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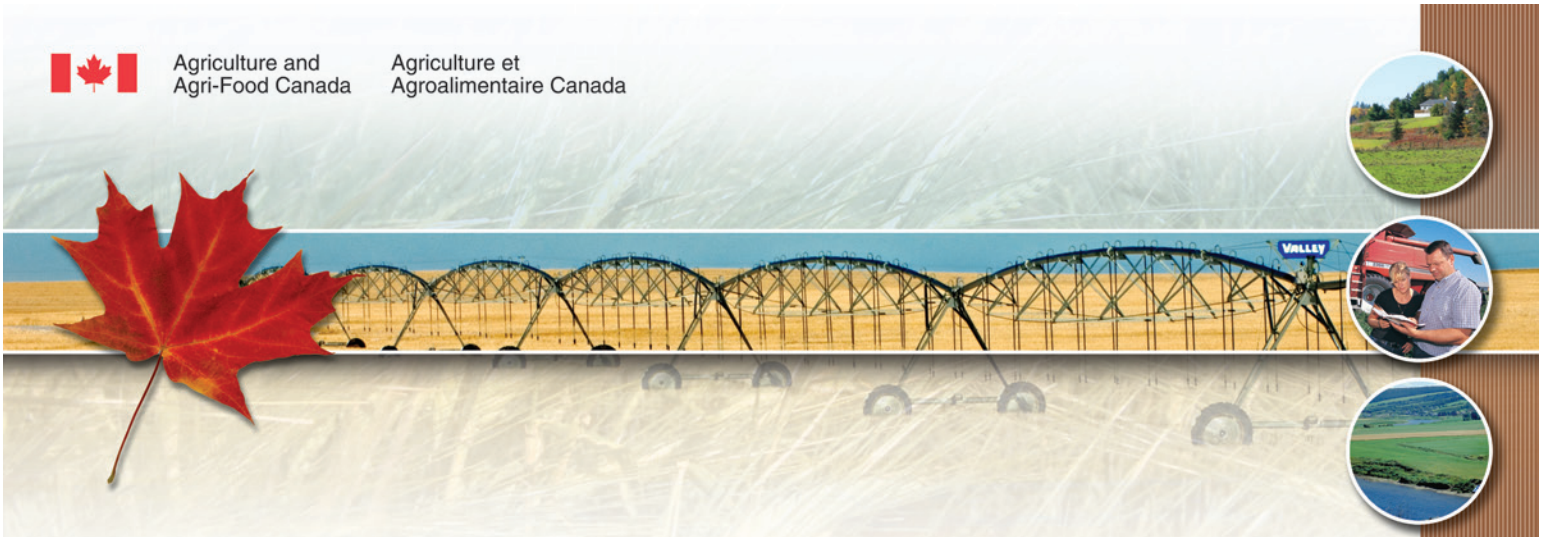

Discussion and review of agri-environmental reference levels used in other countries

Canada

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Discussion and Review of Agri-Environmental Reference Levels Used in Other Countries

Final Report

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EXECUTIVE SUMMARY

In the second half of the 20th century, technological progress combined with market globalization has changed the face of agriculture around the world. Agricultural producers have gradually moved away from a subsistence production approach by increasing productivity and adopting production methods based increasingly on mechanization and manufactured inputs. These market organization and technology advances have gone hand in hand with an abundance of inexpensive foods, which has greatly improved the welfare of the general populace.

However, given that agricultural producers have been adopting an industrial production approach, with all the associated environmental impacts, society has been gradually facing the need to view agricultural activities as industrial activities. This has naturally led to tension. Unspoken social contracts have been broken, and the role of trustee of the environment that has traditionally and implicitly belonged to agricultural producers has been gradually brought into question. Throughout the West, the State has had to intervene and arbitrate between producers' individual property rights and the public's right to environmental quality.

