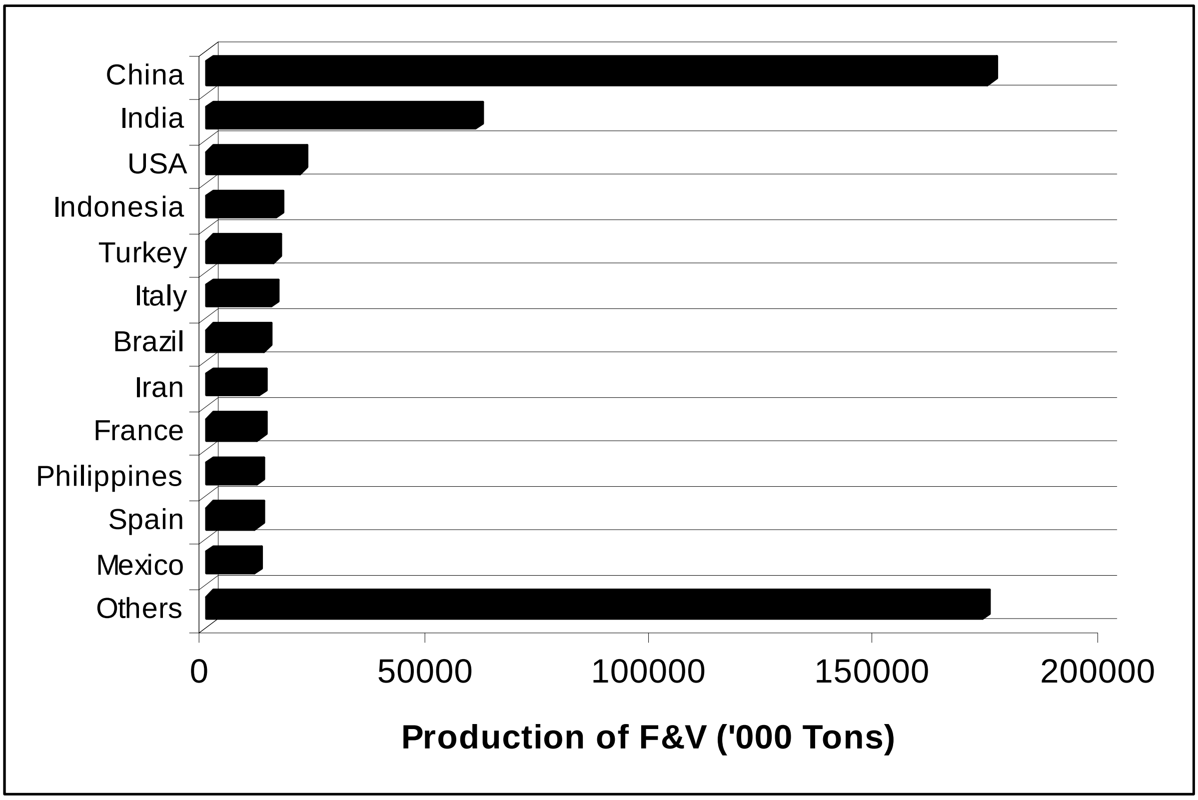
8.2.1 The world market

World production of fruit and vegetables was just over 1 230 million tons (2002) with fruit amounting to 470 million tons and vegetables to 760 million tons. Asia is the leading production region with a share of 61 %, followed by the EU (9 %), North and Central America (9 %), Africa (8 %) and South America (7 %).

The international trade in fresh fruits and vegetables is a multibillion-dollar business. It provides vital export revenues for many countries.

The main competitor for the EU fruits and vegetables productions in terms of export values is the USA Mexico is 2nd, having overtaken EU in the past decade. Other big exporters are China, Chile, Ecuador and South Africa. In total, the top 10 exporters account for 2/3 of the world's fresh F&V exports.

Figure 8.2: Fruits and Vegetables main producers in the world (2005)



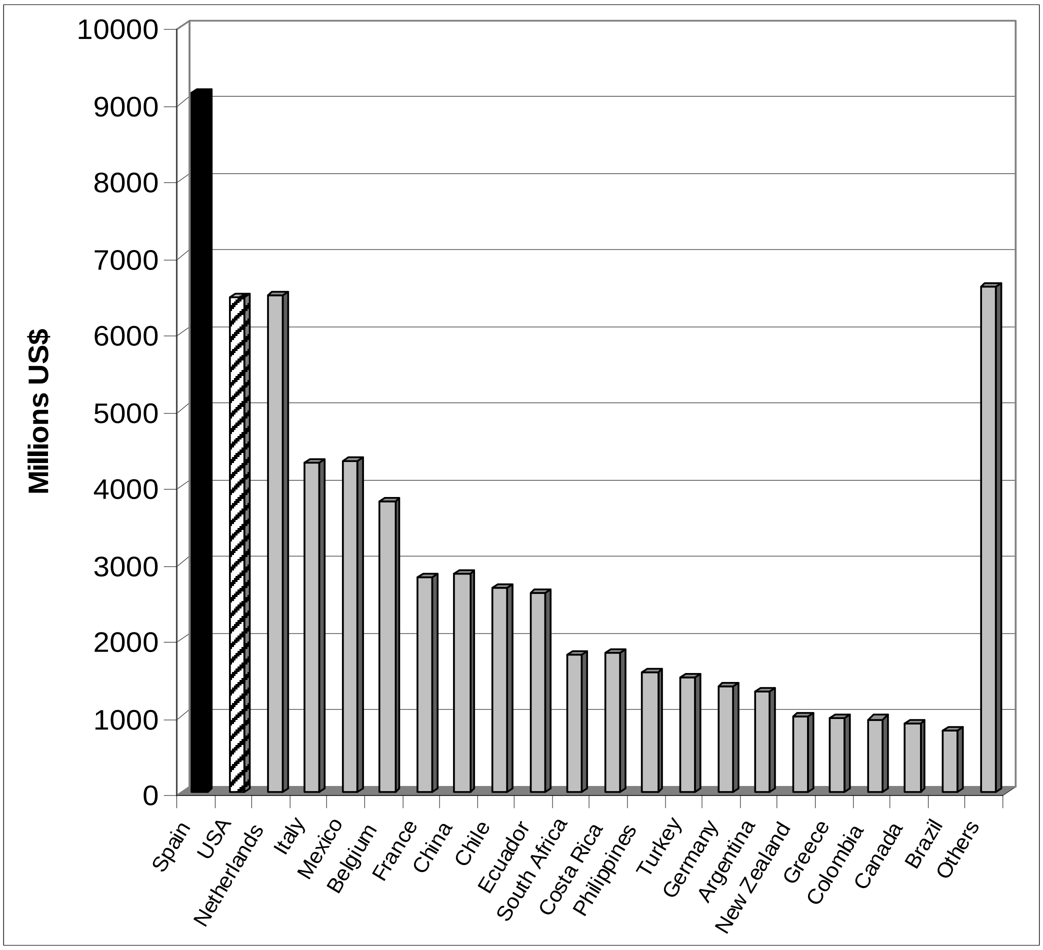
Source: FAOSTAT (2007)

On the import side, the EU is the world's biggest importer. The US follows closely behind, while other countries, like Canada, Japan and China have significantly smaller imports. The top 2 importers (EU and USA) take in 50%.

In general, world trade in F&V is getting more concentrated. If in 1982-84 the top 10 importers had a market share of 73% of the world's imports, it reached 80% in 2002-2004. On the export side, the top 10 exporters gained from 51% to 67% of the world F&V export market.

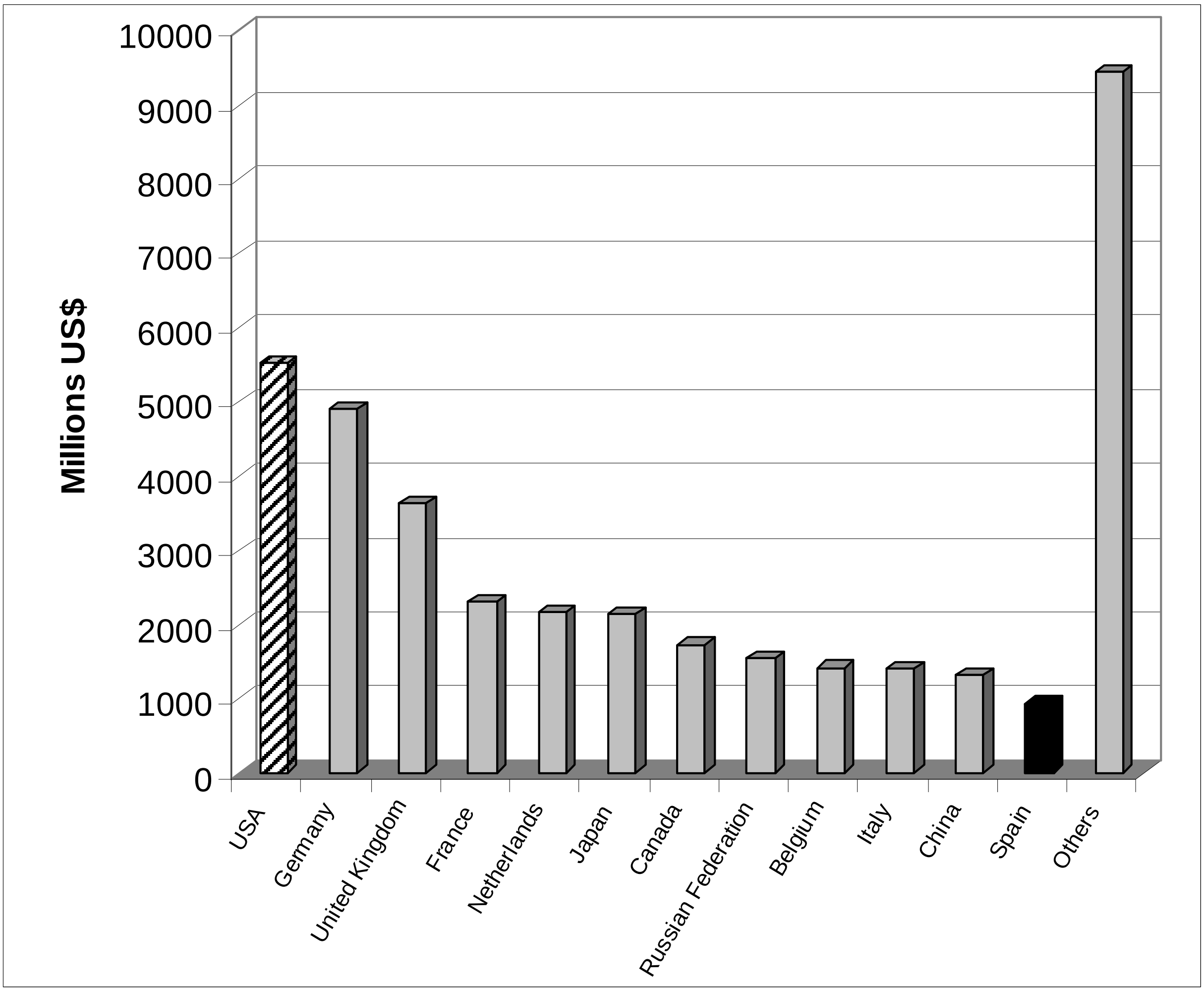
Regarding potential competitors for Spanish vegetables and fruits production, it is clear that even when China is largely the most important producer of F&V in the world (Figure 8.2), it is not exported oriented as Spain or US (Figure 8.3). United States is the second F&V exporter in the world and is the biggest competitor for Spain. Inside Europe, Italy and The Netherlands are important suppliers as well (Figure 8.3). Nevertheless, China, India, Indonesia and Turkey are huge potential competitors for the EU, especially considering that are all developing countries that would improve their technology and efficiency while having lesser costs at the farm level. Spanish and Italian competitiveness should increase during the next years to face this threat.

Figure 8.3: Fruits and Vegetables main suppliers: Export values (millions US $) in the world market in 2005



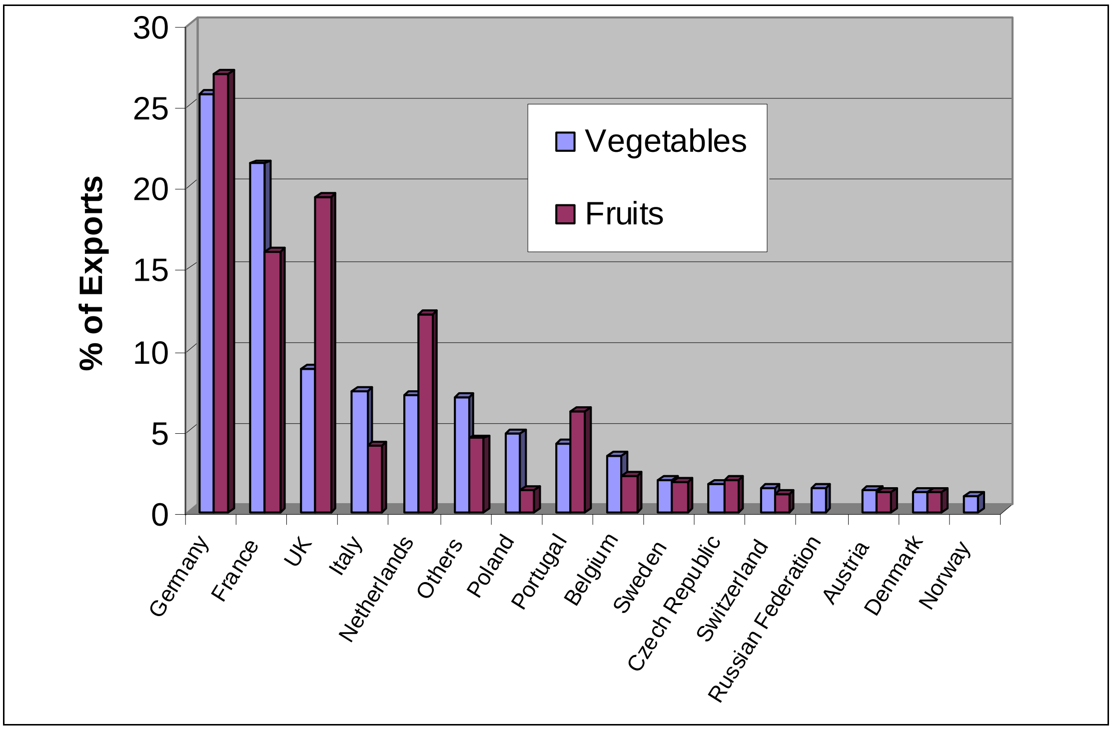
Source: own elaboration from FAOSTAT (2007)

Figure 8.4: Fruits and Vegetables Import Values (millions US $) in the world market in 2005



Source: own elaboration from FAOSTAT (2007)

Figure 8.5: Destinations for Spanish fruits and vegetable exports, 2004 (% of exported value)



Source: MAPA, 2006

Main exports of fruits and vegetables from Spain are exported to EU countries as shown in Figure 8.5. The Spanish exports are mainly for EU member countries. Only less than 7% (of vegetables and 5% of fruits is exported to the rest of the world. Exports to the United States represents 1,4%.

8.2.2 The European F&V sector

Fruits and vegetables account for about a sixth of the value of EU agricultural production, making the EU the second largest producer in the world and the second largest exporter; despite this it is also the largest importer. The common market organization for fruit and vegetables was established in 1962, instituting a minimum grower price amongst several other interventions. Reform of the regime began in 1996 and in 2001 the minimum price was abandoned. Nevertheless, total support in 2004 for the EU15 was hardly changed from that in 1996 at about €1.6 billion. Although, most by then was in the category of 'other interventions'; the total rose to €1.8 billion in 2005 as a result of enlargement of the community to 25 members. In January 2008 decoupling in subsidies for processing fruit and vegetables will start and this sector will be incorporated in the wider single farm payment system for agriculture (see below "F&V reform").

Total vegetable production in the EU-15 was about 55 million tonnes in 2001/02. The leading vegetable producing Member States were Italy, Spain and France (with 15, 12 and 8 million tonnes respectively). Fresh fruit production was 57 million tonnes. Again, Italy was the leading Member State (18 million tonnes), followed by Spain (15 million tonnes) and France (11 million tonnes). The 10 Accession States together produced 9 million tonnes of vegetables and 6 million tonnes of fruit (in 2005). Poland is the main producer (5 million tonnes of vegetables and 3 million tonnes of fruit). Production of 15 million tonnes makes tomatoes the most produced vegetable. Of this volume, 7 million tonnes are produced in Italy, almost 4 million tonnes in Spain, 2 million tonnes in Greece and over 1 million tonnes in Portugal. Apples are the leading fruit in the EU-15 with production of just over 9 million tonnes. Production takes place primarily in France (2.5 million tonnes), Italy (2.3 million tonnes) and Germany (1.8 million tonnes)[228].

The leading products traded are citrus fruit (oranges, tangerines and clementines) with 7 million tonnes, apples (5 million tonnes), tomatoes (4 million tonnes) and onions (3.7 million tonnes).

Latin American countries are the main suppliers for Europe. From total imports 27,4% coming from these countries, and 20,1% are only from MERCOSUR countries where most important products are Chilean apples and Argentinean lemons. Secondly, Mediterranean countries supply 14,7% of total vegetable and fruits imports to the EU (Turkey, 30,7% and Morocco 27,6%). Main products imported from Morocco are citrus and tomatoes which are the 70% of total vegetable and fruits supply from this country to Europe. Turkey offers mainly citrus and dry fruits which totalize a 30% of total Turkish exports in this sector.

European liberalization and the addition of new countries or new bilateral or multilateral trade agreements are important sources of new markets, threats and opportunities for Spanish horticulture and fruit productions. Since vegetable and fruits consumption into those new markets is relatively low but an increment in demand is probably taking place, exports from Spain might have few competitors and a potential expansion in nearest markets. Nevertheless, other products, like potatoes in Poland, are increasing their importance and might be considered during the following years (Pérez and De Pablo, 2003).

Consumption of fresh fruit and vegetables is generally stable with 43 million tonnes and 46 million tonnes (respectively) consumed within the EU.

Within total citrus fruit production of 10 million tonnes, oranges account for 6 million tonnes and small citrus fruits (tangerines, mandarins and clementines) for 2.6 million tonnes. Spain is the main producer of citrus fruit (5.6 million tonnes), followed by Italy (3 million tonnes) and Greece (1.3 million tonnes). Peaches and nectarines (4.2 million tonnes), dry onions (3.9 million tonnes), carrots (3.7 million tonnes), lettuce (3.2 million tonnes), cabbages (3 million tonnes) and pears (2.9 million tonnes) are also widely produced within the EU.

[228] EC Directorate-General for Agriculture (2003).

8.2.3 Economic relevance of F&V sector in Spain

8.2.3.1 Sector importance in Spain

Horticultural and fruit production has a main role in Spanish economy and agricultural production. Its participation on the final value of agricultural production is 32% which is largely higher than in most countries in the EU (except Italy and Greece).

The vegetable and fruit production is mainly not dependant on public funds because it has been traditionally market oriented (both for internal consumption and exporting destinations). In 2000 only 6,7% of the final value of total production was represented by public funds, which is an obvious indicator of the exporting capacity.

The fruits and vegetables sector in Spain contributed in 2006 with (FEPEX, 2006):

- 13.681 million of € (38% value of total agricultural production)
- 550.000 jobs (60% of total agrarian employment)
- 7388 millions of € in exports (only fresh F&V), which represents 42,7% of total Spanish agrarian exports, including fish and all primary products.

Table 8.2: Shares of production values for fruits and vegetables in Spain (2005)

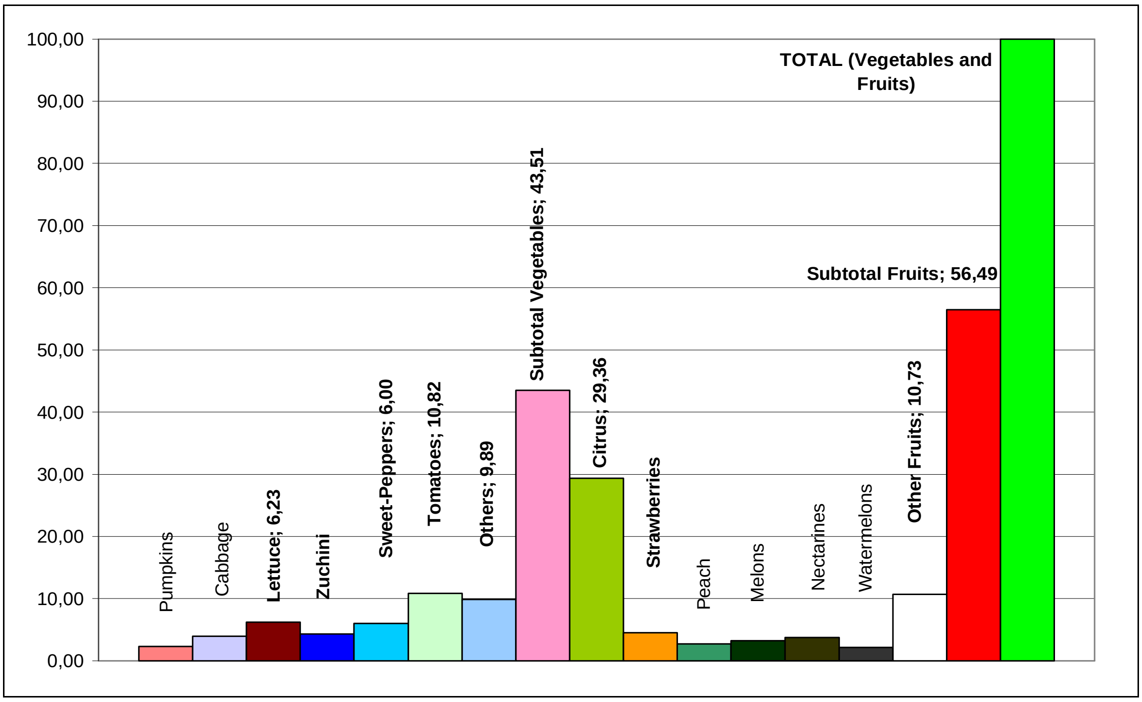
Product	Shares - Prod.value (%)
Citrus [1]	**44,65**
Tomatoes	15,49
Chillies and peppers	4,87
Peaches and nectarines	4,23
Lettuce and chicory	3,35
Beans	2,41
Strawberries	2,28
Other melons (incl. cantaloupes)	1,84
Pears and quinces	1,79
Cucumbers and gherkins	1,55
Apples	1,40
Onions (inc. shallots)	1,30
Bananas	1,27
Cauliflowers and broccoli	1,25
Mushrooms and truffles	1,24
Others	11,10

Source: Own elaboration from MAPA (2006)

[1]: Category “Citrus” includes tangerines, lemons and limes, oranges, and grapefruits

As can be seen in Table 8.2, Spanish citrus are the most relevant products followed firstly by tomatoes. Other significant products are lettuce, sweet peppers, peaches, melons, strawberries and cucumbers.

Figure 8.6: Relative weight of each product in the total Spanish exports of fruits and vegetables in 2006



Source: Own elaboration from FEPEX, 2006

Following Spain's incorporation into the EU, its fruits and vegetables exports grown from 3,5 to 9 million tons. The main destinations of these exports are among European countries (90%), where Germany and France are the most important buyers (25 and 20% respectively). UK (13%) and Netherlands (11%) are the next importers for Spanish fruits and vegetables. (FEPEX, 2006)

Considering products, citrus is the most important goal exported by Spain contributing up to 39,4% of all exports in this sector (see Figure 8.6). Other products in this sector are: tomatoes (900.000 t and 11% total exports), lettuce (420.000 t), peppers (425.000 t), zucchini (370.000 t), melons (375.000 t) and watermelons (320.000 t). All exports together reach a 35% of total fruits and vegetable crops. (FEPEX, 2006)

8.2.3.2 Main export-oriented regions

The region of Valencia was the most important area of citrus production. As shown in Figure 8.7 and Figure 8.8, Valencia, Murcia and Castellón provinces have been exporting the main fraction of Spanish citrus production.

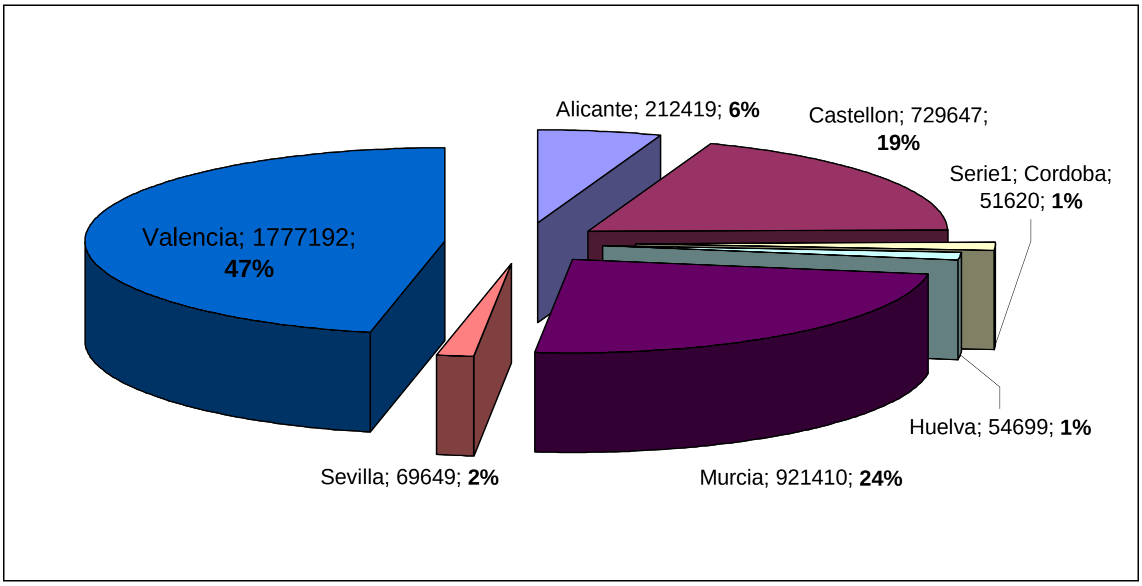
These citrus exports are mostly oranges and tangerines and they are mainly exported from the Autonomous Region of Valencia (Table 8.3 and Figure 8.7). This is a remarkable aspect that even when the region of Andalusia produces around 1 million tons of oranges it only exports a small fraction (239.661). The region of Valencia is producing about 1.7 millions annually and is ranked clearly as the main exported oriented region of the main product of the sector we are analyzing in this report.

Table 8.3: Citrus exports from main regions by product in 2004 (tons)

Product	Valencia	Andalusia	Murcia
Orange	1.159.714	172.849	103.463
Tangerine	1.263.938	29.869	69.344
Lemon	280.365	31.877	734.910
Grapefruit	15.241	5.066	13.693
TOTAL	2.719.258	239.661	921.410

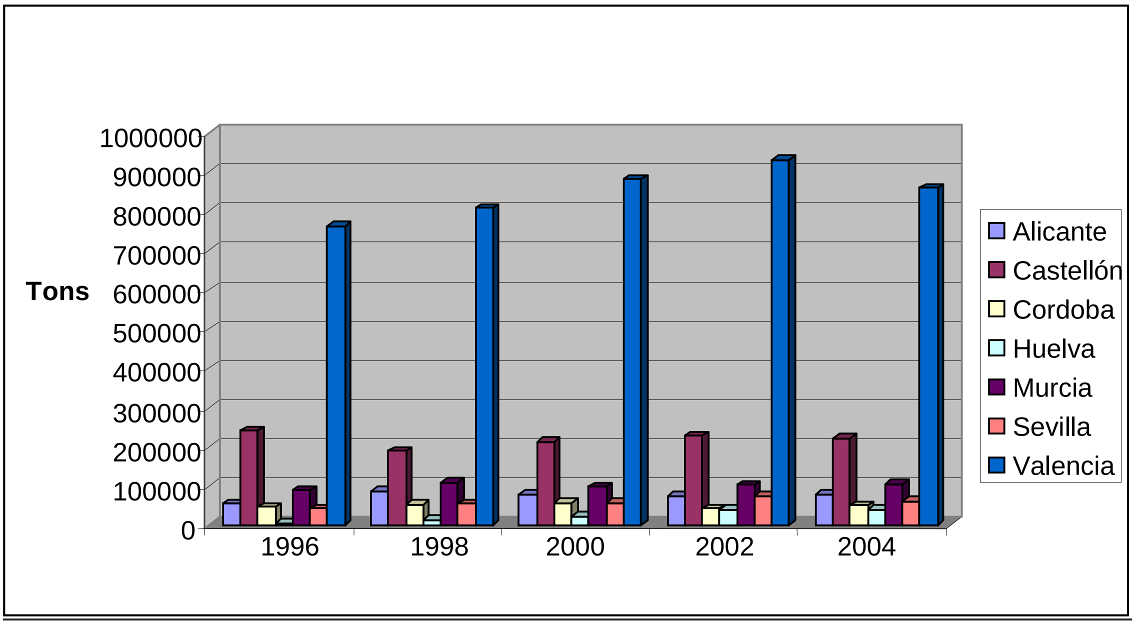
Source: Asociafruit (http://www.asociafruit.com/)

Figure 8.7: Total exports of Spanish citrus by province (tons and percentage of total exported in 2004)



Source: Own elaboration from Asociafruit, 2006

Figure 8.8: Evolution of Orange Exports in Spain from 1996 to 2004 (by provinces)



Source:Own elaboration from Asociafruit, 2006

8.2.4 Relevant regions for fruits and vegetables in Spain

As followed in this section, the study of the fruits sector will focus on citrus and the region selected for this analysis is the province of Valencia (Autonomous Region of Valencia). The study of the vegetables sector and of how compliance affects costs of production and consequently competitiveness will focus mainly in the region of Castilla-La Mancha.

In order to characterize the F&V production sector in Spain, we briefly described main products and regions. Table 8.4 shows the vegetable and fruits production, excluding flowers and ornamental plants is about 24,7 million tons and 7518 million euros. The vegetable crops like tomatoes, peppers, melons and lettuce are 56,7% of total value and 48,8% of total volume. Citrus production represents 22,1% of total volume and 15,9% of value, specially oranges and tangerines that are more than 80% of total production and value of this group. Followed by potatoes production, non-citrus fruits are respectively 12,6% and 5,9% of volume and value.

Table 8.4: Vegetable and Fruits production and value by crop groups (average 1997/1998)

Group	Production			Value	
	‘000 tons	%		Millions of €	%
Vegetables	12075,00	48,80		4260,00	56,70
Citrus trees	5462,00	22,10		1192,00	15,90
Fruits (not citrus)	3123,00	12,60		1125,00	15,00
Dry Fruits*	452,00	1,80		305,00	4,10
Potatoes	3191,00	12,90		504,00	6,70
Bananas	422,00	1,70		131,00	1,70
TOTAL	**24.725**	**100,00**		**7518,00**	**100,00**
Flowers and ornamental plants (thousands of dozens)*	**419.405**	**100,00**		**568,00**	**100,00**
Flowers	275.597	66		391	69
Ornamental Plants	143.708	34		177	31

Source: MAPA 2003

** Production in thousands of plants and surface*

*** Including hazelnuts, walnuts and prosopis trees*

Among a variety of more than 80 products from oranges to potatoes or cabbage, it is possible to identify several markets and productive scenarios since this sector is wide and diverse due to its production characteristics and complexity (Junta de Andalucía, 2004).

Regarding the regional distribution in the national territory, vegetable and fruit productions (both in total area and production value) areas are concentrated in provinces closed to the Mediterranean coast. Thus, a 64,4% of total production quantity is located mainly in the Autonomous Regions of Andalusia, Murcia and Valencia while other inland areas in the country account for the rest of the nation’s production specially in the regions of Extremadura in the Eastern central part and Castilla La Mancha in the Southern central plateau of Spain (see Table 8.5).

Table 8.5: Total production by regions and crops / 97-98 / (thousands of tons)

Regions	Vegetable crops	Citrus	Fruits (non citrus)	Dry fruits	Potatoes	Bananas	Fruits and Vegetables (total)
Andalusia	**4710**	**846**	**282**	**85**	**489**	**0**	**6412**
Aragon	218	0	549	58	57	0	882
Balears (islands)	206	46	52	30	79	0	412
C. Valenciana	**836**	**3825**	**256**	**123**	**153**	**0**	**5192**
Canarias	491	22	18	1	90	422	1044
Cantabria	17	0	4	0	36	0	56
Castilla-La Mancha	1191	0	60	20	233	0	1504
Castilla y León	373	0	63	5	875	0	1316
Cataluña	508	89	1037	84	130	0	1849
Extremadura	1033	1	178	2	39	0	1253
Galicia	264	8	78	3	524	0	876
La Rioja	267	0	91	7	193	0	558
Madrid	137	0	4	0	36	0	177
Navarra	344	0	33	3	25	0	405
P. De Asturias	23	0	34	0	71	0	128
País Vasco	48	0	13	1	115	0	177
R. De Murcia	1408	625	371	31	48	0	2484
ESPAÑA	**12075**	**5462**	**3123**	**452**	**3191**		**24726**
Value Millions €	4260	1192	1125	305	504	131	7517
% Value	57	16	15	4	7	2	100

Source: MAPA, 2003

Summing, main products produced and exported in Spanish horticulture and fruit sectors are citrus, tomatoes and some other vegetable crops like strawberries, peppers, melons and lettuce. Altogether, those products are mainly exported from few regions as has been mentioned before.

8.3 Agricultural and environmental policies

8.3.1 The F&V Common Market Organization and the CAP reform

The Common Market Organization (CMO) for F&V differs from other CAP regulations applied to other agricultural products. The basic regulations covering fresh F&V, processed F&V, and a system of Community aids granted to certain citrus fruits were laid down in 1996, although the basic regulation has been subjected to a number of amendments since 2000. For fresh products, the system is characterized by support to Producer Organizations (POs) under Operational funds as well as and intervention measures through market withdrawals compensated with Community funds. Processed products are guided by a system based on direct aids to producers according to national thresholds with penalties if processed volumes increase beyond fixed limits.

A Community production aid scheme for tomatoes, peaches and pears intended for processing has been established. All products, whether raw material or finished products, have to meet minimum quality requirements. The aid is granted to producer organizations recognized under Regulation (EC) No 2200/96 on the common organization of the market in fruit and vegetables.

On January 24, 2007, the European Commission presented the Proposal of the reform for the fruit and vegetable sector[229]. The reform brings the fruit and vegetable sector closer to the rest of the reformed Common Agricultural Policy guidelines. The European Union aims to address the following concerns: improve the competitiveness and market orientation, reduce fluctuations in producers' income, increase fruit and vegetable consumption, and endeavor to protect the environment, and simplify and reduce the administrative burden for all concerned.

The production and marketing of fruit and vegetables should take full account of environmental concerns, including cultivation practices, the management of waste materials and the disposal of products withdrawn from the market, in particular as regards the protection of water quality, the maintenance of biodiversity and the upkeep of the countryside.

In order to achieve this, the Commission proposes:

- the introduction of fruit and vegetables areas in the Single Payment Scheme means that the cross compliance rules will be compulsory for all fruit and vegetables producers receiving direct payments;
- an enhanced approach to operational programs: Currently there are no limits in the operational programs for environmental measures expenditures: The reform proposal introduces a minimum of 20% of expenditure in each operational program;
- an enhanced approach to organic production: During the last years, an increasing demand for organic vegetables, largely being met by innovative, medium scale producers has occurred. The proposal introduces a Community co-financing rate of 60% for organic production in each operational program.

All fruit and vegetable areas will be eligible under the Single Payment scheme. Subsequently, Member States will consider excemptions to receive entitlements and determine the period of reference and the payment amount for each product (vegetable or fruit). Also a transitional stage is considered in order to facilitate growers' adaptation to the new scheme. Moreover, Member States have the faculty to encourage farmers to be part of producer's organizations through a conditional requirement in order to obtain the payments.

