HOW TO EVALUATE THE IMPACTS OF A SUSTAINABLE CAP AIMED AT A MULTIFUNCTIONAL AGRICULTURE? THE ENRICHED PAM-FRAMEWORK

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Abstract

The challenges of agricultural policy evaluation change with the evolution of the CAP. The CAP, well-known for its classical common market organizations for key products such as wheat and dairy, has significantly changed over time. After having been ignored in the past sustainability has become increasingly important. Not only the policy objectives have widened, but also the policy measures have become more varied, with regulations and standards, and direct payments made conditional on compliance with these standards (cross compliance) gaining weight relative to price support and other incentive policies .In the paper the PAM policy evaluation framework is discussed and extended to take properly into account the changed policy environment. Things being considered are the role on green services and public goods, negative externalities, climate change, transaction costs and budget issues. Moreover, a number of well-known indicators, among which those indicating competitiveness, are revised. Finally, as an illustration the enriched PAM framework is applied to the case of the Dutch dairy sector, with a focus on the impact of the milk quota regime (relative to a constructed counterfactual in which quota are abolished)

Key words: agricultural policy, competitiveness, dairy, policy analysis matrix

1. Introduction

The importance of agriculture as a multifunctional industry seems to be growing. As European society, which its steadily increased welfare levels, is not only concerned about food (safety, prices), but increasingly also about biodiversity loss, landscape degradation, pollution of water, soil and atmosphere. To a large extent these concerns can be translated into public environmental services which can be delivered by suitably incentivized land managers (Buckwell, 2009). Alongside incentives also the impact of regulations needs consideration. By reducing negative externalities, strict(er) environmental regulations, for example, can also be argued to contribute to a public service. At the same time the increased levels of public and pseudo-private standards, may impose additional costs onto farmers, thereby weakening their competitiveness.

The CAP, which its division into two pillars (i.e. the classical price and income support policy and the rural policy), provides a policy framework, that already partly addresses these concerns, but could be further tailored to enhance the delivery of private as well as public services. Non-surprisingly, alongside the budgetary issues, the remuneration of public goods provided by agriculture plays a central role in the current debate about the design of the CAP after 2013. Various opinions exists on what exactly these public goods constitute, how they can be quantified and what monetary values might be assigned to them (IEEP, 2010 and Plankl et al., 2010).

This paper provides a framework for an economic assessment of a CAP which aims at the provision of private as well as public goods and services. The attractiveness of the framework is that it presents the impacts of incentive policies, the costs and benefits of public goods and externalities, and impacts of regulatory constraints in one integral framework. This framework not only helps to present different policy approaches in a way which makes them comparable, but also provides a number of indicators addressing efficiency as well as competitiveness issues. As such it provides a scheme which might help to think about promising directions for further agricultural policy reform. This is even more so because also a linkage is made between the various policies and their budget consequences.

The main aim of this paper is to explore ways to evaluate the impact of agricultural and environmental policies aimed at exploring a sustainable and multifunctional agriculture. It provides a framework to properly assess the costs and benefits of such policies, while it also considers the issue of competitiveness. In the next section a brief overview of the policies and the instruments they exploit will be given (Section 2). Section 3 introduces the policy analysis matrix (PAM) approach and extends this in such a way that it can be applied to a case where private as well as public goods and bads play a role. Section 4 gives an overview of empirical approaches to measure the impact of policies on competitiveness. Section 5 presents an illustrative application of the approach to the EU dairy sector. The paper closes with some concluding remarks.

2. Policies aimed at a sustainable and multifunctional agriculture

To properly attempt to evaluate the European CAP by the mean of the enriched PAM framework we think it is important to understand the mechanism behind it and how the current policy framework has been constructed during the time. If we look at the dominant theme of the nowadays CAP, it is clearly related to enhancing the conditions for sustainable resource use and delivery of private as well as public services from agriculture and rural areas. Moreover the multifunctional model of agriculture is its evident and underlying reference point.

This emphasis on sustainability and multifunctionality is the outcome of a long process of policy changes of the EU institutional environment which makes the CAP almost a unique type of policy framework worldwide. From an institutional point of view, in fact, the CAP represents an interesting case study for analysing how changing formal rules can shape and influence natural resource management in different social contexts[1]. In fact, the almost continuous process of CAP reform reinforced and confirmed the idea that institutions and institutional changes have to be deeply studied and considered in order to understand their influences on sustainability. This is often defined as the institutional dimension of sustainability which aims at integrate the three more “classical” and widely used economic, social and environmental dimensions (Spangenberg, Bonniot, 1998; Spangenberg, 2002).

Table 1 presents an analysis of the historical evolution of the CAP and how its institutional building-block process has increasingly led to a more sustainable-oriented approach in the agricultural sector and rural areas. We distinguished three phases of the CAP and highlighted the main dimension of sustainability introduced by the policy decision-making process. The first phase (1957-1968) can be defined as the “start-up” of the CAP. It is the period where the concept of sustainability and multifunctionality are not treated directly and they are not part of the policy debate. Anyway during this “constitutional” phase the concepts of economic and social viability of the CAP were both the main political goals and inspired the relative policy measures in the borning EU.

The second phase is the one characterized by the first attempt of reform and it could be considered the period between the second Masholt Plan (1968) to the 1988 when the document “The future of rural society” was published. This phase of the CAP can be considered as a substantial step forward for the inclusion of a more sustainable resource use in agriculture also underlying the relevance of the ecologic and social dimensions[2]. This phase

[1] Several theoretical approaches have been employed to study the causes and effects of institutional changes. Among the main reasons, and besides the already mentioned introduction of new policies are set, for example, the emergence of new types of transactions, new technologies, new preferences in the markets, external shocks of a socio-political (Schleyer et al. 2007). In particular strands that dealt directly with the issue of institutional changes are the "Efficiency Theories of Institutional Change" which analyzes aspects of institutional efficiency (Eggertsson, 1990; Allio et al., 1997), the "Distributional Theory of Institutional Change" which analyzes institutional changes as a result of conflicts between social groups (Knight, 1992), and finally the "Public Choice Theory of Institutional Change" which focuses on the role of political actors in the change of institutional arrangements (Weimer, 1997).

[2] in this regard an emblematic example is the contents of the Commission discussion document entitled "Prospects for the common agricultural policy" (1985), where proposals for revision of what was called the first pillar of CAP and recovery / proposition of structural policies and rural development, linking them to regional and territorial programs partially financed are put forward for the very first time. It also discussed issues related to the use of polluting chemical inputs, introducing the first references to organic farming as an alternative to traditional techniques, and emphasizing the role of agriculture in the process of maintaining and safeguarding of disadvantaged areas.

In the final chapter of the document, entitled “Agriculture in society”, the Commission again indicates the road for rural development and presents a reassessment of some components at that time neglected: the position of agriculture in the socio-economic development of rural appears as a general period of policy reflection instead of intervention which we think played a fundamental role in the understanding of a more comprehensive approach to settle the aims of the agricultural and rural policies in the EU.