Canadian governments are no exception, and they too intervene to act as arbitrators. In particular, the Federal/Provincial/Territorial Ecological Goods and Services Working Group (FPT EG&S Working Group) is advancing the policy framework on EG&S with a work plan which includes research and analysis projects that should enable policy-makers to set clear environmental targets and select an optimal mix of policy instruments to maintain or enhance the provision of EG&S from agriculture.

The overall objective of this report is to provide the FPT EG&S Working Group with an analysis of how various reference levels have been defined and implemented in other countries, and provide lessons learned applicable to the Canadian context.

Specifically, the report (1) discusses how reference levels are defined and established in policy and practice; (2) reviews existing reference levels used in six countries as benchmark components of their agri-environmental policy measures; (3) discusses the extent to which these reference levels have been defined based on environmental standards specified within regulations or established by administrative decisions; (4) describes environmental performance indicators developed by these countries to estimate or monitor environmental improvements associated with the use of such agri-environmental policy measures; and (5) draws lessons learned with regard to establishing reference levels in the Canadian context.

Government intervention, in the form of regulations or support programs for certain practices, involves establishing a reference level, which we define as "what society feels it has a right to expect from agricultural producers in terms of environmental protection." Concretely speaking, reference levels often correspond to environmental objectives.

One important aspect that stands out in this definition of "reference level" is that it is a societal choice. This societal choice results mostly from available scientific knowledge on the impact of various farming practices on the environment and the play of negotiations between stakeholders concerned about agri-environmental issues. Very often, at one end of the bargaining space are the agricultural producers, who want as few constraints as possible, and at the other are the environmental groups, who want to see practices change so as to ensure to the extent possible a degree of environmental integrity.

How reference levels are defined depends on the environments in which they are established and on the desired objective. Thus, for reference levels covering amenities, the science is not as strong as that for habitat preservation or ecological functions.

In theory, it seems that different categories of reference levels can be used. Thus, the following possibilities have been catalogued as reference levels: absence of environmental standards; current situation (status quo); best management practices (BMPs) corresponding to good farming practices that align with good trade practices; business as usual, which starting from the "status quo" assumes continuous improvement in taking environmental issues into account; world best technology, which refers to best practices often economically unavailable; and representative competitor standards. In the agriculture sector, absence of environmental standards, business as usual and world best technology are unlikely to be implemented.

Ultimately, the value of the reference level concept is that by defining "what society has a right to expect from agricultural producers in terms of environmental protection", we identify the scope of producers' property rights as well as citizens' right to a clean environment. By establishing a reference level, a line is drawn between what society considers damage prevention and what it considers benefit creation. This way, a threshold is established up to which the polluter-pays principle applies and beyond which the beneficiary-pays principle applies. The polluter-pays principle applies to all damage prevention measures, whereas the beneficiary-pays principle applies to benefit creation measures.

It is with this conceptual framework in mind that the various case studies were conducted. The aim in studying them was to attempt to understand how different countries facing various problems had defined reference levels within some of their programs. Concretely speaking, we were just as interested in the

process that led to reference level selection as we were in the definition of the reference levels themselves. The objective was to identify, within the context and process, those aspects that assisted the decision-making process regarding these reference levels and to identify specific aspects pertaining to the sharing of the economic burden of the measures implemented within the programs presented.

France

France favours a voluntary/contractual approach. The *sustainable agriculture contract* (CAD) is a voluntary five-year contract between a farmer and the French State whereby the farmer agrees to develop a set of environment-friendly practices for his farm in exchange for monetary compensation. In fact, the reference levels are defined by these best practices. The assistance received is to cover the shortfall incurred by implementing agri-environmental measures.

A general national catalogue of measures per issue is prepared by the Ministry of Agriculture. Regional authorities then establish a list of priority measures for the regions. Finally, using a farm diagnostic, farmers can select up to two issues from those identified by the *département* and up to three priority actions (farming practices) per issue.