With this reform, all agricultural area that had fruit & vegetables during the reference period, including permanent crops and land under table potatoes, is eligible in all 27 Member States. The major difference is that now payments to processors are decoupled and the Single Farm Payment budget is increased to offset the additional enrollment that including fruit and vegetable production in all 27 Member States will bring.

[229] For Commission proposals (January '07) see: http://europa.eu/rapid/pressReleasesAction.do?reference=IP/07/75&format=HTML&aged=0&language=EN&guiLanguage=en

Producing Member States have concerns with the decoupling of aid, mainly for flexible crops (those that can be eaten fresh or processed) like oranges and tomatoes. Moreover, the new possibility to produce fruit and vegetables on areas eligible to Single Farm Payments has raised serious concerns of competitiveness for traditional producers corresponding to the entitlements.

Regarding the trade with third countries, the main measure outlined in the reform proposal was the abolition of export refunds. The rest of the provisions related to trade with third countries remain unchanged until the outcome of the WTO negotiations (entry prices, special safeguard clause, and general safeguard clause) (USDA, 2007).

8.3.2 Reaction in Spain

Immediate reaction to the reform from both Spain's major Producer Organizations (PO) and Spanish Export Federation has been negative. The Small Farmer's Union (UPA), The Young Farmer's Association (ASAJA), Agricultural Cooperatives (CCAE) and the Federation of exporters of Fruits and Vegetables (FEPEX) have all raised their concerns with the EC proposal.

They argue that decoupling will severely destabilize the market and will not alleviate the current structural issues like those facing citrus producers. Spanish Ministry of Agriculture agreed mostly with the EC proposal but argued that transformed citrus quantity would be affected negatively, perturbing fresh markets as well. The Spanish exporters question the future competitiveness of the sector given that some producers will be eligible for Single Farm Payments and others will not be. Others cite the failure of the proposal to address regulation of distribution practices.

Farmers lobbies are pushing for keeping the status quo, but its position will have little influence over the Commission final proposal to the Council. The compromise agreements will probably focus on (i) the maintenance of support on Producer Organizations through Operational Funds (ii) the flexibilization of the use of the funds originating in the decoupling of processing aids, through national envelopes. A significant part of the reform's success depends on the effectiveness of the POs in concentrating supply and on the right use of committed funds, which requires a closer monitoring and assessment of the operational programs.

García Alvarez-Coque *et al (*2007), argued that …"Nevertheless, the new CMO approved by the Council will not be effective to correct the most important weaknesses affecting the F&V market. These mainly refer to (i) the lack of market transparency across the supply chain, which limits the ability of farmers to successfully negotiate with retailers, and to (ii) the decreasing demand trend, which has to do with a major change in the food habits of young people, and calls for a decisive a persistent public action on promotion of human consumption".

8.3.3 Environmental concerns on the F&V sector: a comparison between Spain and the US

As mentioned before, the EU environmental policy that affects directly to the F&V sector is strictly linked to the CAP and its reforms. The implementation of pesticides and nitrogen regulations started decades ago, for instance the Plant Protection Products Directive (91/414/EEC). The EU also applies regulations to protect water quality in respect of pesticides, which affect importantly the use of agrochemicals, especially in horticulture were inputs are high. The Water Framework Directive demands for measures to reduce or eliminate discharges and losses of hazardous substances, for the protection of surface waters. By 2001, 33 priority substances had been listed, out of which 13 substances were used in plant protection products.

Agri-environmental measures imply the obligation of keeping records of actual use of pesticides, lower use of pesticides to protect soil, water, air and biodiversity, the use of integrated pest management techniques and the conversion to organic farming. The EU's Sixth Environment Action Programme addresses the need to encourage farmers to change their use of plant protection products. In this line, the reinforced cross-compliance established by the 2003 CAP reform includes the respect of statutory requirements arising from the implementation of EU regulation covering the placing of plant protection products on the market.

The environmental policies and payments in the US differ importantly from those in the EU and this has an important impact in the fruits and vegetable sector. The European Union (EU) adresses ,green payments more broadly than does the United States, using them to achieve socioeconomic and rural development goals as well as environmental goals. The EU offers agri-environmental payments to farmers within the framework of its rural development policy, which encompasses not only environmental activities but also investments in farm renovation, programs to help young farmers get established or to promote early retirement, assistance with processing and marketing farm products, and programs to promote the non-farm rural economy such as agri-tourism or preservation of cultural heritage (Hanrahan and Zinn, 2005).

In the US there are also programs which encourage the implementation of conservation practices by farmers in the F&V sector. The Environmental Quality Incentives Program (EQIP) was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) as a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. The EQIP offers financial and technical help to participants for the implementation of structural and management practices on eligible agricultural land. This program may cost-share up to 75 percent of the costs of certain conservation practices. Incentive payments may be provided for up to three years to encourage producers to join the program. However, limited resource producers and beginning farmers and ranchers may be eligible for cost-shares up to 90 percent. Farmers and ranchers may decide to use a certified third-party provider for technical assistance. An individual or entity may not receive, directly or indirectly, cost-share or incentive payments that, in the aggregate, exceed $450,000 for all EQIP contracts entered during the term of the Farm Bill (USDA, 2007).

In vegetable crops, the Pest Management incentive payment offers an Integrated Pest Management (IPM) base payment ($20-30/acre) and a record keeping ($10/acre) incentive rate, with additional money for add-on components for activities such as: pest monitoring systems, weather monitoring and disease forecasting, predator and parasitoid augmentation and conservation, crop rotation, utilizing less hazardous chemicals, adhering storage guidelines, improving coverage at the target zone, applying pesticides with retrofitted sprayers, perimeter trapping systems, and spot treatment.

Another example regarding environmental concerns and producers' organizations is the Florida Fruit and Vegetable Association. This organization collaborates with state, regional and federal regulatory agencies, with stakeholders, with other grower organizations, with the crop protection registrant community and with University extension specialists on an extensive array of actions designed to advance the implementation and embracement of integrated pest management practices for achieving meaningful crop protection chemical risk reductions[230].

8.4 Selection of the case study regions

The approach chosen for the analysis of the impact of standards and GAECs on farm income is based on the selection of case studies. The criteria for the selection of the case study areas are three:

- Main products within the sector (in terms of production)
- Importance of the sector in the region
- Importance of the standard in the region
- Availability of data and tools for the analysis

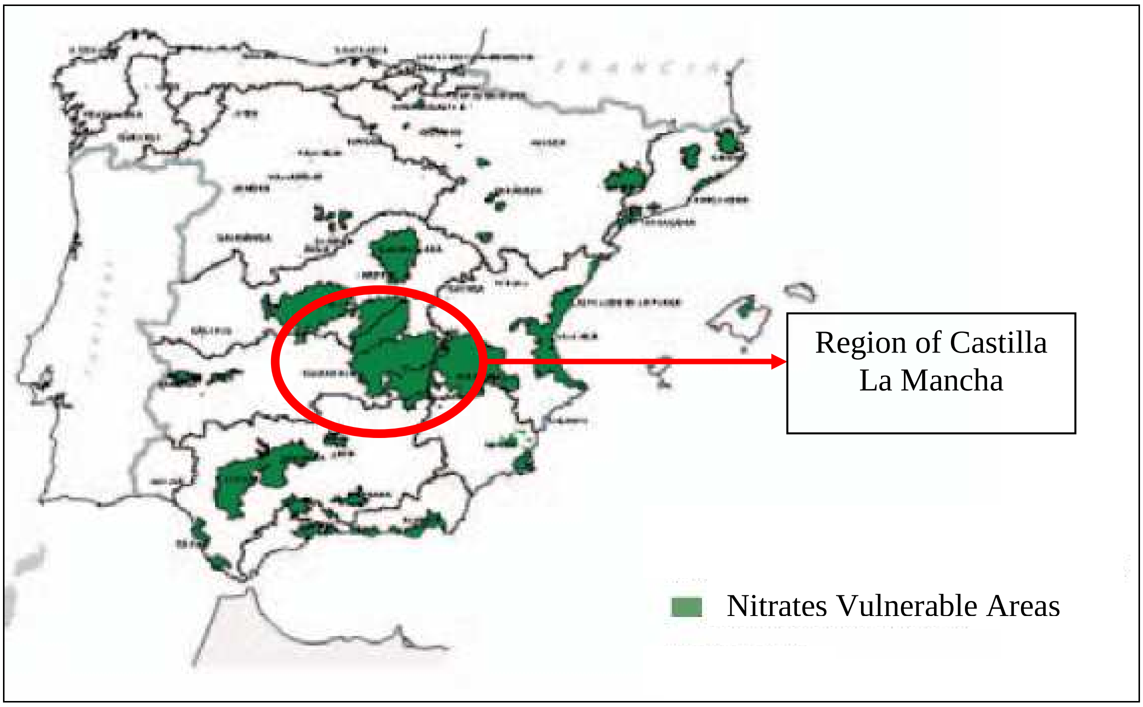
For the analysis of the fruits sector, the study focuses in citrus farms, because of the main role of citrus both in production and in exports value. According to Figure 8.7 and Figure 8.8, and Table 8.5 the main Spanish region in citrus production and exports is the Region of Valencia, so that the case study area for the citrus farms analysis will be the Region of Valencia.

For the analysis of the vegetables sector, the region selected for the case study is the Region of Castilla La Mancha. The reasons for the selection of this area are the following:

- Availability of an agronomic model calibrated for the area (Azaña, 2007).
- Availability of the economic model SIWAP (System for Integration of Water and Agricultural Policies) specially designed for the farm systems place in this region (Newater Project, Varela et al, 2006).
- This region is one of the most important nitrates vulnerable area in Spain.
- Aquifer overexploitation is a main issue in the area, so that GAECs requirements for overexploited aquifers are relevant here.

[230] Source: http://www.epa.gov/oppbppd1/pesp/strategies/2005/ffva05.htm

Figure 8.9: Nitrates Vulnerable areas in Spain



Source: MMA, 2005

The study will focus on the farm systems placed on the Western La Mancha Aquifer, in the Upper Guadiana river basin, which combine problems of nitrates pollution and overexploitation, where the Water Abstraction Plan (WAP) establishes water quotas for the farms in the aquifer. The surface of the aquifer is 5500 km^2 and irrigated agriculture in the aquifer represents a surface of 140000 hectares.

The products selected for the study are the main vegetable crops cultivated in the area: potato, melon, pepper and garlic.

8.4.1 Fruits in the region of Valencia

As seen in the first section, citrus and tomatoes are the most important products in order to analyze trading and competitiveness due to their total value in money units and in the volume of exports.

The analysis of the distribution of surface by strata of citrus orchards in Valencia, shows that 71.166 farms from a total of 92.117 (77,2%), concentrate their production on oranges. Secondly, farms that grow tangerines are 40% of total farms.

Around 66% of orchards in Valencia uses irrigation (92117 farms from 138.901, see Table 8.6) and most growers occupy the 1-5ha rank. The farm type that characterizes citrus production in the Valencia region grows mainly oranges and tangerines as it is shown in Table 8.7.

Table 8.6: Irrigated and rain fed fruit farms in Valencia: number of farms and surface by strata

	TOTAL		Raifed (%)		Irrigated (%)	
	Num.Farms	Ha.	Num.Farms	Ha.	Num.Farms	Ha.
Farm Strata	138901	304424	**26,90%**	34,35%	**73,10%**	65,65%
< 1	40304	20864	1,49%	0,28%	28,97%	6,57%
1 a < 2	30332	34511	5,56%	1,70%	17,20%	9,64%
2 a < 5	**30217**	**67421**	**8,47%**	**6,08%**	**16,58%**	**16,07%**
5 a < 10	**15976**	**71286**	**7,24%**	**11,23%**	**6,92%**	**12,18%**
10 a < 20	5637	43512	2,60%	5,91%	2,51%	8,38%
20 a < 30	1359	15498	0,73%	2,67%	0,34%	2,43%
30 a < 50	979	19192	0,41%	2,48%	0,36%	3,82%
50 a < 100	503	14423	0,25%	1,74%	0,15%	3,00%
>=100	277	17718	0,15%	2,26%	0,06%	3,56%

Source: Own Elaboration from INE 1999

Table 8.7: Number of farms and surface by products and by strata in the province of Valencia

	CITRUS		ORANGE		TANGERINES		LEMONS		OTHERS	
	Number of Farms	Surface (ha)	Number of Farms	Surface (ha)	Number of Farms	Surface (ha)	Number of Farms	Surface (ha)	Number of Farms	Surface (ha)
Farm Strata(ha)	92117	173899	71166	98986	36870	64299	7451	10439	78	175
< 1	38070	18511	26522	11783	12607	5859	2409	869	..	..
1 a < 2	22317	26505	18414	16607	9297	8402	2104	1496	..	..
2 a < 5	19754	43146	16172	24834	9519	17184	1763	1127	..	..
5 a < 10	8275	31146	6997	17590	3500	11035	796	2513	53	8
10 a < 20	2741	21682	2256	12311	1306	8166	247	1198	10	6
20 a < 30	393	6164	313	2686	268	3333	29	145	..	..
30 a < 50	365	10066	314	4784	226	4445	50	751	10	87
50 a < 100	136	7746	118	4178	97	2978	21	589	1	0
>=100	67	8933	59	4211	50	2896	32	1752	5	74

Source: Own Elaboration from INE1999

In the province of Valencia, rain fed agriculture for citrus production is about 30% and the association with other fruits is not very usual. Based on the data of farm size, surface, number of farms and crop association, we can select an orchard farm type for the province of Valencia that characterizes the citrus production in the Region.

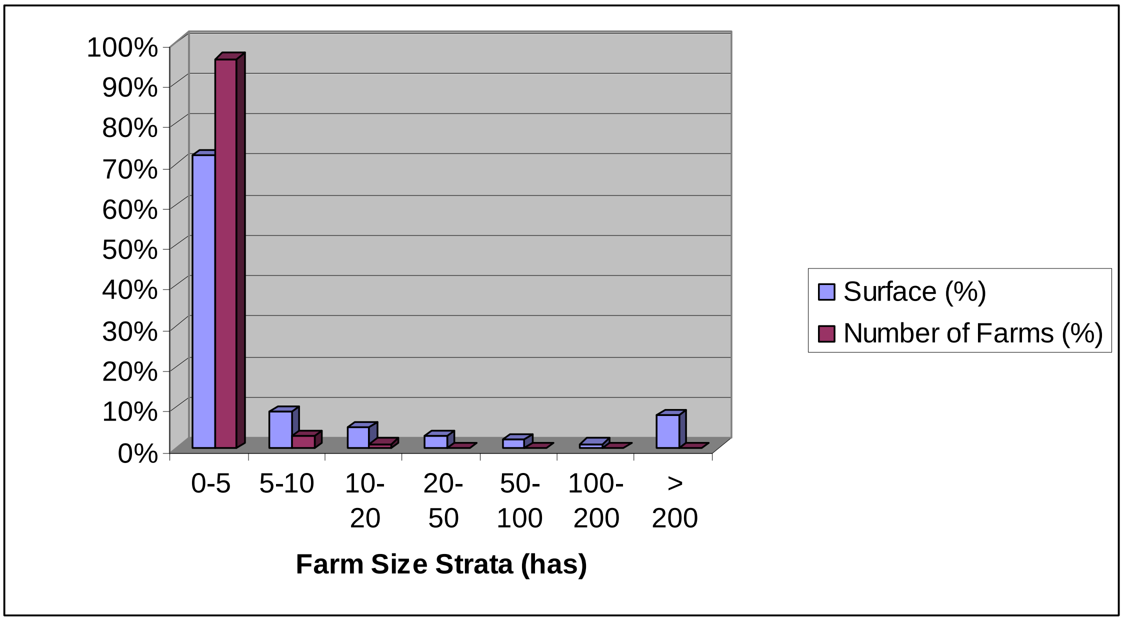
8.4.2 Selection of a representative farm in the region of Valencia

Regarding representative regions and municipalities among the Autonomous Region of Valencia, this study has selected some specific locations. The Valencia province is the most important province regarding the fruit production area[231]. Inside the Region of Valencia, some specific locations might be selected to describe a typical and representative farm of citrus production. Among agronomic zones, the subregion Riberas del Jucar is the most important area for citrus production, and Alzira is the municipality which represent the most important production area. This region is also designated as a nitrates vulnerable area and there are several reports of water contamination from horticulture and rice on the Júcar river basin.

In the municipality of Alzira, most farms (96%) are 5 hectares at most, covering about 72% of the land used for fruits (Figure 8.10). Thus, according with our analysis we have outlined the following farm type for Valencian citrus as follows:

- F&V_F1: denotes an irrigated orange grove in the province of Valencia, municipality of Alzira. The average size for this farm type is 2-2,5 hectares and it is irrigated using groundwater sources mainly[232].

Figure 8.10: Number of farms and surface by farm size strata (hectares) in the municipality of Alzira



Source: own elaboration from INE 1999

[231] Valencia province accounts 79,000 orchards and 104,000 hectares and it is followed by Castellón (25,000 orchards, 40,000 hectares) and Alicante (19,000 orchards, 34,000 hectares). Source: INE, 1999. www.ine.es

[232] Irrigation using groundwater in the municipality of Alzira (sub-region of Riberas del Júcar) is about 60% and orchards using surface water for irrigation are 35%. This is an important fact because a nitrogen reduction in order to comply the legal framework, might have less effect. Contamination with nitrates using groundwater has been reported to cause more nitrate contamination than irrigated orchards that used surface water sources; this fact has been attributed to the more important content of nitrates in ground waters (De Paz Becares and R.Mompó, 1998).

8.4.3 Vegetables in the region of Castilla La Mancha

Data from the Agrarian Census of 1999, (INE, 1999) show that the fruits and vegetables sector covers 9.1% of the total cultivated area in Spain, distributed in 1,216,653 farms with an average farm size of 1,26 hectares. Since 1989, the surface and number of the farms have decreased (4.7% and 25%) and the average size of the farm has increased in 27%.

Coupled to the importance of the sector in terms of production and exports, it is important to highlight the social relevance of this sector due to its high labor requirements. Horticultural crops are called “social crops”, and most regional governments are promoting this type of crops.

In The region of Castilla-La Mancha monoculture is not very common and farms are mainly oriented to mixed productions. Vegetables are profitable crops in this area and yields tend to be high. However, water scarcity in the area is the limiting factor for expanding production of vegetables and therefore most farms have to rely on mixed cropping patterns combining vegetable production with less water intensive crops like winter cereals. Vineyard is the main crop in terms of area and very often it is combined with vegetables as well. Table 8.8 shows the land distribution in the region of Castilla-La Mancha.

Just a 10% of the vegetables surface in the region of Castilla-La Mancha is rain fed and therefore our study will focus on irrigated farms. The major environmental problems in the region of Castilla-La Mancha related to agriculture are the depletion of aquifers due to over pumping for irrigation water and nitrates pollution. For this reason, our study will focus on the area covered by the Western-La Mancha aquifer that is currently overexploited and therefore subject to water use restrictions and situated in a nitrates vulnerable zone. This area is situated in the provinces of Ciudad Real, Albacete and Cuenca.

Table 8.8: Land distribution in CLM and Spain

	Castilla La Mancha	**Spain**	**% CLM/Spain**
Number of farms	197.668	1.790.162	11,0
Total Area (TA)	6.869.606	42.180.950	16,3
Used Agricultural Area (UAA)	4.581.592	26.316.787	17,4
Total Cultivated Lands (ha)	3.763.479	16.920.360	22,2
Irrigated Agricultural Area (ha)	462.964	3.289.021	14,1
Permanent pasture (ha)	818.113	9.396.427	8,7
Category of crops			
Annual species			
Farms	92.535	890.094	10,4
Area (ha)	2.864.902	12.399.723	23,1
ha/Farm	31,0	13,9	223,0
Vegetables			
Farms	14.439	274.077	5,3
Area (ha)	34.975,2	288.843,0	12,1
ha/Farm	2,4	1,1	218,2
Fruit trees			
Farms	22.711	565.018	4,0
Area (ha)	58.158	1.151.968	5,0
ha/Farm	2,6	2,0	130,0
Olive groves			
Farms	111.010	602.249	18,4
Area (ha)	312.971	2.273.589	13,8
ha/Farm	2,8	3,8	73,7

	Castilla La Mancha	Spain	% CLM/Spain
Vineyards			
Farms	81.452	342.096	23,8
Area (ha)	526.727	1.035.347	50,9
ha/Farm	6,5	3,0	216,7
Others			
Farms	396	40.155	1,0
Area (ha)	721	59.733	1,2
ha/Farm	1,8	1,5	120,0

Source: Junta de Castilla la Mancha, 2004

8.4.4 Selection of Representative Farms in the region of Castilla La Mancha

The municipalities selected for the study are located in the province of Ciudad Real and their farm structure, cropping pattern and input use characterize largely the farming sector of the whole region. Specifically, the municipalities selected are: Daimiel, Alcázar de San Juan, Herencia and Manzanares where an ample field work has already been carried out by Varela-Ortega *et al*. (2007). The next Table 8.9 shows the farm size strata in the region of Castilla-La Mancha and the number of farms and surface included in each stratum.

Land distribution in the province of Ciudad Real is similar to the distribution in the Region of Castilla La Mancha (Table 8.9 and The next level of desegregation is the study of the agronomic zone. The four municipalities selected for the study belong to the agronomic zone of "Mancha" and its surface distribution has been considered for the definition of the farm types. Several municipalities have been selected since there are different kinds of associations among a variety of vegetable crops. Then these locations will be listed below when describing main areas production and crops in order of importance.

Table 8.10).

Table 8.9: Number of farms and surface by farm strata in the Region of Castilla-La Mancha

CASTILLA LA MANCHA					
	Number of farms	Number of farms %	% Accumulated	Surface (Ha)	Surface %
Farms with land	194842	100,00		4581592	100
0,1 a < 1	27087	13,90	13,90	12326	0,27
1 a < 5	69512	35,68	49,58	147605	3,22
5 a < 10	30316	15,56	65,14	181513	3,96
10 a < 20	24464	12,56	77,69	296790	6,48
20 a < 50	21894	11,24	88,93	601970	13,14
50 a < 100	10135	5,20	94,13	635147	13,86
100 a < 200	5944	3,05	97,18	718904	15,69
>=200	5490	2,82	100,00	1987337	43,38

Source: Own elaboration from INE 1999

The next level of desegregation is the study of the agronomic zone. The four municipalities selected for the study belong to the agronomic zone of "Mancha" and its surface distribution has been considered for the definition of the farm types. Several municipalities have been selected since there are different kinds of associations among a variety of vegetable crops. Then these locations will be listed below when describing main areas production and crops in order of importance.

Table 8.10: Number of farms and surface by farm strata in the Province of Ciudad Real

CIUDAD REAL					
Farm size strata	Number of farms	Number of farms %	% Accumulated	Surface (Ha)	Surface %
Farms with land	55435	100,00	-	1229573	100
0,1 a < 1	6497	11,72	11,72	3402	0,28
1 a < 5	20592	37,15	48,87	46786	3,81
5 a < 10	9450	17,05	65,91	60201	4,90
10 a < 20	7521	13,57	79,48	96320	7,83
20 a < 50	6602	11,91	91,39	189619	15,42
50 a < 100	2382	4,30	95,69	149786	12,18
100 a < 200	1138	2,05	97,74	140446	11,42
>= 200	1253	2,26	100,00	543012	44,16

Source: Own elaboration from INE 1999

Table 8.11: Number of farms and surface by farm strata in the agronomic zone "Mancha"

Agronomic zone: "Mancha"					
Farm size	Farm No.	% Farms	Surface (ha)	% Surface	Average surface (ha)
< 5 ha	9697	44,16	21156	5,43	2,18
5 a < 10 ha	4247	19,34	29416	7,55	6,93
10 a < 20 ha	3470	15,80	47556	12,21	13,70
20 a < 50 ha	3028	13,79	90966	23,36	30,04
>= 50 ha	1515	6,90	200373	51,45	132,26
Total	21957	100	389467	100	17,74

Source: Own elaboration from INE 1999

For the selected municipalities (that correspond to the water user associations, namely Daimiel, Alcázar de San Juan, Herencia and Manzanares) we have carried out the correspondent analysis of surface and number of farms by farm strata to select the statistically representative farm types for the province of Ciudad Real in the Region of Castilla-La

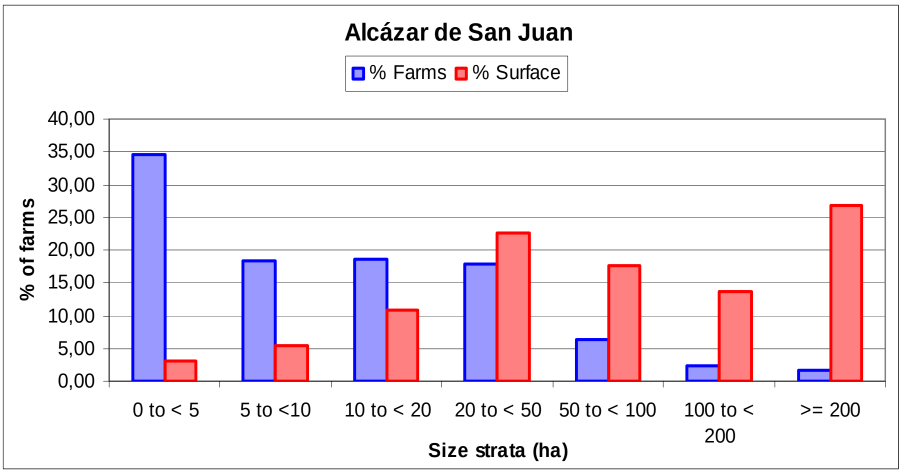
Mancha. Figure 8.11-8.14 summarize the statistical analysis carried out for the selection of farm types.

The farms in Western La Mancha Aquifer are mainly mixed production oriented, combining cereals with permanent crops and other more water demanding crops such as vegetables. According to statistical data from the regional government of Castilla-La Mancha (2005) the main crops in the area are winter cereals (mainly barley and wheat), horticultural crops such as melon, pepper and garlic, and vineyard, which accounts for a large surface and is a major social crop as it is a highly labour demanding crop.

The farm types selected for the study are:

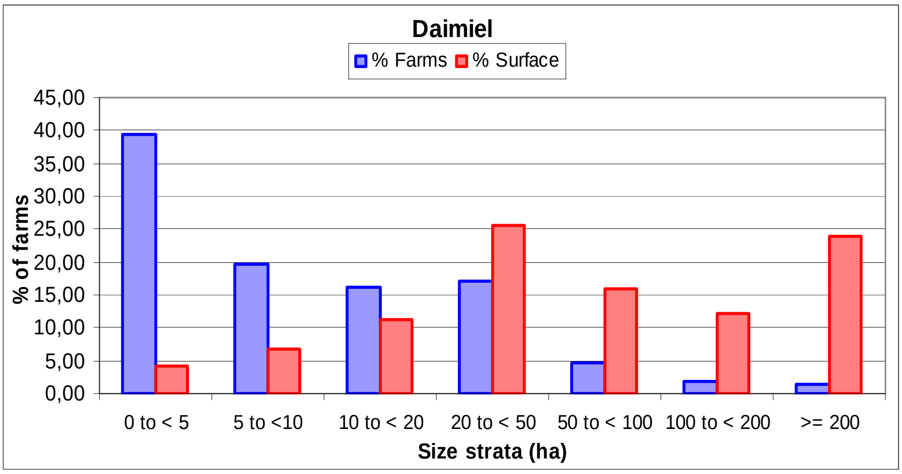
- F&V_F2: 150 hectares, medium soil quality with the crop mix of winter cereals, **garlic, melon** and set-aside. Municipality of Alcázar de San Juan.
- F&V_F3: denotes a farm of 70 hectares, medium and low soil quality with the crop mix of winter cereals, **melon**, **potato**, and set-aside. Municipality of Daimiel.
- F&V_F4: 19 hectares, medium soil quality. The crops are winter cereals **melon** and set-aside. Municipality of Herencia.
- F&V_F5: 40 hectares, 85% good quality soil and 15% low quality soil. Crop mix of winter cereals, vine, **potato, green pepper** and set-aside. Municipality of Manzanares.

Figure 8.11: Distribution of farms and surface in farm size strata in the municipality of Alcázar de San Juan



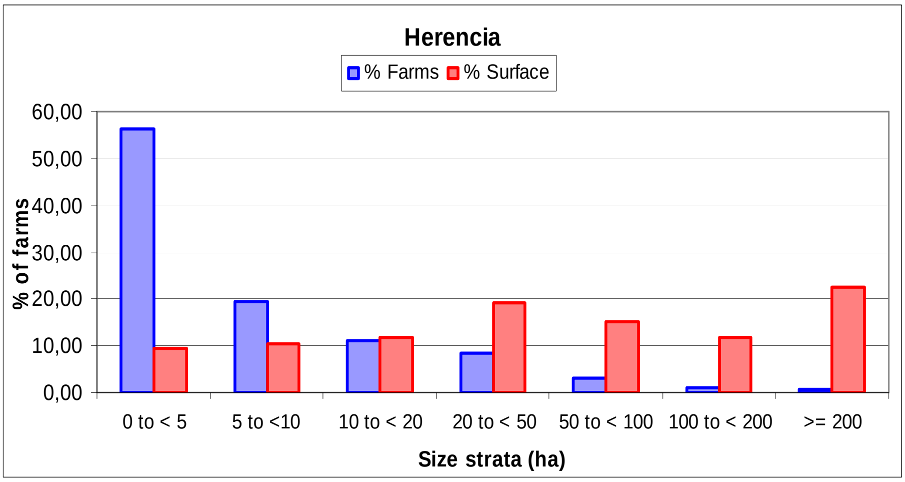
Source: own elaboration from INE 1999

Figure 8.12: Distribution of farms and surface by farm size strata in the municipality of Daimiel



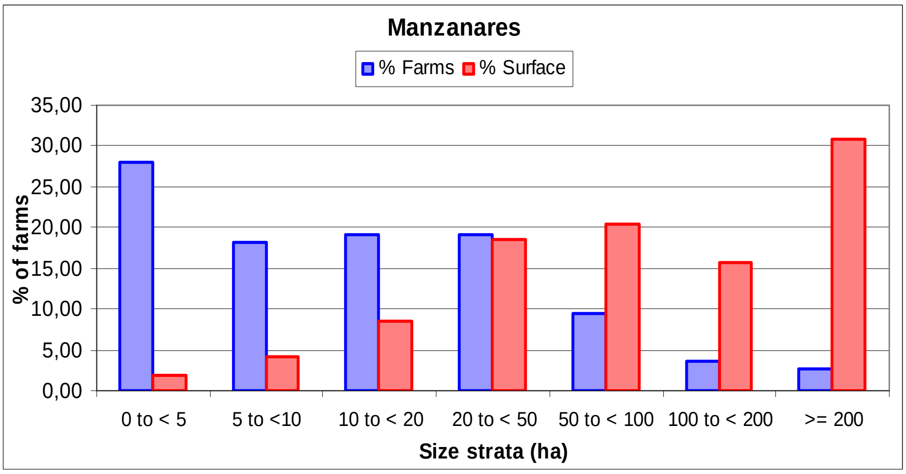
Source: own elaboration from INE 1999

Figure 8.13: Distribution of farms and surface by farm size strata in the municipality of Herencia



Source: own elaboration from INE 1999

Figure 8.14: Distribution of farms and surface by farm size strata in the municipality of Manzanares



Source: own elaboration from INE 1999

8.5 Costs of compliance for fruits in the region of Valencia

8.5.1 Costs structure in a Citrus Orchard in Valencia

As seen in Table 8.12, all fertilizers and pesticides, and its- applications might represent about 30% of costs. Irrigation in a flood irrigation scheme (which is 60% of orchards in Valencia), is about 3 times more expensive than a dripping irrigation scheme.

Table 8.12: Cost structure at a citrus orchard level in Valencia (data from 1997, values in €/ha)

	OPTION 1				OPTION 2			
	ORANGES		CLEMENTINES		ORANGES		CLEMENTINES	
Yield (Kg/ha)	30000		26500		30000		26500	
1. Variable costs	€	%	€	%	€	%	€	%
Water for irrigation	668,48	17,58	668,48	16,23	565,25	17,08	565,25	15,28
Fertilizers	438,74	11,54	138,74	3,37	468,79	14,17	468,79	12,67
Pesticides and foliar fertilizers	453,27	11,92	677,56	16,45	302,25	9,14	432,18	11,68
Others chemical products	60,85	1,60	60,85	1,48	60,85	1,84	60,85	1,64
Variable costs of own machines	58,74	1,55	58,74	1,43	181,92	5,50	189,64	5,12
Hand work								
* Irrigation	**159,87**	4,21	**159,87**	3,88	**52,89**	1,60	**52,89**	1,43
* prunning	495,83	13,04	743,75	18,06	447,75	13,53	646,09	17,46
* Product applications	318,54	8,38	383,45	9,31	191,72	5,79	206,15	5,57
* Other manual operations								
and transport works	190,14	5,00	212,96	5,17	66,11	2,00	66,11	1,79
TOTAL VARIABLE COSTS	**2844,46**	**74,82**	**3104,4**	**75,38**	**2337,53**	**70,65**	**2687,95**	**72,64**
2. Fixed Costs								
Machinery	262,94	6,92	262,94	6,39	159,27	4,81	159,27	4,30
Plantation Amortization	346,42	9,11	365,49	8,88	224,33	6,78	243,41	6,58
Trees reposition	56,86	1,50	56,86	1,38	56,86	1,72	56,86	1,54
Irrigation equipment amortization					295,7	8,94	295,7	7,99
Taxes and Insurance	291,16	7,66	328,39	7,97	234,88	7,10	257,23	6,95
TOTAL FIXED COSTS	**957,38**	**25,18**	**1013,68**	**24,62**	**971,03**	**29,35**	**1012,46**	**27,36**
TOTAL	**3801,84**	**100**	**4118,08**	**100**	**3308,56**	**100**	**3700,41**	**100**
TOTAL per Kg	0,127		0,155		0,11		0,14	

Source: Caballero and De Miguel (2002b). Option 1 and 2 are two levels of intensification in Valencia: level 1 is a single unit with similar characteristics than the farm type selected in this analysis (flood irrigation, 2has unit) and option 2 is 25has farm that result of a cooperative unit formed by several growers or a single association of small growers (1 or 2 has) where a more mechanized scheme is used. Values in € per hectare.

Other important issues affecting the fruits sector are food safety, and the use of pesticides. This analysis is very difficult to have at the farm level in citrus production; since pesticides are broadly diverse and agricultural practices and technology have improved extensively during the last years. Even if it seems a contradiction, using fewer pesticides has been always correlated with higher control efficiency at the farm level because new methods consider monitoring of insects and fungus, symptoms studies, and new products that are not necessarily more expensive. These issues might eventually produce an increase in costs of protection in some cases and also some crop costs at the far level might be changed since cropping patterns or agricultural practices (calendar, irrigation, fertilization, etc.) could be others. Yields and costs are balanced at the farm level depending on farmer's strategies every year. These strategies are correlated with pest populations and expected damages they do. In the following pages, we analyze diverse combinations in order to improve our understanding about cost increases on pesticides at the farm level when complying new measures.

8.5.2 The legal framework

Table 8.13: Legal framework and expected costs

Standard	Operations requirements description	Comment on costs
***Nitrate Directive in vulnerable areas**	Dosages allowed for **Citrus orchards** Dripping irrigation: 200 Kg N / ha.Year Flood irrigation: 240 Kg N / ha.year	**Assessment is needed:** An expenditure reduction on fertilizers or pesticides is expected New yields need to be assessed.
***Pesticides commercialization** *** Water sources contamination from dangerous substances (biocides, phosphates. Nitrates and pesticides).**	Chemical products used in both, fruits and vegetables, have presented the following (now not-allowed) compounds in the past (National decrees: 849/1986, 1315/1992 and 606/2003): * organophosphorades * organoclorades * Metyhil bromide and others biocides * others organic active principles	**Assessment is needed:** Cost might change in pesticides uses and potential yield losses should be investigated. A comparison between different management alternatives (and its costs) is required.