The moment for acting is represented by the Mac Sherry round of reform and the introduction of the so-called "accompanying measures". De facto they embodied in the formal policy environment of the EU all the reflections and earlier attempt of introducing environmental and socially related policies related to agriculture and rural areas. It has been the starter for all the debate around sustainability and multifunctionality we experienced in the '90s which have been included in the third round of reform with the Agenda 2000 debate.

For example the Agenda 2000 reform of the Common Agricultural Policy (CAP) introduced the requirement for EU Member States (MS) to take environmental measures they consider being appropriate in view of their agricultural land.

MS could give support for agri-environmental commitments, could fix general mandatory environmental (legal) requirements, and set out specific environmental standards. As decided in the Midterm Review of the CAP in 2003, all farmers receiving direct payments are subject to compulsory cross-compliance since 2005 (Council Regulation No 1782/2003; Commission Regulation No 796/2004) [3].

There are 19 legislative acts (statutory management requirements or SMRs) which directly apply at the farm level in the fields of environment, public, animal and plant health, and animal welfare (minimum housing standards) taken up in the cross-compliance package. Farmers will be sanctioned if they do not comply with these established requirements and risk partial or even entire reduction in their direct support. Alongside the SMRs beneficiaries of direct payments are also obliged to keep their land in good agricultural and environmental conditions (GAECs).

These GAECs are defined by the MS and include standards related to soil protection, maintenance of soil organic matter and soil structure, and maintenance of habitats and landscape. Finally, they also include the protection of permanent pasture by requiring member states not to allow significant decreases in their total area of permanent pasture.

The same environmental framework (SMRs + GAECs) applied for the Rural Development Policy for the 2007-2013 as stated by the Regulation (EC) 1968/05. In 2008 the CAP Helth Check conclusions[4] reinforced the aims to achieve a more sustainable oriented agriculture in the EU Member States by strengthening the Rural Development measures aiming at supporting biodiversity and natural resource management.

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areas, the importance of space, the environment and green services. It was a first formulation of the concepts that have found place in the EU policy debate on the CAP and which introduced *de facto* the concept of multifunctionality of agriculture

[3] The Fischler reform, for example, has introduced a gradual decoupling of agricultural subsidies by introducing a single payment directly linked to evidence of possession of land and subject to the achievement of minimum requirements regarding the environment, public health, Plant and animal welfare, defined as Statutory Management Requirements (SMR) while maintaining good stewardship of the earth through the observance of rules on Good Agricultural and Environmental Condition (GAEC). This mechanism, known by the term compliance, should lead to a modification of a set of business choices from those on the types of crops and production processes (technology) to use. Furthermore, the decoupled single payment scheme and the simultaneous reform of many of the Common Market Organisations, discouraging the distorting effects of previous policies of support, which determined the chronic surplus of some crops, in fact have more "liberalized" the business and production decisions are causing a shift in strategy by being more productive than strictly on the marketing (market orientation). The reform provided, inter alia, the initiation of a gradual shift of financial resources available to the agricultural sector from first to second pillar of CAP, making it increasingly strategic options present in the Rural Development Programs (RDP) in each of the MS . The new plan for rural development has already implemented this approach and adopted as a baseline reference for the granting of any type of aid (premium, investment allowance or support) the respect of SMR and GAEC

[4] See Council Regulation (EC) No 72/2009, 73/2009 and 74/2009

Table 1 - The role of sustainability in the historical evolution of the CAP

Phase	Legislation and policy change	Relevant aims and contents	Dimension of sustainability
	Art. 39 - 47 Treaty of Rome (1957)	- To increase productivity and growth in agriculture; - To ensure adequate life conditions to the farmers; - Market (price) stability; - Food security (availability).	
	Stresa Conference declaration (1958)	- To link price stabilization policies and structural measures; - Support MS trade without compromising third countries one; - balancing production and market opportunity; - increase productivity and avoid production surplus by price control; - dismantelling national support schemes; - increase equity between agricultural and non agricultural income in the MS	Economic
CAP start-up	**I° Mansholt Plan (1960)** European Economic Community Commission, Proposals for the Working-Out and Putting Into Effect of the Common Agricultural Policy in Application of Article 43 of the Treaty establishing the European Economic Community, Brussels, 30 June 1960, VI/COM(60) 105, II/13 and 14.	- Price control - Preference for MS productions - Financial solidarity	
	Council Regulation No 17/64/EEC of 5 February 1964 on conditions for obtaining aid from the European Agricultural Guidance and Guarantee Fund	• Structural policies aim at supporting farming, farmers` production orientations, farm size, market relationships (both input and output markets) • Two lines of intervention 1. Improving social conditions and structures in agriculture (i.e. schemes for supporting farmers retirements, social indennity), introduction of extension services to increase human capital conditions 2. Improving structural conditions of the farms, access to land and capital, market relations	Economic Social
First round of reform	**II° Piano Mansholt (1968-1972)** European Commission "Memorandum on CAP reform" (1968) Directive 159/72/EEC "The modernization of agricultural holdings" Directive 160/72/EEC "Encouragement to cease farming, i.e. early retirement aid" Directive161/72/EEC "Vocational training measures for people working in agriculture" Directive 268/75/EEC "Agriculture in mountainous and certain less-favored areas "	Dir. 159/72 : Supporting the modernization of agricultural holdings via farm investment, keeping farm accounts and the setting up of producer groups; Dir. 160/72: Incentives/aids for land managers for a early retirement in favor of a land managers oriented to increase the structural endowments of the agricultural holdings Dir.161/72: Vocational training measures for people working in agriculture and support for the development of services providing socio-economic advice to farmers on whether to continue farming or to move out of agriculture Dir. 268/75 : Support of agriculture in mountainous and certain less-favored areas	Economic Social (Ecologic)
	Reg.(CEE) 797/85 for improving farm efficiency	Strengthening the principle that farmers have to be compensated for reducing input uses Continuing the support for early retirements	
	Perspectives for the common agricultural policy. Communication of the Commission to the Council and the Parliament COM(85) 333, July 1985	Modification of the price support measures and introduction of a strategy for agriculture and rural development, regional plans and MS co-funding schemes First analysis of the impact of agriculture on the environment, the use of inputs, the role of organic farming and the role of the sector in less favorite areas Re-grounding of agriculture in the general socio-economic contexts of rural areas First conceptualization of the "multifunctionality"	Economic Social Ecologic
	Council Regulation (EEC) No 2088/85 of 23 July 1985 concerning the integrated Mediterranean programs	Introducing more regional-based/oriented interventions for agriculture and rural areas. Cultural and local differences are also discussed and considered for the first time.	Economic Social Ecologic (Institutional)
	Single European Act (SEA) (1986)	Introduction of the policy for socio-economic cohesion and regional development (including rural dev.) Harmonization of the environmental policy for the MS and the strengthening of the principle "polluters pay"	Economic Social Ecologic
	Regulation EEC 797/85 and Regulation EEC 1760/87	Introduction of agri-environmental measures (i.e. nature conservation schemes, input reductions, etc.)	