In France, reference levels take many forms, based on the problems and specific issues encountered regionally. They are defined within agri-environmental programs. Since the CAD program is voluntary and a variety of measures are available to producers, reference levels are not absolute. Producers in a way choose the reference level they want applied to their operation, in light of their analysis of the requirements involving them in exchange for subsidies.

In the negotiation process, the public policy-maker's fairly obvious intent seems to have been to achieve practice improvements along the lines of BMPs; environmental groups have generally sought to achieve best practice modifications, similar to what we have called "world best technology" in the conceptual framework, but with more generous compensation for producers. Producers themselves have proven to be open because the program is voluntary. However, the reality seems to be that they favour the status quo.

It is particularly interesting that, when looked at more closely, stakeholders as a whole essentially seem to have been in agreement in choosing the status quo as a reference level. Indeed, the basic principle of the CAD is to compensate producers for losses incurred by implementing agri-environmental measures. Ecologists have proposed more stringent measures, but with greater compensation.

Nevertheless, a number of important points are worth bearing in mind regarding the negotiation process. Specifically, sound knowledge of environmental problems, the preparation of a national catalogue of

measures, the fact that stakeholders are used to working together and voluntary contracts are all aspects that made it much easier to define reference levels.

Spain

The current environmental cross-compliance programs in Spain stem from Europe's Common Agricultural Policy (CAP). This is a set of measures that differ depending on the issues and are mandatory for access to direct payments. There are no complementary programs for financially assisting producers who go beyond the recognized good practices.

Concretely speaking, Spain's reference level could be defined as "good farming practices that farmers should implement to preserve their land." As a result, the costs involved with adhering to good farming practices are at the farmers' own expense.

In Spain, reference levels are clearly established through conditions that agricultural producers must meet to be entitled to support payments from the European Community. BMPs are the basis of all reference levels. In fact, at the outset, officials imposed BMPs as the reference level; producers have not objected to them, and environmental groups have not had the opportunity to express a preference.

As to the negotiation process, there are a number of characteristics specific to Spain:

- It was imposed from outside by the European Community;
- Thinking and decision-making occurred at the national level first, with little participation from regional authorities.
- Consultations were very close and were limited to producer associations. Civil society in general and environmental groups in particular were not consulted.

In Spain's case, the ability to arrive at a reference level definition was greatly facilitated by the fact that the negotiation process had been open to only a few stakeholders that are used to negotiating with each other and the fact that the negotiation process was very structured at the national level from the outset.

Switzerland

In Switzerland, environmental objectives (biodiversity, phosphorus, nitrogen and phytosanitary products) are defined nationally. Two programs are used to help achieve these objectives: 1) an environmental

cross-compliance program in which ecological requirements called required agricultural services (*prestations écologiques requises* – PERs) must be met in order for producers to receive direct payments; 2) an ecological direct payment program for adopting specific practices that go beyond the PERs. Payments under the latter program vary based on the zone in which the parcel is located.

Thus, the reference level for the programs is defined by the required ecological services (PERs). As such, the practices giving rise to subsidies are very specifically defined and the program is voluntary and contractual.

PERs are defined consensually. They are established scientifically, taking both ecological and agronomic aspects into consideration. Reaching consensus is facilitated by Switzerland's democratic culture at the various levels of the decision-making process.

Ultimately, if we refer to our conceptual framework, we note that, like elsewhere, agricultural producers try to get the reference level to be as low as possible, especially where agri-environmental issues are more prevalent. Civil society, however, is not as organized for expressing a differing viewpoint.

It is interesting to note, however, that in Switzerland, the positions taken by stakeholders do not really seem too far removed from what we call BMPs in our conceptual framework. As such, Switzerland does not shed any light on the power relationship between agricultural producers and civil society, which seems to exist to a stronger degree in other OECD countries. This is no doubt partially explained largely by civil society's and agricultural producers' recognition of the multifunctional role of agriculture and the merits of compensating this contribution to society's well-being.