Source: own elaboration

8.5.2.1 The Nitrates Directive

The directive 91/676/CEE, referred to the water contamination with nitrates from agriculture, has been transposed to the Spanish legislation requiring to the autonomous regions to establish GAECs for farmers in order to reduce contamination with nitrogen from agricultural uses (Royal Decree 261/1996, art 5).

Regarding nitrogen applications, good agricultural practices for citrus production in Valencia have been distributed among farmers in the region of Valencia. These measures specify clearly application schedules and dosages as follows[233]:

- Nitrogen fertilizers are recommended to be applied in spring and summer (not in autumn or winter)
- In flood irrigation orchards, nitrogen applications must be fractioned in at least 2 times (spring and summer)[234].
- In drip irrigation dosages must be fractioned weekly.
- Nitrogen forms recommended are nitro ammoniac and ammonia
- Ammonia: first application should be 15 to 30 days before blossom (half of total N dosage).
- N nitric-ammonia, urea (solutions): Second application should be on spring, at the set of fruits (second half of total N dosage).
- Ureic N: foliar applications should be before flowering but should respect the maximum content in biuret (0, 3%).
- Organic N, organic-mineral, manures, composts, etc.: must be fractioned as other fertilizers.

The compliance with the nitrates directive might determine lesser costs since there are maximum restrictions (e.g. 240 Kg N / ha in citrus production as shown in Table 8.13). Thus, some dosage recommended by local farmer associations, experts and published fact-sheets are used to assess the potential reduction on costs. In addition, yields losses might happen in many crops as a consequence of compliance with the regulations mentioned above. In the following sections, the gross margin reduction and the potential yield reduction for the main crops involved is calculated and discussed.

8.5.2.2 Plant protection products

In order to minimize the detrimental environmental impact of pesticides the EU seeks to ensure their correct use and informs the public about their use and any residue issues. Soil and water may be polluted via spray drift, dispersal of pesticides into the soil, and run-off during or after cleaning of equipment, or via uncontrolled disposal.

There are EU regulations covering the placing of plant protection products on the market, the placing of biocide products on the market and fixing maximum residue levels in food. The Plant Protection Products Directive (91/414/EEC), 'The Authorizations Directive', was adopted by the Council of Ministers on 15 July 1991 and published on 19 August 1991. The EU also regulates to protect water quality in respect of pesticides. The Water Framework Directive provides an integrated framework for assessment, monitoring and management of all surface waters and groundwater based on their ecological and chemical status. The directive requires measures be taken to reduce or eliminate discharges and losses of hazardous substances, for the protection of surface waters. By 2001 33 priority substances had been listed, out of which 13 substances were used in plant protection products.

[233] Extracted from the local legislation (autonomous region of Comunidad Valenciana) regarding GAECs for citrus production. Source: DOGV (2000)
[234] In sandy or very permeable soils nitrogen applications should be fractioned in 3 times, establishing the second time between spring and summer.

Agri-environmental measures offer support for commitments on keeping records of actual use of pesticides, lower use of pesticides to protect soil, water, air and biodiversity, the use of integrated pest management techniques and conversion to organic farming. The EU's sixth environment action programme addresses the need to encourage farmers to change their use of plant protection products.

The reinforced cross-compliance established by the 2003 CAP reform includes the respect of statutory requirements arising from the implementation of EU regulation covering the placing of plant protection products on the market.

The directive 91/414/CEE, about pesticides commercialization in the union is excluding the following products (banned) that had been used on fruits and vegetables in Spain:

- Fention (organophosphate)
- Triclorfon (organophosphate)
- Malathion (organophosphate)
- Metil-Anzifos (organophosphate)
- Carbofuran (carbamate)
- Carbosulfan (carbamate)
- Dicofol (organoclorade)
- Yellow Oil (DNOC or 4,6-Dinitro-o-cresol): 2-methyl-4,6-dinitrophenol
- Bromopropilate

This products control insects, mainly aphids and trips on oranges and lemons productions. Their exclusion, mean surely a reduction in possibilities for controls, but there are many other products available that control almost all pests. The local government in Valencia has promoted the integrated crop management techniques and GAECs that include citrus production (DOGV 2000).

Four Council Directives regulate pesticides residues in food: 76/895/EEC, 86/362/EEC, 86/363/EEC and 90/642/EC. Regulation (EC) No 396/2005 consolidates and amends these. The legislation covers the setting, monitoring and control of pesticides residues in products of plant and animal origin that may arise from their use in plant protection. The European directives established the limits for pesticides contents allowed in cereals and vegetables including fruits as well. In Spain the MRLs (maximum residue levels) where established by the national law 280/1994 which has given to the autonomous regions the control and surveillance responsibility on chemical products allowed.

8.5.3 Assessment of the costs of compliance in citrus production in the region of Valencia

8.5.3.1 Impact on costs

The assessment of the cost of compliance in the region of Valencia requires a special consideration and a different analytical approach. Fruits' growing has a larger range of farm practices and input types than other crops, like cereals. The approach used for the fruit sector in Valencia considered a cost/benefit analysis and the estimation of expected variations in gross margins due to the compliance with the legal framework.

Schemes of production selected by the farmer affect considerably the farms' cost-benefit results. These schemes are different options that growers may choose depending on finantial availability, soil and wheather conditions, prices or premiums if quality differentiation exists, or just depending on specific features from their region (e.g. distance to markets or prices paid by cooperatives may allow different techniques or costs). Thus, a grower may prefer a more intensive cultivation method, or an organic production, or just a less intensive use of fertilizers and water with a lower yield per hectare. Additionally, because fruits are perennial crops, the behaviour of growers face to risks might be different from gowers of other commodities. Annual crops like wheat or oats have a simpler, more specific scheme for production, with lower inputs per hectare, lower labor requirements, and a more stable and predictable market (e.g. cereals may be stored for months by brokers, and markets are affected in a completely different way when cost changes take place because of new policies). The amount of money that growers use for fruits production is also larger than in other commodities (annual crops). This is a remarkable consideration, because supervision, pests control and monitoring by farmers may cause a considerable change in input use efficiency.

In our specific area of study, citrus orchards have a high variety of cultural practices. Fertilizers and pesticides doses vary from one region to other. In order to calculate a possible reduction in costs caused by reductions in nitrogen doses used in orchards, we have estimated a nitrogen rate based on the mostly used by growers in the past. We used local information and recommendations from local entities during the last years. Regarding the pesticides cost assessment when complying new legal framework, our approach takes into account the EUREPGAP scheme, that complies with all requirements and is well documented for this study region.

8.5.3.2 Nitrogen application costs

Citrus orchards in Valencia have nitrogen dosages that hardly exceed annually 280 kgN / ha (MAPA, 2000), and dosages allowed are 240Kg N / ha. A reduction of 40 Kg N / ha might be the maximum amount of N that growers should decrease in order to comply with the nitrate directive. Considering that the number of applications should not have a variation since only the dosage should be different (growers do only 2 o 3 applications usually), and we have calculated the lesser cost of N in fertilizers they use as follows:

<u>Ammonia nitrate price:</u> 0,1564 €/kg

<u>N content:</u> 33,5 %

280 Kg N / ha = 836 Kg Ammonia Nitrate

240 Kg N / ha = 716 Kg Ammonia Nitrate

Difference in cost: 18.76 € / ha

Other cost analysis suggests that lesser costs for fertilizer reductions might occur to comply with the European new legal framework. Peris Moll and Juliá Igual (2005) have made a cost analysis in the Valencia province for a cooperative with 450 farmers. This cooperative has agreed with farmers to do a certification applying for EUREPGAP cultivation methods, which means an important reduction in inputs. Fertilizers are reduced in 118 € / ha and this cost includes phosphorus, potassium, magnesium, calcium and many other microelements in addition to nitrogen. Thus, assuming that element nitrogen inside all elements represent around 20% of the cost, and that the reduction is equal for all elements, then a reduction would result in about 23 €/ha which is consistent with our own estimations.

8.5.3.3 Costs of pesticides

The legal framework determines an “a-priori” reduction in pesticides doses in fruits. Regulations allow maximum limits for certain products in fruits (quality controls). There are no limitations in the application doses and this is consistent with the fact that horticultural and fruit production have several applications during the year and it would be very difficult to control or register all of them. Nevertheless, products commercialization is regulated and growers have been encouraged during the last decades to reduce the amounts applied to their products and to improve the application efficiency.

Changes in costs for pesticides use are not easy to estimate for different reasons. The most important changes on pesticides use during the last year took place on insecticides because their active substances had become more dangerous for living organisms and human health. Thus, a variety of alternative products has been developped during the last years. Since organophosphorades and other pesticides used for aphis and trips were banned, no alternative active principles have been suggested. Additionally, new controlling and monitoring techniques determine changes in application efficiencies. These new practices are already used by many growers in certified schemes like EUREPGAP. Our approach, as mentioned, considers a complete list of activities and costs in a certified scheme that complies with all cross-compliance measures. The clearest example to clarify how compliance could affect costs is the EUREPGAP scheme. Pesticides suggested for EUREPGAP conditions show an important reduction as shown in Table 8.14.

All farmers, retailers or trade operators who join the EUREPGAP protocol are committed to five main principles (EUREPGAP, 2001):

- To maintain consumer’s confidence in the quality and safety of the EUREP certified food.
- Compliance with good agricultural practices.
- To minimize the use of pesticides and other chemical inputs as much as possible.
- To use non renewable resources (as soil, water, etc.) efficiently.
- To be responsible for the occupational health and safety of their workers.

Unfortunately, there is little information about real applications in the farm since the total variation of practices among growers is very large. Some of them split applications in many times during the year (as recommended by producers organizations) and the number of products they use for pest controls is diverse and large[235]. Also they need other applications for improving quality in fruits (like microelements as cupper or nitrogen as well). As shown in the Table 8.14, a completely different scheme for production is available to growers. Costs and yields are reduced and premium prices may take place.

[235] There about 2500 authorized pesticides and herbicides registered at the Ministry of Agriculture since 2003 new national legislation took place and they could be revised in www.mapa.es .

Table 8.14: Production costs of certified (Eurepgap) and conventional oranges

Variable costs	EUREPGAP		Conventional	Conventional	
	2003 (€/ha)	%	2002 (€/ha)	2003(€/ha)	
Irrigation water	259,91	10,88	668,48	685,19	17,48
Fertilizers	319,5	13,38	319,5	449,71	11,47
Pesticides and herbicides	220,95	9,25	453,27	464,6	11,85
Other inputs	0	0	60,85	62,37	1,59
Equipment operating costs	93,67	3,92	58,74	60,21	1,54
Labor costs	734,12	30,74	1187,67	1217,36	31,05
TOTAL VARIABLE COSTS	**1628,15**	**68,18**	**2748,51**	**2939,44**	**74,97**
FIXED COSTS					
Equipment ownership costs	336,74	14,1	262,94	269,51	6,87
Crop depreciation	360,79	15,11	346,42	355,08	9,06
Taxes & insurances	62,5	2,62	291,16	298,44	7,61
TOTAL FIX COSTS	**760,03**	**31,82**	**957,38**	**981,31**	**25,03**
EUREPGAP certification and analysis costs (€/ha)	**205,4**				
TOTAL COSTS	**2593,58**		**3705,89**	**3920,75**	
Average production (Kg/ha)	23000			33000	
Price (€per Kg)	0,13			0,12	
Average costs (€/kg)	0,11			0,13	

Source: Peris Moll and Juliá Igual (2005)

8.5.3.4 Integrated Crop Management in Valencia

In 2002, the Ministry of Agriculture (MAPA) regulated the Integrated Crop Management for Citrus production (Royal Decree 1201/2002, (BOE, 2002)). Later, in 2004, the MAPA also regulated the technical norms for the “Identification of National Warrantee for Integrated crop Management in Citrus” (BOE 2004b). Thus, pest management has changed during the last decade and biologic controls have increased (as insect usage to control other insects like spiders for mite and aphids controls). The Integrated Production of citrus is quite advanced in Spain, citrus being one of the key crops and one of the first sectors to adopt these approaches. Valencia has pioneered work in this field. Current Integrated Production of citrus in Valencia is in its fourth marketing year with almost 16,000 hectares under production.

The costs and production impact of Integrated Crop Management (ICM) were analyzed for several cases (Box 1; source: AGRACEAS, 2002). Nitrates and pesticides protocols for Integrated Crop Management in citrus production almost produced any impact on yields or costs. There was a reduction on pesticide and fertilizer costs, and an increment in other costs such as pest monitoring and soil, foliar and residual analysis. Although growers often do not consider their own time as a cost, they are aware that ICM requires more management time to undertake some tasks such as pest and natural enemies population monitoring. Overall costs are felt by growers and advisors to be higher under ICM, however a full economic study has not been undertaken. Nevertheless, it does make it easier to sell to multiple retailers and there is therefore a marketing advantage. This situation is especially important for Spanish citrus exports.

Box 1: ICMs Protocol

Water

• Leaching of pesticides. Although this is not perceived as a problem, the guidelines include measures for reducing pesticide input. Coupled with the reduction in irrigation water of 20%, this is likely to reduce the risk of nitrate leaching.

• Leaching of nitrates. Maximum nitrogen doses are established under the guidelines and these result in a reduction in the amount of nitrogen applied of between 15% and 35%. As above, the reduction in irrigation water is likely to reduce the risk of nitrate leaching.

• Irrigation. There is a 20% reduction in the use of irrigation water based on adherence to the guidelines.

Soil

• Soil nutrient balance. This is done every five years and the results relating to the nitrate concentration will be used to adjust the recommended nitrogen doses.

• Soil erosion. Cultivation equipment that destroys soil structure is banned. It is obligatory to allow a spontaneous green cover to develop from mid-autumn to the end of winter to anchor the soil thus reducing the risk of erosion.

Source: (AGRACEAS[236], 2002)

8.5.3.5 Soil disinfection without methyl bromide

Improvements on technology had brought a repetition of horticultural production cycles resulting in a more demanding use of lands and products as disinfections of soils. During the last 20 years Methyl Bromide was the most important product for this purpose but it became forbidden in 2005 and new alternatives are being used by growers in Valencia (Caballero *et al.* 2002a). These authors have been suggesting that there are many other activities possible for a successful disinfection of soils in horticulture and fruits production. Thus a product named “Telone” (1,3-dicloropropene) with Cloropicrine is suggested to have the same impact and costs that Methyl Bromide had before. In addition they suggest solarization[237] combined with some chemical controls (in low dosages) might have same costs and a very good performance in disinfection. In this context, Caballero and De Miguel (2002b) have suggested that the integrated pest management practices for fruits and vegetables as a potential way for reduction on costs with low impact on yields.

8.5.3.6 Impact on Yields

As much as local experts concern, at present there is no evidence of yields decreases as a consequence of dosages recommendations and regulations about food safety or the Nitrates

[236] Agra CEAS Consulting is a joint venture between Imperial College London (University of London) and Agra Informa ltd (part of T&F Informa plc), and was established at the Bureau Européen de Recherches in Brussels in 1973 and at Imperial College London’s Centre for European Agricultural Studies in Wye in 1986. http://www.ceasc.com/

[237] The term solarization is used to describe sterilisation of soil or plant material by cooking the material in a plastic bag. In this case the sun's radiation is converted to heat by absorption, heating the material above 60 C, which kills off most harmful pathogens. The UV in the light may also have a germicidal effect on the surface material.

directive. Nitrogen doses recommended during the last years in Valencia, were about 200 and 240 Kg N/ha as required by the legal framework. There is not evidence of yield reductions in the field (Ferrer, 2007[238]).

Citrus species, especially oranges, in Valencia have been showing different results depending on irrigation methods when nitrogen fertilizers are used. Thus, several workshops and scientific reports have been reporting a lack of evidence of yields change when nitrogen dosages are above 250Kg N / ha, in particular for flood irrigation methods (Legaz and Millo, 1988). Some experiments showed that the use of fertilizer additives as DMPP might increase the nitrogen efficiency and avoid yield decreases when using nitrogen dosages below 300Kg/ha and it its costs per ha is barely not appreciable in total costs (Legaz and Millo, 2000). These authors have reported an incremental efficiency of nitrogen absorption when using dripping irrigation methods that suggest that the new legal framework could not have a clear effect on yields expressed as Kg of fruits per plant and year.

Even when Integrated Crop Management methods present greater input reductions, citrus orchards in Valencia[239] using ICM protocols have been mentioned as preventing better from pests without yield losses or additional cost (Beitiam, 2005). These practices reduce the use of pesticides in about 50% through monitoring pests using tramps and periodical surveillance and insect attacks alarms. Accounts of insects or fungus are carried out at farm level in order to compare with threshold levels. Their symptoms on vegetative or reproductive organs as leaves or fruits are monitored in order to prevent pathologies[240]. These methods usually determine lesser and more effective pesticides applications without any additional cost. Choosing right moments for applications and using those authorized products that are commercialized for citrus productions might determine good performances and yields in citrus orchards.

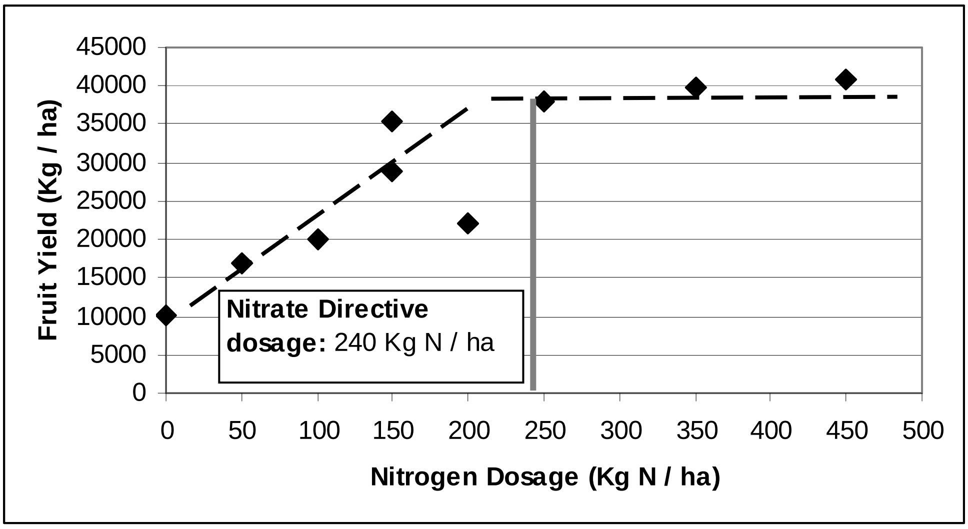
The yields under ICM are comparable to those under conventional production. Thus, revenue is approximately the same as yields are comparable and there is no premium. However, the increased certainty of sale is likely to reduce revenue risk (AGRACEAS, 2002). With similar revenue, but higher production costs, it is likely that profitability is slightly reduced for the ICM system. However, the risk of not finding a marketing channel for perishable goods is reduced which could, in certain circumstances, increase overall returns. Several evidences have been reported about nitrogen absorbance efficiency in different scenarios and for a variety of fertilization dosages (Serna et al., 1992).

In addition to this, some authors have reported a threshold level or dosage for Nitrogen fertilizers in Oranges. Bañuls Gil *et al.* (1997) studied orchards in a 4 year experiment in Valencia and found dosages above 250 Kg N / ha determined little or no yield responses. This results have revealed that the new legal framework imposed by the European Nitrates Directive (a maximum dosage of 240 Kg N / ha in citrus) is quite reasonable and would not necessarily produce a lower revenue because of yield reductions. In Figure 8.15, these results are synthesized showing the maximum nitrogen doses allowed in the Region of Valencia in accordance to the Nitrates Directive

[238] Local citrus expert at the Agricultural Research Institute of Valencia (personal communication).
[239] Described and legislated by the national government: Royal Decree 1201/2002 - Nov. 20th, regarding Integrated management for agricultural products (BOE 2002)..
[240] Recommendations refer to accounts made at the farm in order to make decisions. For example, more than 30% of leaves with one or more holes; or aphids accounts in stems during early flowering.

Nitrogen use efficiency might be higher in the following years since the use of dripping irrigation methods in Spain. Dripping irrigation uses considerably less water and its use derives in an increment on application efficiency (40 to 90% increments are known to occur in most cases when changing from flood irrigation(Legaz et al., 1994)), and increasing water costs and constraints in the coming years might conduct into new investments on irrigation technologies.

Figure 8.15: Fruit yield responses to different nitrogen dosages



Source: Data extracted from Bañuls Gil *et al.* (1997), and Molina and Morales (1998)

8.5.3.7 Effects of compliance

Summing, the effects of compliance on citrus production cannot be defined as a cost of compliance since a reduction in inputs could not have been associated to a yield decrease in a clear manner. There is not evidence of yield decrease because of reductions in the average amounts of pestices used or nitrogen dosages. Pesticides regulations and nitrogen dosage reductions do not clearly modify revenue in citrus production.

According to information of local experts, nitrates and erosion measures are not very much controlled in Valencia at farm level and even if the main citrus production areas belong to the nitrates vulnerable zone in the region of Valencia, GAECs and N directive seem to be easy to comply for most citrus farmers and local experts. Therefore, the introduction of Cross-compliance measures in the context of the F&Vs' CMO of F&V reform is not suspected to introduce a clear change in the costs at the farm level.

The Spanish transposition of the Nitrate Directive (Royal Decree 261/96), through giving the authority for control and supervision of nitrates to the autonomous governments in Spain does not specify control measures at the farm level[241]. The elaboration of a GAEC code, a study of nitrates vulnerable zones and a specific executive program for these areas had to be completed by each autonomous region (in the case of Valencia this has been approved in 2000 (DOGV

[241] See Nitrates Directive transposition: BOE (1996), Royal Decree 261/1996, (art.8) and Official Newspapers of Valencian "Generalitat" (DOGV): DOGV 3677 (2000), DOGV 4683 (Fab-2004), 4710 (March-2004) and 3727 (April 2004) that especify nitrates vulnerable zones, GAEC codes, sample measures and executive programs on environment, damns, rivers, basins, etc.

2000). Thus, each region has the control and supervision and must inform to the Spanish Ministry of Environment, which elaborates a report to the EU Commission every 4 years. Because of these aspects, specific controls such as fertilizer application periods or dosages at the farm level are not expected to happen at least immediately and cross-compliance local legislation will probably take place after the approval of the F&Vs' CMO reform (starting in 2008).

The effect of changes on nitrate dosages or pesticides application in different farming methods, would not necessarily determine increment on costs or yield loses that could derive into income loses.

Pesticide regulations and pest management in the US citrus are analyzed and the results are presented in Annex (Part I, section 6) with a different perspective. The effects of water regulations (environmental resource permits, ERP) and Best Management practices on costs determine an increase on marginal costs (about 2.12% of total grove care expenses of the Florida growers' budget). Nevertheless, there is no information about yield losses or a detailed production scheme that would allow a better understanding of the effect of complying with those measures.

Additionally, Citrus canker and hurricane spreading are mentioned in Annex as considerable limiting factors for the citrus industry in Florida. A calculation from literature reported slight costs (0, 87% of total expenses) of preventive measures against this disease. However, this should be considered as a production cost in the budget entitled as "pest management", rather than a cost of compliance of environmental regulations. Citrus greening (a very important disease in Florida citrus industry) does not represent a significant cost.

When comparing farm performance and production schemes in Valencia and Florida, is not possible to outline any decrease in productivity or losses in the gross margin due to compliance. This is mainly because growers are already using nitrate dosages that comply with GAECs in this region or because the costs of compliance with regulations (as in the case of Florida) are not considerable high in the growers' budget. Production schemes compatible with most regulations on pesticides, are disseminated by extension services in the region of Valencia and well known by growers. These schemes determine a reduction of costs rather than an increase on care expenses.

8.6 Cost of compliance for vegetables in the region of Castilla La Mancha

8.6.1 Costs structure in a mixed production farm in Castilla-La Mancha

This Table 8.15 shows the cost structure of a mixed farm whose main technical orientation is horticultural crop and the weight of each fraction over the total costs.

Table 8.15: Cost structure at farm level

COSTS	(€/ha)	%
Seeds and plants	245,74	19,14
Fertilizers	112,44	8,76
Crop protection	62,44	4,86
Other crop specific costs	12,59	0,98

COSTS	(€/ha)	%
Contract work	34,42	2,68
Machinery & building current costs	38,68	3,01
Energy	85,63	6,67
Water for irrigation	27,82	2,17
Other non crop specific costs	18,98	1,48
Depreciation	122,59	9,55
Wages paid	332,18	25,87
Rent paid	114,42	8,91
Interest paid	11,78	0,92
Capital Investments	64,52	5,02

Source: Source: MAPA 2004

A cost structure by crops has been studied with data from the fieldwork, statistics of the Spanish Ministry of Agriculture and the department of agriculture of the Regional Government of Castilla-La Mancha, and literature:

Table 8.16: Cost structure at crop level

CROP	POTATO[1]	MELON[2]	PEPPER[2]	GARLIC[3]
Seed (€/ha)	1190	704,99	865,46	1230,57
Fertilizer (€/ha)	455,32	650,53	836,69	161,42
Pesticides (€/ha)	301,8	262,82	412,39	142,21
Tilling (€/ha)	64,97	108,48	90,34	64,99
Sowing (€/ha)	53,32	130,64	61,51	117,54
Pruning (€/ha)	0	0	0	0
Harvest (€/ha)	82,52	507,53	119,52	80,74
Labor (€/ha)	668,05	3435,7	4726,9	3257,2
Water (€/ha)	420	300	450	180
TOTAL VARIABLE COSTS (€/ha)	3235,98	6100,69	7562,81	5234,67
Yield (kg/ha)	57000	49000	40000	8000
Price (€/kg)	0,105	0,19	0,26	0,72
TOTAL REVENUE (€/ha)	5985	9310	10400	5760
GROSS MARGIN (€/ha)	2749,02	3209,31	2837,19	525,33

Number above mean irrigation methods: 1: Sprinkler irrigation (Intensive) ; 2:*Drip Irrigation ;* 3 Sprinkler irrigation (extensive).

Source: Own elaboration from De Juan Valero et al.(2003), SIAR 2006, and surveys to farmers (Varela et al. 2007)

The main cost for those products will be the ones coming from labors as all vegetables are very hand work intensive (this is why they are called “social crops”).

The analysis of the increase of costs due to cross compliance will focus on the Nitrates Directive and in the water conservation requirements included in the GAECs, as these are the main environmental problems associated to the vegetables crops in Castilla-La Mancha, as this is a nitrate vulnerable area and a region of overexploited aquifers.

8.6.2 The legal framework

Since the study area is the main vulnerable area in Spain, our analysis focuses on the impacts of the Nitrates Directive, as well as on the impacts of ground water use related GAECs. This is an issue of special importance in Spain as it is the only country, together with France, in which ground water affairs are considered in the GAECs. The area under study is a nitrate vulnerable area and it is known as a significant example of aquifer overexploitation.

8.6.2.1 The Nitrates Directive

As seen in section 8.5.2 the Nitrates Directive was transposed to the Spanish legislation by the Royal Decree 261/1996, in which it is stated that regional governments must establish action programs for vulnerable areas. In the region of Castilla La Mancha there are six nitrate vulnerable zones, whose action program is defined by the Order 15/06/2001 (DOCM, 2001) (revised in 2007) of the department of environment and rural development of the regional government of Castilla La Macha.

The action program establishes the maximum nitrogen application allowed in these vulnerable zones (Table 8.17) and the agricultural practices required in order to minimize nitrogen leaching. Next table shows the nitrogen limitations for the main crops included in this study.

Table 8.17: Maximum nitrogen dosages in the nitrogen vulnerable zones of Castilla La Mancha (DOCM, 2001)

CROP	IRRIGATED N (Kg/ha)	RAIN FED N (Kg/ha)
Wheat	110	55
Barley	110	55
Maize	200	--
Sunflower	80	40
Leguminous crops	30	20
Sugarbeet	200	--
Alfalfa	30	--
Melon	135	--
Garlic	80	--
Onion	160	--
Other horticultural crops	160	--
Potato	120	--
Vine	70	50
Olive	70	50

8.6.2.2 The Water Conservation Policy

The Spanish GAECs include groundwater conservation measures for overexploited aquifers, being the only country together with France which introduces water conservation requirements among the GAECs. The Upper Guadiana river basin's main characteristic (Region of Castilla La Mancha) is the important natural interaction between surface and groundwater. The ground water system is composed by five main aquifers, linked to a group of highly valuable wetlands included in the RAMSAR list.

The use of groundwater in Western La Mancha aquifer allowed, during the 60's and 70's decades, a large development of the irrigated agriculture which implied an important economic growth in the area. The joint effect of the CAP and the Spanish rural development policies, which encouraged irrigation and intensification, together with the technological development, which reduced water pumping and abstraction costs, produced a huge increase of water abstraction from the aquifer, which led to a provisional declaration of overexploitation in 1987 and a permanent declaration in 1991.

According to the article 54 of the Spanish Water Law of 1985, the river basin authority established a water quotas policy (Water Abstraction Plan). The Water Abstraction Plan is updated every year and stratification has been introduced, setting higher restrictions for large farms. The Water Abstraction Plan is espicified in the next Table 8.18.

Table 8.18: Water Abstraction Plan quotas (2006)

Farm size (ha)	Water quota (m3/ha)
0-30	2640
30-80	2000
> 80	1200
Vineyards	1000

This water conservation policy produced important social and economic impacts, but has not succeeded to achieve the aquifer recovery. Agriculture is the main responsible of the aquifer overexploitation and wetland degradation and, therefore, its inclusion among the GAECs is highly relevant. In accordance to the GAEC's water conservation requirements, in one hand, farms with irrigated area in overexploited aquifers zones have to credit their legal water abstraction permits; on the other hand, the installation of water flow meters is compulsory to all farmers in every well in the farm.

8.6.3 Assessment of the costs of compliance in vegetables in the region of Castilla La Mancha

8.6.3.1 Methodological framework: integration of economic and agronomic models

As we have mentioned in the section 8.1.3, our methodological approach for the region of Castilla La Mancha involves a case study, with representative farms and the integration of the economic model SIWAP and an agronomic model for the designated areas.

The economic model is a mathematical programming model of constrained optimization that includes a risk component that takes into account climate as well as market variability. Constraints in the model include land, water, labor and policy constraints. The technical parameters of the model are based on an ample field work conducted in the area of study as well as on interviews from experts and data from the regional and national administration departments (see Figure 8.16).

The model used is a farm-based non-linear single-period mathematical programming model of constrained optimization, developed by Varela-Ortega et al. (2006a). The model describes the behavior of the representative farmers selected confronted by different policy scenarios. Following previous work in the area of study (Varela-Ortega *et al* 1998, Varela-Ortega *et al*. 2002) the model incorporates new risk parameters and maximizes a utility function (U) subject to technical, economic and policy constraints (g). The utility function is defined by a gross margin (Z) and a risk vector (R) that takes into account climate as well as market prices variability. The model can be summarized as follows:

Maximize U = $f(x)$, $f(x)$ = Z - R

Subject to the following constraints $g(x) \in S_1$,

$x \in S_2$

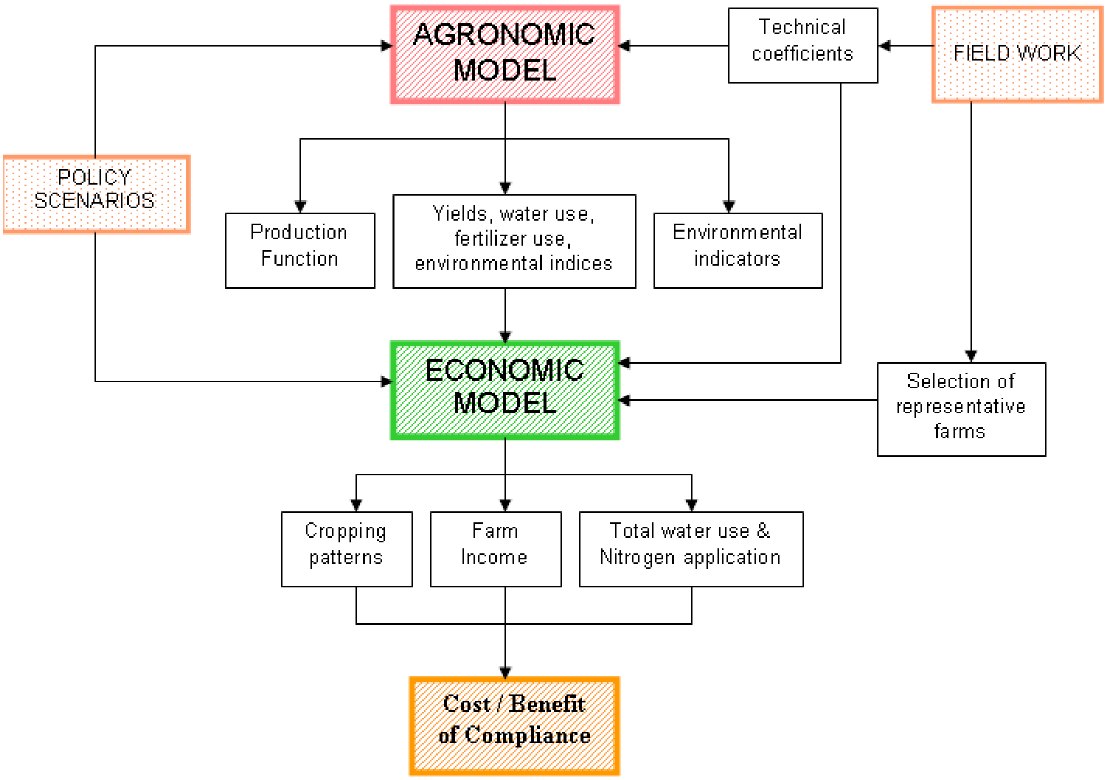
Where "x" is the vector of the decision-making variables or vector of the activities defined by a given crop-growing area and by an associated production technique, irrigation method and soil type (S). The problem-solving instrument used is GAMS (General Algebraic Modeling System). The technical coefficients and parameters of the model were obtained from field work carried out during 2006 and 2007 (Varela et al., 2007) in the study area, consisting of surveys and interviews with farmers, irrigation community representatives, technical experts, river basin managers, and regional government officials. The model was duly calibrated and validated, using the risk aversion coefficient as calibration parameter and the comparative data on crop distribution, land and labor parameters in the study area (Varela, 2007 (in press)).

The water policy constraints limit the water availability by imposing to farmers a water abstraction plan (quotas system) (CHG, 2006).

In the case of the evaluation of the impact of the Nitrates Directive on these types of farms it has to be taken into consideration that nitrates are used as mineral fertilizers and are thus subject to quantity limitations. Therefore, main effect of the application of the Nitrates Directive is that it affects yield and thus farm revenue that is translated into a foregone income rather than into a direct increment of costs. This extra-income can be considered as the cost to comply with the directive and it can be expressed as a percentage of the total costs.

For this analysis, the agronomic model Cropsyst has been calibrated for the region and for the main crops. This model provides data about the yield and water use decrease when complying with the Nitrates Directive. The amounts of nitrogen used for the analysis are the traditionally used quantities in this area for each crop, based on the study done by De Juan Valero et al. (2003). In order to simulate the Nitrates Directive impact, the amount of nitrogen used refers to the maximum amount of nitrogen allowed by the Directive and specially by the special program of the region of Castilla La Mancha for fertilizer application (Orden 15-06-2001 de la Consejería de Agricultura y Medio Ambiente, DOCM 2001).

Figure 8.16: Methodological approach for cost / benefit of Compliance assessments



Source: based on Varela et al. 2006a

The two scenarios simulated with the agronomic model are the reference situation, which represents the traditional use of nitrogen fertilizers, and the Nitrates Directive, which corresponds to the full compliance with the directive. The following Table 8.19 shows the results of the simulations for two scenarios by crop and by technique.