	European Commission "Environment and agriculture" COM(88) 338, 1988	Rural areas and agriculture are conceptualized as multiple services providers for the European society. Landscape conservation is also emphasized. Low-input agriculture and biodiversity is included in the policy reflection .	Economic Social Ecologic Institutional
	European Commission "The future of rural society" COM(88) 501, 1988	Strengthening the role of rural areas in the European society	Economic Social Ecologic
	Support Organic agriculture Regulation (CE) n. 2092/91	Introduction of the Organic farming procedures, regulations and labeling rules.	
Mac Sherry reform	"Accompanying measures": Council Regulation (EC) 2078/92 on agri-environmental measures Council Regulation (EEC) 2079/92 on early retirement from farming Council Regulation (EEC) 2080/92 on forestry measures in agriculture.	Council Regulation (EC) 2078/92: use farming practices which reduce the polluting effects of agriculture, e.g. by significantly reducing the amount of fertilizer and/or pesticides they use; • maintain farmland or woodland which has been set aside or who set aside farmland for a long period for environmental protection purposes; and, • participate in education and training measures on types of farming compatible with the requirements of environmental protection and upkeep of the countryside. Council Regulation (EEC) 2079/92: Provide an income for elderly farmers and also for elderly family helpers and elderly paid farm workers who lose their employment as the result of a farmer's early retirement; and, • Organize the transfer and expansion of agricultural holdings and the reassignment of agricultural land to non-agricultural use and ensure rational use of the countryside. Council Regulation (EEC) 2080/92: afforestation as an alternative use for agricultural land; and, the development of forestry activities on farms.	Economic Social Ecologic (Instituional)
Third round of reform	European Conference on Rural Development "A sustainable rural environment" (Cork, 1996)	• Rural preference – i.e. sustainable rural development must be put to the top of the agenda of the European Union; • Integrated approach - rural development policy must be based on an integrated approach, multi-disciplinary in concept, and multi-sectoral in application, with a clear territorial dimension; • Diversification - rural development must provide support for diversification of economic and social activity in order to promote the development of viable rural communities; • Sustainability - rural development policy must be sustainable; • Subsidiarity - given the diversity of the Union's rural areas, rural development policy must follow the principle of subsidiarity, i.e. must be as decentralized as possible and based on partnership and co-operation between all levels concerned (local, regional, national and European); • Simplification - rural development legislation has to be simplified, in order to increase coherence between various rural development measures and subsidiarity in decision-making, to decentralize policy implementation and enhance overall flexibility; • Programming - the application of rural development programs must be based on coherent and transparent procedures, and integrated into one single program for rural development for each region; • Finance - the use of local financial resources, financial engineering in rural credit techniques and greater participation by the banking sector and other fiscal intermediaries must be encouraged; • Management - management assistance to regional and local governments and community-based groups must be increased	Economic Social Ecologic Institutional
	Commission Document "Agenda 2000 : For a stronger and wider Union" COM(97) 2000	Definition of the multifunctional model of agriculture combining competitiveness, income stability, quality, food security, local development, environmental compatibility and Rural Development as a second pillar of the CAP	
	Directions towards a sustainable agriculture COM (1999) 22	Increase interest in the environmental aspects and consequences of the CAP, the definition of a multifunctional model of agriculture, the development of environmental indicators.	
	Council Regulation (EC) No 1257/1999 on Rural Development	Brought together the previous nine instruments into a single legal framework for rural development offering a 'menu' of 22 measures; • Increased financial resources for rural development; • Introduced CAP Pillar 1 and 2 concept.	
	Goteborg strategy (Eureopean Commission, 2001)	Proposal for a European Union strategy for supporting sustainable development in the EU	

CAP Mid Term Review Council Regulation (EC) No 1782/03 and 1783/03	Increase in funds for rural development by introducing compulsory 'modulation'; • Introduction of new rural development measures (meeting standards, animal welfare, food quality, developing (as well as applying) new technologies), increasing the number of measures from 22 to 26; • Increase in EU-funding rates for agri-environmental and animal welfare schemes from 75% to 85% in Objective 1 areas and from 50% to 60% in other areas; and, • Increase in investment support for young farmers, compensatory payments in certain less favoured areas and areas with environmental restrictions, expansion of forestry support measures to state-owned forests.
Salzburg declaration (Salzburg, 2003)	Preserving the diversity of Europe's countryside and encouraging the services provided by multifunctional agriculture; • increasing competitiveness of the farming sector; • covering all rural areas of the European Union; • serving the needs of broader society in rural areas and not basing rural development on agriculture alone; • taking a decentralized, 'bottom-up' approach, i.e. relying on local partnerships and regional input; • increasing flexibility and responsibility (including capacity building); and, • simplifying rural development policy by introduction a single programming, financing and control system.
Council Regulation (EC) No(CE)1698/05 on Rural Development	1. Increasing the competitiveness of the agricultural and forestry sector through support for restructuring; 2. Enhancing the environment and countryside through support for land management; and, 3. Enhancing the quality of life in rural areas and promoting the diversification of economic activities through measures targeting the farm sector and other rural actors.
CAP "Health Check of the CAP" Council Regulations (EC) No 72/2009, 73/2009 and 74/2009	1. A single farm payment for EU farmers, independent from production; 2. Limited coupled elements may be maintained to avoid abandonment of production, this payment is linked to the respect of environmental, food safety, animal and plant health and animal welfare standards, as well as the requirement to keep all farmland in good agricultural and environmental condition ("cross-compliance"), 3. A strengthened rural development policy with more EU money, new measures to promote the environment, quality and animal welfare and to help farmers to meet EU production standards starting in 2005, 4. a reduction in direct payments ("modulation") for bigger farms to finance the new rural development policy, 5. a mechanism for financial discipline to ensure that the farm budget fixed until 2013 is not overshot, 6. revisions to the market policy of the CAP

Source: our elaboration

From a theoretical point of view what the history of the CAP tells us is that:

- the introduction of any policy changes aiming at introducing a more sustainable and multifunctional agriculture and rural development is a complex mechanism which takes time;
- new regulations modify the institutional environment by embodying in the formal rules of society informal rules such as cultural perspectives, traditions, norms, ethical and political sensitiveness;
- to make any of these changes (institutionally) sustainable it is necessary to introduce a balanced set of rules which acts at different institutional levels and not only impose restrictions and constrains (penalties and limitations) but also incorporate "new" pay-offs (incentives) such as subsidies and supports for non-tradable productions and services, which are remunerated directly by societies.

It is straight forward to include and consider more in detail all these elements to renew and reinterpret more tradition tools of policy analysis such as the Policy Analysis Matrix.