United Kingdom

In the United Kingdom, nitrate contamination significantly impacts the costs of supplying drinking water. Moreover, under the European Union's Nitrate Directive, member states must a) identify surface and groundwater sources polluted by nitrates, b) identify nitrate vulnerable zones (NVZs) (watersheds), c) devise action plans for meeting the requirements of the Directive and d) implement them.

The program put in place in the UK meets this Directive. Vulnerable zones are identified, and additional mandatory farming practices are defined for those zones. They represent the reference level. These practices do not give rise to compensation. However, beyond these practices, payments for specific practices are provided for on a contract basis.

In the UK's case, as with Spain, reference levels are clearly established by conditions that must be met in order to meet the European Community's standards for nitrate concentration in drinking water. The reference level was specifically defined based on best management practices. Science was used for the reference levels since scientific studies were consulted for determining the most effective farming practices for limiting nitrate migration to sources of drinking water.

As in the United States, the negotiation process for defining reference levels was not needed because the program was voluntary and based on scientific studies. As a result, the discussion dealt instead with the amount of compensation to be paid to producers to encourage them to alter their practices.

United States

In the United States, there is the Conservation Security Program along with the Conservation Reserve Program and the Environmental Quality Incentives Program (EQIP). Under this program, watersheds with specific problems are identified. For each watershed, payments are granted for farming practices that address environmental objectives.

The program operates on a voluntary/contractual basis by farm and offers incentives on an increasing scale according to the requirement level the producer selects (three levels – Tier 1, 2 and 3). For access to this program, agricultural producers must also comply with legislation (*Food Security Act*) pertaining to erosion-sensitive land and wetlands.

The US program is unique in that subsidized practices are not specified at the outset. Outcomes are the focus, leaving producers to choose the methods to achieve them. As a result, reference levels vary depending on the watershed and, for the most part, involve the implementation of BMPs. The program is very labour intensive (governmental) and is based on a mechanism requiring a great deal of information and knowledge.

There is virtually no hint of the power relationship between agricultural producers and environmental groups in the dynamic of choosing reference levels for watersheds. The following aspects account for this near lack of conflict in the negotiation process:

- voluntary nature of the measures implemented;
- recognition of measures already implemented;
- factual material existing prior to the program and the use of science to establish reference levels locally;
- copious financial resources for compensating producers for actions they take.

Concretely speaking, in choosing the program's operating criteria, the government implicitly chose to make BMPs the basis for reference levels.

The US program is distinct in that it applies our conceptual framework to the letter. With the reference level being BMPs, producers are compensated when they go beyond it, even where the status quo (no additional action) already exceeds the baseline.

Australia

Australia is facing serious environmental problems due to high soil salinity levels and water quality problems. To deal with this, the program (NAP) targets 21 priority regions out of a total of 56. These areas roughly correspond to either bio-regions or watersheds.

Under this program, each region/watershed defines its own objectives for salinity and water quality. Each region/watershed also prepares an integrated watershed management plan including actions for achieving the established objectives.

For implementation, the program involves bilateral agreements between the Commonwealth and each State. The Commonwealth and the States must accept the integrated plans and certify each strategic objective, the intended outcomes, and the monitoring and reporting methods. The regions/watersheds plan and carry out projects aligning with the integrated management plan. These projects may involve actions for agricultural producers and methods to compensate for resources used, but not necessarily.

In fact, given that, in Australia's case, the problems largely go beyond agri-environmental issues, the power relationship between agricultural producers and environmental groups is inadequate for explaining reference level selection, which is done on a per-watershed basis. In fact, the methods for establishing reference levels can vary greatly from one watershed to the next. As mentioned earlier, in some cases, consultants establish them using scientific data, whereas in others, committees consisting of representatives from society establish them using available science to a varying extent.

Nevertheless, the analysis shows that, in Australia, as elsewhere, BMPs are often used to define reference levels.