Among the horticultural crops, potato and garlic are the most sensitive crops to nitrogen restrictions in terms of yield (Table 8.19). Sunflower and sugar beet are also very sensitive, and cereals in intensive irrigation are highly affected by changes in nitrogen dosage applied. These results fit with the farmers' perceptions (see Deliverable 5, Varela-Ortega et al., 2006) and with the expert consultations (INAGRO, S.A.).

Depending on the crop, these reductions in fertilizer costs, water cost and yields will have different impact on the gross margin.

Table 8.19: Effects of the Nitrates Directive on nitrogen application, water consumption and yield

Crop	Techn.	Nitrogen amount (kg/ha)			Water Consumption (m3/ha)			Yield (kg/ha)		
		Reference	Nit. Directive	Reduction (%)	Reference	Nit. Directive	Reduction (%)	Reference	Nit. Directive	Reduction (%)
BARLEY	RF	49,4	55	0	0	0	0,00	1520	1530	-0,69
	SP1	105,3	110	0	1520	1430	5,92	3402	3191	6,22
	SP2	127,4	110	13,66	1560	1430	8,33	3943	3191	19,08
WHEAT	RF	59,5	55	7,56	0	0	0	2177	2027	6,89
	SP1	126,2	110	12,84	1730	1670	3,47	4985	4479	10,15
	SP2	159,5	110	31,03	1740	1670	4,02	5273	4479	15,06
MAIZE	SP1	275,5	200	27,40	3420	3370	1,46	10866	9877	9,10
	SP2	348	200	42,53	3450	3370	2,32	11022	9877	10,39
SUNFLOWER	RF	39,4	40	0	0	0	0	638	652	-2,19
	SP1	117	80	31,62	2520	2530	-0,40	3102	2522	18,70
	SP2	135	80	40,74	2550	2530	0,78	3159	2522	20,17
SUGARBEET	SP1	213,8	200	6,45	6340	6140	3,15	49402	42646	13,68
	SP2	270	200	25,93	6450	6140	4,81	56100	42646	23,98
PEAS	RF	56,5	20	64,60	0	0	0	980	878	10,44
POTATO	SP2	313,5	120	61,72	3540	3410	3,67	56000	50400	10,00
MELON	DR	188,7	135	28,46	3010	2960	1,66	40000	38600	3,50
PEPPER	DR	202,5	160	20,99	4140	4075	1,57	35220	34060	3,29
GARLIC	SP2	80	80	0	1610	1610	0	7138	6673	6,51
VINE	RF	26,3	50	0	0	0	0	10927	10600	2,99
	DR	158,2	70	55,75	2190	1970	10	25007	23427	6,31

Source: Own elaboration from Azaña, 2007.
RF: rain fed - SP1: extensive sprinkler irrigation - SP2: intensive sprinkler irrigation -
** Maize water requirements are daily ET requirements at maximum water use efficiency, therefore lower than on-field actual irrigation applications.*

8.6.3.2 Effects of the Nitrates Directive without adaptation

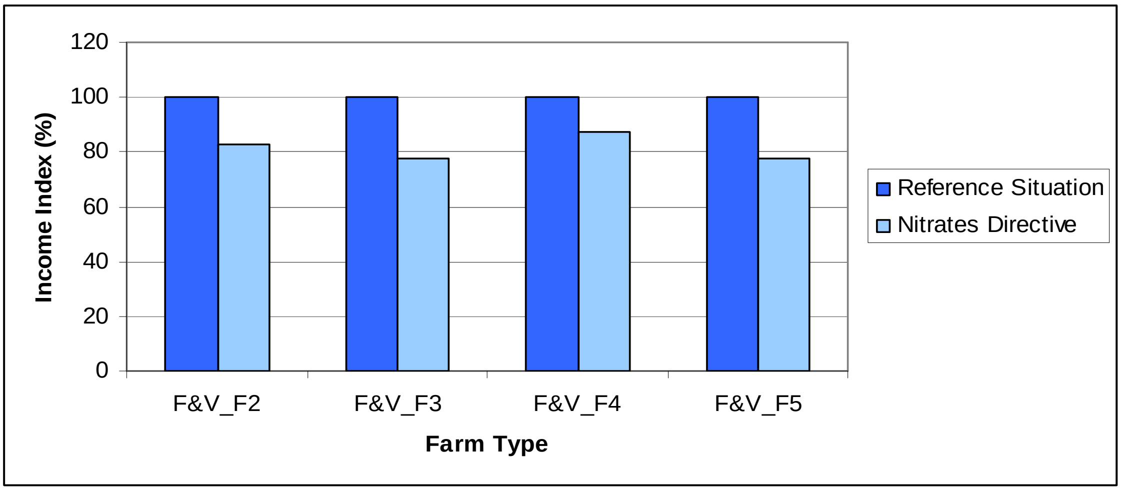
Since in this region, farms are mixed and production oriented, then the real impact of compliance with the Nitrates Directive must be analyzed at the farm level. If changes in the cropping patterns do not take place and adaptation does not occur, income losses may be significant. The next Table 8.20 shows the farm income among the different scenarios without changes in the cropping patterns in the four representative farms of the area under study (farms' characteristics in section 8.4.4).

Table 8.20: Farm income and income losses among different scenarios without changes in cropping patterns

Farm Type	Farm Size (ha)	Farm Income (€)		Farm Income per hectare (€/ha)		Income Index (%)		Income Loss (%)
		Reference situation	Nitrates Directive	Reference situation	Nitrates Directive	Reference situation	Nitrates Directive	
F&V_F2	150	93798	77499,13	625,32	516,66	100	82,62	17,38
F&V_F3	70	51760,8	40056,17	739,44	572,23	100	77,39	22,61
F&V_F4	19	14318,21	12513,59	753,59	658,61	100	87,40	12,60
F&V_F5	40	41561,6	32156,99	1039,04	803,92	100	77,37	22,63

The impact of nitrogen reductions at farm level varies a lot depending on cropping patterns. In the four farm types, income losses varies from 12% to 23%, which is similar to the farmer's perception obtained in the field work (Varela *et al*. 2007) (see Deliverable 5 from Spain). Figure 8.17 summarizes the income loss in the different farm types selected.

Figure 8.17: Farm income index in the different scenarios with no changes in the cropping patterns



8.6.3.3 Effect of the Nitrates Directive and the Water Abstraction Plan (groundwater conservation measure included in GAECs) with adaptation

For a better analysis of the real impact of compliance with the Nitrates Directive it has been used the economic model, which allows us to simulate farmers' strategies for adaptation to these policy constraints. The requirements of compliance are not constraints inside the model, but they have been simulated as different scenarios where farmers comply or not with the requirements under study, the Nitrates Directive and the GAEC requirement on ground water abstraction legal concessions and water meters installation. Table 8.21 shows the results of the model for four scenarios simulated, which are:

- Reference situation
- Nitrates Directive
- Water abstraction Plan (with no compliance with the Nitrates Directive)
- Water Abstraction Plan + Nitrates Directive

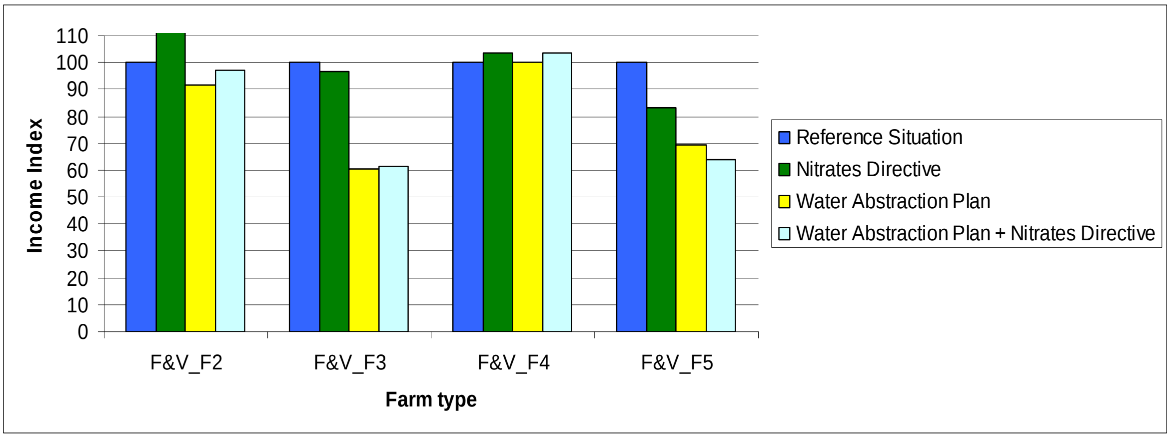
Table 8.21: Effect of the Nitrates Directive and the Water Abstraction Plan on farm income at farm level (from the economic model)

Farm Type	Farm Income per hectare (€/ha)				Income Index (%)			
	Reference situation	Nitrates Directive	Water Abstraction Plan	Water Abstraction Plan + Nitrates Directive	Reference situation	Nitrates Directive	Water Abstraction Plan	Water Abstraction Plan + Nitrates Directive
F&V_F2	625,32	695,74	573,04	606,89	100	111,26	91,64	97,05
F&V_F3	739,44	712,72	447,43	453,63	100	96,39	60,51	61,35
F&V_F4	753,59	781,27	753,59	781,27	100	103,67	100	103,67
F&V_F5	1039,04	877,59	718,64	676,34	100	84,46	69,16	65,09

Source: Own elaboration

The impact of nitrogen reductions at the farm level change dramatically depending on the cropping pattern. The results of the model show that given the farmer's capacity to adapt them selves to the legislation (switching from one crop to another), changes in the cropping patterns would increase their income. Therefore, farms F2, F3 and F4 do not suffer any income loss because of Nitrates Directive compliance. Just farm F5 has a relevant income loss due to the lower adaptation ability because of the permanent crops (vines). Figure 8.18 summarizes the income variation in the different farm types selected for the different scenarios.

Figure 8.18: Effect of the Nitrates Directive on farm income



Source: Own elaboration

The results of the model show that farm income is more vulnerable to reductions in water availability than to nitrogen doses limitations. The income losses coming from the compliance with the Water Abstraction Plan are very relevant, especially to farms F3 and F5. Farms F2 and F4 are more extensive farms with less horticultural crops surface. However, F3 and F5 are farms that are more intensive and their profitability decreases seriously when water restrictions take place.

It is important to remark that new cropping patterns are very similar between the four farms when they comply with the Nitrates Directive. Melon is the vegetable crop chosen in the four farms; therefore, a dynamic analysis would be necessary to assess the effect of this in the following years when melon prices would probably be lower.

It is not correct to assume that income losses produced by the Water Abstraction Plan are directly a cost of compliance from GAEC requirements on legal permissions for water abstractions. The GAEC requirement requires a water meter installation and the possession of water abstraction legal concessions, but it does not punish the "not compliance" with the water quota in the water concession. Therefore, we cannot consider that there is a direct cost coming from this GAEC requirement (apart from the water meter installation). However, the River Basin Authority considers that there is already a benefit of compliance with the GAECs requirement, as it is increasing compliance with the Water Abstraction Plan and reducing illegal water abstractions.

8.7 Competitiveness assessment for the Spanish F&V sector

Following D12 approach for competitiveness assessment, Cross-Compliance standards "*trigger a supply response under the influence of various external conditions. This supply response interacts with the supply response of competitors and with demand to produce certain market effects*" (Page 8).

These conditions are the following:

- Initial conditions: farm type, farm size, farming intensity, farm localization (field topology, soil, agro-climatic conditions, proximity to water sources, local environmental pressure …)

- Industry conditions: industry competences (e.g., logistics), rivalry, supplier relations, customer relations, substitutes, voluntary standards
- Institutional conditions: implementation and enforcement of legislation
- Macro-economic conditions: interest rate, exchange rate

As explained in the introduction to this chapter, the analysis for the fruits and vegetables sector is based mainly on the initial conditions and on the institutional conditions. Among these conditions, already studied, the analysis on Fruits and Vegetables focuses mainly on all the indicators included in the initial conditions, namely, farm types, size, farming operations and techniques, agronomic conditions, situation of the farms in the region and irrigation districts. These structural conditions will determine the different levels of competitiveness across farm types.

Table 8.22: Competitiveness and standards at farm level (Table 2 of D12)

	Pre-standard situation	Post-standard situation
EU farm A	Gross product GP_a - variable costs V_a = gross $margin_a$ GM_a - fixed costs F_a = Profitability P_a	Gross product GP'_a - variable costs V'_a = gross $margin_a$ GM'_a - fixed costs F'_a = Profitability P'_a
EU farm B	Gross product GP_b - variable costs V_b = gross $margin_b$ GM_b - fixed costs F_b = Profitability P_b	Gross product GP'_b - variable costs V'_b = gross $margin_b$ GM'_b - fixed costs F'_b =Profitability P'_b
ROW farm C	Gross product GP_c - variable costs V_c = gross $margin_b$ GM_c - fixed costs F_c = Profitability P_c	

Source: Cross-Compliance Project, Deliverable 12, table 2

8.7.1 Effects of the Nitrates Directive on competitiveness

The analysis is carried out for short-term competitiveness, as effects on costs in the long run have not been analyzed. The analysis follows the farm-level index approach, by comparing the gross margin obtained in the different farm types before and after the application of the policy standard. The analysis is, therefore, a farm level analysis linking production costs, gross product and competitiveness, following table 2 of D12 “Competitiveness and standards at farm level”. Comparisons on profitability between pre and post standard situations and across farm types have been done using the gross margin indicator, as data on fixed costs were not obtained in the field work analysis. Although fixed costs are not considered, we will refer to these comparisons with the term "profitability".

The farm types selected to assess the effect of the ND on competitiveness at farm level are the farm types selected in previous sections. In the case of citrus orchards in the region of Valencia, F&V_1 is a similar farm that reflects costs comparisons taken from the literature review (see section 8.5 and Caballero and DeMiguel, 2002b). Similarly, for the vegetable-mixed farms of Castilla-La Mancha, we have used the selected farm types of the previous section and the modeling results. Table 8.23 shows the results of gross margin estimates in each of the selected farm types for the pre and post establishment of the ND.

Table 8.23: Effects of the Nitrates Directive on competitiveness

		Pre-Nitrates Directive situation	Post-Nitrates Directive situation
Citrus orchard	F&V_F1	GP_{F1} = 4200 €/ha	GP_{F1}' = 4200 €/ha
		V_{F1} = 2337,53 €/ha	V_{F1}' = 2318.77 €/ha
		GM_{F1} = 1862,47 €/ha	**GM_{F1}' = 1881,23 €/ha**
Mixed production farms	F&V_F2	GP_{F2} = 2072,07 €/ha	GP_{F2}' =2915,79 €/ha
		V_{F2} = 1446,75 €/ha	V_{F2}' = 2220,04 €/ha
		GM_{F2} = 625,32 €/ha	**GM_{F2}' = 695,74 €/ha**
	F&V_F3	GP_{F3} =2745,72 €/ha	GP_{F3}' =3401,46 €/ha
		V_{F3} = 2006,29 €/ha	V_{F3}' = 2688,74 €/ha
		GM_{F3} = 739,44 €/ha	**GM_{F3}' =712,72 €/ha**
	F&V_F4	GP_{F4} =1852,46 €/ha	GP_{F4}' =2910,31 €/ha
		V_{F4} = 1098,87 €/ha	V_{F4}' =2129,04 €/ha
		GM_{F4} = 753,59 €/ha	**GM_{F4}' =781,27 €/ha**
	F&V_F5	GP_{F5} =4272,9 €/ha	GP_{F5}' = 4423,53 €/ha
		V_{F5} = 3233,85 €/ha	V_{F5}' = 3545,93 €/ha
		GM_{F5} = 1039,04 €/ha	**GM_{F5}' = 877,58 €/ha**

Note: V: variable costs; GP: gross product; GM: Gross Margin

Following the methodology of D12, the assessment of short-run competitiveness at farm level is based on the relative changes in gross margin GMi. The impact on gross margin may be defined as $\Delta_i^{GM} \Delta GM_i \tilde{:} GM_i$

Δ_{F1}^{GM} = GM_{F1}'-GM_{F1}= 18,76 €/ha

Δ_{F2}^{GM} = GM_{F2}'-GM_{F2}= 70,42 €/ha

Δ_{F3}^{GM} =GM_{F3}'-GM_{F3}= -26,72 €/ha

Δ_{F4}^{GM} =GM_{F4}'-GM_{F4}= 27,68 €/ha

Δ_{F5}^{GM} =GM_{F5}'-GM_{F5}= -161,45 €/ha

Table 8.23 and equations above show the variation on gross margin for the different farms between the pre and post application of the Nitrates Directive. Results show the differential effect of the Nitrates Directive across farm types and regions.

The analysis above outlines the effects on farm revenue of the application of the Nitrates Directive. The farms F3 and F5 have losses about 5% and 15 % respectively. The farm F5 presents the highest losses because of its lowest capacity to adapt considering its high proportion of permanent crops (16 hectares of vineyard out of 40). However, farm F1 that grows only permanent crops (citrus in Valencia) shows a higher farm income after the application of the ND, due to the lesser dependence of citrus productions of nitrate fertilization as compared to horticulture crops and also due to the high level of adaptation of these types of specialized farms on the region of Valencia. In the vegetable farms of Castilla-La Mancha, we can see that farm income increases in farms F2 and F4 under the Nitrates Directive regime, evidencing their higher adaptation capacity due to a more flexible cropping pattern with less proportion of permanent crops. These results show that compliance with the Nitrates Directive can have beneficial economic effects on certain types of farms in Spain.

To explain the differential effects on farm income (gross margin) of the application of the ND, it is worth noting the following distinctions across regions and crop types (citrus vs. horticulture): In the citrus orchards, the gross margin is mostly affected by a reduction in costs. In the mixed farms in the region of Castilla La Mancha, farm income depends on the capacity to adapt to a new regulation by choosing different crop patterns that affect costs and yields[242]. The biggest farm (F2, 150 ha.) presents the best capacity to adapt (GMF2'/GMF2= 1,113), and consequently profitability is higher with the application of the nitrates directive in comparison with the other farms. Bigger farms cultivating annual cash crops have a clear comparative advantage to absorb the impact of the application of an environmental regulation (nitrate fertilizer or water quotas) due to their flexible cropping pattern and their capacity to adjust it. Choosing different crops in a larger surface, selecting and adapting to changes in

[242] Results of the model in the region of Castilla La Mancha, has shown that changes from cereals or other vegetables (lesser profitable crops) into melons (higher income and costs) implied an increment in the use of hired labor but not necessarely an increment in nitrates dosages. More details about changes in crop patterns and model results are explained in previous sections of this report (see "Assessment of the costs of compliance in vegetables in the region of Castilla La Mancha").

resources restrictions (e.g. water, fertilizers or even financial availability), may determine a better resource allocation.

GM_{F1}'/ GM_{F1} = 1,010

GM_{F2}'/GM_{F2}= 1,113

GM_{F3}'/GM_{F3}= 0,964

GM_{F4}'/GM_{F4}= 1,037

GM_{F5}'/GM_{F5}= 0,845

$$\frac{GM_{F2}'}{GM_{F2}} > \frac{GM_{F4}'}{GM_{F4}} > \frac{GM_{F1}'}{GM_{F1}} > \frac{GM_{F3}'}{GM_{F3}} > \frac{GM_{F5}'}{GM_{F5}}$$

The comparison of the farm profitability in the pre-standard and post-standard situation for each farm (GM_{Fi}'/ GM_{Fi}), allow us to compare different farms. This, in positive effect cases, shows the effect of the Nitrates Directive on competitiveness (F2 lower than F4, F4 lower than F1, etc).

In order to get a better perspective on the effect on competitiveness of the application of the Nitrates Directive in the region of Castilla-La Mancha, we have aggregated the results to the irrigation zone that we have studied, that corresponds to one of the most important nitrate vulnerable areas in the region. This zone, located in the sub-region of La Mancha and along the Western La Mancha aquifer, is one of the most relevant irrigation areas of the region, covering 20 irrigation communities and a total surface of 140.000 ha (mostly from groundwater sources), one third of the region's total irrigation lands.

Aggregate results are calculated as a weighted average considering the relative weight of each farm type in the area (sub-region of "La Mancha"):

$$GM_{Av} = \sum_i \sum_j \alpha_j * GM_{Fi} \quad ,$$

i= 2 to 5

j= 1 to 5

Where α_j is the surface weight of the farm size stratum *j*, to which each farm F_i belongs in the area studied (La Mancha sub-region)

Table 8.24: Average Aggregated effects of the Nitrates Directive in the study area (Irrigation zone of the Western La Mancha aquifer)

	Pre-Nitrates Directive situation	Post-Nitrates Directive situation
Average Aggregated results in the irrigation zone of the Western-La Mancha aquifer	GP_{Av} = 2820,41€/ha	GP_{Av}’ = 3493,54 €/ha
	V_{Av} = 2016,37€/ha	V_{Av}’ = 2710,95(€/ha
	GM_{Av} =804,05€/ha	**GM_{Av}’ = 782,58 €/ha**

Δ_{Av}^{GM} =GM_{Av}’- GM_{Av}= -21,47 €/ha

GM_{Av}’/GM_{Av}= 0,973

The aggregate results for the irrigation zone of the Western La Mancha aquifer (main nitrates vulnerable area in the region of Castilla La Mancha) show an average gross margin loss of 21,47 €/ha and a decrease of profitability of about 3%.

8.7.2 Effects of the water conservation measures (GAEC) on competitiveness

For the analysis of the effect of compliance with the water policy measures, the same approach has been used. The next Table 8.25 shows the comparison between the pre and post situation of the Water Abstraction Plan (WAP), for each farm type in the region of Castilla La Mancha.

Table 8.25: Effect of the GAECs ground water policy measures at farm level

		Pre-WAP situation	Post-WAP situation
Mixed production farms	F&V_F2	GP_{F2} = 2072,07 (€/ha)	GP_{F2}’ = 1858,24 (€/ha)
		V_{F2} = 1446,75 (€/ha)	V_{F2}’ = 1285,20 (€/ha)
		GM_{F2} = 625,32 (€/ha)	**GM_{F2}’ = 573,04 (€/ha)**
	F&V_F3	GP_{F3} =2745,72 (€/ha)	GP_{F3}’ = 1234,07 (€/ha)
		V_{F3} = 2006,29 (€/ha)	V_{F3}’ = 786,64 (€/ha)
		GM_{F3} = 739,44 (€/ha)	**GM_{F3}’ = 447,43 (€/ha)**
	F&V_F4	GP_{F4} =1852,46 (€/ha)	GP_{F4}’ = 1852,46 (€/ha)
		V_{F4} = 1098,87 (€/ha)	V_{F4}’ = 1098,87 (€/ha)
		GM_{F4} = 753,59 (€/ha)	**GM_{F4}’ = 753,59 (€/ha)**

		Pre-WAP situation	Post-WAP situation
	F&V_F5	GP_{F5} =4272,9 (€/ha)	GP_{F5}' = 2566,95 (€/ha)
		V_{F5} = 3233,85 (€/ha)	V_{F5}' = 1848,31 (€/ha)
		GM_{F5} = 1039,04 (€/ha)	**GM_{F5}' = 718,64 (€/ha)**

$\Delta_{F2}^{GM} = GM_{F2}' - GM_{F2} = -58{,}28$ €/ha

$\Delta_{F3}^{GM} = GM_{F3}' - GM_{F3} = -292{,}01$ €/ha

$\Delta_{F4}^{GM} = GM_{F4}' - GM_{F4} = 0$ €/ha

$\Delta_{F5}^{GM} = GM_{F5}' - GM_{F5} = -320{,}4$ €/ha

In section 8.6.3 of this chapter it was already observed that the Water Abstraction Plan produces a more significant effect on gross margins than the Nitrates Directive. In this case we can see an important impact of this measure for farms F5, F3 and also for farm F2. This decrease in gross margin is due first to the structure of the farm, which allows different degrees of adaptation, and second to the current water consumption in the farm. Some farms, like F4, are already complying with the WAP and therefore the measure will not have any impact.

$GM_{F2}'/GM_{F2} = 0{,}916$

$GM_{F3}'/GM_{F3} = 0{,}605$

$GM_{F4}'/GM_{F4} = 1$

$GM_{F5}'/GM_{F5} = 0{,}692$

$$\frac{GM_{F4}'}{GM_{F4}} > \frac{GM_{F2}'}{GM_{F2}} > \frac{GM_{F5}'}{GM_{F5}} > \frac{GM_{F3}'}{GM_{F3}}$$

The comparison of the farm profitability in the pre-standard and post-GAEC situation for each farm (GM_{Fi}'/ GM_{Fi}), shows that under the Water Abstraction Plan the effect on competitiveness is lower (in this case is a positive effect) for F4 than for F2, for F2 than for F5, and for F5 lower than for F3. Competitiveness for farm F4 does not change as this farm is already adapted to a lesser water consumption. In farms F3 and F5 competitiveness is seriously affected by this measure. These farms have a high proportion of horticultural crops, which are highly dependent on water, and farm F5 additionally presents a 40% surface cultivated with vineyards, whose profitability decreases enormously when switching from irrigation to rain fed conditions.

In the same way that the results of the Nitrates Directive analysis were aggregated, the results for the water policy application analysis have been aggregated as well in order to get a better view of the global effect of the GAEC measure impact on competitiveness.

Table 8.26: Effects of the Water Abstraction Plan (WAP) (GAEC requirement) at farm level: average effects on the Western La Mancha Aquifer

	Pre-WAP situation	Post-WAP situation
Average values for the Western La Mancha aquifer irrigated farms	GP_{Av} = 2820,41 €/ha	GP_{Av}' = 1977,41 €/ha
	V_{Av} = 2016,37 €/ha	V_{Av}' = 1337,30 €/ha
	GM_{Av} =804,05 €/ha	**GM_{Av}' = 640,11 €/ha**

Δ_{Av}^{GM} =GM_{Av}'- GM_{Av}= -163,94 €/ha

GM_{Av}'/GM_{Av}= 0,796

The results for the Western La Mancha aquifer show an average gross margin loss of 163,94 €/ha and a decrease of profitability of 20%, which must seriously decrease competitiveness for the mixed production farms of the region. However, as explained in section 8.6.3, these costs are not actually a consequence of the GAECs because it is not the GAEc which makes it compulsory, but the river basin´s water policy. On contrary, this GAEC requirement increases compliance with this water policy which is considered as a benefit of compliance.

8.7.3 Effects of the plant protection products and food safety regulations on competitiveness

Following the same methodology described in the past section, we outlined changes in variable costs, gross product (through yield losses) or gross margin, at the farm level in those type farms for which we had enough detailed information.

As seen in previous section, regulation about pesticides is complex. Regulations affect pesticides commercialization and consequently plant protection products available for growers in the local market. Maximum residues allowed and GAECs about products application techniques determine some restrictions imposed to farmers. In the region of Valencia, voluntary certification schemes like ICM and EUREPGAP (see previous sections) have been used extensively during last decades. These certification systems include cultivation methods that are compatible with GAECs and all European directives related with farming methods and food production.

In order to assess competitiveness in citrus production in Valencia, two farm types are used as described in costs assessment in previous sections. Then, we used EUREPGAP cultivation methods to describe a situation in which all GAECs about pesticides regulations and cross-compliance restrictions are covered. Analysis for F&V_1 has been done by using information from Table 8.14 in previous sections (Peris Moll and Juliá Igual, 2005).

Following the example used in Table 8.14, about costs comparison between EUREPGAP certified orange orchards and a conventional orange grove in the region of Valencia, Table 8.27 shows a pre-standard situation as the conventional cultivation methods, and a post-standard situation as the certified EUREPGAP orchard.

Table 8.27: Selection of regions, products, Cross Compliance policy issues and methodology

	Pre-standards situation	Post-standards situation
F&V_F1	GP_{F1} = 3960 (€/ha)	GP_{F1}' = 2990 (€/ha)
	V_{F1} = 2748,51	V_{F1}' = 1628,15 (€/ha)
	GM_{F1} = 1211,49 (€/ha)	**GM_{F1}' = 1361,85 (€/ha)**

$\Delta_{F1}^{GM} = GM_{F1}' - GM_{F1} = 150,36$ (€/ha)

$GM_{F1}' / GM_{F1} = 1,124$

As shown in Table 8.14 (see previous sections), the certified production scheme, implies less yield, less costs and premium prices as well. Differences found in Table 8.27 in gross products (more than 150€ in gross margin in the certified scheme) are smaller than the differences in variable costs between years.

Although there are no premium prices for cross compliance measures, differences in variable costs, yields and price per kg are clear evidence that alternative cultivation methods are available for growers and might be used successfully. Additionally, it could be expected that a considerable number of farmers would be encouraged to change towards integrated pest management certification schemes, such as EUREPGAP, for citrus orchards in the future[243]. In this regard, it could be expected that cross compliance might induce an increase in competitiveness not only due to an increment in gross margin, but also to positive potential changes towards a better quality certified product.

8.8 Comparative overview with the United States F&V sector

The following section includes a brief overview comparison of the US and EU F&V sectors. Discussion follows on the US environmental regulations that affect the F&V sector in comparison with the Spanish F&V sector. Focus is on tomatoes and citrus production.

In Annex, section 6, the US report on F&V sector, the case studies of citrus and tomato industries consider state assessments and permits that determine low effects on the growers' budget (in some cases 3%). The approach used in the Spanish case studies for the assessment of the costs of compliance, is focused on pesticides, nitrates and water directives.

8.8.1 Tomatoes production and Methyl bromide

Methyl bromide is a very toxic biocide extensively used in agriculture and food storage. Its main compounds affect severely the ozone layer. World-wide consumption of methyl bromide grew from 16,000 tons in 1975 to 42,000 tons in 1984 and 73,000 tons in 1993 (Miller 1996).

[243] Compliance with Nitrogen directive or more controls on pesticides in order to attain to GAECs and SMR might induce famers to consider ICMs Protocol and its benefits.

The US and European horticulture used this product during last decades. In 1995, developed countries froze their consumption of methyl bromide at 1991 levels and have agreed to a schedule of a reduction of 100% by 2005 (US Federal Register, 2000). In Europe, legislation on Methyl Bromide began with CEC 2037/2000 as a consequence of the Montreal agreement in 1997. These regulations act on trading, pre-shipping and commercialization standards defining quarantine treatments, defining periods for pest treatments on products, categorizing and enlisting pests and products and citing exceptions.

Spanish MeBr consumption was important in horticulture (around 4,000tns in 1996) but only 5% of this product was used for pest control in tomatoes. (875 hectares were fumigated with 215 tns on 9000 hectares of this crop by 1998). In Spain other crops such as strawberries or peppers used to be more important consumers of BrMt, accounting for about 60% of total BrMt consumption by 1997 (Bello et al., 2001). In the regions of Canarias, Murcia, Valencia and Andalusia several alternatives in tomatoes have been successfullyused used during the last decade. For instance, in the region of Canarias (1446 hectares with tomatoes in 1998) and Extremadura (16327 hectares the same year) bromide methyl phaseout was 100% with high yields (63MT/ha under normal cropping conditions and 96MT/ha in glasshouses). In Murcia and Andalusia, the use of bromide methyl was less than 3% and only the Baleares islands used bromide methyl in about 11% of tomato surface.

Three explanations have been given as reasons why MB is not used for tomato production in Spain (Tello, 2002):

- Small number of pathogens causes relevant losses in Spanish tomato crops.
- Stability of the genes resistant to the fungus “Fusarium sp.”
- Alternative control techniques based on bio-spraying, alone or combined with solarization, as the use of nematicides developed in Spain, have demonstrated their utility and cost effectiveness when correctly applied.

Section 7 in Annex, suggests that the Environmental Protection Agency (EPA) estimates about 56$/acre (97.21€/ha) as the extra costs of Californian tomatoes growers for replacing this method with other same effective methods for pest controls. Spanish growers have alternative methods that have not evidenced negative effects on yields. In the US study of the vegetable sector, this would be probably the most important environmental regulation affecting costs (total expenses are about 4,852 U$D per acre then environmental regulations - 56$/acre in this case- would represent about 1,2% of total operational costs). It is remarkable that the EPA calculation on Bromide Methyl, is 4% losses (10-20% in strawberries), for the same effect with an alternative method (fumigation, other pesticide, etc.). EPA does not inform about yield losses or changes in gross margins.

Several projects were undertaken in the Mediterranean coast of Spain (Valencia and Murcia) to evaluate the cost of products and alternatives to methyl bromide on crops such as citrus, open-air horticulture, strawberry, and greenhouse-grown pepper. Telone (1,3-dichloropropene with chloropicrin) gave the most consistent and reliable results (Caballero et al., 2002a). There is an important developing interest in solarization, particularly when combined with chemical or bio-spraying at low dose (Caballero et al., 2002b) that result in similar costs and gross margin.

8.8.2 Citrus in Southern Florida and in the region of Valencia

According to the US contribution (in section 7 of Annex), citrus production in Florida is more affected by diseases and climate conditions than in the region of Valencia in Spain. As mentioned in the previous sections, there are slight or null changes in variable costs or competitiveness in citrus orchards in the latter region. When applying certified schemes, such as integrated pest management or EUREPGAP, incidence on costs remained constant or decreased.

Regulatory costs, citrus canker protocols and other expenses, represent 32,74U$ for citrus growers in Florida (US). This is about 4% of total expenses in groves calculated by the Florida Cooperative Extension Service (Muraro et al., 2004). Nevertheless, this approach should be considered carefully because fruit production has an enourmous variation within practices. Weed and pest management might determine variations in costs and margins of about 100 U$/acre, which is more expensive than regulatory costs. Other methods, using farm level analysis and statistical data, should be added in further studies in order to determine the exact benefits or costs that this regulatory context produce on Flordia growers' productivity and competitiveness.

Spanish citrus problems are quite different from those affecting productivity in Southwestern Florida. In the EU, the F&V CMO is being reformed and cooperative and producers organizations are being encouraged to change into a more competitive performance. However, policy measures tending to enhance farmers are required in order to improve managerial skills and the efficiency of external service firms and co-operatives (Picazo and Reig, 2006).

In the context of the CMO reform of F&V, the importance of implementing new protocols like Integrated Crop Management, and expanding new markets seems to be the key issue for citrus production. New markets, traceability and a more efficient use of resources seem to be acting together in these new integrated pest management visions.

8.9 Concluding reflections for the Fruits and Vegetables sector

Overall remarks: The results of this study suggest that, in general terms, the cost of compliance with the environmental regulations for the fruits and vegetables sector in Spain would be probably slight (or even none or beneficial in some specific cases). It has to be noted, however, that due to the limitations of the study, not all the fruits and vegetables production regions have been considered and, therefore, these general conclusions may differ across regions, farming systems and types of farms.

Cost of compliance in Citrus productions: In highly productive areas of single-crop productions, such as the citrus groves of the region of Valencia, the assessment of the cost of compliance for pesticides and nitrates show that benefits of compliance might be possible. In these farms, most products banned by European legislations or its Spanish transpositions have an alternative method that is not necessarily associated to a higher cost at farm level. Special cultivation methods applied during the last years for pest management have a clear improvement in pest control efficiency without almost any extra cost, even if products have evolved into solutions that are more specific.

In the case of the cost of compliance of GAECs related to pesticides and food safety at farm level, certified schemes like EUREPGAP could have a potential increase in the farms' gross margin. The application of this farming methods derive into lesser costs, lesser yields and slight increments in gross product since premium prices take place.

Cost of compliance in Horticulture production : The analysis of the impact of compliance with the Nitrates Directive on vegetable crops in the region of Castilla La Mancha showed that the cost of compliance (measured as income loss) at farm level varies depending on farm types ad adaptive capacity of farmers to face the regulations. When farmer's adaptation ability is low (i.e. changes in cropping patterns are not easily preformed) the most vulnerable farmers account for income losses around 15%. These results were validated by fieldwork data and interviews to farmers and experts in the area of study. Nevertheless, when farmers adjust the cropping pattern to comply with the ND (by changing to less nitrate-demanding crops and reducing the extended over-fertilizations practices) income loss is low and, in some cases, it may even increase, evidencing a clear benefit of the compliance measure.