3 The PAM-framework

3.1 The standard Policy Analysis Matrix

The policy analysis matrix (PAM) framework was initially developed in the early 1980s by Monke and Pearson (1998)[5]. The PAM framework involves the derivation of several important indicators for costs and benefits as well as of protection and comparative advantage. The basic framework is shown in Table 1. The PAM consists of two accounting identities (see row 1 and row 2). The first one (row 1) defines profits as the difference between revenues and costs evaluated at private terms. The second one (row 2) calculates social profits as the result of revenues minus costs evaluated at social terms. The last line (row 3) measures the effects of distortions (distorting agricultural policies and/or market failure) as the difference between private and social values. These divergences are approximations because the social values are evaluated at the initial distorted levels of outputs and inputs (Masters and Winter-Nelson, 1995). Hence, the PAM provides guidance for incremental changes rather than wholesale ones (Fang and Beghin, 2000).

Table 1 Policy Analysis Matrix

	revenues	costs		profit
		tradable inputs	non-tradable inputs	
1) valued at private prices	A	B	C	D = A – (B +C)
2) valued at social prices	E	F	G	H = E – (F + G)
3) divergence	I = A-E	J = B-F	K = C-G	L = D-H

Source: Monke and Pearson (1989, Table 2.1)

Measures A, B, C, and D (private profitability) reflect observed prices, including the impact of taxes and transfers. As such they show the competitiveness of the agricultural system of production activity, given current technologies and policy transfers. Row 1 can thus

[5] The PAM approach links to the extensive literature on social benefit-cost analysis. Monke and Pearson (1989) and Pearson *et al* (2003) provide also a detailed discussion of the empirical estimation of the PAM.

be directly linked to the costs of production approach discussed in the previous section. The main difference is that now revenues are explicitly included and that the costs decomposition is slightly different. Costs are distinguished according to the tradability of the inputs.

The second row of Table 1 measures social profitability, by evaluating revenues and costs at shadow prices or social opportunity costs. A positive social profit (H) indicates that scarce resources are used efficiently and the activity has a static comparative advantage[6]. When social profit is negative, a sector cannot sustain its current output without assistance from the government. The costs of domestic production then exceed the cost of importing at the margin. Continuing home production in that case implies a waste of resources, irrespective of the (positive) private profitability.

The PAM framework can be easily used to address the efficiency issue, which is so prominent in cost benefit analysis. The link between private and social costs and benefits (or profitability) can be expressed in terms of a private PCB and social cost benefit ratio SCB indicator. These may be written as:

$$PCB = \frac{B+C}{A}, \qquad SCB = \frac{F+G}{E} \tag{1}$$

These indicators may have any value in the non-negative domain of $\Re$. Positive net benefits imply a ratio smaller than 1. Ratio's larger than 1 indicate net economic losses and point to a waste of private or social resources.

As compared to the cost of production approach the PAM approach has several advantages. It explicitly recognizes the impact of policy distortions. Moreover, standards might generate a price premium from the consumer, which is automatically taken into account in the PAM-approach because it includes the revenue-side.

As Table 1 shows, the PAM requires estimates of the social output and input prices (shadow prices). The link between observed market prices and shadow prices is the nominal protection coefficient (NPC), a ratio that contrasts an observed (private) price with a comparable (social) world market price. An NPC for outputs (=A/E) which are subsidized would imply a factor greater than 1. An NPC for inputs (=B/F) which are subsidized will generate a conversion factor less than 1. See Tsakok (1990) for a detailed discussion about the determination of shadow prices.

3.2 Extending the PAM to include positive and negative externalities and public goods and bads

In this subsection the PAM approach is extended further to explicitly include the positive and negative externalities of agriculture, as well as its contribution to public goods and bads. This is a necessary step if one aims at analyzing the policy impacts aimed at achieving an integral evaluation of a multifunctional and sustainable agriculture.

Negative externalities arise when a producer (or a consumer) imposes costs on others for which the imposer can not be charged. Positive externalities occur when a producer (or

[6] From the project appraisal literature (e.g. Gittinger, 1984, 329-352) it is known that to compare mutually exclusive alternatives, the ideal measure would be net social profits (or net economic benefit) H. However, in the competitiveness assessment literature the NSP is found less useful because it is denominated in specific units with a physical numeraire (hectare, ton product). As a consequence it is difficult to compare NSP values across different activities. For reasons of comparison unit free measures like DRC and SCB are preferred (Tsakok, 1990).

Changes in competitiveness can be analyzed by comparing the changes in PAMs associated with different policy scenario's. This is in principle a comparative static comparison. However, newly introduced or changed regulation often involves an adjustment process by farmers over time. It could be therefore necessary to take into account a more dynamic analysis (DEFRA, 2005, 17 and 21).

consumer) creates a benefit for others, for which the provider can not or does not receive compensation. Examples of negative externalities are environmental externalities (e.g. soil degradation, impact of chemical use on groundwater) and animal welfare, whereas examples of positive externalities are the joint-‘production’ of a nice and enjoyable landscape by agriculture (e.g. cows in the meadows, birdlife and biodiversity associated with rice wetlands). Externalities are closely related to public goods and their allocation suffers from market failure (see Baumol and Oates, 1988 for further details). In Table 2 the positive and negative externalities therefore are included in the column non-tradable outputs (see the newly added column as compared to Table 1).

Table 2 Extended Policy Analysis Matrix for analyzing the impact of regulations in a case including externalities

	Revenues		costs		profit
	non-tradable outputs	Tradable outputs	tradable inputs	non-tradable inputs	
1) valued at private prices	AES subsidies (FNMB)	A CMO coupld. direct payments (FCDP)	B	C	**D** = A + FNMB + FCDP – (B +C)
2) valued at social prices	Public net benefits from reduced negative and increased positive externalities (PNMB)	E	F	G	**H** = E+PNMB – (F + G)
3) divergence	M = FNMB-PNMB	I = A+FCDP-E	J = B-F	K = C-G	L = D-H = M+E–J-K

Source: Own scheme based on Monke *et al* (2003)

As Table 2 shows farmers can be compensated for producing positive externalities or avoiding negative ones, which would increase their total revenues (e.g. compensatory payments for participating in AES). As is shown in the second row of Table 2, the negative (positive) externalities generated by agriculture impose costs (benefits) to society. As Table 2 further shows, taking into account the externalities changes the calculations, both in horizontal and vertical direction. Farmer’s profits is corrected by adding the non-market benefits received by farmers (FNMB) to the revenues. Also direct payments, which are coupled to production activities, but go beyond the market, are explicitly recognized (see FCDP) and added to the farmer’s revenues (see row one)[7]. In the second row the public net benefits associated with the positive and negative externalities (PNMB) are taken into account in the social evaluation of production. If agriculture creates large amount of positive externalities (e.g. due to agriculture’s claimed multifunctionality) this gives a positive PNMB and improves its social profitability (H).

[7] Although the decoupled direct payments (cf. the Single Farm Payment under the CAP) do contribute to private profits in case they are really decoupled it does not make sense to include them in the PAM analysis.