A synthesis of the case studies enables us to make some general observations:

- The programs define reference levels. They always begin with an environmental problem. This problem can be:
  - ⇒ national and very specific (Spain, United Kingdom, Australia),

⇒ national with broad themes adapted regionally or locally (Switzerland, France),

⇒ place-based, particularly on a watershed basis (USA, Australia);

- Most programs are administered on a voluntary/contractual basis by farm. In Spain, there are no payments, only environmental cross-compliance. In Australia, the program is intended primarily for catchment/regional authorities that receive funding for projects designed to achieve certified objectives. These projects may involve agricultural producers, but not necessarily;
- In most cases, the programs define reference levels that are in the form of very specific agri-environmental practices (BMPs) except in the United States, where outcomes on farms are the focus, irrespective of practice, and in Australia, where outcomes at watersheds are the focus;
- Payments are received as compensation for practices that go beyond reference levels. In fact, the reference level used is BMPs on the farm (Switzerland, France, United Kingdom, USA, Spain). In Australia, catchment authorities define and carry out specific actions;
- Reference levels depend primarily on the ecosystems in which farming is done and on specific problems and objectives:
  - ⇒ for example, Switzerland's PERs would be difficult to implement as a "normal" practice in Canada and vice-versa,
  - ⇒ the mandatory requirements for vulnerable zones in the United Kingdom depend on the specific nitrate problem in the UK and pertain to the EU's Nitrate Directive.
  - ⇒ Switzerland's PERs appear to be the only program directly targeting amenities creation and habitat preservation. The other programs target ecological functions (except the United Kingdom, which targets human health).

The conceptual framework helped determine that reference level selection had a determinative effect on the sharing of the burden between agricultural producers and the rest of society. In fact, defining the reference level draws the line up to which the polluter-pays principle applies and beyond which the beneficiary-pays principle must be used.

However, the case study analysis shows that the various countries differ very little from each other in terms of the reference levels used. In most cases, BMPs are used. France refers to them, but in reality uses the status quo as the baseline for calculating producer subsidies. This means that, in France, the reference level is the status quo.

Concretely speaking, the case study analysis revealed that, in common practice, it is not so much the reference levels that affect burden sharing but rather the type of program implemented. Essentially, there are a variety of program types:

- mandatory programs with no compensation (Spain);
- mandatory programs with compensation (Switzerland and United Kingdom)
- voluntary programs with compensation (Switzerland, United Kingdom and France)
- voluntary programs with compensation that recognize past actions (US)

If we place these programs on a continuum based on generosity to producers, we see that Spain's program is by definition the least generous because it offers no compensation. The UK and Swiss programs come next because they offer compensation. France's program comes further along because it funds new measures based not on exceeding BMPs, but on exceeding the status quo. Finally, the US program appears to be the most generous to producers because it subsidizes even actions already in place.

The summary of the characteristics of the different negotiation processes shows that essentially two types of process can govern reference level selection: the authoritarian process and the participative process.

The authoritarian process can be based on an external constraint that the country or jurisdiction has no control over. It may also stem from a sound scientific basis regarding knowledge of agri-environmental problems and solutions. Such a process leads to the desired outcome more easily because certain stakeholders in conflicting positions are not consulted.

With a participative process, beyond a democratic culture like that found in Switzerland, things that help it run smoothly are: sound knowledge of the problem, a national catalogue of measures and stakeholders who are used to working together. These appear to make up the basic premises of a constructive participative process during reference level selection.

Our case study review also teaches us that other things greatly facilitate the negotiation process for determining reference levels. Introducing a voluntary program seems to be a guarantee of success. When the program is voluntary, agricultural producers do not object to implementing it and do not say much about reference levels. Environmental groups can see measures of their choosing included. Agreement on the list of possible voluntary measures could turn the discussion away from reference level selection towards a discussion on the amount of financial incentives for compensating agricultural producers.