Competitiveness at farm level: Our analysis of short-term competitiveness at farm level indicates that the effects of the nitrate directive on competitiveness of **citrus production** might be null or even positive. In this regard, nitrogen changes due to legislation determine on citrus orchards in Valencia result in the same yields with lower dosages (according to literature and experts consulted); this is in fact a benefit of cross compliance (cost reduction). Growers tend to use nitrate fertilizers exceeding the maximum permitted dosage. Nevertheless, there is no evidence in yield decreases when fertilization is reduced to the directive's limits. In consequence, production costs decrease and gross margins in citrus production might increase slightly.

In the case of the mixed **vegetable farms** of the region of Castilla-La Mancha, the effects of the application of the **Nitrates Directive** on the overall competitiveness of the region's farms varies across farm types. Farms with a fixed cropping pattern have a lower capacity to adjust and therefore competitiveness is lower when the ND is enforced (85%). Conversely, larger farms cultivating annual cash crops have a clear comparative advantage to absorb the impact of the application of an environmental regulation (nitrate fertilizer or water quotas) due to their capacity to adjust their cropping mix. Therefore profitability can be higher when complying with the Nitrates Directive and in turn competitiveness increases (up to 111 %) , evidencing that compliance can have beneficial effects on certain types of farms in Spain.

Regarding the effects of the **water conservation measures (GAEC)** on competitiveness, results indicate that the water quotas established by the region's Water Abstraction Plan have a significantly larger impact on farm profitability than the Nitrates Directive. Aggregate average loss in profitability is 20% as compared to a 3% in the case of the ND. Consequently, the average competitiveness in the case of compliance with the water conservation measure is 79% and for the Nitrates Directive is 97%.

Policy synergies: GAECs related to water use: In relation to compliance with the water use limitations (GAECs in the Spanish legislation) the results of the analysis show that farm income is much more sensitive to water restrictions than to nitrogen restrictions, being water the most limiting factor for horticulture production in this regions as well as in other Mediterranean regions. However, it is important to emphasize the important role of the ***synergies between water and agricultural policies.*** In this area of Spain, water use limitations is promoting the substitution of water demanding crops with less water intensive crops which require also lower nitrogen dosages.

Policy reform: Cross Compliance effects and the reform of the F&V CMO*:* In the context of the new F&V CMO reform, cross compliance will be a crucial research and it will be required to conduct further analysis for assessing the cost of compliance on the F&V sector. In this changing scenario, implications on the fruit and vegetable market are presumed to be considerably important.
As the land cropped under fruits and vegetables will be eligible for the Single Farm Payment, it is expected that mixed-production farms that combine vegetable productions with COP products (as in the region of Castilla-La Mancha), will increase the surface dedicated to vegetables. In consequence, increased supply may induce a product price reduction and a derived fall in farm profitability and competitiveness.

In the areas of specialized-production farms (such as the orange groves of Valencia, the open-air vegetable productions of Murcia or the extended greenhouse and plastic-covered productions of Almeria), the effect will be very different as these farms are not subject to the SFP structure. Alongside, new protocols and regulations as the Integrated Crop Management practices would determine higher profitability in the medium and long run because there would probably be important effects on risk reductions on revenue and possibly new marketing advantages under price premium.

Additionally, producers' organizations in Spain have complained about the CMO reform affecting processed F&V (especially citrus in the region of Valencia) claiming that the application of the single farm payment will destabilize fresh fruits and vegetables markets.

Cross Compliance and world market competitiveness: Regarding the F&V sector, US and Europe have important challenges due to changes in the international scenario (new market agreements, environmental restrictions, farm policies, etc.).
Input use ruled by European environmental policies like the Nitrates Directive and pesticides authorization measures, would probably determine improvements and quality differentiation for Spanish F&V products in the world market. In addition, an improvement on competitiveness of F&V in Spain in more standardized production patterns might be expected soon.

EUREPGAP and other certification schemes which consider new technologies and improved knowledge on integrated pest management would increase their relevance because of new environmental restrictions, reinforcing the competitiveness of this sector without clear decreases in operational costs, and even premium prices in some cases.

Citrus and tomatoes are both main products in the Spanish and US F&V sectors and might have changes in competitiveness as new restrictions are taking place. In the context of OCM of F&V sector in Spain, and considering the potential markets represented by US (and Japan), exported tomatoes and citrus might have gains in profitability for growers. The comparative analysis between the US and the Spanish F&V sectors, has given an idea about the total costs of compliance with regulations in both case studies (citrus and tomatoes). Thus, regulations concerning methyl bromide phaseout in the citrus industry in US seem to represent less than 2% of total operational costs. In the case of tomatoes, regulations, environmental assessments and other costs of compliance represent about 0,27% of total costs (see section 6.3 in Annex to this report in a separate document). Other regulatory costs, state assessments and environmental permits for citrus, account for about 4% of total farm expenses in Florida citrus industry, but yearly variations on cultivation methods and practices among growers are considerably higher, determining that these regulatory costs might be marginal as well.

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9 The olive sector

9.1 Introduction

9.1.1 Scope and Contents

This chapter focuses on the analysis and assessment of the effects that cross compliance programs have on the olive sector. The analysis is focused on Spanish agriculture as the main producer and exporter of olive oil in the world. The olive sector in Spain is characterized by a large surface with small units and mainly rain fed conditions. The main production area is located in the region of Andalusia, where the most important environmental concern is erosion. This report includes different methodologies to evaluate the cost of compliance with the legal framework in the selected region.

The chapter has a similar structure than the previous one on fruits and vegetables. The first part includes an introduction with a brief summary of the methodology used and the selection of regions and policy measures that have been analyzed. Focus is on the impacts at farm level of GAECs, specifically of the requirements on erosion control and soil maintenance.

9.1.2 Compliance and competitiveness

Different methodological approaches have been used to address the link of the costs of compliance with the competitiveness of the olive oil sector on the world market. As in the case of the fruits and vegetables sector, the olive sector characteristics make it innadequate to be analyzed with GTAP. In consequence, other methodological approaches that are closer to the farm-level structure have been used to address competitiveness issues.

Following the analysis of competitiveness of D12, the sets of key conditions to address competitiveness are, namely, initial, industry, institutional and macroeconomic conditions. The analysis of the olive oil sector has been based mainly on the two following conditions:

- *Initial conditions: farm type, farm size, farming intensity, farm localization, (field topology, soil, agro-climatic conditions, proximity to water sources, local environment pressure, etc.).*
- *Institutional conditions: implementation and enforcement of legislation*

9.1.3 General Methodological Framework

Following the same criteria described in the chapter of fruits and vegetables, the general methodology developed in this study was:

(i) Selection of the regions, sub-regions, agronomic areas and municipalities (counties) that represent the agricultural production systems of the Spanish olive sector.

(ii) Selection of the most relevant cross-compliance policy measures, SMR and GAECs.
(iii) Selection of representative farms within the study regions that will allow the analysis of cost structure at farm level
(iv) Assessment of compliance costs in the pre- and post establishment of the selected SMR and GAECs regulations
(v) Analysis of competitiveness and policy standards at farm level

The analysis focuses on GAECs regulations related to erosion and soil management requirements in slope agriculture, which is mentioned as 70% (Pastor et al., 1997) of olive farms in Spain. Compliance with these regulations can have an effect on farm income (through lower yields) and also an increase on specific farm costs when adapting agricultural practices and tillage operations, such as pesticides, fertilization applications or soil maintenance (terraces, grass strips, etc) is needed. These changes are evaluated to assess their effects on farm costs and on the overall farm income.

Other studies should also consider flat areas and compliance with the nitrates directive, but we have not considered it in this chapter, since there are not strong evidences of nitrate pollution or exceeding the nitrate directive dosages when consulting literature and experts on the Spanish olive sector.

Table 9.1: Selection of regions, products, Cross Compliance policy issues and methodology

REGION	PRODUCT	CC POLICY ISSUE	METHODOLOGY
Region of Andalusia	Olive oil	GAECs: • Erosion • Soil organic matter • Soil structure	• Representative farms • Cost structure

9.2 The Olive sector: market and trade

9.2.1 Olives in Europe and the world

Olive oil is a very versatile product. Long known to many generations in the Mediterranean world as essential to their health and diet, it is now widely appreciated in Europe and around the world for its nutritional, health and sensory properties. The European Union is the leading world producer, accounting for 80 % and consuming 70 % of the world’s olive oil. Given its importance to the economies of many regions, demand is steadily increasing both in the EU and in third countries, helped by information and promotional campaigns supported by the Union and others. The main aim of the EU olive oil policy is to maintain and strengthen its position in world markets by encouraging production of a high-quality product for the benefit of growers, processors, traders and consumers.

Olive cultivation is widespread throughout the Mediterranean region and it is important for the rural economy, local heritage and the environment. In 2000, the area under olive groves in the EU was approximately 5 163 000 hectares (EC, 2003), roughly 4% of the utilizable agricultural area, of which 48 % were in Spain and 22.5 % were in Italy. Approximately 2.5 million producers — about one third of all EU farmers — are involved, with 1 160 000 in Italy, 840 000 in Greece, 380 000 in Spain, and 130 000 in Portugal. France, the fifth producing country in the EU, has a much smaller number of growers. Olive production is the main source of employment and economic activity in many producing regions, and it has shaped the landscape in these countries over many centuries.

The fact that the EU is self-sufficient does not preclude it from trading olive oil. Imports in 2000/01 from third countries (mostly in bulk) were 127 000 tonnes, while EU exports reached 290 000 tonnes, the main destinations being the United States of America, Japan, Canada and Australia. EU olive oil exports tend to be in bottled form.

The sector consists of growers, cooperatives, pressing mills, refiners, blenders, and companies involved in various aspects of marketing. Three broad types of production can be distinguished: traditional groves, often of ancient olive trees; more intensive traditional groves involving a higher use of inputs; and intensive, modern, farms using more mechanisation and other technologies including irrigation. This mix of ancient and modern explains the differing farm sizes, ownership characteristics and processing structures that exist within the EU. Likewise, large differences in production systems occur within each producing region. The average holding size is as low as 1 hectare in, for example, Italy, though olive holdings in Spain are larger (6 hectares on average).

9.2.2 Olive production in Spain

Spain has 2,4 million hectares of olive trees under cultivation, which ranks it as the top producer and exporter of olive oil in the world (around 30%). By comparison, Italy, the second ranked producer has about 0,8 - 1 million hectares. Although Spanish olive area has been steadily declining since 1960’s, new plantings in recent years have altered the trend, particularly in Andalusia region, which produces approximately 75% of Spain’s olive oil. Due to the gradual replacement of older low-producing orchards with higher density and higher productivity orchards, average production per hectare has been rising.

Oil production has also risen during the same period to just over 655,000 metric tons in 1996/1997. Production is highly influenced by seasonal rainfall (most orchards are not irrigated) and alternate bearing (low yields followed by higher yields due to the influence of crop on the next year’s production). World production is approximately 2,000,000 tons per year, valued at 1,7 billion (US$).

Spanish exports are 40% of total production but depending on years, exports might vary between 30% and 50%. European countries are main destination for this production: for example in 1997/1998 429.000 t where produced and 352.800 t where exported to the EU and 76.200 to third countries. Third countries exports are about 50.000 and 100.000 tons in the best cases. Main export destinations in 2001/02 were United States (32.677 t), Australia (13.304 t), Japan (11.803 t), Mexico (5.332), Brazil (4.729 t), Russia (3.106 t) and Canada (2.397 t).

Inside the European Union, main destinations in 2001/02 were Italy (328.083 t), France (71.524 t), Portugal (54.047 t), UK (18.733 t), Belgium (5.617 t) and Germany (3.774 t).

Main competitors of Spanish production are mainly in the pan-European zones. Thus, the rest of oil production in the world is produced by Italy (21%), Greece (12,8%), Tunisia (6,3%), Syria (3,8%), Morocco (2,8%), Turkey (2,1%), Portugal (1,3) and Argentina (0,8%).

The olive sector has two different sub-sectors highly differentiated in its uses. However both uses are together in many farms, and this is why for many aspects of this analysis both uses will be treated together.

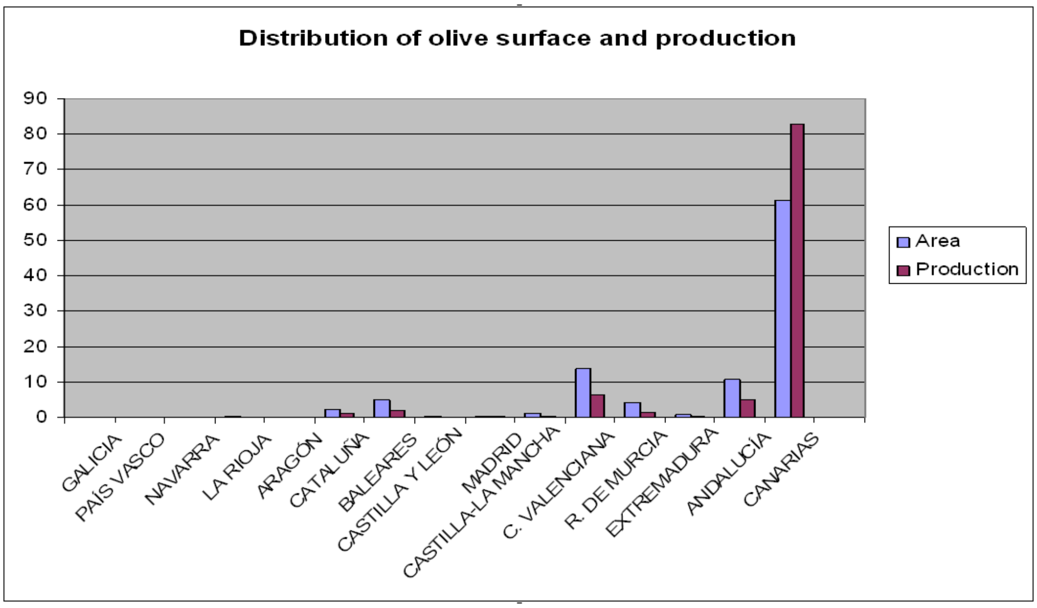
In 2003 the surface of Olive trees in Spain was 2.439.582 hectares being widely spread in most of the national territory. However, as it is shown in the Table 9.2 below, the olive area is mainly concentrated in the region of Andalusia (61,4% of total olive area), and the second most important area is the region of Castilla La Mancha. In terms of production, the region of Andalusia is again the most important area with a 82,9% of the total Spanish production (of olives), followed by The region of Castilla-La Mancha (6,43).

Table 9.2: Olive surface and production by Autonomous Regions, 2003

Autonomous Regions	Surface (ha)	Surface %	Production (t)	Production %
GALICIA	10	0,00	0	0,00
PAÍS VASCO	92	0,00	642	0,01
NAVARRA	4790	0,20	11166	0,15
LA RIOJA	3827	0,16	7281	0,10
ARAGÓN	52936	2,17	72397	0,96
CATALUÑA	122531	5,02	141797	1,88
BALEARES	8200	0,34	594	0,01
CASTILLA Y LEÓN	7052	0,29	15618	0,21
MADRID	25414	1,04	26009	0,34
CASTILLA-LA MANCHA	**335698**	**13,76**	**485900**	**6,43**
C. VALENCIANA	100951	4,14	123741	1,64
R. DE MURCIA	22821	0,94	27318	0,36
EXTREMADURA	261200	10,71	378997	5,02
ANDALUSIA	**1.494.048**	**61,24**	**6261780**	**82,90**
CANARIAS	12	0,00	326	0,00
SPAIN	**2.439.582**	**100,00**	**7553566**	**100**

Source: MAPA, 2003

Figure 9.1: Relative weight (%) of each Autonomous Region for the Olive sector in Spain



Source: MAPA, 2003

In the graph above the difference between importance in olive area and olive production highlights the difference in agriculture orientations in the different regions. The autonomous region of Andalusia has a more business-oriented agriculture while the region of Castilla-La Mancha has more family farm oriented agriculture.

The study of the olive sector and of how cross-compliance affects costs of production and consequently competitiveness will focus mainly in the region of Andalusia.

9.2.3 Single Farm Payment in the Spanish Olive sector

The 2003 reform of the CAP has introduced a new system of single farm payments[244] (income support, SFP) and interrupted the link between support and production (decoupling). Most Common Market organisations (OCMs) became subject to this system in 2005 and 2006 (with the exception of the new Member States). Existing direct aids may be continued until 2012, subject to cross-compliance conditions, but they will be gradually reduced.

Olive production has been regulated in order to have a partial decoupling application of aids (minimum decoupling rate of 60%).

During 2006, Olive farmers in Spain have started to apply for the Single Farm Payment and the local governments begun to designate rights for olive areas under certain conditions. The following section considers some issues and features of the SFP in Spain in the Olive sector, using current legislation.

9.2.3.1 Structure of Coupled/decoupled payments in Olive

Aids have been changed from a coupled form into a decoupled form. 2006 has been the first year for the application of single farm payments (SFP) in Spanish olive production. The

[244] CEE 1782/2003

application and aids distribution is being carried out on each regional government (autonomous regions) by the local administration: e.g. "Junta de Andalusia" (Andalusia regional government) and it is regulated as follows:

- 95% of the aids have been decoupled in a SFP (100% when farm total surface is lesser than 0,3 hectares)
- The other 5% of amounts are applied as a coupled aid by surface. This amount depends on olive categories established. The average value is 52,8 € per hectare and might be increased applying a factor of 1,5 when farms are located in municipalities with more than 80% of olives in the total agrarian surface.

SFP happen after the period considered. For example, 2006 payments have taken place from 1st January to June 30th 2007; delays in payments cannot occur after September of 2007.

The autonomous regions designate and distribute coupled payments in Olive production in about 103 millions of €. Five categories of Olive production schemes and features are defined:

a) Olive orchards in main production areas, where the zone is absolutely dependent on this crop (80 % or more surface of the total ploughed surface). These cases receive 1.5 more of aids applied to the rest of the territory.
b) Old olive orchards with cultural or landscape value or on terraces
c) Olive orchards in highly constraint areas such as strong slopes, low rain, etc.
d) Olive with high risk of abandonment.
e) Ecologic olive orchards and those integrated in quality as "Protected designation of origin[245]"

<u>Modulation</u>

In Spain, the modulation of aids started in 2005. The modulation is obligatory from 2005 until 2012. In 2005 this value is 3% of total aids, and in 2006 is 4%. From 2007 until 2012 this retention will be 5%. The amount retained in the first 5000 euros is going to be refunded to farmers as an additional aid amount, linked to rural development or agri-environmental programmes.

9.2.3.2 Reference period, amounts and calculations

In olive production, the historical procedures for calculation of farmer's rights had been taking into account 1999/2000, 2000/2001, 2001/2002 and 2002/2003 campaigns with some exemptions[246].

In olive production, the reference amount is the average calculated from the past 4 year's payments received by farmers. The next Table 9.3 considers an olive farm in Andalusia for SFP calculation from a 4 year's reference period:

[245] For more details see: http://ec.europa.eu/agriculture/foodqual/quali1_en.htm
[246] When farmers had initiated their farming activities during the years happened on the reference period, and then the reference becomes dependent only on the years or years they had started. Also some considerations had been done when extraordinary events taken place during the years of the reference period.

Table 9.3: Single Farm Payment calculation for olive farms in Spain

	1999	2000	2001	2002	Average
Surface **(has)**	5	5,2	5,1	5,3	**5,15**
Oil Production **(kg)**	2500	2600	3060	2915	**2769**
Aid Amount **(€/kg)**	1,3040	0,9391	0,6375	0,9192	
Amounts **(€)**	3260	2442	1951	1679	**2583**
Reference Amount (€): 2583 x 0,95					**2454**

Source: Junta de Andalucía, 2006.

The number of rights is defined using the average number of hectares that have been receiving payments during the reference period. The value of these rights is equal to the reference amount divided by the number of hectares. For the previous example the number of rights is equal to 5.15 (equal to the average number of hectares during the reference period), and the value of each right will be the result of dividing the reference amount (2454) by the number of rights (5.15): 476.47 €/right

9.2.3.3 Rights

For the use of rights in order to obtain the SFP, all farmers should:

- Activate the rights through sending a proper payment application
- Declare the number of admissible hectares as rights
- Comply with Cross Compliance regulations

Olive farms surface planted before May 1st 1998 are admissible for the Single Farm Payments as new substituted olive plantations registered in the geographical information system.

Those areas designated for other purposes are not admissible surfaces (e.g.: Horticulture, other permanent crops, forests and not agrarian activities).

Rights might be administrated as they can be lost when not using them in a period of 3 years after received or those rights obtained from the national reserve that have not been used in 5 years.

Rights trade is allowed and administrated by each autonomous region in Spain.

9.2.3.4 Cross compliance controls and non-fulfilment

In Spain, the Royal Decree 1617/2005 established the terms for rights and concessions for farmers in the Single Payment Scheme. Additionally, in 2004 the Royal Decree 2128/2004 established a geographical information system for agricultural surface identification (SIGPAC[247]). The last decree has: a) defined the national and local authorities for its administration, b) established its application from Jan 1st 2005, c) set the complete information for parcels identification and d) give competence to autonomous regional governments to regulate its application with farmers. The use of SIGPAC in Andalusia started in 2005 and single farm payment applications have started during 2006. Thus, the Agriculture

[247] SIGPAC: Sistema de informacion geografica de parcelas agrícolas (geographical information system for agricultural plot).

Ministry has developed a Cross-Compliance Control Plan for the surveillance measures concerning SMR and GAECs.

The national authority responsible for the implementation of controls is FEGA (Spanish Fund for Agrarian Guarantee). In the region of Andalusia, the "*Dirección General del Fondo Andaluz de Garantía Agraria*" is the competent autorithy for farmers identification, aid applications, control surveillance and their resolution and aprovement (BOJA, 2005). Controls must be done in a 1% of total growers in Andalucia and legislation considers non-fulfilment procedures for those growers that asked for the payments but do not comply with cross-compliance measures. In the case on the region of Andalucia, two different institutions designated by the autonomic government carry out controls and apply reductions on aids depending on compliance.

The Autonomic legislation on aids and SFP, estipulate all procedures for the farmers' request of payments and also establishes controls that must be done to olive growers (BOJA, 2005). In this regard, local institutions, associations or companies designated by the regional administration and FEGA must regulate controls to farmers that are eligible for the SFP and outline a complete report to the national authority. The legislation also details all the documentation needed by farmers in order to declare surface under olive production, production quantities to be delivered to the cooperatives, etc. (MAPA, 2007)

There is also a score system obtained from compliance and severity of non-fulfilment forseen by the legislation. Different degrees of severeness are calculated from compliance levels (ranked as A, B or C). Multiplying by a coefficient (A (slight)=1, B (severe)=1.2 and C (highly severe)=1.5) aids reduction are calculated. These degrees depend on the persistence of the non-fulfillment, the number of regulations that the owner has not complied and the possible damages of non-fulfilment for other properties (CEC 796/2004[248]).

For instance, in the case of olive groves in Andalucia and soil erosion measures, non compliance with GAECs on soil covers might be C if non-fulfilment takes place in a designated highly erodable area. The same is in the case of lands that are not allowed to be ploughed because of having more than 15% of slope. With a complete report and information regarding all measures fulfillment in the property (including other regulations as proper documentations), aid reduction is calculated. This may result in 1, 3 or 5% (BOJA 115, 2005) reduction.

9.3 Generalities about farm typologies in Spanish olive farms

The main characteristics of the Spanish olive sector are its traditional features and the very large size of the production area. It is located in 34 provinces from different autonomous regions (e.g. Andalusia region). Thus, there are diverse farming typologies with different farm practices and methods. During the last years, intensification is increasing through the introduction of technology and irrigation in the olive groves, however the rain fed olive grove is the most representative farm typology.

[248] Commission Regulation 796/2004 establishes the application provisions of cross compliance, modulation and an integrated system of management and control

9.3.1 Regions

The Spanish olive sector has in most of its area a traditional character. Olive farms are very heterogeneous as it is common in most of the Spanish territory, but extensive farming prevails over the intensive one. However, in terms of production, it is mainly concentrated in the region of Andalusia where farming is more intensive.

Table 9.4: Spanish olive farms and surface under production: rain fed and irrigated types.

	Total		Rain fed		Irrigated	
	Numer of Farms	Has	Numer of Farms	Has	Numer of Farms	Has
Andalucía	243867	1426505	203563	1110039	69555	316466
Balears (Illes)	2520	8371	2417	8255	110	117
Canarias	202	23	66	6	137	17
Castilla y León	9710	6536	9570	6423	240	113
Castilla-La Mancha	111010	312971	107507	292035	7355	20935
Cataluña	34040	102781	28230	88866	8565	13915
Comunidad Valenciana	72821	89636	63614	80673	15169	8963
Extremadura	70283	223123	69173	212370	2122	10753
Galicia	236	23	229	21	7	1
Autonomous region of Madrid	8021	23103	7970	22719	88	384
Region of Murcia	14662	22691	8020	14523	7731	8169
País Vasco	414	195	381	182	37	13
Rioja (La)	3828	2488	2966	1598	1131	890
Ceuta	..	..	..	..	..	..
Melilla	6	11	5	11	2	0

Source: INE, 1999

Regarding farm typologies, Andalusian olive groves should be considered as most representative because of its proportional production inside the national territory.

Table 9.5: Irrigation methods for olive groves in Spain by regions (2005)

CC.AA	Gravity	Sprinkler	Dripping	Others	TOTAL
Pais Vasco	0	42	39	0	81
Navarra	1829	0	144	0	1973
La Rioja	228	35	992	10	1265
Aragon	4963	6	3123	0	8092
Cataluña	1156	20	14123	0	15299
Baleares	5	0	551	0	556
Castilla y Leon	125	0	671	0	796
Madrid	31	0	0	0	31
Castilla La Mancha	481	1768	37058	0	39306
C.valenciana	3598	221	5464	13	9295
R. de Murcia	1441	0	4728	30	6200
Extremadura	422	42	13110	0	13574
Andalucia	26114	2104	385932	4851	419001
SPAIN	**40393**	**4237**	**465933**	**4904**	**515467**

Source: ESYRCE (2005)

In the next Table 9.6, some economic features and farm typologies in different regions of Spain are described.

Table 9.6: 1999-2001 Average results from Farm Accountancy Data Network in Spanish Olive groves by main production regions

1999-2001 average Results (€/ha)	Andalucia	Aragon	Castilla La Mancha	Extremadura
Average area by farm (ha)	34,29	4,58	2,67	14,13
Production (Kg/ha)	3.460	1.124	1.069	1.374
Product value	1.907	747	644	714
Income	1.215	459	416	427
Subsidies	692	288	228	288
Direct costs	181	60	53	26
Gross Standarized Margin	1.726	687	591	688
Machinery and labor costs	440	91	100	240
Gross Margin	1.286	596	491	448
Indirect costs paid	119	48	53	82
Revenue	1.167	548	438	366
Amortizations	121	86	50	64
Net Margin	1.046	462	388	302

Source: Data from "Farm Accountancy Data Network (FADN)", cited at Libro Blanco de la Agricultura (available at: www.libroblancoagricultura.com).

The analysis of the distribution of surface and number of farms by farm strata in the olive farms in Spain shows that 85% of farms are smaller than 5 hectares and olive trees are grown in farms smaller than 2 hectares. Rain fed average farms are bigger (3,58 has) than irrigated farms (3,16 has). In the region of Andalusia the average rain fed olive farm has 5,22 has (data from the last Agrarian Census in 1999). Although rain fed olive groves are more representative, irrigated olive groves are increasing in number, shifting from a 5% in 1989 to a 22% in 1999.

Next Table 9.7 shows the number of farms and surface by farm size strata in the region of Andalusia.

Table 9.7: Olive farms and surface by farm size strata in the region of Andalusia

	Number of farms	Number of farms %	Accumulated % (number farms)	Surface (ha)	Surface %
Farm strata (ha)	171149	100,00	-	1377382	100,00
< 1	1419	0,83	0,83	397	0,03
1 a < 2	40475	23,65	24,48	49456	3,59
2 a < 5	58409	34,13	58,61	163651	11,88
5 a < 10	31052	18,14	76,75	175768	12,76
10 a < 20	19257	11,25	88,00	201377	14,62
20 a < 30	6537	3,82	91,82	112124	8,14
30 a < 50	6017	3,52	95,34	159111	11,55
50 a < 100	4310	2,52	97,85	164132	11,92
>=100	3671	2,14	100,00	351366	25,51

Source: INE, 1999

Table 9.8: Analysis of olive surface and production by province in Andalusia region

	Area in production			Total Production (olives) (Tm)
Province	Rain fed (ha)	Irrigated (ha)	Total (ha)	
Almería	5925	9575	15500	52865
Cádiz	18100	1275	19375	35498
Córdoba	318376	21689	340065	1540185
Granada	126384	38863	165247	513964
Huelva	24831	3821	28652	30270
Jaén	389698	173977	563675	2920492
Málaga	111166	7490	118656	434781
Sevilla	137433	50641	188074	734525
ANDALUSIA	1131913	307331	1439244	6262580

Source: INE1999

The Table 9.8 above shows the surface of olive trees in the different provinces in the region of Andalusia. Jaén is the most important province in terms of both surface and production, and Cordoba is the second one. Although irrigated olive groves are less important, its worth to see the impacts of cross compliance in this type of farms as water saving can be one of its major impacts.

Table 9.9: Surface of olive groves by province and importance of irrigated olive groves

Province	Total Area (%)	Irrigated area in the province (%)	Irrigated area in the Region of Andalusia (%)	Production (%)
Almería	1,08	61,77	3,12	0,84
Cádiz	1,35	6,58	0,41	0,57
Córdoba	23,63	6,38	7,06	24,59
Granada	11,48	23,52	12,65	8,21
Huelva	1,99	13,34	1,24	0,48
Jaén	39,16	30,86	56,61	46,63
Málaga	8,24	6,31	2,44	6,94
Sevilla	13,07	26,93	16,48	11,73
ANDALUSIA	100,00	21,35	100,00	100,00

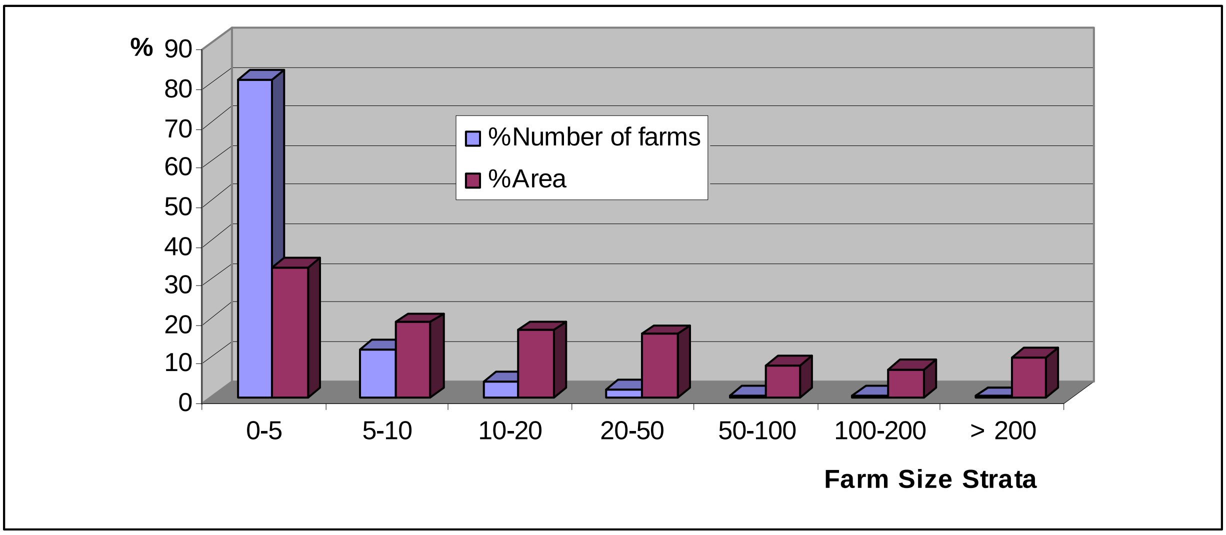
Source: Own elaboration from Junta de Andalusia 2003

9.3.2 Characterization of farm types

Based on the statistical analysis, and following the scheme "Region/Province/ Sub-region/Municipality", we have selected the provinces of ***Jaén and Cordoba*** as major olive oil producers in the region of Andalusia. For the selection of the most important areas of production and for the selection of representative farms types in those locations we considered the total production area. The farms described in our analysis are typical Spanish olive groves and can be considered as representatives for the cost of compliance assessment (Gallardo and Ceña 2006).

The graphs below show the distribution of surface and number of farms in percentage terms of olive groves per farm strata in two of the most important municipalities from each of the selected provinces. Regarding sub regions, there are 5 in ***Jaen*** Province that totalizes 571.772 farms and we selected the subregion of "*Campiña Sur*" which is the most important in area of production (105.165 farms).

Figure 9.2: Number of farms and surface on each size strata in rainfed olive in the Municipality of Martos, sub region Campiña Sur, Province of Jaen

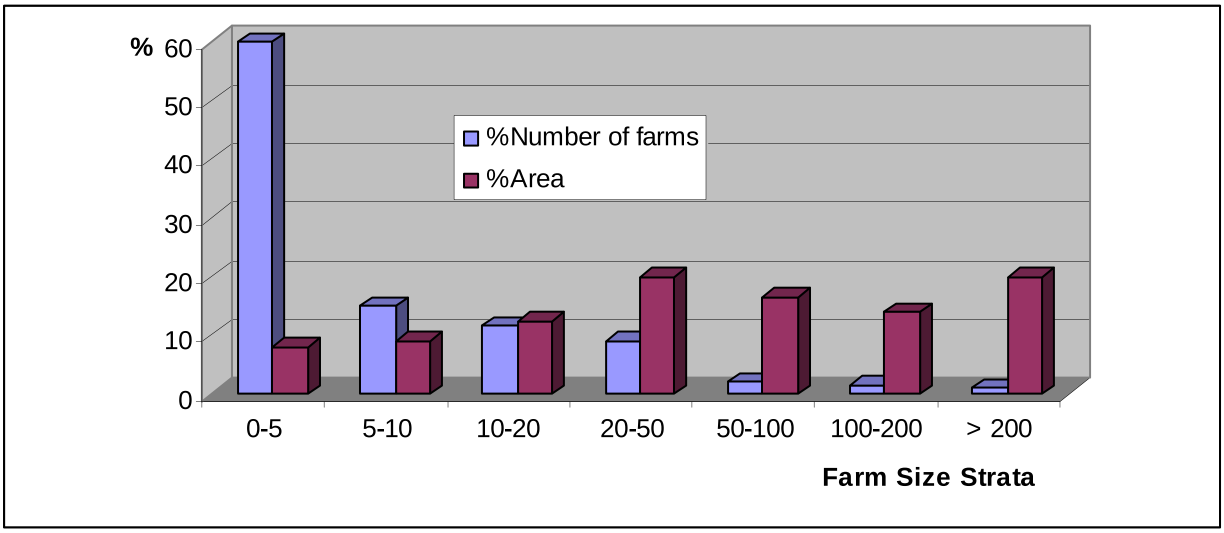


Source: INE, 1999

In the province of Jaén 70% of farms are under rain fed conditions and 30% are irrigated farms. In the subregion of Campiña Del Sur, this is kept and about 20% of production area (17% of farms) is irrigated orchards. In Martos, there are 23,000has with Olives in about 5500 orchards and 80% of them have an average size of 1,73has.