As a result of the extension the private and social cost benefit ratio's (see equation 1) also have to be adjusted. These more inclusive measures may now be written as:

$$PCB = \frac{B + C}{A + FCDP + FNMB}, \qquad SCB = \frac{F + G}{E + PNMB} \tag{2}$$

Both public goods and externalities are sources of market failure and provide a reason for government interference in order to guarantee an adequate and acceptable provision. Although, like is well-known from public sector economics, there is no need for the government to rely on in house production. She can be outsource to agriculture, but the government is needed to provide the required finances (Stiglitz, 2000). For that reason, as an additional indicator, a budget line maybe attached to the extended PAM-framework. The budget expenditure equation (BE) may be written as

$$BE = FCDP + EXSUB + DP + FNMB \tag{3}$$

where price support expenditures FCDP, export subsidies EXSUB and decoupled direct payments DP together make up the expenditures under the 1st pillar of the CAP, and FNMB comprises (part of the) 2nd pillar expenditures.

3.3 Transaction costs

Table 2 does not refer to transaction costs. However, different policies imply different transaction costs of enacting, implementing, organizing and monitoring. Well-designed and implemented administrative activities, organizational procedures, etc. are may be crucial for the success of agricultural, environmental and nature conservation policies. Although there might be an element of waste (rent-seeking costs) as such transaction costs are likely to often have a productive function. Recognizing that transaction costs are costs associated with human activity implies that these costs should be taken into account if decisions are to be made to maximise economic efficiency in resource allocation (Falconer et al., 2001: 99). Note that transaction costs will occur both at the public and the private side. Moreover, they are likely to vary with different institutional arrangements and policy instruments. Hence transaction costs need to be included in an integral and comparative cost-benefit evaluation.

How should transaction costs be included in Table 2? As regards the private transaction costs, they can be argued to be already implicitly included in line one of Table 2 and therefore also already implicitly accounted for in the estimate of private profitability. Take the private transaction costs for the farmer associated with participating in an AES-scheme. The farmer is likely to have some search costs in order to find the optimal scheme for his situation. Moreover, when participating, the farmer will face some costs in terms of record keeping, monitoring, etc. As such these activities imply that the farmer participating in an AES has to allocate part of his time to these activities. He is then no longer able to spent this time elsewhere at his farm, and his 'reduced' labour input elsewhere is likely to imply certain costs (forgone benefits). For example the time reallocation might imply a slightly lower roughage production, as a consequence of which the farmer decides to buy some additional compound feed. The increase in compound feed costs will be reflected in the private profitability calculation. So private profitability will usually already include the impact of private transaction costs. Explicitly recognizing them and adding them as an additional costs to the observed profitability would imply double counting.

As regards the public transaction costs (e.g. costs of public administration), they are often ignored and not yet part of the calculation scheme presented in Table 2. Since public transaction costs imply a social cost they should be added to the costs. For example, the social costs associated with offering a farmer an AES-scheme, are not limited to the government expenditure associated with compensating the farmer for his agreed efforts, but also should include all costs the public administration makes to be able to offer and operate such a scheme. As they are social costs they should show up in the second line of Table 2. Moreover, they lead to an adjustment of the budget expenditure equation (see equation 3), which now should also account for the public transaction costs (PuTC), or

$$BE = FCDP + EXSUB + DP + FNMB + PuTC \qquad (3')$$

Although here presented in an aggregated way, the public transaction costs could be decomposed into subcategories linked to specific government policies (e.g. direct payments, AES-schemes, the milk quota regime, the monitoring of the Nitrate Directive, etc.).

3.4 Sustainability and compliance

Pearson *et al* (2003, Chapter 7) extent this further and calls a farming practice unsustainable if it imposes negative environmental externalities, creates environmental degradation or results in both types of market failure. They call a production system sustainable if production system the farming practice imposes few or no negative environmental externalities and resource degradation. The existence of market failure or absence of certain markets provides a rationale for government intervention, where efficient policies will aim at removing or lessening the divergence between private and social prices[8]. As compared to Table 1 now a new divergence is included (see Table 2, node of first column and third row). If FNMB < PNMB, or M < 0, the externalities valued at farm are lower than when valued at society's willingness to pay. If agriculture produces a lot of negative externalities (PNMB < 0), this creates a social cost to society[9]. Note that (given FNMB=0) the divergence of the externalities column will be than a positive amount (M>0) representing an implicit subsidy to farmers (by not charging any costs for the negative impact they create to society by producing the negative externality).

In order to evaluate the impact of regulation Pearson *at al* (2003) propose to calculate an unsustainable (without regulation) and sustainable (including the impact of the regulation) PAM-scenario's and doing a comparative analysis. Moreover, they advise the construction of an environmental PAM, which include as a first row the private evaluation corresponding to the non-sustainable case and as a second row the social evaluation associated with the sustainable PAM. The divergences in the environmental PAM thus measure the differences between private returns, costs and profits under the initial unsustainable system and the social returns, costs and profits under the policy-induced sustainable PAM. The divergences found in such an environmental PAM are normally greater than those in either the sustainable or

[8] In principle a first best solution would be to impose a system of Pigovian taxes (see Baumol and Oates, 1988, Chapter 2). Policy makers instead usually turn to a second-best policy of imposing regulative standards because in practice it is extremely hard to measure external costs or benefits with any degree of accuracy. This prevents selection of appropriate tax rates. For the same reason the selection of an appropriate quantitative standard to regulate for example the input use of chemicals turns out to be also arbitrary (Pearson *et al*, 2003, Chapter 7). However, direct regulation has the 'advantage' to define clear and specific policy targets.

[9] See Pretty *et al* (2000) for an assessment of the external costs of UK agriculture. Rather than the willingness to pay-valuation approach they focus on the financial costs of prevention or restoration. They show the substantial role of external costs, but did not yet value the contribution of positive externalities.

unsustainable PAM because they reflect the effects of the restricting regulation. For an empirical application following this approach see Reig-Martinez and Estruch-Guitart (2006).

The PAM analysis can also be used to determine the costs of compliance. However, following this methodology it becomes clear that cost of compliance can refer to either the private or the social cost of removing or reducing negative externalities (e.g. through cross-compliance regulations) or by introducing or increasing positive externalities (e.g. by agri-environmental schemes). The compliance costs can be found by comparing the profitabilities in the unsustainable PAM (normal type D and H) with those in the sustainable PAM (denoted by bold type **D** and **H**; see Table 2). The private cost of compliance (PCC) is the private profit forgone due to the imposed regulation[10]. The social cost of compliance (SCC) is the loss in national income (social profitability) incurred because of the decision to apply the regulation standards. As regards the social costs of compliance, it is clear that this will be affected by the 'value added' of the regulation, *viz*. the created net benefits in terms of an improved environment, an increased animal welfare level, or a more attractive landscape.