More broadly, the Swiss case shows that recognition, by civil society and agricultural producers alike, of the multi-functional role of agriculture in society and the merits of compensating this contribution to society is rich ground for any negotiation process for determining reference levels.

Thus, the idea of taking a participative approach for determining reference levels in Canada raises its own questions. On one hand, certain basic elements do exist for initiating such a process. The democratic culture, despite a few defects, is fairly strong and the existing science simply needs to be consolidated. However, certain keys elements for the success of this approach are problematic. First, it is unclear whether the stakeholders involved, with opposing views, are used to working together. Also, as the analysed cases would suggest, the most promising approach for collectively determining reference levels is the voluntary approach. Also, its success is obviously very dependent on financial support to go along with it, yet it is far from clear whether governments are prepared to devote the funds required for this type of measure. An alternative could be to take monies currently allocated to farm income support and re-allocate them to supporting all agricultural functions. However, the agriculture community is fairly closed to this.

In this context, it is undoubtedly necessary to take it one step at a time when developing programs and defining reference levels. It is definitely possible for Canada's governments to move forward on the issue by:

- promoting the development of a sound scientific basis illustrating the impact that agriculture has on the environment and the potential of various solutions;
- preparing a national and provincial catalogue of measures;
- creating opportunities for stakeholders to meet so they get used to working together and discussing agri-environmental problems;
- working to foster recognition, by civil society and agricultural producers alike, of the multi-functional role of agriculture;

Actions aligning with these directions would be helpful for promoting a collective approach to defining agri-environmental reference levels in Canada.

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1. INTRODUCTION

The Federal/Provincial/Territorial Ecological Goods and Services Working Group (FPT EG&S Working Group) is advancing the policy framework on EG&S with a work plan which includes research and analysis projects that should enable policy-makers to set clear environmental targets and select an optimal mix of policy instruments to maintain or enhance the provision of EG&S from agriculture.

The provision of EG&S will often be subject to market failures either because these data exhibit public good characteristics, we are missing information about their true costs and value or due to the fact that they might constitute externalities resulting from prevalent economic decisions and actions. To correct such market failures, the government can, among other options, step in and assure the supply of public goods in the marketplace through economic incentives or it can better define property rights in order to internalize the externalities.

In the realm of agri-environmental policy making, issues of this sort have been addressed through various policy instruments. Some of them, for example cross-compliance measures or direct payments to farmers, include agri-environmental reference levels, hereafter reference levels, which define, explicitly or implicitly, the rights and responsibilities of farmers regarding the environmental impacts of their actions.

Analytical work by the Organisation for Economic Co-operation and Development (OECD) on agri-environmental policies defines reference levels as measurable levels of environmental quality that should be achieved at the farmer's own expense. They can be used to distinguish between the cases where the polluter-pays principle requires that the farmers bear the costs of avoiding environmental damage, versus those where delivering additional environmental services by means of privately-owned resources or factors of production may require an incentive borne by society on the basis of the "user (beneficiary) pays" principle. Reference levels can be expressed as environmental outcomes, farming practices, or emissions levels.

One of the emerging principles for Canadian agri-environmental policy is to develop policies that will balance the costs of farm stewardship action among farmers and society according to corresponding EG&S benefits that these respective groups receive. In doing so, policies must also recognize the rights of agricultural producers and build on their basic responsibility for sound environmental stewardship. Reference levels are essential in that regard since they constitute the fulcrum for the exercise of balancing benefits and responsibilities.

The overall objective of this report is to provide the FPT EG&S Working Group with an analysis of how various reference levels have been defined and implemented in other countries and to provide lessons learned applicable to the Canadian context.