In the province of Córdoba, irrigated olive groves are less common (just a 6,38% of the surface in production), and association of olive trees with other crops is not very usual. In this province, 86,20% of the olive farms are smaller than 20 hectares but farms are bigger than in Jaén, with high importance and similar distribution in the strata under 20 hectares. The subregion Campiña Alta (in Cordoba province) is characterized by a high irrigation use (96% of cultivated surface).

Figure 9.3: Number of farms and surface on each size stratus in irrigated olive in Lucena, sub-region of Campiña Alta, province of Córdoba



Source: INE, 1999

Based on the statistical analysis, we have selected two farm types that are denoted as follows:

- O_F1: denotes a rain fed Olive grove (approximately 2 hectares) in Martos, province of Jaén,
- O_F2: An Olive grove (approximately 10 hectares) with 90% irrigated trees in the Municipality of Lucena, province of Córdoba.

9.4 Assessments of the costs of compliance

9.4.1 Cost structure in Spanish Olive production

The methodology proposed will analyze costs of compliance at the farm level. Thus, the next section focus on cost structures for Olive groves both on irrigated and rain fed schemes for plantations in the region of Andalusia and specifically in identical or very similar conditions to the regions that we had previously selected as representative farm types..

The most common soil management practice among olive farmers in Spain over the past few decades has been to maintain bare soil year-round, underneath and between olive trees, by means of frequent tillage. Traditional practices in the region of Andalusia were very diverse and have broad rank of cultivation methods. Those methods depend especially from soil characteristics, like depth, structure and texture, slopes, customs or habits in each area, farming implements and its availability, etc.

Farming implements are usually used in spring and winter for weeds control. Chisel plows and rotovators (for rotary tillage) are usually applied in a cross way in each labor (double pass in both cases). In summer, a superficial ploughing works take place two times separated in 20 or 30 days. After those summer works an implement to compact the soil (roll bars) is used to allow olive harvest later. Some growers use in summer a disk plow but nowadays it is not as frequent as it was before. In October residual herbicides are used in the space under trees canopies.

Table 9.10: Frequent farming operations and costs for Olive conventional management at the sub-region of "Campiña Sur"

Work	Cost (€/ha)
Pruning and cleaning with axe and Power saw[1] (1,5 day's wage on 36,61€ each):	59,41
Burning and collecting rests (2 working days)	71,36
Branches and rests transportation from groves to burning place	56,49
Cross pass with chisel plows (tillage)	19,15
Fertilization in Spring	82,00
Fertilization with spreader	12,78
First fungicide treatments (Spanish "repilo" fungus: Cycloconium oleaginum)	51,02
Insecticide treatments (Spanish "prays" moth)	56,46
Two passes with rotovator (rotary tillage on surface)	19,12
Shoots removal and burning (1,25 day's wage)	44,60
Soil compaction with roll bars	9,63
Weed chemical control in September	27,38
Terrestrial Application	24,35
Second fungicide treatment	51,02
Harvest for 4000Kg/ha, 12,16 €/100Kg taxes included	486,40
Cleaning and washing: for 4000Kg - 0,90 €/100kg including taxes	36,00
Transport to press: 4000Kg. - 0,84€/100kg taxes included	33,60
Interests rate 3,25% on capital (1140,77)	37,08
TOTAL DIRECT COSTS	**1177,85**
TOTAL INDIRECT COSTS	39,74
Administration and supervision	80,00
TOTAL	**1297,59**

[1]: Including amortization

Source: Guerrero Garcia, 2005.

In the Table 9.10 above, we have selected an intensive grove as example in order to show detailed information about the habitual practices in the region of Andalusia. Nevertheless, costs varies from 900 to 1400 €/ha in rain fed olive groves in the area of this study (Martos in Jaen province for example). This variation depends on farming methods, zones, soil conditions, slopes and even yields (since harvests affect costs depending on how much olives it has). Irrigated groves yield about 7000kg/ha with considerably higher costs and are more profitable.

Table 9.11: Cost structure for an irrigated and a rain fed Olive grove in the autonomous region of Andalusia

Concept	Irrigated Orchard *Cost (€/ha)*	Rainfed Orchard *Cost (€/ha)*
Fertilizers	104,80	51,65
Pruning	326,15	174,30
Soil Maintenance	302,58	162,10
Pesticides treatments	171,80	127,87
Olive harvest	831,52	471,12
Commercialization and transformation	233,62	92,12
Direct Costs	**1970,47**	**1079,16**
Energetic pumping* costs	270,00	0,00
Installation, maintenance and repairs	73,62	0,00
Water fees	60,00	0,00
Water costs	**403,62**	**0,00**
Non direct Costs	**197,05**	**107,92**
TOTAL COSTS	**2571,14**	**1187,08**

* Considering an energetic cost of 0.18 €/m^3

Source: Pastor Muñoz-Cobo, 2005.

We will firstly consider the new legal framework for the evaluation that is required for cost of compliance calculation. Many practices like pruning, harvest and fertilizations or pesticides treatments change depending on yields. Then we are going to detail these aspects in order to make a better assessment for cost of compliance calculation. Statistical data, local information and previous studies are being considered.

The analysis of the increment of costs due to cross compliance require to focus on the requirements to avoid erosion, as this is the main environmental problem associated to the olive groves in the region of Andalusia. These practices derive into a non tillage system that is already adopted by many farmers in the region of Andalusia. This possibility with or without irrigation might determine different costs and yields that are detailed in the next sections.

9.4.2 The Legal Framework

The following Table 9.12 synthesizes the legal conditions required to prevent from erosion that might be considered for costs of compliance in the region of Andalusia due to agronomic practices and topography and soil conditions:

Table 9.12: Olive legal framework and expected costs for assessments

Standard	**Operations requirements description**	**Comment on costs**
Farming operations in Hillslopes on parcels higher than 1 hectare depending on the slope angle	Ploughing in olive groves is forbidden when slopes are higher than 15% except when special conservation practices like no-tilling, grass strips, benches or total vegetal covers are done. GAECs establish that olive groves above 8% should use certain specific implements	**Assessment is needed:** A complete cost analysis should be carried on in order to quantify and compare alternative costs with historically happened in those olive groves slopes
Minimum vegetal cover:	When slopes are higher than 10%: Covers strips should take place in roads that are perpendicular to the maximum slope When olive groves have ploughed spaces green covers (like grass stripes or pruning rests) should be kept.	The cost of planting grass stripes and use vegetal covers like native or cultivated grasses or pruning rests should be assessed
Trees removal	In rain fed olive groves a slope higher than 15% it is allowed to remove trees only when other trees are going to be planted	Not necessarily a cost.
Terraces and contour bunds	Those terraces or bunds that already exist must have maintenance operations in order to avoid breakdowns and eventual gully erosion	**Cost of maintenance**
Organic matter maintenance:	Harvest rests should be removed following local norms	Not necessarily a cost.
Maintenance of a minimum agrarian surface	Prohibition for cutting olive trees; if it is done, then norms for new plantations, new varieties usage and a good vegetative condition surveillance should be taken into account	Not necessarily a cost.

Source: BOE, 2004a (transposition of the EU reg. 1782/2004 to the Spanish legislation).

Olive production is characterized by small rain fed units, a familiar type of management and low inputs. Nevertheless, olive growing produces an important impact on soils, because a historical process of mechanized cultivation methods. These methods are changing from 70s into a more intensive use of chemicals that replace mechanical pest and weeds controls. Secondly, olive trees require less nitrogen inputs than other perennial trees like citrus or pommes. Pesticides are not as necessary as in citrus production because the climate, water and soil nutrients requirements determine drier locations as optimal rather than humid areas where development is limited by nematodes or other pests. Citrus and horticultural products usually have higher inputs requirements and elevated costs per hectare. Thus, olive oil production mostly occurs in semiarid environments, inner lands and extensive rain fed conditions, hills and locations where pests (fungus or insect diseases) and other cropping options are not so frequent (Guerrero Garcia, 2005).

In our analysis, GAECS and SMRs measures regarding prevention from erosion are the main constraint and could introduce additional costs. The assessment will involve the terrace maintenance, gree covers and grass stripes in slope agriculture.

9.4.3 Assessment of the costs of compliance in the Olive Sector

9.4.3.1 General procedures for land conservation schemes

No till farming in olive groves started two decades ago with a simple practice that consisted on doing weed controls without any soil preparation or cultivation and replacing mechanical methods for chemical ones. Many farmers used to pass implements for deep ploughing in order to obtain a better drainage. This method was criticized and changed since raindrops in intense storms produced more erosion, particularly in hill-slopes. Drops from strong storms might dislodge tons of soil per hectare which is carried away by surface runoff. During the last years land conservation practices started to avoid this methods since covers and no tillage systems improve water infiltration reducing evaporation rates and decreasing splash erosion. Traditional growers in Spain have been thinking that controlling weeds and cleaning the surface with tillage practices would determine higher yields as a consequence of lesser insects or fungus populations on weeds, changes in soil porosity and improvements in water infiltration or just because they preferred how it looks. There are different “land conservation methods” that should be considered since they are largely used in the region of Andalusia:

A. Minimum tillage (weeds are let in surface up to a limit and then incorporated into the ground through disks ploughing)
B. Non tillage and bare soil (less recommended since storms affect soil erosion, especially when slopes are higher than 4%)
C. Non tillage with vegetal covers (cultivated, native grasses and spontaneous vegetation, chipped pruning rests, etc.)
D. Mixed systems
E. Grass Strips
F. Terrace Maintenance

We are considering different options regarding cultivation techniques. For costs calculations and yields estimations, legal framework application and usual local practices were taken into account.

9.4.3.2 Costs of land conservation methods for Olive groves

Cost assessment for conservational practices as green covers on the ground, grass strips, benches and terraces maintenance is not an easy task since soil conditions and cultivation techniques might present broad and diverse situations even in the same region. In order to establish the degree of compliance of the new legal framework, cost calculations and implications on yields we are considering those practices of an olive grove under rain fed conditions in the Jaen province separately from irrigated farms. The following Table 9.13s have detailed information about the costs for those practices that will change as a result of GAECs and cross compliance legislations. We have included two levels of green covertures and the conventional olive grove for the mentioned area:

Table 9.13: costs details in conventional and non-tillage systems

Non tillage method with green covers	
Works	Cost (€/ha)
Basic herbicide treatment (autumn) 2,4Kg/ha diuron x 40% ground considering cleaning areas under treetops for harvest	11,18
Application (0,75 hours with tractor x 21,25€/h)	15,94
Herbicides for all ground surfaces[1]	**94,5**
Application (1 hour with tractor x 21,25€/h)	21,25
Proportional part for soil preparation in the beggining (1/5) 2hours x 19,15 €/h + 2h works for levelling and compacting the soil	15,48
Cleaning for harvest without ploughing (with roads for sweeping leaves in ground)	18,84
TOTAL	**177,19**

No till method with bare soil	
Works	Cost (€/ha)
Basic herbicide treatments	27,96
1 hour application (21,25€/hr)	21,25
Round up herbicide	7,2
Backpack sprayer application of herbicide (0,5 day wage x 35,68 €/day's wage)	17,84
Proportional part for soil preparation in the beggining (1/5) 2hours x 19,15 €/h + 2h works for levelling and compacting the soil	15,48
Cleaning for harvest without ploughing (with roads for sweeping leaves in ground)	18,84
TOTAL	**108,57**

[1] Spring treatment: 7Kg of commercial product (Diuron 20% + Aminotriazol40%, 13,5€/kg)

Source: Guerrero García (/2005)

Table 9.14: Costs details in a conventional system in the region of Andalusia

Conventional method (bare soil) and covering only under the treetop	
Works	Cost €/ha
Ploughing (5hours x 19,15/h)	**95,8**
Herbicides treatments (Diuron x 40% ground surface x 11,65€/kg)	28
Herbicide application with tractor and bars (0,75h x 21,25€/h)	15,9
Round up herbicide to complement treatments[1]	36,2
Proportional part for soil preparation in the beggining (1/5 x 40%)	6,2
Backpack sprayer application of herbicide (0,25 day's wage x 35,68 €/day's wage)	8,9
Cleaning for harvest without ploughing (with roads for sweeping leaves in ground)	18,8
TOTAL	**209,8**

[1] Some weeds are *Diuron* resistant and should be treated complementarily in some areas (usually circles) using 8lts/ha with backpack sprayer (0,25 Day's Wage/ha x 35.68 €/day)

Source: (Guerrero García, 2005)

As shown in the tables above, conventional systems have important costs on ploughing labors (which represent around 45% of all costs).

Some other practices are taking place for vegetal covers in the region of Andalusia but we have not considered them for cost of compliance calculations since its application is not obligatory but recommended.

- Cultivated species instead of spontaneous vegetation (seeding using no till or conventional methods)
- Vegetation maintenance in different situations (fertilizing with 50KgN/ha, some P and K on corridors to maintain vegetation).
- Mulching with pruning wastes (typical recommendations)
- Tools and equipment acquisition.

In our study we are assuming that irrigated farms have similar implications for no tillage cultivation methods. In general, there is an accepted idea that irrigated orchards improve its water use efficiency when leaving vegetal covers. In addition, irrigated orchards present a complete different scheme that might have less influence on costs and yields (1 irrigated hectare in Cordoba might produce 7000kg of olives and have a cost/ha around 2200€/ha).

Grass Strips and terrace Maintenance

Olive groves above 8% are oblied to maintain green covers like grass strips or contour lines with native or spontaneous vegetation. Its application on roads or spaces between parcels is very frequent in the region of Andalusia on slope agriculture.

The cost of land conservation practices varies largely depending on how much leveling or soil movements are required. In the case of Grass Strips, costs are not high since only a proportional part of the surface is cultivated (see Table 9.15). When growers do not plow and only herbicides for the maintenance of natural vegetation is practiced in contour line on hill-slopes, costs might be reduced considerably[249].

Table 9.15: Grass strips cultivation costs

Grass Strips: 100mts line for 3,5mts wide in one hectare: 350m2	Costs (€/ha)
Proportional part of soil preparation (3,5m x 100m) (19,15€/hour) x 5km/hour velocity	3,83
Seeder 28 lines (3,5mts wide) x 100mts (proportional part of 1ha)	0,41
Seeds Barley (30kg/ha)	0,84
Seeds Undergrounf Vetch (80kg/ha) [1]	0,19
Fertilizer 8-24-16 (complex) x 300units/ha x 0,1803€/u for 350m[2]	1,89
Application costs for fertilizer (spreader for 350m[2])	0,07
Other practices (cutters, pesticide applications, compacting passes, etc.)	1,56
TOTAL	**8,81**

Source: data collected from Guerrero García (2005) and De Juan Valero *et al*., (2003)

Terrace Maintenance

Annual terrace maintenance is necessary in some situations, although less frequent maintenance is adequate in others. Typically, more frequent maintenance is required for steep slopes and/or highly erodable soils. Intense tillage operations and intense rainfall runoff also increase maintenance needs.

Terrace maintenance can be done with virtually any equipment that will move soil. The main idea is to plow the ground using levels curves on landsides. Thus, rains and sediments produce a slight and deeper level curve that derives into a better shape and improvement of the old terrace. Some commonly used tools include moldboard plow, disk plow, one-way, belt terracer, bulldozer, front blade, three-point blade, towed straight-wheeled blade, towed terracing blade (pull-type grader), scraper, motor grader (road-grader), three-point ridging disk (terracing disk) and whirlwind terracer.

The most common farm implement used for terrace maintenance is the plow or one-way. The number of passes required for maintenance depends on the size of the tool, the depth of operation, travel speed (which controls distance of throw), and the amount of soil to be moved. The plow or one-way throws soil further at higher speeds, so a minimum ground speed of 5 mph is suggested, but 6 mph or more is better. This speed should be achieved as the equipment moves through loose soil.

In Andalusia, terraces have almost not maintenance by growers or at least no controls are mentioned by local entities or experts. For calculations for 100mts of reshaping terraces,

[249] Leaving a line for 350m2 (100mts by 3,5mts Wide) for every hectare might cost from 3 to 4 €/ha (herbicides + application, cutting and other works but without expenditures on seeds or fertilizers/pesticides for cultivated species).

guidelines from Kansas University (Powel and McVay, 2004) and local costs collected from Guerrero Garcia (2005) and Valero et al., 2003 were used. Thus, costs include plowing 100 meters deeply with traditional implements available in Andalusia (traditional large plows). These practices requires from several passes in both directions in order to move the soil in order to build a channel. We have considered 5hs for all passes and 5km/h as tractor velocity when plowing the ridge. Table 9.16 shows the costs calculations for terrace maintenance in 100 meters contour lines on slopes in Andalusia (15%). Calculations for higher slopes would increase considerably since other methods like tree barriers, stones and benches might determine higher costs. Although no information is available about how frequent terraces on slopes of 25 o 35% are in Spain.

Table 9.16: Calculations for terrace maintenance in Andalusia

Items	Details for estimations
Plowing (19,15€/hour)	40cm deep
Number of passes	5 times
Velocity	500mts/hour
Contour line length	100 m
Labor total longitude	500 m (both directions)
Cost per hour [1]	25,15€/h
TOTAL Cost calculation	In 1 hour 500mts are made with 19,15€/h
COST of Terrace maintenance:	**25,15 €**

[1]: Plowing costs consider a higher value since this is a deeper labor from usual plowing costs

Source: own elaboration taking data from Kansas University Guidelines (Powel and McVay, 2004) and local costs (*Guerrero García, 2005)*

9.4.3.3 Variation in costs for rain fed olive groves

The following Table 9.17 shows the potential variation in costs because of compliance considering changes from conventional techniques to no till management with green covers (see tables above), and practicing grass strips and terrace maintenance for one hectare.

Table 9.17: Variation in costs for all GAEC measures

	Cost (€/ha)
Conventional management costs (a)	209,76
No tillage system cost (b)	177,19
1: Difference (a minus b)	**-32,57**
Cost of grass strip x 100mts	8,81
Annual cost for terrace maintenance	25,15
2: Sum	**33,96**
Total Variation (between 1 and 2)	**1,39**

Source: own elaboration

Variation in costs should be considered unappreciable as costs and yield variations might produce more important differences between years or among the different management used for each method.

9.4.3.4 Cultivation methods and olive yields

Yield in Oil Kg/ha is complex to evaluate and depend on many factors including soil types, water availability, weather conditions, cultivation techniques and varieties used. Sometimes growers decide to apply a cultivation protocol that is lower in expenditures and yield but result more profitable, easier to achieve or in lower risks.

Olive groves yields in Andalusia have been evaluated largely for different conditions and situations. As erosion was always found as one of the most important environmental problems in this region, the use of vegetal covers to improve water infiltration and reduce soil losses (and organic matter losses) have been proved as incrementing yields per hectare. Measures that reduce erosion like most alternatives to conventional tillage (cover crops and minimum and no-tillage techniques) increase rainfall infiltration and decrease runoff and soil losses obtaining more stable or even higher yields per ha (Gomez *et al*., 1999).

Thus, non yield losses can be expected from the implementation of non-tillage cultivation or the practices mentioned above (grass stripes or terraces maintenance).

9.5 Competitiveness assessment in olive groves

Considering D12 highlights about measuring production costs and competitiveness as a consequence of cross-compliance restrictions, this section focuses on the assessment and comparative analysis of production costs and gross margins at farm-level. Based in an analysis that considered initial conditions and institutional conditions, as the case of the F&V sector chapter, we followed the farm-level index approach, by comparing the gross margin obtained in the different farm types analyzed before and after the standard application.

In above sections, this report included a clarification about costs and yields changes as a consequence of the compliance with GAECs for erosion in Olive groves for the region of Andalusia. Irrigated olive groves have been mentioned in literature as less affected by erosion and not to be as representative as rain fed orchards are in Spain. Among rain fed cultivation methods a variety of farm types and cultivation methods might be found. Thus, low-income and high performance olive groves have been described (Brenes 2005 and 2006).

Yields, costs and margins were taken from the following literature review: “Pastor et.al.“ (1997), “Hurtado Ruiz and A. Jurado“ (2002), “Pastor Muñoz-Cobo“, (2005) and “Alonso and Guzman“ (2007); Variable costs were taken from “Guerrero Garcia“ (2005). O_F1A and O_F1B are two variants from F1 described for Jaen in previous section. Both are rain fed olive groves cultivated in more than 10% slope lands. F1A is low cost olive groves (low inputs) that present relatively low yields; Comparatively with F1A, F1B is a more intensive rain fed orchard (higher inputs and yields) with higher costs. Olives price considered is 0,87 €/kg. Pre and Post standards values shown (variable costs, gross products and gross margin) include calculations made in tables Table 9.13 to Table 9.17 of this chapter.

In Table 9.18, we have included farm variable costs, gross product and gross margins (in €/ha) for two farm types. Farms "O_F1A" and "O_F1B", represent two farm types in the region of this study. First, GAECs introduce an improvement in yields of 100kg/ha in the O_F1A farm type. This results in am increased gross product: 1218€/ha[250]

Table 9.18: Effects of GAECs for erosion at the farm level

	Pre-standards situation	Post-standards situation
O_F1A	Gross product (GP_{F2}) = 1131 (€/ha)	Gross product (GP_{F2}') = 1218 (€/ha)
	Variable Costs (V_{F2}) = 687,08[251] (€/ha)	Variable Costs (V_{F2}') = 688,47 (€/ha)
	Gross Margin (GM_{F2}) = 443,92 (€/ha)	**Gross Margin (GM_{F2}') =529,53 (€/ha)**
O_F1B	Gross product (GP_{F3}) = 2436 (€/ha)	Gross product (GP_{F3}') = 2436 (€/ha)
	Variable Costs (V_{F3}) = 1187,08[252] (€/ha)	Variable Costs (V_{F3}') = 1187,08 – ***32,57 + 33,96***[253] **=** 1188,47 (€/ha)
	Gross Margin (GM_{F3}) = 1248,92 (€/ha)	**Gross Margin (GM_{F3}') =1247,53 (€/ha)**

Source: own elaboration based on table 2 D12

$\Delta_{F1A}^{GM} = GM_{F1A}' - GM_{F1A} = 85{,}61$ (€/ha)

$GM_{F1A}' / GM_{F1A} = 1{,}19$

$\Delta_{F1B}^{GM} = GM_{F1B}' - GM_{F1B} = -1{,}39$ (€/ha)

$GM_{1B}' / GM_{1B} = 0{,}9988$

As can be inferred from the above Table 9.18, the effect of standards considered in this report on olive sector result in a non-effect or positive response depending of the type farm considered. Thus, a low income farm type as F1A may determine an increment in GM_{F1A}'/GM_{F1A} of 1,19 which implies a higher margin of 185,39€/ha. The F1B has remained without almost any change.

The explanation of this effect is related to the fact that some low-income olive orchards may present either lower costs and/or increments in productivity when adopting the non-tillage system that comply with GAECs standards. There are no changes in variable costs but a clear increment in yields per ha. Using own machinery and herbicides treatments instead of the conventional ploughing practices (see previous sections) might not only save up to 90€/ha but

[250] O_F1A PRE standard: Yield (Kg/per ha) = 1400 kg / ha; O_F1A POST standard: Yield (Kg/per ha) = 1300 kg / ha. It is considered an olive oil price of 0,87€/kg. Source: Alonso and Guzman (2007).
[251] Source: Guerrero Garcia" (2005)
[252] See Table 10
[253] Correspond to calculations in previous section about grass stripes and terrace maintenance (see table 16)

also increase productivity through improvements in several important agronomic parameters. Green covers, terrace maintenance, grass strips or benches, as mentioned in previous sections, cause increments in yield/ha through an improvement in biomass production, radiation interception, infiltration rates and water use efficiency (Gomez et al., 1999, 2000 and 2001; Villalobos et al., 2000; Villalobos et al., 2005). Erosion effects on conventional olive groves grown on slopes will increase during years as a consequence of gradual soil losses (and organic matter losses or nutrients as well), lower infiltration rates and water runoffs. These changes affected yields and costs in the long term (Gomez *et al*, 1999, 2000 and 2001; Raya *et al.*, 2005)

Gallardo and Ceña (2006) detail farm characteristics and the evolution of olive sector in the region of Andalusia during the last decade. In a costs and net margins comparison between non tillage-conventional schemes for rain fed and irrigated systems, the authors concluded that there are slight or null impact on margins using different farming methods. Other authors have reported little differences in yields when comparing conventional and non-tillage cultivation methods. In four year studies in the same region Alonso and Guzman (2007) have mentioned differences between both schemes of 89Kg/ha that cannot be considered statistically different (p value < 0,05). This is the case of F1B: has higher yields and may comply with standards without significant changes in variable costs or gross margins.

Erosion and olive production should be evaluated also in a long period. Erosion is a very long and slow process that depends on a complex system as it happens in the region of Andalusia. Costs and yield evaluations in the long term presume to be importantly different from those calculated in the short term. For instance in conventional olive groves on land-hills, costs of erosion should consider gully eroded caverns and soil movements (land leveling) in the field as a consequence of important soil losses. Additionally, yields reductions caused by organic matter and soil losses in conventional agriculture in Andalusia, must be assessed carefully since yields might decrease considerably in the long term. If non tillage systems might have an increment in yields and lower operational costs in the long term, cross compliance measures will increment profitability since variable and some fixed costs might decrease (e.g. permanent works against erosion when conventional tillage determine gully eroded caverns or other damages in the farm).

Ecologic olive groves present in some cases premium prices as voluntary certification schemes take place. This may represent an interaction with the cross compliance benefits in the case: the ecologic olive system consider 1,13 instead of 0.87€/kg of olive oil. Even when some cultivation areas present lower yields in the non-tillage system (sometimes in the first years), revenues are always higher because of the premium prices in the ecological olive grove mentioned in previous sections of this report.

Finally, from Gallardo and Ceña (2006) some remarkable points in the context of CAP reform affecting competitiveness during the last decade should be outlined as follows:

- Costs reductions in hand labor through mentioned for olive groves in the region of Andalusia through:
  - Increments in machinery for chemical treatments
  - Improvements in pruning rest recollection after harvest equipment
  - Cheaper and more efficient harvest equipment
  - Immigrant population derives into important costs reductions

- More effective herbicides controls with lesser costs (post emergence selective products)

- Expansion in the olive surface and production in Andalusia attracting new investments.
- Increments on farm size.
- Improved productivity (new varieties, irrigation, more efficient practices regarding non-tillage cultivation methods, green covers, soil maintenance, etc).
- Better quality products
- increment in olive oil consumption and markets evolution.
-

9.6 Concluding remarks for the Olive Sector

Overall conclusions: Our results of the olive production analysis indicate that compliance might not have a clear effect on costs. Even a possible benefit on compliance in Spanish olive groves is suggested as a consequence of the application of GAECs requirements regarding prevention from erosion (section 9.4.2).

GAECs for preventing erosion in slope agriculture for olives in the region of Andalusia, are determining an obligation for rain fed olives growers that should take into account new techniques for slope agriculture. Most important tasks involve the maintenance of vegetable covers and no tillage practices in order to avoid erosion produced by runoffs and soil losses. All these practices imply a completely different production scheme for growers. This scheme is very well known since the 70s but it is not always preferred by traditional growers.

Costs and benefits of erosion control measures (no tillage operations): These cultivation methods presume not to plough and avoid a bare soil using herbicides and cutters or just leaving native grass to grow under the treetop or in roads.
Since the cost of plowing is considerably higher than the cost of extra herbicide treatments and other measures like cleaning under trees before harvesting, total costs are equal or rather lower in the no tillage system. The cost of maintenance for terraces and the obligatory grass strips that many growers should practice in slopes represent an extra cost that might be equal to the possible reduction in costs when not plowing or using no till cultivation methods.
Regarding yields for these schemes, many evaluations during the last decades have been indicating that untilled orchards improve the water use efficiency and increase infiltration rates determining lower runoffs and organic matter losses, improve water use efficiency and productivity (Raya *et al*., 2005).

Soil protection and competitiveness: In the assessment of the effect of erosion and soil regulations on competitiveness for the Spanish Olive sector, our results showed that there is not evidence on negative effect on profitability.
Two farm sizes were evaluated for the assessment of competitiveness. In the case of low cost/income rain fed olive groves, the use of green covers, grass strips and terrace maintenance imply an increment in yields without changes in variable costs. Changes in productivity through a better water use efficiency (improved infiltration rates, less run offs, etc.) are a possible explanation of this increment in yields and gross margins. Larger rain fed

farms, with higher productivities, are other important farm type in the region. Costs assessments and changes in yields reported when using non-tillage cultivation methods, determine slight or null changes in competitiveness.

Irrigated olive orchards are presumed to have slight or null effect when complying new legal framework.

Further yield assessments should be considered when studying the cost of compliance in olive production on hill slopes. Long-term assessments might be the most important analysis required to study competitiveness in Spanish olive oil on international markets because the erosion effect and the production itself both require to be evaluated in the long run. Practices like covers and reduced or non tillage cultivation techniques change soil characteristics such as the content of organic matter, nitrogen and other microelements, texture and structure, porosity and many other agronomic variables that influence infiltration rates, water use efficiency, and productivity (Gómez *et al*., 2001 and 2002).

Complementary Cross compliance measures: Our study focused on slope olive groves since erosion is the main environmental problem in the region of Andalusia and about 70% of farms are above 7% slope. Further analysis for cross compliance effects on costs of olive groves cultivated in flat areas could complement this study as these types of olive farms might be subject to other regulations like the Nitrates Directive in nitrate vulnerable zones.

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10 Assessing the Benefits of Cross Compliance

10.1 Introduction: The Costs and Benefits of Policy Intervention

This study has focused on the economic impact of cross compliance on farmers and farm sectors and the implications this impact has had on the external competitiveness of EU agriculture. Two sets of costs were examined: the cost to farmers of complying with EU legislation, and the additional cost of complying with any new requirements introduced by cross compliance[254]. This chapter seeks to contextualise the identified costs, reported by the lead authors of this Deliverable as minimal, by examining the benefits cross compliance is likely to provide. As argued in this chapter, the policy has the potential to provide a range of benefits: in relation to helping to encourage compliance with EU legislation at the farm level, to improving environmental standards at the farm level though the establishment of GAEC standards, with encouraging a minimum level of land maintenance in order to avoid land abandonment, and with maintaining the area of permanent pasture. The evidence of the actual benefits cross compliance has provided is, however, very limited at this stage. This is largely because of the absence of a system to monitor the impact of cross compliance at the EU and Member State levels[255] and the time lag between the date of policy introduction and the point at which the impacts become observable[256].

The benefits provided by a policy can be expected to stem from its objectives. Therefore, if the objectives are met, then benefits are provided and the policy can be considered effective. Outputs, results and impacts may result in benefits to an actor and/or a range of actors at one or more spatial scales. An inappropriately designed policy at the EU level or inadequately implemented policy at the Member State or regional level may mean the objectives are not realised and inadvertently result in negative outputs, results and impacts. The objectives of cross compliance, along with the potential benefits, are set out further in Section 10.2. An analysis of the extent to which the identified objectives are likely to be met is presented in Section 10.3.

Achieving compliance with legislation or new standards is rarely a cost free exercise. In many cases, the farmer is expected to absorb the necessary cost in order to become compliant with baseline regulatory standards. In many cases, the cost private individuals or businesses need to incur in order to meet legal standards is deemed necessary in order to meet the desired political objective[257]. There is, however, a rationale for public money to be provided to those

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[254] This study has not examined the cost to Member State administrations of introducing a system to implement cross compliance. The focus has been on the costs at the farm level.

[255] There are some exceptions, such as the CAP Observatory set up by Defra in England to monitor the impacts of the 2003 CAP reform on the environment. See: http://statistics.defra.gov.uk/esg/ace/index.htm

[256] Evaluators of agricultural and rural development policy often highlight the difficulty of attributing impacts to a policy shortly after its introduction. Environmental impacts, in particular, may take several years to become apparent. See: EPEC (2004) Impact assessment of rural development programmes in view of post 2006 rural development policy, for DG Agriculture; and Agra-CEAS (2005) Synthesis of Rural Development Mid-Term Evaluations Lot I EAGGF Guarantee, Final Report for the European Commission.

[257] See, for example: Defra (2007) Administrative Burdens in EU Agriculture: An Evidence Base.

who meet standards that both exceed this baseline and provide broader public benefit. This is largely the purpose of CAP Pillar II expenditure.

Benefits are sometimes assessed alongside the cost of achieving those benefits as part of formal evaluation procedures[258]. This is necessary to understand the cost-effectiveness of a policy measure, its inherent efficiency[259] or the value for money provided by the policy. This project does not attempt to perform an evaluation of the costs of delivering the potential benefits, although some general remarks are made in Section 10.4. The conclusions, in Section 10.5, frame the benefits provided by cross compliance in the context of the policy debate surrounding the future development of the CAP.

The costs attributed to cross compliance are sometimes portrayed in a negative light by some stakeholders. Farming unions, for example, often argue that cross compliance results in extra bureaucracy, a burden of extra costs and competitive distortions[260]. The value placed on the different benefits that may be provided are therefore likely to vary between different actors. There are likely to be benefits for wider society in terms of the contribution cross compliance makes to re-enforcing compliance with mandatory standards that have been established to serve the wider public interest. Benefits may also accumulate for the farmer, since in many respects cross compliance simply underpins good agricultural practices, may improve operational efficiencies and therefore help reduce costs. Benefits may also arise for government, particularly if cross compliance is a relatively low cost policy option to help enforce a large swathe of legislation. Despite this, the actual benefits may differ from the perceived benefits. These benefits may be outweighed by any real or perceived problems, such as the practical administrative difficulties faced by the relevant authorities when introducing cross compliance and applying the control system.

Sometimes, an attempt is made to assess whether the benefits may have arisen in the absence of the policy, a situation often referred to as ‘the counterfactual’. If the benefits would have been provided without the policy, then the policy is considered ‘deadweight’. In addition, attributing benefits to a specific policy is problematic as the chain of causality is not always clear. These issues should be kept in mind when reading the text below.

10.2 Cross Compliance – The Potential Range and Level of Benefit

As with any policy intervention, cross compliance is most likely to tackle the issues it is designed to address, although there may be additional, indirect impacts which result in further benefits. The benefits of cross compliance must therefore be considered in terms of the objectives set for the policy. A certain amount of interpretation of the various legislative and non-legislative texts, alongside informed critical judgement, is required in order to understand the objectives of cross compliance.

[258] See for example Pearce, D (2005) ‘What constitutes a good agri-environmental policy evaluation?’ In Evaluating Agri-Environmental Policies: Design, Practice and Results, OECD, Paris.

[259] Efficiency means ‘the extent to which the desired effects are achieved at a reasonable cost’. See: DG Budget (2004) Evaluating EU Activities: A Practical Guide for the Commission Services.

[260] See, for example, The National Farmers’ Union of England & Wales Preliminary Submission to the European Commission on Cross Compliance and the Single Payment Scheme (November 2006). Such arguments are often confused given that farms are subject to EU legislation even if cross compliance is not in place and that the additional farm level costs imposed by cross compliance are minimal as concluded elsewhere in this report.

According to the European Commission's Communication regarding the Mid Term Review of the CAP[261] (text in italics reflects emphasis added by the author):

- '*the main purpose* of cross-compliance [is to] to support the implementation of environmental, food safety and animal health and welfare legislation'.
- cross compliance is '*a whole-farm approach* with conditions attached to both used and unused agricultural land'.

The preamble to Regulation 1782/2003[262] reveals the following objectives for cross compliance:

- 'to incorporate in the common market organisations *basic* standards for the environment, food safety, animal health and welfare and good agricultural and environmental condition' and thus make receipt of direct aid conditional on meeting certain standards. The Regulation outlines the scope of cross compliance, with Annex III listing a compulsory list of Statutory Management Requirements (SMRs) for the environment, food safety, animal health and welfare, and Annex IV providing a framework of standards for Good Agricultural and Environmental Condition (GAEC).
- 'to *avoid the abandonment* of agricultural land and ensure that it is *maintained* in good agricultural and environmental condition' whilst taking into account the specific characteristics of the areas concerned (e.g. soil types and farming systems).
- 'to avoid a massive conversion into arable land' by encouraging 'the maintenance of existing permanent pasture' since 'permanent pasture has a positive environmental effect'.
- In overarching terms, 'to promote more *market oriented* and *sustainable* agriculture'.