4. Competitiveness

4.1 Competitiveness

To answer the question whether EU agriculture may loose competitiveness due to its increased compliance and adherence to cost-increasing standards following cross-compliance, first the concept of competitiveness has to be defined. Surprisingly the notion of competitiveness—although often used in business and policy-maker language—has no single definition and clearly established link to economic theory (Gardner, 2006, 7)[11]. In itself, competition is a complex economic phenomenon, which alongside the notion of classical price competition includes a multitude of other dimensions. The competitiveness concept has been used in a broad set of contexts and levels of aggregation (country, industry, firm level) and is often defined relative to its use.

From a producers perspective competitiveness could be described as the ability to supply goods and services in the location, form and place sought by buyers, at prices that are as good or better than those of other potential suppliers, while earning at least the opportunity costs of the return on resources employed. Alternatively, national sector level competitiveness refers to the ability of a country to produce goods and services hat meets the test of foreign or world market competition, while simultaneously maintaining and expanding domestic real income (Kaspersson et al., 2002).

The competitiveness of a firm or sector cannot be separated from the performance of up- and downstream industries. To asses the competitive potential of a complete supply chain Porter's (1990) diamond-framework is helpful. Porter relates competitiveness to the ability to successfully innovate. His approach is thus useful to be applied to differentiated products. His competitiveness indicator consists of six elements: firm strategy and rivalry, government, demand conditions, related and supported industries, factor conditions and change.

[10] The cost of compliance of a set of regulations can be different from the aggregated costs of single regulation evaluation studies. The cumulative burden could be well less than this sum, due to synergies between efforts to satisfy more than one regulation at the same time (see DEFRA, 2005, 21).

[11] Gardner gives a preference to the productivity concept rather than to competitiveness, which he argues to often be an ambiguous or tautological concept. "Meaningful international comparisons of overall competitiveness go no further than comparisons of total factor productivity. For analytical purposes, economists would do just as well to dispense with the concept of competitiveness, except as a shorthand expression for a country's capabilities to export a commodity under a free-trade regime" (Gardner, 2006,7).

The concept of competitiveness can be applied not only at different levels of aggregation, but also from an *ex ante* and *ex post* perspective. In this analysis, we will apply an *ex ante* perspective and focus on measures of potential competitiveness taking into account the current reforms as implemented by the cross-compliance constraints. This means that in our case, the counterfactual situation is a hypothetical situation where all EU farms adopted the cross-compliance measures. This situation is compared to the observed factual situation, where no cross-compliance measures are adopted.

4.2 Indicators based on PAM-framework

There are two indicators of relative efficiency or comparative advantage, which can be easily derived from the PAM are the domestic resource costs (DRC) and the social cost-benefit (SCB) ratio. The DRC, which was developed in the 1960s by Bruno and Krueger, is defined as the shadow value of non-tradable factor inputs used in an activity per unit of tradable value added (Masters and Winter-Nelson, 1995). Or, the DRC compares the opportunity costs of domestic production to the value added that it generates. In terms of the PAM the DRC is defined as G/(E-F), where the term (E-F) can be interpreted as an estimate of the social value added[12]. The DRC indicates whether the use of domestic factors is profitable (DRC<1) or not (DRC>1). The DRC may alternatively be written as

$$DRC = \frac{G}{(E-F)} = 1 - \frac{H}{(E-F)} \qquad (4)$$

which shows that activities contributing to income growth (net social profits H>0) will imply DRC values between zero and one. Unprofitable activities (H<0) have DRC values above zero, or negative if tradable input costs exceed revenues (F>E).

The DRC measure has been widely used, both in academic research as well as in applied work (e.g. the World Bank sector studies, and studies done by FAO, IFPRI and OECD), to measure efficiency and competitiveness and as a guide for policy reforms for developing countries.

A weakness of the DRC is that it may be biased against activities that rely heavily on domestic non-traded factors. Because the DRC isolates the costs of domestic factors, it might understate the social profitability of activities which make intensive use of these resources rather than of tradable inputs. Examples particularly relevant in agriculture are land and some subsets of labor. An alternative measure avoiding these weaknesses is the SCB ratio, which was already defined before (e.g. equations (1) and (2)). The SCB indicator, which accounts for all costs, equivalently may be written as

$$SCB = \frac{F+G}{E+PNMB} = 1 - \frac{(E+PNMB)-(F+G)}{E+PNMB} = 1 - \frac{H}{E+PNMB} \qquad (5)$$

If net social profits (H) are zero the SCB (and also the DRC) is equal to one. Profitable activities have an SCB between zero and one, and unprofitable activities have an SCB greater than one.

As such the SCB avoids the classification errors, which may show up in the calculation of the DRC (Masters and Winter-Nelson, 1995). As can be easily seen, the SCB ratio produces activity rankings that are consistent with maximizing social profitability (H).

[12] There are two methods in use to calculate the value added: the Corden method and the Balassa method. Here the Balassa method, which refers to only direct value added and is less data demanding than the Corden method, is our preferred choice (see Tsakok, 1990, for further details).

When only internal competitiveness comparisons are made, the issue of exchange rates can be ignored. For assessing external competitiveness and exchange rate conversion is required to transform all costs and benefits into a common currency.

Similar to costs of production estimates, DRC and SCB ratio's are estimated from average cost budgets and use observed input-output coefficients that are observed under market prices rather than under shadow prices. Because the coefficients are observed under market prices rather than shadow prices the indicators ignore substitution and cross-price effects (Masters and Winter-Nelson, 1995). Although the indicators are not ideal, they remain widely used since the elasticities and other data needed to implement a more flexible model are often not available or too costly to recover[13]. An alternative and more flexible way would be to use an economic simulation model. This approach is sketched in the next section.

5. Illustrative application to Dutch dairy sector

This section provides an illustration of the extended PAM evaluation framework by applying it to the Dutch dairy sector. Dairy is an important sector in the Netherlands with a total production value in 2008 of 4.2 billion euro (the second sector after ornamental plants) and a share in total land use of about 45%. In terms of its main output, the main contribution of the dairy sector is the supply of raw milk, which is used in a host of dairy products such as drinking milk, fresh dairy products (yogurts, etc.), cheese, cream, butter, skimmed and whole milk powder, whey, casein, etc. Alongside raw milk, the sector also produces beef and veal. Moreover, at the same time the dairy sector contributes to the delivery of certain public goods or rural services (e.g. IEEP, 2010). The sector also has an environmental impact or generates negative externalities, which may or may not be subject of agricultural and environmental policies. More specifically the impacts can be listed as:

- Landscape and habitats (for birds)
- Biodiversity
- Soil
- Water
- Air
- Greenhouse gases
- Erosion reduction
- Damage to the environment
- Damage to (human) health
- Animal welfare

The set-up of this illustrative case is constructed in the context of the announced dairy policy reform. Since 1984 the dairy sector is subject to a milk quota *cum* super levy regime. Whereas other sectors, such as cereals, wine, etc. have been significantly reformed since the 1992 MacSharry Reform of the CAP, the dairy sector was largely exempted until 2003. However, criticisms of the milk quota system increased, as being to distortive, protectionist, and inflexible to profit from expanding world trade in dairy products. In the 2003 Mid Term Review, it was decided to abandon the milk quota regime in 2015. In the meantime an anticipatory stepwise policy adjustment has be announced (see outcome of Health Check, 2008), implying a quota increase of 1 per cent per annum. This gradual phasing out of the