Cross compliance is presented in Commission texts as a tool to contribute to the enforcement of compliance with pre-existing legal requirements. It has a wide policy reach in that it applies to all those farms on which the Single Payment is claimed. It therefore embraces a large area of land, as cross compliance applies to all land on the farm holding and not just the utilised agricultural area. The intention is to incorporate basic standards. The use of the term 'basic' suggests that the implemented standards should be undemanding to comply with and means they may be relatively untargeted in terms of seeking specific outcomes. The policy also seeks to avoid land abandonment and to maintain, as opposed to enhance, good agricultural and environmental condition. Overall, and alongside the decoupling of direct payments, cross compliance should contribute to market oriented and sustainable agriculture.

If the policy is well designed at the EU level and implemented appropriately at the Member State and regional levels, it would be reasonable to assume that cross compliance could provide the following five benefits:

1. Cross compliance will encourage compliance with EU legislation at the farm level.
2. Cross compliance will improve environmental standards at the farm level though the establishment of standards to achieve good agricultural and environmental condition.

[261] COM(2002)394 Communication from the Commission to the Council and the European Parliament Mid-Term Review of the Common Agricultural Policy 10.07.02.
[262] Council Regulation 1782/2003 of 29 September 2003 establishing common rules for direct support schemes for farmers, OJ L 270, 21.10.2003.

3. Cross compliance will encourage a minimum level of land maintenance in order to avoid land abandonment.
4. Cross compliance will maintain the existing area of permanent pasture and thereby the associated environment values.
5. And, as a result, cross compliance will contribute to sustainable agriculture.

This study and a number of others have assembled both quantitative and qualitative evidence that allows an assessment of the extent to which the above benefits have been delivered[263]. The available evidence is utilised in order to make an assessment of the extent to which each benefit is likely to be provided. The outcomes of this exercise are presented in the next section.

There are two main drawbacks to performing a fully informed evaluation. The first, is that there is no formal procedure in place to monitor the impacts of cross compliance. Whilst the studies examined do provide some useful information, this is limited due to the relatively early stage of implementation; cross compliance was introduced in 2005 and fieldwork for the examined studies conducted throughout 2005 and 2006. This means there is an absence of quantified evidence on which to base any assessment. In any case, any changes to the environment that may arise as a result of the environmental SMRs and GAEC standards are likely to take many years to become apparent. The second drawback is related to the difficulty of detecting non-compliance for some of the requirements. Non-compliance with the tagging of animals, under the animal identification requirements, is easy for inspectors to detect as missing eartags can easily be observed. Being certain, for example, that landscape features protected by GAEC have not been removed is more problematic. In addition, although control samples generally include a random element, most farms are selected on a risk based approach. The farmers most likely to not comply are therefore the more likely to be inspected. Although the inspection system may be an efficient way to monitor compliance, data from compliance checks may not fully reflect actual compliance levels across the farming sector as a whole. The analysis presented here therefore makes a number of informed judgements as to the extent to which each of the five above benefits is likely to be provided by cross compliance.

10.3 The Benefits Provided by Cross Compliance

This section considers each of the five potential benefits in turn. Examples are provided for the beef and cereal sectors, although many of the benefits are more general and cross-sectoral in nature.

1. *Encourage compliance with EU legislation at the farm level.*

[263] The arguments presented here are drawn from multiple sources including a number of papers produced for the Cross Compliance Network Study (2006-2007) (referenced separately in the text) and the findings of an evaluation of cross compliance produced for the European Commission in 2007: Alliance Environnement (2007) Evaluation of the Application of Cross Compliance as Foreseen Under Regulation 1782/2003: Part II, Replies to Evaluation Questions; and Alliance Environnement (2007) Evaluation of the Application of Cross Compliance as Foreseen Under Regulation 1782/2003: Part II, Descriptive Report.

An aim of cross compliance is to incorporate ‘basic standards’ for the environment, food safety, animal health and welfare into the common market organisations. The basic standards are referred to as the Statutory Management Requirements and are composed of various Articles from a range of EU Regulations and Directives. ‘Basic standards’ therefore are equivalent to the standards sought by legislation. The SMRs apply to those Member States applying the SPS (i.e. the EU-15, Malta and Slovenia) and will be introduced in the new Member States that operate SAPS over a three year period from 2009 (or 2012 in the case of Bulgaria and Romania). The SMRs apply to both used and unused agricultural land, meaning cross compliance should support compliance with the relevant legislation on all land at the farm level. This objective rests on an assumption that public money should only be dispensed to those who adhere to legislation. In this sense, cross compliance acts as a safeguard to ensure that those in receipt of CAP direct payments are also respecting the law. The extent to which cross compliance is successful in this regard is dependent on the effectiveness of the inspection system in identifying non-compliance. The threat of a financial penalty, in the form of a reduction to the Single Payment, therefore acts as incentive for farmers to comply, if this was not already the case.

Attaching SMRs to the receipt of the Single Payment may help to increase compliance where this is less then universal. The achievement of full compliance would be to the credit of cross compliance and would demonstrate the added value of the policy if compliance cannot otherwise be provided through mandatory regulation[264]. A key way to understand whether compliance improves as a result of cross compliance is to monitor the number of SMR breaches over time. Whilst there is an absence of baseline data from which to estimate an improvement in compliance, the limited data available on the number of breaches from the first year of cross compliance inspections in 2005 helps to give an idea of compliance rates by Member State[265]. An assessment of this kind is hampered by the small sample size used for cross compliance inspections (about 1% of farms in receipt of the Single Payment receive an inspection every year), the sampling procedures (high risk farms are identified meaning that the sample is unlikely to be a representative reflection of compliance levels at a national level) and the inspection procedures (non-compliance with some standards may be easier to identify than with others). In addition, data is generally absent on the cause or nature of breaches, although the penalty applied provides some indication of the degree of severity. Some caution is therefore needed when interpreting breach data and comparing inspection results. Clearly, some SMRs are relevant to specific sectors whilst others, due to their horizontal, cross-cutting nature, may apply to many farm sectors. However, it is difficult to ascribe any increase in compliance for any particular sector as data has not been publicly provided at this level.

According to Commission figures[266], 71% of all instances of non-compliance among those Member States applying SMRs in 2005 were related to the identification and registration of cattle. A total of 10% of all breaches arose in relation to the Nitrates Directive. A total of 68% of all reductions were made at the one per cent level, indicating that most breaches were

[264] One consideration is that cross compliance may have been considered to have served its purpose once compliance is universal. Whilst this is clearly aspirational, the question then arises as to whether the leverage cross compliance and the Single Payment have over farmers would decline if either were subsequently downscaled in ambition or removed outright.

[265] No information on the level of compliance with the animal welfare SMRs - the last set of SMRs to be introduced in 2007 and clearly relevant to the beef sector - is currently available and hence is omitted from this chapter.

[266] Report from the Commission to the Council on the Application of the System of Cross Compliance (COM 2007 (147) 29.03.07)

relatively minor. Data is not publicly available on the penalties applied for specific SMRs, or by farming sector. Data for 2006 and 2007 is not yet available and so it is not possible to estimate whether compliance levels have altered following the introduction of cross compliance.

The variation in compliance levels across Member States can be illustrated through the example of the animal identification SMRs, which are clearly relevant to the beef sector. Table 10.1 shows the proportion of breaches among inspected farms where data has been provided for the first year of inspections (2005).

Table 10.1. Breaches of Animal Identification SMRs (2005).

MS	SMRs	Breaches (% of inspected farms)
AT	7 and 8	24.1
BE (F)	7	0.3
	8	6.1
BE (W)	7 and 8	29.1
DE	7 and 8	33.0
EL	7 and 8	18.6
ES	7 and 8	11.7
FR	7	48.1
IE	7 and 8	20.6
IT	7 and 8	2.8
LU	7 and 8	86
NL	8	6.1
SE	7	19.2
	8	41.3
UK (E)	7 and 8	6.3
UK (NI)	7 and 8	17.0
UK (W)	7 and 8	39.4

Source: Alliance Environnement, 2007.

Note: SMR 7 is Council Regulation 911/2004 regarding eartags, holding registers and passports in relation to the identification and registration of bovine animals. SMR 8 is Regulation 1760/2000 on a system for the identification and registration of bovine animals. MS present data in different ways, hence some breach data is combined. MS that group breach data in other ways (e.g. by including SMR 6 on pigs with result data for SMR 7 and 8) are excluded from the above Table 10.1.

The level of non-compliance, according to this data, varies from 6.3% to 86%. This range may reflect differing approaches to inspection inasmuch as variations in the level of compliance, rendering comparison problematic. Compliance issues with other SMRs are less pronounced and difficult to assess given breaches tend not to be broken down by farm sector. The monitoring of compliance rates over time is needed in order to show any improvements in compliance within the control sample. It may be logical to assume that improved compliance is most likely to occur amongst those SMRs that are easily understood by farmers and where inspectors can easily verify compliance, such as the animal identification and registration requirements.

Despite the current lack of quantitative evidence, a consideration of the wider system that supports the operation of cross compliance allows an assessment to be made of the potential of cross compliance to deliver improvements to the level of compliance. The need for Member States to define meaningful farm level standards from complex pieces of legislation, to provide an advisory system and apply an inspection regime may be expected to work together to facilitate compliance among farmers.

As a result of cross compliance, the relevant authorities have attempted to translate complex legislation into standards that are both meaningful to farmers and, from a practical perspective, can actually be checked during an on-the-spot control. This has been a demanding exercise, although more straightforward for some pieces of legislation than for others. The SMRs for the Nitrates Directive tend to be relatively clear, where the limits for organic and inorganic fertiliser loading are relatively clear and where farm and field records of Nitrogen application can be easily checked during an inspection. It has been more problematic for Articles 3 and 4 of the Birds Directive[267] since management plans are site specific and hence inspections ought to be as well. Attributing the removal of protected landscape features or the killing of a wild bird to a farmer may also be problematic, as identifying non-compliance is dependent on the timing of the inspection and the expert knowledge of the inspector. The definition of appropriate farmers' obligations for the SMR on food and feed law and verifiable standards for inspectors to check compliance with has also proved difficult. The inclusion of the EU legislation listed in Annex III of Regulation 1782/2003 is beneficial not least because it may help to raise farmers' awareness of a wide spectrum of requirements affecting their business. However, given the range of legislation included in the SMRs, a question can be posed about the suitability of a general cross compliance control system to help enforce specialist areas of legislation. The inability to detect non-compliance may undermine the effectiveness of cross compliance, underlining the importance to define verifiable standards at the farm level and communicate these to farmers.

The distribution of information booklets, the establishment of dedicated websites and the use of events such as farm walks, all part of the mandatory Farm Advisory System, have helped to make the standards more meaningful to farmers[268], and may lead to a change in mindset for some farmers away from purely productive considerations to those that also embrace the environmental and other elements of sustainable production. The inspection system, and the inherent threat of penalisation, provides an incentive for farmers to understand the standards, make any necessary adjustments to farm management and achieve full compliance[269]. There is a more coherent approach to inspection, with a range of legislation now controlled for by either one competent control authority or, in some cases, a limited number of competent control authorities. The use of a risk based approach to identifying the minimum of one per cent of farms for inspection may also create efficiencies and benefits relative to the prior

[267] Article 3 refers to the creation of protected areas and the management of habitats and Article 4 refers to the designation of Special Protection Areas.

[268] Povellato, A and Scorzelli, D (2006) The Farm Advisory System: A Challenge for the Implementation of Cross Compliance, Deliverable D14 of the CC Network Project, SSPE-CT-2005-022727.

[269] Nitsch, H and Osterburg, B (2007) Efficiency of cross compliance controls – public administrative costs and targeting, Deliverable D18 of the CC Network Project, SSPE-CT- 2005-022727.

situation of different agencies inspecting for different standards and applying different inspection rates. Whilst the compulsory rate of inspection for cross compliance is one per cent, the extent to which a modest increase in this rate, offset against any associated increase in costs, would provide a greater incentive to achieve compliance is unknown. As such, the design of the inspection system has implications for the achievement of this objective, and hence the effectiveness of cross compliance.

The SMRs will apply to the new Member States from 2009 (or 2012 in the case of Bulgaria and Romania), although the underlying EU legislation does. Cross compliance may have a slightly different impact in these countries. First, cross compliance may act as a lever to encourage the full transposition of EU legislation in these Member States. From the perspective of the European Commission, this may avoid the need to pursue infringement procedures against Member States for a failure to meet the requirements of a Directive or Regulation[270]. Second, the policy provides a framework to communicate obligations to farmers, which should be beneficial for the reasons explained above. However, compliance may be difficult to achieve in some cases because farmers may need to make additional investments in order to achieve compliance with the underlying legislation. Farmers in the new Member States often face problems with accessing credit, although such investments may potentially be partially funded by rural development policy. In addition, the governments in the new Member States may face difficulties due to the political connotations associated with introducing standards to a sector that has previously experienced a low intensity of regulation. The impact of the SMRs in the new Member States requires careful scrutiny.

At the current stage of implementation it is not possible to state whether cross compliance has improved compliance with legislation at the farm level. However, there is evidence to suggest that cross compliance may have this effect. The delivery of farm advice, an active inspection system and the accompanying threat of penalty appear to coalesce to provide conditions that encourage farm level compliance. Compliance levels need to be monitored over time in order to observe whether cross compliance improves the implementation of legislation at the farm level. Techniques to understand compliance across the farming sector as a whole also need to be developed[271].

2. *Improve environmental standards at the farm level though the establishment of standards to achieve good agricultural and environmental condition.*

The preamble to Regulation 1782/2003 makes it clear that basic standards for good agricultural and environmental condition (GAEC) should be harnessed to the receipt of direct aids under the CAP. Whilst all Member States have introduced GAEC standards that farmers

[270] Infringement procedures are common for older Member States, even though these countries have been exposed this body of legislation for a relatively long time. The set of infringement proceedings pursued by the Commission against Greece, Portugal and Malta in 2007 for different violations of the provisions of the Birds Directive may force these Member States to take the necessary measures in order to properly implement this legislation. See recent Commission press releases: ‘Nature protection: Commission takes legal action against Portugal over protected bird areas’, IP/08/154, 31.01.2008; ‘Nature protection: Commission takes Malta to court over spring hunting, closes Finnish case’, IP/08/153, 31/01/2008; ‘Environment: Commission to pursue legal action against Greece over infringements’, IP/08/152, 31/01/2008.

[271] This need may be addressed by the Cross Compliance Assessment Tool (C-CAT) project: http://www.ccat.nl/UK

need to comply with in order not to risk a deduction to the Single Payment, the work undertaken for this and other studies shows a large variation in the number of GAEC standards set by Member States and differences in the scope and level of ambition of the chosen standards[272]. In many cases GAEC is composed of existing national legislation or the requirements that were in place for Good Farming Practice. In some cases completely new requirements have been introduced. The baseline of environmental protection afforded by GAEC is therefore not consistent across the EU. A certain amount of variation should be expected given Member States have some discretion as to how farm-level standards are defined and that the GAEC framework is designed to be sufficiently flexible to take into account the different farming and environmental characteristics of the Member States[273]. Despite these differences, there are examples of GAEC providing new and additional environmental benefits as well as evidence to suggest that GAEC is not being used to its full potential.

The greatest level of benefit for the environment is likely to be realised where compliance with national requirements was previously poor or where Member States have introduced new standards above and beyond pre-existing national requirements that target specific environmental needs. Benefits may especially accrue in the new Member States, where for many farmers the melding of environmental concerns to production considerations requires a step change in the way farms are managed.

An example of GAEC standards relevant to the cereal sector helps to illustrate the environmental benefits GAEC can provide. Cereal farming can produce a number of environmental pressures. The use of fertilisers can lead to excessive nitrate loading in soils, leading to leaching and a reduction of water quality. The incentives created by the market to increase production may lead to an expansion of field sizes and the removal of boundary features. The GAEC framework provides the potential to limit and reduce these kinds of environmental pressures. Requirements to maintain buffer strips, field margins or environmental areas have been introduced in some Member States in the form of specific GAEC standards under the Annex IV issues of minimum level of maintenance and soil erosion, as summarised by Table 10.2. These GAEC standards are likely to provide environmental benefits. In addition, they are all new measures, introduced at the farm level for the first time as part of cross compliance, and therefore imbue cross compliance with some added value in these Member States.

Whilst there are positive examples which demonstrate the potential of GAEC to deliver environmental benefit, the GAEC framework is arguably not being utilised to its full potential. In many Member States, not all GAEC standards included in Annex IV are addressed, and many GAEC standards are simply made up of pre-existing legal requirements at the national level. In some cases, the GAEC standards are no stronger than the standards for Good Farming Practice applied under the previous rural development Regulation. These points are discussed in turn.

[272] Including: Alliance Environnement (2007) Evaluation of the Application of Cross Compliance as Foreseen Under Regulation 1782/2003: Part II, Replies to Evaluation Questions; Farmer, M., et al., (2007) Cross Compliance: Practice, Lessons and Recommendations, Deliverable 24 of the CC Network study for DG Research, SSPE-CT-2005- 022727.

[273] As stated by Article 5 of Regulation 1782/2003.

Table 10.2. Examples of GAEC standards applicable to the cereals sector that are likely to promote positive environmental outcomes.

Member State	GAEC Standards
Austria	The standard under 'retention of landscape features' defines a minimum distance for tillage of 10m near stagnant water bodies and 5m near water courses. This should be beneficial for reducing soil erosion and improving water quality and may also produce a habitat suitable for wildlife.
Finland	There must be a 60cm wide, untilled verge between fields and major ditches and/or watercourses, where no fertilisers or pesticides application are allowed. This should be beneficial for reducing soil erosion and improving water quality and may also produce a habitat suitable for wildlife.
France	Three per cent of the area declared in order to obtain CAP subsidies must be sown with an environmental cover (minimum width 5m, maximum width 10m, minimum surface $5m^2$) mainly in strips along watercourses. Fertilisers and pesticides are forbidden over this cover. This should be beneficial for reducing soil erosion and improving water quality and may also produce a habitat suitable for wildlife.
UK (England)	Under the GAEC measure 'Minimum Level of Maintenance', farmers are required to establish a protection zone in fields along hedges and watercourses. It must measure two metres from the centre of a hedge or ditch, with a minimum of one metre from the top of the ditch bank. It must not be cultivated or have fertilisers, herbicides or pesticides applied. This should be beneficial for reducing soil erosion and improving water quality and may also produce a habitat suitable for wildlife.

In a number of Member States, some of the issues identified by the GAEC Annex IV framework - soil erosion, soil organic matter, soil structure and minimum maintenance - are not addressed. Just over half of all Member States have not defined standards for the retention of landscape features, the majority of Member States have not defined standards for soil structure and two Member States have not included standards for soil erosion[274]. Unless these issues are addressed outside of cross compliance or are not considered an environmental problem, the ability of cross compliance to provide environmental benefit is curtailed.

In many cases, farmers' obligations are based on the requirements of pre-existing national legislation. The soil erosion requirements in the Netherlands and the Slovak Republic, for example, are based on pre-existing national legislation, as are many of the minimum maintenance requirements in Belgium (Wallonie), Finland, Malta and the UK. In such cases, the additional benefit provided by cross compliance might be rather low. The exceptions are those cases where cross compliance significantly instigates a higher level of compliance if this has previously been less than universal. The added value of cross compliance also lies in those Member States where environmental issues have not yet been addressed through the national regulatory framework; in such cases cross compliance provides an opportunity to

[274] Alliance Environnement, 2007

tackle important environmental issues. There are examples where new standards have been introduced with cross compliance, such as the soil organic matter standards in Spain (although these were based on good farming practice requirements), the soil erosion requirements in England and landscape feature retention requirements in the Czech Republic. Cross compliance may therefore improve the baseline across the EU. However, it is not clear whether the standards are well targeted to the environmental needs and whether they will provide the necessary level of protection. Because of this, the GAEC framework should be reviewed in the future when the impacts and additional benefits provided by cross compliance become clearer.

In many Member States GAEC standards originate from the Good Farming Practice (GFP) requirements applied under the previous rural development Regulation[275]. Standards of Good Farming Practice applied to those farmers claiming an LFA payment or agri-environment payment and have since been succeeded by cross compliance GAEC and SMRs. This means that non-compliant farmers risk a deduction to both Pillar I and Pillar II aid. As observed with cross compliance, GFP standards were diverse in ambition and focus[276]. Many Member States confined the GFP standards to binding measures derived from national legislation. This avoided potential confusion for farmers but reduced the scope of the measures, and potentially added less value. Cross compliance, in a way, represents a step forward as a more structured legal framework, in the form of Annexes III and IV, is provided. However, in many cases, GFP standards have been simply rolled over into GAEC. This allows some continuity and means any environmental benefits provided by GFP are not lost by the new system. However, unless the GFP standards were well designed, they may not necessarily provide any additional environmental benefit unless new obligations which tackle identified environmental needs have also been introduced.

The reason for a less than comprehensive approach may at least be partially explained in terms of the determination of some Member States to maintain a ‘level playing field’[277]. The need to avoid the distortion of competition could have lowered the ambition of Member States with respect to the GAEC framework. It appears that some Member States may have taken advantage of the flexibility provided by Regulation 1782/2003 and opted for a conservative approach to defining GAEC standards, so as not to introduce standards that may place their farmers at a competitive disadvantage.

The benefits of GAEC are therefore diluted if a Member State fails to make full use of the scope afforded by GAEC to address environmental needs. In terms of the wider policy context, it is worth considering whether Member States’ use of cross compliance is affected by other policy measures. A key example relates to the decisions taken as to which standards are appropriate for inclusion in cross compliance GAEC and which are relevant for agri-environment schemes funded by Pillar II of the CAP. Considerations of the mutual role of

[275] Regulation 1257/99. Article 14 of the Regulation states that farmers receiving a compensatory allowance must ‘apply usual good farming practice compatible with the need to safeguard the environment and maintain the countryside, in particular by sustainable farming’. Good farming practice has been succeeded by cross compliance GAEC and SMRs.

[276] For an overview of GFP, see: IEEP (2006) An Evaluation of the LFA Measure in the 25 Member States of the European Union - Report for DG Agriculture.

[277] The Communication from the Commission at the time of the Mid Term Review stated that ‘Although cross-compliance must reflect regional differences, avoiding distortion of competition requires a level playing field’.

discrete regulation and the enabling structure of cross compliance in encouraging compliance with standards that otherwise do not have a legal grounding are also relevant.

The GAEC framework is also, arguably, not static. There was a staggered introduction of the SMRs over a period of three years, and it is possible in the context of the CAP Health Check that further standards could be introduced to address sustainable water management, climate change and the environmental benefits previously provided by compulsory set-aside[278]. The policy rhetoric suggests that cross compliance can embrace new environmental challenges, but the extent to which these are adequately dealt with rests on suitable leadership at the EU level and appropriate implementation at the Member State or regional level.

The second objective has therefore been partially met. The baseline provided by GAEC varies across the EU. In some cases cross compliance is likely to produce a higher level of environmental protection than was the case previously. For those standards where cross compliance is simply composed of existing national requirements, the additional benefit provided by cross compliance is less clear, although the consolidation of legislation in one policy frame may help improve farmers' understanding of their obligations. The approach to implementation should be reviewed once the environmental impacts become clear.

3. *The avoidance of land abandonment.*

The preamble to Regulation 1782/2003 states that land should be maintained in good agricultural and environment condition in order to avoid the abandonment of agricultural land. In Member States which operate a fully decoupled Single Payment Scheme or the Single Area Payment Scheme, farmers are not obliged to produce any particular agricultural commodity in order to receive the direct payment. This creates a threat of the cessation of agricultural activity, and potentially, land abandonment. Land abandonment is a complicated, multi-layered issue that has repercussions both for the environment and the socio-economic fabric of rural areas. In particular, land abandonment threatens more marginal livestock farming areas that are associated with high-nature value semi-natural pastures. It is a key issue in many Member States of Central Europe[279]. The management of any trend toward land abandonment is highly influenced by other measures within the CAP such as decoupling and Pillar II measures. Non-policy drivers, such as market forces and rural to urban migration, also play a role. It is not possible to determine the actual impact of cross compliance in relation to land abandonment due to the lack of monitoring data and insufficient time having elapsed since the start of the policy for impacts to become apparent. However, some comments on the potential impact can be made.

The value of the Single Payment to farmers - and particularly the amount received through the Single Area Payment Scheme in the new Member States - is likely to be a persuasive factor in maintaining farming activity. GAEC should also ensure that land is maintained in a state so that it can readily be returned to farming use, if farming activity does not take place. In turn, this may slow down potentially environmentally damaging agricultural restructuring processes such as the regional concentration and specialisation of production. In some cases

[278] Communication from the Commission to the Council and the European Parliament - Preparing for the "Health Check" of the CAP reform, COM (2007) 722, 20.11.2007.
[279] See, for example: DLG (2005) Land abandonment, biodiversity and the CAP – Outcome of an international seminar in Sigulda, Latvia, 7-8 October, 2004.

the Single Payment may form a large proportion of farm household income and be influential in retaining the farmer on land that may otherwise become abandoned. The farmer may continue to engage in traditional agricultural practices, which in turn, may help to maintain the conservation value of the associated pastures. However, the farmer is not obliged to undertake any agricultural activity in order to receive the Single Payment meaning in the absence of active management, agricultural land may come to resemble abandoned land. The role of GAEC is therefore to ensure some form of activity actually takes place in order to maintain the appearance of the agricultural landscape and its ability to be farmed. In this way, cross compliance acts as a flanking measure designed to minimise some of the negative impacts which may arise from decoupling. It is important to note that GAEC is unlikely to be suited to maintaining the environmental interest of semi-natural pastures threatened by abandonment, as discussed further below.

Cross compliance has two key advantages with respect to addressing the threat of land abandonment. The first is that it has tremendous policy reach. It applies to all farmland on which the Single Payment is claimed, and hence bears an influence on the behaviour of the majority of farmers. Cross compliance, for instance, concerns about 90% of farmers in England[280]. Secondly, the GAEC minimum maintenance provisions help to ensure that some activity takes place on land that is no longer in production. Standards range from requirements to cut vegetation every year (e.g. Germany) to keeping land free of scrub and trees older than five years (e.g. Denmark). The standards are designed to ensure that land can readily be returned to agricultural production, if necessary, and also help to ensure an ‘open’ agricultural landscape free of significant scrub encroachment. Therein lies a crucial distinction between cross compliance and the rural development measures under Pillar II. It is not the aim of GAEC to maintain or increase the environmental value of farmed areas threatened by abandonment. In a coherent policy framework, the agri-environment measure should work alongside cross compliance to ensure that appropriate land management takes place in order to safeguard, if not enhance, biodiversity value. The LFA measure also plays a role, by providing additional support to farmers in those areas most threatened by natural handicaps, where land abandonment is a possibility.

The following example from the beef sector helps to illustrate the role cross compliance plays in responding to the threat of land abandonment. Certain beef farming systems, such as in the upland and mountainous areas of the EU are less financially viable and the cessation of farming activity is a threat. Extensive cattle grazing practices are important to maintaining the biodiversity value of pastures. The GAEC minimum maintenance provisions ensure that a minimum level of farming activity takes place. A total of eleven Member States require farmers to maintain pasture by grazing - potentially beneficial from a biodiversity perspective if stocking densities are appropriate - or through appropriate mowing regimes, which are likely to be rather less beneficial[281]. In a decoupled payment context, Member States have retained mowing as an option and avoided specifying stocking density requirements. Unless the farmer choose to maintain grazing activity at the appropriate density, the emphasis of GAEC on basic standards – in particular mowing - results in minimal land management that is insufficiently prescriptive from a biodiversity conservation perspective. Rather, it is the role of the agri-environment measure, the LFA measure and the Article 69 option of Regulation

[280] Silcock, P and Swales, V (2007) Cross Compliance: A Policy Options Paper, report for the LUPG.
[281] Evidence is presented here from the Alliance Environnement Evaluation for DG Agriculture (2007).

1782/2003[282], if appropriately implemented, to work in synergy with the basic cross compliance standards in order to promote the continuation of environmentally beneficial farming practices.

Cross compliance is therefore one of several policy measures that works towards minimising the negative environmental impacts that can arise from the cessation of agricultural activities. The role of cross compliance is more agronomic; it requires a minimal intervention on the part of the farmer in order to maintain production capacity rather than environmental function. From this perspective, cross compliance is likely to be successful. However, GAEC standards alone are not sufficiently fine tuned to maintain the environmental interest of the associated land. This underlines the importance of Pillar II measures to work in conjunction with cross compliance in order to preserve the environmental, as well as the socio-economic fabric, of areas threatened by land abandonment. This objective is therefore only partially met as cross compliance needs to operate alongside other measures in order to address all the issues raised by land abandonment.

4. *Maintenance of the existing area of permanent pasture.*

Member States are obliged to maintain the area of permanent pasture within 10% of 2003 levels (or 2004 levels in the case of the EU-10). The requirement is founded on a desire to avoid a ‘massive’ conversion to arable land and to maintain the environmental benefits provided by permanent pasture. Converting pasture to arable land can create negative environmental impacts in the form of carbon release, increased soil erosion, decreased water quality (if fertiliser use increases) and biodiversity loss (particularly if the pasture was associated with low inputs and was extensively grazed). Cross compliance acts as a safeguard against arable conversion. However, the level of environmental protection is weakened due to poor targeting of the most environmentally important pasture, as explained below.

The permanent pasture rules, as with the GAEC rules in relation to land abandonment, are another example of a flanking measure put in place to avoid the negative environmental impacts that might arise from decoupling. The possibility of arable expansion might occur if market prices and demand for cereals increased, for example. Given recent rises in commodity prices, the permanent pasture rules seem entirely sensible and are likely to act as a brake on arable conversion and so meet this objective.

The success of the rules is partly dependent on how sensitive Member State monitoring is to changes in the area of permanent pasture. Member States have established trigger levels to determine the point at which farmers can no longer convert pasture or need to establish a new area of pasture to compensate for an overall loss. In many Member States the farmer needs permission in order to convert pasture when a 5% decline has been observed across the Member State. Generally, a new area of land needs to be established as permanent pasture when a 7.5% to 10% decline in the area of permanent pasture has occurred. These requirements appear suitable for maintaining the area of permanent pasture within ten per cent of the reference level. However, the trigger level has not yet been passed in any Member State, meaning it is not yet possible to determine the effectiveness of the measure. Evidence

[282] Article 69 allows Member States to retain up to 10% of a sector specific direct payment in order to grant an additional payment for specific types of farming which are important for the protection or enhancement of the environment.

suggests that the area of permanent pasture has in fact increased in many cases since the introduction of cross compliance, meaning there has not yet been a need to apply the rules[283].

The main objective, to maintain the area of permanent pasture, seems likely to be met. However, the potential to preserve the associated environmental benefits, a clear sub-objective of the measure, is less certain. This is because the targeting of the requirement from an environmental perspective is underspecified in the legislation. For instance, there is no requirement for Member States to restrict the conversion of more environmentally sensitive habitats, to prioritise the re-establishment of pastures according to the potential value for biodiversity or to assess the capacity for newly established pasture to reduce environmental pressures. For example, the rules appear to allow a loss of high nature value grassland in one place to be compensated by an increase in the area of lower biodiversity value fertilised permanent grassland elsewhere. In addition, the decision as to which land to reconvert to permanent pasture is the responsibility of the farmer, who is not required to take account of environmental priorities. In addition, the definition and monitoring of the ratio of permanent pasture at the national level is unlikely to be sufficiently sensitive to highlight those areas where a small decrease in permanent pasture might result in negative environmental impacts.

The ability to provide environmental benefit therefore rests on the effectiveness of the permanent pasture rules to restrict the exchange of relatively extensive grasslands for more intensively farmed arable land. This may be tempered to a certain extent by the Environmental Impact Assessment (EIA) Directive[284] which requires an assessment to be made of the environmental consequences of restructuring agricultural holdings and exchanging uncultivated land or semi-natural areas for intensive agricultural purposes. However, EIA requirements do not necessarily stop environmentally damaging activities from taking place. In addition, the Commission state that implementation by Member States has, to date, been poor[285].

This objective is partially met by cross compliance. The rules should act as a simple safeguard to ward off large scale arable conversion, particularly in the face of rising arable commodity prices. Maintaining the environmental value of permanent pasture, a clear sub-objective of the measure, requires cross compliance or EIA rules to be adapted in order to adequately protect the most environmentally valuable permanent pasture and to target the re-establishment of pasture where it will bring the greatest environmental benefit.

5. *Contribute to market oriented and sustainable agriculture.*

Sustainable agriculture is difficult to define precisely. It is generally seen to convey economic, environmental and social aspirations. With respect to the environment, it encompasses notions of sound environmental stewardship, the promotion of environmental

[283] According to the Alliance Environnement (2007) study, the area of permanent pasture has increased in eleven Member States, whilst a small decrease has been observed in four Member States and remained stable in one further Member State.

[284] Council Directive 85/337/EEC (O.J. No. L175, 5.7.85, p.40) on the assessment of the effects of certain public and private projects on the environment, as amended by Council Directive 97/11/EC, Directive 2003/35/EC (O.J. No. L156, 25.6.03, p. 17)

[285] Report from the Commission to the European Parliament and the Council On the Application and Effectiveness of the EIA Directive (Directive 85/337/EEC as amended by Directive 97/11/EC), How successful are the Member States in implementing the EIA Directive.

outcomes which are beneficial to society as a whole and the legally enforced restriction of environmentally damaging practices.

The extent to which cross compliance is able to contribute to sustainable agriculture is limited by the policy's objectives. The analysis of the above four objectives shows that cross compliance clearly contributes to environmentally sustainable agriculture. There is evidence to show that compliance with legal requirements should improve, as should environmental standards, particularly where new standards have been introduced because of GAEC. The extent to which this will be achieved is partly dependent on farmers' reaction to cross compliance and how much the policy instils a change in behaviour, where this is needed. Cross compliance is likely to play a more limited role in avoiding land abandonment, and should act as a safeguard against large scale arable conversion. Cross compliance should also contribute to a more economically sustainable sector if standards can be raised at minimal cost to the farmer.

Cross compliance could come under criticism in several respects if it is believed it should more fully contribute to sustainable agriculture. The emphasis placed on 'basic' standards severely limits the ability of the policy to more fully address environmental needs. The coherence between cross compliance and more targeted environmental measures is therefore very important. In some cases, the added value of cross compliance is debatable, particularly where compliance rates were high before the introduction of the policy, where pre-existing requirements have simply been reframed by the SMR and GAEC framework and where GAEC standards remain less than ambitious. In some instances, cross compliance may not be suitable to enforce specialist areas of legislation which require inspectors to have expert knowledge.

Decoupling, arguably, plays the stronger role in promoting market orientation by allowing farmers to base production decisions on market conditions rather than subsidy payments. An increase in the scope and ambition of standards may respond to the broader public's desire for environmentally sound production, although many EU consumers are unlikely to be aware of the standards farmers need to comply with under cross compliance. In this sense, cross compliance may help to provide the standards desired by consumers and therefore play a role in market orientation. In the new Member States decoupling may result in some restructuring. This may bring economic benefits and greater market orientation, but may equally result in some social and environmental problems, particularly where the existing structure of small scale low intensity farming is split up. GAEC in itself is not a strong enough mechanism to respond to all of the issues raised by restructuring or agricultural intensification.

This objective is partially met. Cross compliance contributes to sustainable agriculture and may contribute to market orientation, but must work in synergy with Pillar II measures in order to address all environmental needs. Market forces and agricultural restructuring trends may alter the ability of cross compliance to contribute to sustainable agriculture.