[13] Tsakok (1990, 90) cites a study from Balassa et al (1982) from which she concludes that there is a high correlation between effective protection coefficient measures under the alternative assumptions of zero and unitary elasticities of substitution. This suggests that ignoring substitution might still give a reasonable approximation. However, this issue needs further research.

milk quota was intended to create a soft landing and helping to avoid a big shock in 2015 (Requillart et al, 2010). With the extreme price volatility during the period 2007-2009 the soft landing that was aimed for was not achieved. Due to the low prices in 2008-2009 in many EU member states the milk quota were no longer binding, although in the Netherlands they remains binding and prices for quota right remained still high (Jongeneel and Van Berkum et al, 2010). As was projected by Réquillart et al (2008) quota abandonment is likely to lead to a significant milk supply increase by about 20% in 2020. The EU has lowered intervention prices for dairy products to about €0.21/kg of milk, which transforms the intervention mechanism into a safety net at a low price level, which is expected to be close to the world market price level (although more stable). The illustrative case is constructed in such a way as to reflect this change. The two alternatives compared are the current situation (with milk quota) and the liberalized dairy market situation (without quota and a 20% higher production, and with an EU raw milk price of €0.21/kg of milk as a proxy for a stable world market or border price level).

In a review article about the Dutch dairy sector and EU dairy policy reforms and elaborating on earlier work of Oskam (1988, 20-24), Jongeneel (2010, 170) shows that the milk quota regime not only affects the dairy market and helps to support the farm income (via restricted supply scarcity of milk is artificially increased), but also generates significant side effects with policy relevance. Reflecting on quota abandonment he signals that the environmental pressure generated by the dairy sector may then substantially increase. In the stylized example constructed below, this aspect is taken into account and integrated as part of an enriched PAM analysis.

The Dutch dairy farms dominantly belong to the so-called high input/high output dairy farming systems. EU wide, this farming system has a share of about 85% in the EU's total milk production (CAES, 2000). When looking to past trends, dairying can be stated to have become more and more intensive. For example in The Netherlands the milk yield per cow and milk output per hectare. Production of milk is concentrating on fewer and larger dairy farms. This increase in the intensity of production has the tendency to increase the negative environmental issues associated with dairy production. Intensive dairy systems are associated with high use of chemical fertilizers, pesticides and mechanical methods, which in turn contributes to direct source point pollution, diffuse pollution and pressure on marginal habitats and landscape features. However, existing agricultural and environmental policies are likely to affect the output of negative externalities.

As an example, the milk quota system combined with the over time increasing milk yields per cow, has contributed to a lowering of the total dairy herd in the Netherlands. As such this policy contributes to a reduction of the animal density with dairy cows and also lead to a (relative) reduction in the emission of green house gases coming from dairy (in particular the emission of methane). 'Relative' here refers to a chosen benchmark, the production of dairy without the quota scheme curtailing the supply of milk. Given the high milk quota rent, the production of milk would most likely have been much larger without the quota system being in place. This is confirmed by a recent study, according to which abandoning the milk quota is estimated to lead to an increase of the Dutch dairy production by about 20% (Réquillart *et al*, 2008). Thus, whereas intensity of milk production is likely to increase due to farm scale increase (increasing herd sizes), the EU's current supply management policy seems to effectively curb the intensity increase per member state and also in terms of animals per hectare.

The choice of a benchmark was already referred to in the case of the assumed alternative dairy policy (no milk quota). However, when the focus would be strongly on sustainability (rather than on the impact of the dairy policy), the reference case could have been chosen in such a way as to reflect the desired sustainability standards. For example, in case of biodiversity this could have implied that the costs of the current situation would have been approximated by the costs that would have to be made to restore biodiversity and habitats to the position in which they satisfy the sustainability criteria (see Pretty et al, 2000, 125 for a study following the latter approach).

Out of the list mentioned above, in this study only the following public goods and externalities are taken into account: biodiversity, wildlife management and landscape, the nitrate pollution, the greenhouse gas reduction-effect and monitoring and evaluation costs (reflecting part of transaction costs). Table 2 presents a rough estimate of the contribution of the Dutch dairy sector to the provision of public goods. The estimates are based on data in the period 2004-2008. As Table 3 shows the total remuneration is €26.7 million. The social value of the green services provided by agriculture is estimated to be on average €125 per hectare for normal land (rough estimate based on Brouwer and Slangen, 1998), whereas the landscape and amenity benefits for land under special bird and habitat agri-environmental schemes is assumed to be or 2 times the price paid for the provision of the services (prices are assumed to cover costs farmers make, but ignore consumer surplus value).

The middle part of Table 2 provides a rough estimate of the environmental (opportunity) costs associated with the pollution of the groundwater caused by surplus manure and fertilizer applications. It is assumed that dairy can be treated as an average sector, and has an N and P surplus per hectare of 120kg N and 25kg P. In order to valuate the costs of these negative externalities a treatment or prevention cost approach is followed. Based on Braaksma and Bos (w.y) these costs are estimated to be €2.20 per kg of N and €8.50 per kg of P surplus.

The lower part of Table 2 gives an estimate of the total amount of greenhouse gases (mainly methane) produced by the Dutch dairy sector. Assuming the price of carbon credits of €10/ton CO2 to be a good approximation of the social costs associated with emissions, the societal value is estimated to be 2.7 million euro. Note that this is a cost.

Finally, at the bottom line of Table 2 an estimate of the monitoring and evaluation costs associated with the provision of public goods or management of the externalities is given. These costs are estimated to be €25/ha for normal land and €50/ha for land which is under special agri-environmental schemes. Applying this to the estimated total number of 727 thousand hectares of pasture and forage area used by the dairy sector, this amounts ??€.

When choosing as a benchmark the without quota system milk output, which is here estimated to have been 20% higher, whereas the price is estimated to decline from €0.32 to €0.21 per kilogram of raw milk (the latter level follows the EU safety net or intervention provision, which is assumed to be close to the world market (or border) price level). Beef and veal border prices are assumed to be 80% of the EU price level. The impact of having the milk quota system, curtailing Dutch milk supply rather than a without quota situation is presented in the most right column of Table 2. It is assumed that in the without quota case participation in agri-environmental schemes will decline by 70%. Alternatively, having the quota regime is assumed to generate additional benefits with respect to biodiversity. With respect to the surplus of N and P it is assumed that a 20% dairy production increase will lead to a 10% increase in the N and P surpluses (the remainder is assumed to simply be replacement of other animal productions by expanding dairy production). With the production with the quota being about 20 percent lower than without the quota, the avoided greenhouse gas emission costs are assumed to be 20 per cent lower (i.e. being proportionally adjusting). Finally it is assumed that abolition of the quota would involve a saving of 20 percent on the monitoring and evaluation costs, since compliance with the quota regulation no longer has to be checked.