10.4 Considerations of Efficiency

The above analysis shows that cross compliance is likely to be effective in some respects, and thus provide a number of benefits. Arguably, it could become more targeted and more effective. A debate along these lines should also be informed by a consideration of efficiency i.e. the extent to which the desired effects are achieved at a reasonable cost[286]. Some comments on the efficiency of cross compliance are made in this section.

An evaluation of efficiency may involve a consideration of whether the same benefits could have been provided more cheaply by an alternative policy. This involves balancing the effectiveness of cross compliance and a number of plausible, alternative policy interventions (i.e. that can meet the same objectives) against the associated costs (e.g. public administration costs, inspection costs and farm administration costs). One recent study concluded that 'there is some evidence that cross compliance can be an efficient means of increasing compliance with statutory standards, and little evidence to suggest that it is not efficient'[287]. The OECD states that 'By piggy-backing on an existing policy measure [i.e. direct payments], environmental improvements are secured at low additional cost'[288]. This literature therefore suggests that cross compliance is efficient and can be a cost effective policy intervention.

The present Deliverable adds some credence to these statements, by stating that the costs attributable to cross compliance at the farm level are low at the EU level, although there may be some significant costs for certain farm types affected by certain standards in some Member States. However, this chapter also shows that the benefits provided by cross compliance are likely vary across the EU, due to differences in implementation by the Member States. Cross compliance also cannot deal with the environmental subtext of the objectives related to land abandonment, permanent pasture and sustainable agriculture on its own. Whilst it may increase compliance with the regulatory baseline, it is likely to be less effective at delivering additional benefits. It is likely to be more effective, and therefore more efficient, in some Member States than others.

It has been stated that for cross compliance to be more effective and provide greater added value, the payments received by the farmer need to be adjusted to reflect the cost to the farmer of implementing cross compliance obligations[289]. Such an approach incorrectly assumes that the rationale for the Single Payment is to reimburse farmers for the cost of the provision of basic standards rather than direct income support[290]. At present, cross compliance is ancillary rather than providing a basic justification for expenditure under Pillar I. Arguably, if the rationale for Pillar I support shifts from traditional CAP objectives to one that seeks the provision of basic or higher standards, the overall policy approach, including cross compliance, as well as the current level of Pillar I funding would need to be adjusted

[286] Efficiency means 'the extent to which the desired effects are achieved at a reasonable cost'. See: DG Budget (2004) Evaluating EU Activities: A Practical Guide for the Commission Services.

[287] Alliance Environnement (2007) Evaluation of the Application of Cross Compliance as Foreseen Under Regulation 1782/2003: Part II, Replies to Evaluation Questions. For the European Commission.

[288] OECD (2005) Evaluating Agri-Environmental Policies: Design, Practice and Results, OECD: Paris.

[289] This is suggested by Núñez Ferrer, J and Kaditi, E (2008) The EU added value of agriculture expenditure – from market to multifunctionality – gathering criticism and success stories of the CAP, Report prepared by the Centre for European Policy Studies for the European Parliament.

[290] The objective of the Single Payment, according to Para. 21 of the preamble to Regulation 1782/2003, is 'to provide for direct income support … with a view to ensuring a fair standard of living for the agricultural community'

accordingly. Not least, the payment received should only cover the cost of those standards that exceed the regulatory baseline at the farm level, thus blurring the distinction between Pillar I and Pillar II. Furthermore, in future evolutions of the CAP, the approach to calculating the value of the Single Payment may also need to be revisited, with the method reoriented from historic levels of subsidy towards one that is based on the cost of providing public goods and services, which could be provided for by a revitalised cross compliance framework. This may or may not be more effective and efficient than the present system.

10.5 Conclusions

Cross compliance is likely to provide some benefits in relation to each of the five identified objectives. The level of benefit is likely to vary across the EU and as such a further research effort is likely to be required to assess the suitability of the current system as evidence of the impacts begins to emerge. Questions need to be asked about whether cross compliance is the most effective tool to provide the benefits identified in this paper, whether these are for the environment, food safety or animal welfare. In its current guise, cross compliance is designed to implement basic, uniform standards that can be easily applied across the whole of the territory in question, irrespective of different agricultural or environmental conditions. This has resulted in differences in implementation across the Member States and in some cases cross compliance may not be being used to its full potential. There may therefore be a shortfall in the benefits delivered when examined against the objectives for the policy.

The objectives for cross compliance, and the range of benefits the policy can provide, are likely to change in the future. Indeed, the longer term relevance of cross compliance, and its potential to provide benefit, very much depends on the future relationship between regulation, Pillar I and Pillar II of the CAP. One line of argument suggests so long as Pillar I exists, the potential for cross compliance to deliver benefit should be maximised by expanding the list of SMRs and including more demanding GAEC standards. However, the addition of more standards poses the risk of a dilution of effectiveness. The case to expand the SMR and GAEC framework also loses weight if the value of Pillar I and the Single Payment declines in the future. It may be difficult to ask farmers to meet more standards (assuming more means more than simply regulatory compliance) if their Single Payment receipts are less than at present or if the cost of compliance outweighs any remaining financial benefit provided by the Single Payment. A large set of policy, political and budgetary questions therefore surround the future of cross compliance as a tool to influence farm level behaviour and the achievement of standards across the EU.

11 Concluding remarks and brief policy outlook

From the previous analysis the following main conclusions can be derived (ordered along themes).

11.1 Review of standards

From the review of all SMR and GAEC standards it appeared that in particular the Nitrate directive, food safety requirements and animal welfare standards might introduce non-negligible cost of production increases, at least at individual farm level and potentially also at sector level. Although the potential cost impact of identification and Registration of animals is low, from previous analysis this appeared to be a standard facing significant problems with compliance. Where the SMRs affect animal productions, the GAEC standards mainly affect the arable sector. Based on the review, for a selected number of products and standards a quantitative competitiveness impact assessment was made.

With regard to the selected EU Member States it became apparent that some Member States have used the GAEC requirements that were introduced as part of cross compliance to compensate for gaps in their existing national legislation (e.g. Poland defines the GAEC standards solely as new requirements and Italy has just one pre-existing standard), while other Member States already had a legislative framework in place and merely adopted that framework for cross compliance (e.g. the Netherlands, where requirements are based just on pre-existing legislation).

11.2 Dairy

As regards the impact of the Nitrate and Identification and registration standards on production, clearly the Nitrate standard has the most impact. At sectoral level for nitrate percentage cost of production increases of 0.1 till 0.6 percent were found, with rates varying over countries and with respect to variations in the prevailing degree of compliance, as well as the assumed improvement in compliance. At farm level the nitrate standard might have even much stronger impacts than at sector level. As compared to the Nitrate standard the estimated percentage costs increases associated with full compliance to the Identification and Registration standard was less than 0.15 percent and thus rather marginal.

The impact of the Nitrate standard on the EU-15's external competitiveness can be described by the changes in dairy exports and imports. Due to the relative costs increase associated with improved compliance to the Nitrate standard EU exports are projected to decline at maximum with 1.9%, whereas imports increase at maximum by 2.8%. So the overall effects are limited, with the impact on exports being the most important effect, since the EU is an important net exporter of dairy products. When a generic 20% increase of compliance to the current best-estimate level is assumed (rather than full compliance) these impacts shrink by 80% percent.

The impact of an improvement of compliance to full compliance with respect to the Identification and Registration standard is projected to lead to a decline of EU dairy exports with 0.1 percent and an increase in EU dairy imports with 1.1 percent.

When the measures on Nitrate taken by the US, Canada and New Zealand are taken into account and it is assumed that compliance to these measures will improve to full compliance, just like was assumed for the EU, this would more or less ‘neutralize’ the trade impacts. The projected change in EU exports is than approximately -0.1%. As such this underscores that for a competitiveness impact analysis it is rather important what is assumed to be happening in key competitor countries. The trade impacts obtained when no changes are assumed to happen in key-competitors countries can thus be argued to provide an upper bound of the likely trade impacts.

The combined impact of the Nitrate and Identification and Registration standards on EU dairy exports and imports is estimated to be -0.87% and +1.01% respectively (given no changes in standards or compliance for other trade partners).

A ban on bST hormone use in the US is argued to lead to a 5% percentage costs increase for US farmers, which appears in turn to lead to a potential improvement of EU dairy exports with nearly 2.5 percent. Alternatively, the EU food safety standard prohibiting the use of bST can be stated to have an opportunity cost in terms of forgone trade opportunities.

11.3 Beef

Within the EU beef is produced in a wide range of farming systems, ranging for the extensive cow calf farms in Ireland, the UK and the centre of France down to the very intensive beef fattening systems located in Italy and Spain. The Nitrate Directive affects 4.2% of beef cattle raised in intensive finishing farms and 3.0% of beef produced on cow calf farms. This low percentage of farms affected by the Nitrate Directive explains the limited sector cost increase, which has been estimated in 0.095%.

The relatively low cost impact associated with the nitrate standard does not have significant consequences for the competitive position of the EU beef production on the world market. The actual trade deficit in beef of the EU would increase, as exports would fall by 0.68% and imports would rise by 0.51%.

More incisive for the beef farms are the regulations concerning the identification and registration of beef cattle. Implemented as a reaction to the BSE crisis the beef farmers have to register all cattle movements and make sure that all animals are correctly identified form birth up to the slaughterhouse. According to the estimates carried out these important measures generate a cost increase for the beef farms of 0.454% in the EU. As a consequence of this measure the EU’s beef imports are projected grow by 2.2% and exports will decline with the same percentage. Again Brazil can exploit most this decline of EU competitiveness increasing its exports to the EU with 2.18% and its global exports with 1,1%. The other competitors on the world market would benefit much less.

11.4 Pigs and poultry

As the pig and poultry sector are most intensive livestock activities in the EU it is quite comprehensible that these sectors are the most affected by the Nitrate Directive. In the present analysis the effects have been quantified only for the pig sector, as poultry farms are very marginally touched by cross-compliance.

The extent to which the Nitrate Directive may create extra costs to the pig sector depends on the pig density per hectare in each Member State, on the percentage of pigs present in Nitrate Vulnerable Zones and on the degree of compliance of pig farmers to the Nitrate Directive. These three data differ very much from country to country and explain primarily the very different sector cost increases for the pig sectors of EU Member States. The overall EU cost increase to be attributed to the pig sector due to attain full compliance with the Nitrate Directive has been estimated at 0.55%.

Such a cost increase has a significant impact on the EU trade balance of pigmeat. Total EU exports will decline by 3% and imports will increase by 4.4 %. This decline of EU competitiveness will favour the exports of Brazil (1%), the US (0.7%) and Canada (0.3%) on the world market. EU imports will increase in particular from Brazil (+4,3%), Canada (+4.1%) and the US (4,1%).

From a comparison with the impact of the Clean Water Act in the US it turns out that this act raises the cost for the American pig sector with 1.08%, an almost double cost effect compared to the impact of the Nitrate Directive in the EU. The reason for this substantial rise of costs has to be attributed to the large percentage of pig affected by this measure and its rather recent application to US pig farms, which still implies a rather low degree of compliance. This rise of costs will cause a fall in US exports of pigmeat of 7.3% and a decline of exports of 4.5%. Canada would gain the most of this situation increasing its exports by 4% on the world market, of which 4.5% more to the US and a 2.1% increase on the Japanese market.

A calculation of the animal welfare regulations for pig farmers in the EU shows, that the cost increase is very limited. The reasons for this minor cost impact are a high degree of compliance with the standards and the limited rise of costs for farmers which still have to adapt their farm to the new legislation. At farm level the cost increase is well below 1% and this generates a rise of costs at sector level of 0.11%. This cost impact evidently causes a growth of imports of only 0.8% and a decline of exports of 0,7%.

As has been expected the Nitrate Directive for the pig farms creates the most substantial burden of costs, in particular in EU Member States a with high pig density and a low degree of compliance.

11.5 Cereals

The percentage cost increases associated with the GAECs for the cereals sector are in all cases less than 1 percent of total production costs. Several factors explain this results. The additional costs per hectare are generally low, with an exception of the costs for idled land.

The best estimates of the current degree of compliance are rather high. Partly this is due to the fact that farmers have, for several reasons, already included a number of GAEC requirements into their existing farming practices. These reasons include the role of pre-existing national legislation and the internal benefits generated from preventing soil erosion and keeping up the soil condition.

This latter factor explains why farmers following their own interest may participate voluntarily in programmes reducing soil erosion and are prepared to accept some costs. The case of Canada also illustrates this. It also makes clear that rather than following a command and control approach a voluntary or self-regulation approach might be effective in particular when the government is prepared to provide education and trainings, technical assistance and cost-offsets. Since in Canada participation is voluntary farmers are not likely to be faced with net costs increases affecting their competitive position.

The use of set-aside land (idling or cultivating with alternative crops) and the set-aside rate will affect the estimated percentage costs increases (see differences between GAEC-1 and GAEC-2 scenario's): higher cultivation rates and lower set-aside rates lead to lower costs. With the set-aside rate currently set to zero, the calculated percentage cost increases more or less halved as compared to the 10 percent set-aside scenario (GAEC-1). The 3% buffer strip requirement in France, whereas previously accounted for within the 10% set-aside requirement, can be interpreted as an 3% minimum effective set-aside requirement (which holds even when the formal rate goes down to zero).

The impact of the GAECs on the EU's external competitiveness varies from a 1.8 percent reduction in exports in GAEC-1 (set-aside rate 10% and all land idled) to a reduction of 1.1 percent (set-aside rate 0%). EU imports increase with approximately a similar percentage as exports decline. Total world trade is hardly effected by the impact of the GAEC standard (although the changes in set-aside policy are likely to affect trade).

11.6 Comparing Dairy, Beef, Pigs & Poultry and Cereals

The GTAP tool allows for the determination of the impact of improvement in compliance with standards on the product and overall trade balances of the EU.

Table 11.1 summarizes these impacts. The first two columns provide the percentage changes of EU imports and exports. As the first row of Table 8.1 indicates, the cost increases associated with full compliance to the Nitrate and Identification and Registration standards in the EU dairy sector lead to a decline in EU dairy product exports of 2 percent and an increase in its imports of 3 percent. The associated impact on the trade balance for dairy products is a loss of 93 million dollar, which is the sum of on the one hand the loss in export revenues and on the other hand the increase in expenditure on imports. Similarly, the cost increase associated with full compliance to the GAEC standards for the cereals sector lead to a decline in EU exports of 1.8 percent and an increase of imports with 2.2 percent (see lowest row in Table 8.1). The impact on the cereals trade balance is a loss of 68 million dollar.

The pigs and poultry sector is the most significantly impacted by a rise in compliance levels. As these sectors are most intensive livestock activities in the EU it is quite comprehensible that these sectors are the most affected by the Nitrates Directive, if fully enforced (some Member States have derogations). However, the change in trade balance should not be attributed wholly to cross compliance. In particular, the poultry sector is barely concerned by cross compliance since poultry farmers do not generally receive the Single Payment. The same is true for pig farmers, unless they have a mixed enterprise.

Cross compliance bears more of an influence on the dairy, beef and cereal sectors because the majority of farmers in these sectors receive the Single Payment. Cross compliance, as an enforcement mechanism, may encourage compliance with the examined standards. Of these three product sectors, the greatest impact is on dairy, followed by beef and cereals. This is line with expectations, given that the SMRs more greatly affect livestock producers, and that the underlying EU legislation may be more costly to comply with. The cereals sector shows the lowest product trade balance impact.

The most right column of Table 11.1 shows the impact on the trade balance (net result of loss in export revenue and increased expenditure on imports). The reported trade balance impacts include the spill-over and feed back effects of simultaneously achieving full compliance with the selected standards in all four considered sectors. For example, the 27 million euro loss in the E-15's dairy sector includes the potential impact from the GAEC standards imposed on cereals on feed prices, etc. As such the sectoral trade balance impacts can be aggregated over sectors, which results in a total trade balance loss of the considered products and measures of 289 million dollar. As the small percentage changes (see two left columns) confirm, this amount is only a small fraction of the total trade balance value.

Table 11.1 does not report the overall trade balance impact that would result from also taking into account spill-over effects to other (non-agricultural) sectors (e.g. food industry, etc.) in the EU economy. Some background analysis suggests that if this would be included the total trade balance loss might even smaller due to counteracting effects generated from the reallocation of production factors. However, these counteracting effects might be easily exaggerated due to assumptions on (an unrealistically high degree of) factor mobility between sectors in the EU economy that are implicit in the GTAP-model version used for this analysis.

Table 11.1: Trade and trade balance impacts of all evaluated standards market-wise implemented at EU-15 level

	EU-15 Imports (%-change)	EU-15 Exports (%-change)	Product trade balance (million US$ in constant prices of 2001)
Dairy	1.1	-0.8	-27.1
Beef	2.7	-2.7	-94.1
Pigs & poultry	5.2	-3.7	-125.4
Cereals	2.2	-1.8	-42.1

Source: own calculations with GTAP (calibrated to 2001 base year) and improvement to full compliance as compared to best-estimate levels of compliance in 2005. Impacts evaluated for EU-15 based on country, product and measure selections as described in the main text.

11.7 Fruit, vegetables (case study and farm level approach)

The case study results suggest that, in general terms, the cost of compliance with the environmental regulations for the fruits and vegetables sector in Spain would be probably low or small (or even none or beneficial in some specific cases). It has to be noted, however, that due to the limitations of the study, not all the fruits and vegetables production regions have been considered and, therefore, these general conclusions may differ across regions, farming systems and types of farms.

In highly productive areas of single-crop productions, such as the citrus groves of the region of Valencia, the assessment of the cost of compliance for pesticides and nitrates show that benefits of compliance might be possible. In the case of the cost of compliance of GAECs related to pesticides and food safety at farm level, certified schemes like EUREPGAP could have a potential increase in the farms' gross margin (due to no reduction in yields and premium prices).

In the case of mixed-vegetable farms of Castilla-La Mancha, the impact of compliance with the Nitrates Directive (measured as income loss) at farm level varies depending on farm types ad adaptive capacity of farmers to face the regulations. When farmer's adaptation ability is low (i.e. changes in cropping patterns are not easily preformed) the most vulnerable farmers account for income losses around 15% (validated by fieldwork). When farmers adjust the cropping pattern to comply with the Nitrate Directive income loss is low and, in some cases, it may even increase, evidencing a clear benefit of the compliance measure.

Short-term competitiveness at farm level indicates that the effects of the nitrate directive on competitiveness of citrus production might be slight or null. Growers tend to use nitrate fertilizers exceeding the maximum permitted dosage but there is no evidence in yield decreases when fertilization is reduced to the directive's limits.

In the case of the mixed vegetable farms of Castilla-La Mancha, the effects of the Nitrates Directive on the overall competitiveness of the region's farms varies across farm types. Competitiveness ranges from 85% for low-adjustment farms to 111% for larger cash-crop farms with flexible cropping patterns. This evidences that compliance can have beneficial effects on certain types of farms in Spain.

The effects of the water conservation measures (GAEC) on competitiveness are significantly larger than of the Nitrates Directive. Aggregate average loss in profitability is 20% as compared to a 3% in the case of the Nitrate Directive. Consequently, the average competitiveness in the case of compliance with the water conservation measure is 79% and for the Nitrates Directive is 97%.

11.8 Olive (case study and farm level approach)

The results from the case-studies on olive production indicate that compliance might not have a clear effect on costs. Even a possible benefit for the Spanish olive groves might come along as a consequence of the application of new European policies and cross compliance.

GAECs for preventing erosion in slope agriculture for rain fed olive groves in the region of Andalusia require specific cultivation techniques such as no tillage operations. All these practices imply a completely different production scheme for growers. This scheme is very well known since the 70s but it is not always preferred by traditional growers. These cultivation methods presume not to plough and avoid a naked ground using herbicides and cutters or just leaving native grass to grow under the treetop or in roads. The cost of ploughing and replacing it by herbicide treatments determine equal or rather lower costs in the non-tillage system. The cost of maintenance for terraces and the obligatory grass strips that many growers should practice in slopes represent an extra cost that might be equal to the possible reduction in costs when not ploughing or using no till cultivation methods. Regarding yields for these schemes, evaluations during the last decades indicate that untilled orchards improve water use efficiency and productivity.

There is no evidence of negative effects on farm profitability when soil erosion control practices are applied in the Spanish olive groves. In the case of low cost/income rain fed olive groves, the use of green covers, grass strips and terrace maintenance imply an increment in yields without no changes in variable costs, due to a better water use efficiency. In more intensive rain fed farms, the use of no tillage practices determine slight or null changes in competitiveness.

Irrigated olive orchards are presumed to have slight or null effect when complying with the new legal framework. Further yield assessments should be considered when studying the cost of compliance in olive production on hill slopes. Long-term assessments will be required to fully evaluate the potential competitiveness of the Spanish olive farms as erosion effects require to be evaluated in the long run.

The case studies focused on slope olive groves since erosion is the main environmental problem in the region of Andalusia and about 70% of farms are above 7% slope. Further analysis for cross compliance effects on costs of olive groves cultivated in flat areas could complement this study as these types of olive farms might be subject to other regulations (like the Nitrates Directive).

11.9 The role of voluntary standards or certification schemes

The research has also demonstrated that standards within agriculture are also set, and compliance achieved, through market led initiatives, particularly through certification and assurance schemes. Examples of such schemes can be found in both EU and non EU countries. In some cases, these schemes promote compliance with regulatory baselines but in other cases, they establish higher or more specific standards that are deemed to confer some kind of market advantage. Organic standards and certification are a good example of this with the application of organic farming standards usually leading to premium prices applied to food stuffs produced to those standards. In other words, standards are used to differentiate products in the market place. Since both cross compliance and certification schemes set standards and require inspections to verify compliance, this has led to a suggestion that there may be some synergies possible between the two approaches. Specifically, farmers who are members of certification schemes might, assuming the standards they comply with are equivalent to cross compliance standards, be deemed as lower risk when authorities select the sample of farms for inspection. This approach might help to improve the targeting of inspections and potentially reduce the cost burden of inspections, both for farmers and the inspection authorities. There are also numerous difficulties with this approach, not least the rationale behind using private bodies to share the control of public standards.

11.10 Qualifications on competitiveness analysis

Although there are uncertainties in the calculations (for example with respect to the assessment of national and EU costs or the upscaling from the farm level to the level of the sector and from the selected member states to EU level, the best estimates of the degree of compliance, the level of improvement of compliance that could be actually achieved, difficulties with establishing one unique base year, as well as limitations in the modelling tool) the general picture that emerges is that the impact of improvements in compliance with the considered standards on the EU's competitiveness is rather limited.

Impacts are not only limited when looking to changes in volume, but also when focusing on price changes. The impact of the simulated measures on market prices were very limited. This suggest that the impact of standards is easily outweighed by other shocks (weather changes, demand shifts, etc.), which normally continuously affect markets.

The estimates provided in this study are likely to represent the upper bound of the expected cost impacts. For example, when not the EU unilaterally, but also key competitors adopt similar standards or aim for increasing compliance with existing standards, this is likely to 'neutralize' the impacts on trade flows (see dairy case). The first phase of this project showed that the EU's key competitors face similar issues, although until recently their policy approaches rely more on self regulation and voluntary standards. Moreover, since the EU is a key player in world trade for agricultural products, being both an important exporter as well as importer of these products, its adoption and enforcement of standards might induce other countries to adopt or/and follow similar standards. This might be particularly relevant for countries exporting to the EU market and for public health and food safety issues.

Another reason why the actually observed impacts might be smaller than the ones simulated in this study is that the burden of the calculated cost increases might in reality (in particular in the short run) partly or fully carried by family labour rather than passed on to buyers of farm products.

11.11 Some reflections cross-compliance policy as inspired by this research[291]

EU agriculture policy, in seeking to promote a more market orientated, sustainable agriculture, reflecting the concerns of European citizens, continues to evolve. The

[291] Following paragraphs are based on Deliverable 15: Guidelines for Policy - A Policy Perspective on Cross Compliance and Competitiveness. See Swales and Farmer (2007) for further details.

development of farm and product standards is likely to continue as part of that process. The European Commission proposed some adjustments to the cross compliance system in 2007[292] and the Commission's paper prior to the Health Check of the CAP[293] also considers changes to this measure. The EU Budget Review[294] is likely to have implications for the CAP beyond 2013 and may result in fundamental reforms to this policy. Any further development of farm standards, arising through any of the above mentioned processes, will need to consider the possible effects on the costs and competitiveness of EU farm businesses. In addition, at global level, the World Trade Organisation negotiations on agriculture, forming part of the Doha Development Round, will – if agreement is reached - have broader implications for trade and, possibly, the competitiveness of EU agriculture. A new agreement including commitments to eliminate export subsidies by a given date and increase market access would increase the competition farmers in the EU face from overseas producers. In this context, the European farming industry is likely to be particularly concerned about the further development of standards, especially if they perceive the standards required of EU farmers to be higher than those which overseas producers have to meet and which impose new costs of farm businesses.

The extent to which standards impose costs on farm businesses is particularly relevant to the issue of competitiveness i.e. the ability of a farm to provide products as, or more efficiently, and at equivalent or lower cost than its relevant competitors. If some farm businesses face higher costs than other farm businesses due to higher or more stringent standards being applied to those farms, then such farms may be at a competitive disadvantage compared to farms facing lower standards.

In considering the future of cross compliance - a key EU mechanism for achieving farm level standards - policy makers need to take account of the possible impacts that such standards can have on the costs and competitiveness of farm businesses. Such cost effects will need to be balanced by consideration of the benefits delivered (or the costs avoided) of imposing standards. In particular it is felt that the benefits side needs further research.

Cross compliance is a policy mechanism designed to achieve some specific benefits in the agriculture sector but which may, as a result of the way in which the policy is applied, impose some new costs on the farming sector. Cross compliance only imposes new costs on farmers where new standards are introduced e.g. through GAEC or by imposing new administrative requirements. Since SMRs are based on pre-existing legislation, any costs associated with meeting SMRs are costs of the underpinning legislation and not costs of cross compliance. The balance between benefits and costs is critical in determining the acceptability of the policy. If cross compliance achieves few benefits but imposes substantial costs, its acceptability is likely to be called into question. But if it achieves significant benefits e.g. improvements in compliance with standards at low or moderate costs, its acceptability is likely to be greater. This study is particularly concerned with the extent to which cross compliance results in costs which are detrimental to the competitive position of EU agriculture when compared to agriculture in certain non EU countries included in this project (US, Canada and New Zealand).

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[292] COM (2007) 147 final. Report from the Commission to the Council on the application of the system of cross-compliance.

[293] COM (2007) 722 Communication from the Commission to the Council and the European Parliament 'Preparing for the 'Health Check' of the CAP reform.

[294] Communication from the Commission, Reforming the Budget, Changing Europe: A Public Consultation Paper in View of the 2008/2009 Budget Review, SEC (2007) 1188, 12.9.2007.

The results derived from this project state that the costs of compliance can be significant at individual farm level in the EU, at least for certain farm types affected by certain standards. These costs may, in turn, affect the competitiveness of such farms. However, when scaled up to sectoral level, the costs of compliance with standards are relatively limited and do not have any substantive impact on trade flows. For the dairy, beef, pigs and poultry and cereals sectors, full compliance with selected standards results in a cumulative total loss of trade of US$289 million, a small fraction of the total EU trade balance for these sectors. Furthermore, when the EU does not act unilaterally, but its key competitors also adopt similar standards or aim for increased compliance with existing standards, the impact on any trade flow is reduced.

The costs identified and the impacts on competitiveness are those associated with achieving compliance with certain selected EU standards. These standards form part of the cross compliance policy but most of the costs and impacts identified are not those of the cross compliance policy since, in the majority of cases, farmers were already required to meet these standards i.e. they pre-existed cross compliance. Cross compliance is likely however to have encouraged farmers to comply with the standards examined and can therefore be said to have induced certain costs. These costs are rather limited at sectoral level and unlikely to competitively disadvantage EU farmers. Based on this evidence, arguments put forward against the use of cross compliance as a means of meeting standards - on the basis of the high costs imposed on the agriculture sector - appear rather weak.

11.12 Alternative approaches by EU's key competitors

The policy mechanisms and private sector approaches used by the group of non EU countries studied here to set standards and achieve compliance contrast with cross compliance in the EU and are therefore of particular interest from a policy perspective. Almost all of the issues addressed by EU cross compliance e.g. nitrate pollution, soil erosion and loss of biodiversity are also the subject of attention in the non EU countries, either through government policy or industry led initiatives. But cross compliance has, for the most part, no equivalent in these countries and rather different approaches are used to address environmental and other problems and achieve desirable outcomes[295].

Some broad conclusions can be drawn regarding the approaches to meeting standards employed in the non-EU countries reviewed compared to the EU:

- Regulation in the non-EU countries is focused on a range of issues, primarily food safety and plant protection products but also control of nutrients and environmental problems arising from large scale livestock production. This regulation therefore seeks to address similar problems to that found in the EU.
- Much greater emphasis appears to be given to voluntary approaches e.g. voluntary codes of practice and best management practices - with the agricultural industry playing a leading role in establishing these – than on regulation.

[295] Jongeneel, R., Brouwer, F., Farmer, M., Müssner, R., de Roest, K., Poux, X., Fox, G., Meister, A., Karaczun, Z., Winsten, J. and Varela Ortega, C. (2007) Compliance with mandatory standards in agriculture: a comparative approach of the EU vis-à-vis the US, Canada and New Zealand. The Hague. LEI.

- Technical assistance plays an important role in particular regarding environmental issues and achieving good farming practice.
- Some financial assistance is granted e.g. linked to voluntary conservation programmes or good agricultural practices. Cost sharing approaches are employed in some cases, particularly in the USA but less so in New Zealand.

Some possible explanations for the differences in approaches are put forward. First, the institutional structures in these countries are different to those in the EU and responsibility for addressing certain issues lies with different authorities at different administrative levels. In Canada, for example, environmental regulations, programmes and policies can be found at federal, provincial and municipal levels. There appears to be less unified legislation in these countries than in the EU where, for minimum standards at least, regulations apply over the whole EU territory in a relatively consistent way. Secondly, in many sectors and locations the production intensity in the non EU countries appears to be less than that in most EU countries which might account for the lower intensity of regulation and the greater acceptance of voluntary approaches. Thirdly, this research has not examined how far cultural and societal differences, for example with respect to property rights, determine the approaches adopted to meeting standards but these are likely to be influential. It is highly likely that the attitudes of farmers, broader society and the presence or absence of different pressure groups will influence the final choices made. There is some evidence however of changing attitudes to regulation in some countries as environmental problems become more apparent.

All the countries examined through this research have a need to set, and achieve compliance with, standards in the agriculture sector in order to deliver certain outcomes in relation to the environment, public, animal and plant health and animal welfare. Policies designed to deliver such outcomes must ensure an appropriate balance between the benefits achieved and the costs imposed on farmers if they are to be deemed acceptable.

The assessment of the costs for EU farmers of meeting selected standards, compared to standards that farmers in selected non EU countries must meet, has demonstrated that, at sectoral level at least, the costs of achieving full compliance are relatively low. These costs, in turn, have only a limited impact on the competitiveness of EU farmers compared to some of their major competitors. The benefits of meeting these standards have not been fully explored by this research but it can be assumed that achieving full compliance with all the relevant standards at the farm level, compared to only partial compliance, is desirable and likely to deliver the greatest benefits.

Policy mechanisms that set standards and seek to achieve compliance with them vary across the countries examined. The EU has adopted cross compliance as a means of achieving improved compliance with existing EU legislative standards and as a means of addressing some specific problems within the agriculture sector that may arise as a consequence of other policy reforms e.g. land abandonment. In most cases, the standards underpinning cross compliance pre-existed its introduction and hence few costs identified are attributable to the cross compliance policy *per se*. Rather, these costs are attributable to the pre-existing standards which stem from pieces of legislation, either at the EU or national level. However, cross compliance encourages compliance with these standards and hence can be said to induce the costs associated with meeting standards and any subsequent impacts on competitiveness. It is for this reason that the question of the impacts of cross compliance on costs and competitiveness arises. If such costs were estimated to be significant, policy makers and stakeholders might question the efficiency of the policy in achieving its aims and explore alternative approaches. That the costs and competitiveness effects of meeting standards, induced by cross compliance as currently applied, are limited or negligible endorses the use of the cross compliance mechanism as a means of achieving benefits in the agriculture sector and helps to justify the policy.

The non EU countries considered by this research appear to use alternative and fewer regulatory approaches to achieving compliance with standards in the agriculture sector. Voluntary approaches, cost sharing programmes and technical assistance appear to be much more common. Such differences may reflect different institutional structures, the lower intensity of the problems needing to be addressed or different cultural values or societal expectations in relation to agriculture. The exact nature of these differences deserves further investigation. It may also be possible for the EU to learn from experiences in non EU countries regarding alternative methods of meeting standards in the agriculture sector. For example, it might be worth considering whether cost sharing programmes and technical assistance can achieve the same or similar benefits to cross compliance at lower cost.

11.13 Looking into the future

Regarding the future of cross compliance in the EU, several observations can be made. Cross compliance is a relatively new mechanism and early experiences of implementation led to the need for some technical and administrative revisions,). The scope of cross compliance is also open to scrutiny. Cross compliance currently consists of a defined list of legislation in Annex III and a set of issues and standards in Annex IV. As new pressures become more apparent, there is an opportunity to revise these Annexes to incorporate new standards in relation to issues such as climate change and water management. Some existing standards may also be considered unnecessary as circumstances change. The inclusion of any new requirements should always however be determined on the basis of the relative costs and benefits of any such addition and consideration of alternative means of achieving similar outcomes. The question of incentive led approaches versus regulatory approaches is likely to play out here.

Finally, the future of cross compliance is inextricably linked with the future of CAP payments. Currently, the threat of reductions or withdrawal of payments is a strong lever the EU can use to influence farmer behaviour. The reduction of direct payments in the future could lessen the leverage administrations have on compliance behaviour. In addition, the role of cross compliance and direct payments could be shaped by increasing internal (societal) or external (WTO) pressure to demonstrate that payments are linked to the provision of public goods that are not provided by the regulatory baseline. These questions may be rehearsed during the CAP Health Check and the EU Budget Review and the answers will have a significant bearing on the future of cross compliance.

In considering the future development of cross compliance, the analysis suggests that the following points are particularly important:

1. There is a need for better quality data on the effects of cross compliance on on-farm costs and compliance rates in order to better judge the effectiveness of the policy (in meeting its stated objectives), the efficiency of the policy (in terms of the cost of meeting the stated objectives) and its impact on external competitiveness.

2. The non EU countries included in this study use a range of different policy tools and mechanisms to achieve compliance with standards. The EU could further examine such alternative approaches – and the underlying factors that determine their use - and consider whether, for example, cost sharing programmes and technical assistance could offer more effective and efficient ways of meeting standards in the EU, compared to cross compliance, regulation or measures under Pillar II. Such approaches could be complementary to current approaches rather than outright replacements.
3. Further consideration could be given to the role of market led schemes and initiatives in achieving standards in the agriculture sector (particularly in relation to monitoring compliance) and the extent to which public policy and private initiatives can be synergistic or complementary.
4. In considering whether new standards should be added to cross compliance, a full appraisal of the likely costs (both on-farm and administrative) and benefits (improved compliance with legislation, more sustainable agriculture) should be conducted. Any changes introduced should ensure that cross compliance remains proportionate i.e. any costs imposed on economic actors are balanced by the public benefits achieved.
5. Regarding the future of the CAP, consideration should be given to the most effective and efficient way of meeting standards and the appropriate roles for regulation, cross compliance, incentives and market led initiatives. The future rationale of direct payments to farmers will have a significant bearing on which measures are likely to be most appropriate.

It is certain that the cross compliance mechanism will need to adapt and evolve to the changing circumstances around it. Currently, its use as a mechanism to achieve compliance with standards appears justified as the impact on costs and competitiveness are very limited. As the CAP evolves, the need for a mechanism that defines a link between payments, mandatory standards and basic environmentally beneficial land management requirements is likely to remain appropriate.