Table 3 Estimated contribution of the Dutch dairy sector to biodiversity, fertilizer pollution and greenhouse gas emission

Themes and management schemes	ha	estimated compensation €/ha	aggregate compenstion (in 1000€)	societal valuation in 1000 €	additional benefits in 1000€
Biodiversity, wildlife and landscape					
Handicaps	10000	250	2500	5000	3500
Botanic	5500	1200	6600	13200	9240
Meadow birds light	60000	225	13500	27000	18900
Meadow birds medium	5800	350	2030	4060	2842
Meadow birds intensive	4200	500	2100	4200	2940
Total biodiversity and wildlife	85500		26730	53460	37422
Total agricultural landscape	641500			80188	32075
Environment	1000 ha	surplus kg/ha	aggregate surplus	purification costs	avoided costs
N	730	120	87600	192720	19272
P	730	25	18250	155125	15513
Climate	mln cows	kg CO2 equivalent per cow	aggregate mill kg CO2 equivalent	emission costs in 1000 €	avoided costs
Greenhous gass	1.2	225	270	2700	540
Transaction costs	1000ha	costs/ha		social costs	avoided costs
Monitoring and evaluation	730	25/50		20313	-4062.5

Source: own estimates based on Leneman and Schrijver et al, (2008, 11), Berkhout and Van Bruchem, (2010, 131), Braaksma and Bos (w.y., 117-119).

Basically the set-up of Table 2 is followed, where the results are presented into two subaccounts: one on the private evaluation of costs and benefits and one on the social evaluation of costs and benefits. As regards the private evaluation of costs and benefits see Table 4 below. Since the example is highly stylized no particular date is added to the data. Data are rounded and 'normalized' estimates using information from the period 2004-2010[14].

Table 4 Revenues and costs valued at private prices (provisional estimates in mln euro)

[14] Note that this Dutch dairy example, which is only used for the purpose to illustrate the enriched PAM methodology, is stylized and rough in various ways. Although the framework includes external costs (i.e. the costs incurred by the rest of society for actions of farmers) determination of these costs has been largely based on a treatment or prevention cost approach. However, this approach is known to be not necessarily appropriate, since it may underestimate the true cost (Pretty et al, 2000, 118). Agriculture's impact on biodiversity is estimated according to the costs of implementing plans or policy measures aimed at returning species and habitats to levels which are assumed to be acceptable by society (with the democratically elected governance body being assumed to well-reflect the preferences of the EU citizens). Although for valuation of the agricultural landscape some WTP information was used, our current estimates of these public good benefits are still very rough and uncertain. Moreover, they are likely to underestimate the non-user value component, which may imply the ignorance of a substantial factor (and the applied upscaling correction might be in adequate). Furtheron, only a few negative and positive externalities and impacts have been included in the analysis, whereas it was shown that agriculture is a multifaceted industry, with many more impacts that deserve consideration. As such the analysis is still largely incomplete. Finally, the example ignores dynamic aspects (i.e. the time lag between the cause of a negative or positive impact and its expression as a cost or a benefit), whereas these are known to be important bot form an empirical pwerpective as well as from a theoretical proper cost benefit analysis-perspective.

Revenues		Costs	
Tradable outputs		*Tradable inputs*	
Milk	3650	Feed	931
Beef & veal	599	Energy	215
		Other	1344
Payments		*Non-tradable inputs*	
Single farm payment	364	Family labor	1308
Other payments	22	Land and capital	1205
		Veterinary services	218
Non-tradable output			
AES compensations	27	Profits	-560
Total	4662	Total	4662

Source: own provisional calculations partly based on Bedrijven-Informatienet van het LEI

Table 5 presents the social valuation of revenues and costs. Milk and beef and veal output are now valued at border prices[15]. Using information from Table 3, the numbers associated with the green services and externalities is added. Note that the direct are now left out because pure transfers cancel out in a social costs benefit analysis. The additional biodiversity benefits, as well as the avoided costs for N, P surpluses and greenhouse gas production are included in the analysis now. However, in relative terms they are to small to compensate the loss in output value (note that the latter effect will be underestimated since the quantity-effect is here ignored). As Table 5 shows the social return (or profit) is 4 times more negative then the private profit (which is also negative). The now included social benefits from the public goods or reduced externalities, which amount about €100 million do not compensate for the negative value adjustment of outputs. Of course the reductions in the value of milk and beef and veal, although negative for farmers, are good for consumers and represent a similar benefit for them[16].

Table 5 Revenues and costs valued at social prices (provisional estimates in mln euro)

[15] Note that only prices, but not the volumes are adjusted although also volumes could have been changed.
[16] The consumer benefit derived from having lower milk prices is ignored

Revenues		Costs	
Tradable outputs		*Tradable inputs*	
Milk	2395	Feed	931
Beef & veal	479	Energy	215
		Other	1344
Services		*Non-tradable inputs*	
Biodiversity	37	Family labor	1308
Landscape	32	Land	1205
		Veterinary services	218
Environment			
N -pollution	19		
P-pollution	16		
Climate		Social return	-2246
Green house gasses (Methane)	0.5		
Transaction costs			
Monitoring and evaluation	-4		
Total	2975	Total	2975

Source: own calculations.

The PCB and SCB indicators are 1.12 and 1.75 respectively. Since they are all larger than one, they indicate that the net benefits are non-positive. As regards competitiveness the DRC indicator is calculated as 7.10. When profits would have been positive the DRC indicator should have a value between zero and one. The indicator indicates that the Dutch dairy sector is not competitive. This is not-surprising since even with the protection implied by the dairy policy it already not profitable (e.g. remunerate the primary factors of production to a level comparable to the earnings for these factors elsewhere in the economy). The degree of protection can be easily calculated as discussed before, with the NPC of raw milk and beef and veal being respectively 1.5 and 1.2, which, since they are greater than one, imply subsidization of the outputs of the dairy sector.

6. Concluding remarks

In this paper we gave a brief sketch of the evolution of the CAP, with an over time increasing emphasis on sustainability, the increasing role of agriculture in provisioning public goods (biodiversity) as well as role of negative externalities (pollution). Subsequently the PAM framework evaluation framework was presented and extended to the case of a multifunctional and sustainable agriculture.

The presented extended PAM approach including externalities, creates the possibility of an integrated or full efficiency analysis taking into account the benefits and costs of positive and negative externalities. Moreover, it helped to define the private and social costs of incentive policies and regulations. The framework provides insight into the 'value added' of the changed policy orientation. The framework also provides indicators for evaluating the impact of agricultural, environmental and rural policies on agriculture's competitiveness. Finally, the issue of budget and transaction costs are linked to the framework.

The evaluation framework was applied to a highly stylized example of the Dutch dairy sector, where a milk quota and a without milk quota scenario are compared. Although the non-market benefits and costs are taken into account, this does not help to make the Dutch dairy sector profitable. As such the sector seems to be not competitive under the highly stylized conditions that were assumed.

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