Specifically, the report (1) discusses how reference levels are defined and established in policy and practice; (2) reviews existing reference levels used in six countries as benchmark components of their agri-environmental policy measures; (3) discusses the extent to which these reference levels have been defined based on environmental standards specified within regulations or established by administrative decisions; (4) describes environmental performance indicators developed by these countries to estimate or monitor environmental improvements associated with the use of such agri-environmental policy measures; and (5) draws lessons learned with regard to establishing reference levels in the Canadian context.

In this light, the report first presents a conceptual framework that defines what is meant by reference level and explains why the concept is necessary, what forms it can take and how it is selected. The report then devotes a great deal of space to concrete cases that confirm how the concept is applied to agri-environmental issues in the following countries: France, Spain, Switzerland, the United Kingdom, the United States and Australia. The final chapter of the report attempts to draw lessons applicable to Canada using the conceptual framework and the test cases studied.

2. DEFINING AGRI-ENVIRONMENTAL REFERENCE LEVELS: CONCEPTS AND CONSIDERATIONS

Agriculture has an increasingly complex relationship with the environment and with society as a whole. Until the advent of industrial agriculture, farming activities had an almost symbiotic relationship with the environment. Production inputs came most often from the surrounding nature, and nature in turn assimilated the outputs effortlessly without being damaged.

Industrial agriculture, with its manufactured inputs and mass production, has upset this balance so that today the relationship between farming activities and the environment is more complex. The relationship between agriculture and the environment has changed, and we are seeing the fairly new phenomena of concentration of production, over-production and release into the environment, which were less common before. At the same time, industrialization and concentration of production offer new opportunities for achieving a balance between food production and environmental sustainability. In fact, concentration of production and its cost-effectiveness can now justify investing in new agri-environmental technologies that were previously inconceivable. For example, there are manure treatment centres and the development of plant varieties resistant to some insects, requiring fewer pesticides. It is also true that concentration fosters the regional development of specialized agri-environmental clubs and technical support clubs encouraging producers to adopt good cropping practices.

According to Bromley (1996), in general, the impact of agriculture on the environment can be divided into three main categories:

- amenities: a broad class of visual attributes that make the rural landscape visually pleasing;
- impact on habitat: attributes of the agricultural landscape that provide living space for animals and plants that are not part of the farming operation;
- ecological impact: the attributes of agriculture that positively or negatively affect ecological functions outside the farm boundary, such as water contamination by pesticides or nutrients.

Depending on the decisions made on the farm, agricultural activities will have a negative or positive impact. The very existence of agriculture in rural areas generally offers, in comparison with forests for example, a variety of landscapes that are usually more highly valued and a natural environment with various types of habitat allowing greater biodiversity. However, these agriculture-related benefits can be altered if individual producers end up adopting practices that cancel out these benefits. What comes to

mind are the elimination of riparian areas, woodlots and marshes, over-use of pesticides and the spreading of excessively large amounts of organic and chemical fertilizers that end up in waterways.

Basically, the private interest of producers seems to overlap with that of society as a whole and should lead them to engage in sound environmental stewardship because farmers' prosperity depends both on local natural resources and the quality of the nearby environment. In fact, *a priori*, it is in agricultural producers' interest voluntarily to engage in sound environmental stewardship because in a way it equates to protecting the sustainability of their operations. Specifically, it is well understood that producers who depend on natural resources like water and soil have an interest in maintaining the renewability and health of these resources to ensure the survival of their operations. On the farm, soil erosion means lower yields or additional expenditures on different types of amendments to remedy poor soil. Also, contaminated water can mean disease leading to daily weight loss of livestock, decreased milk yields from cows or higher veterinary costs. Beyond the financial losses associated with environmental degradation, farmers are the first to suffer from environmental degradation. It is they who first see their countryside and living environment deteriorate visually; they experience loss of enjoyment due to the disappearance of fish from the lakes and streams and the inability to go swimming. They are the ones who watch the number of animal species living in their environment decline. They may also have to bear the disapproval of the community they belong to and the accompanying hostile demonstrations.

However, even though there have always been incentives for voluntary environmental stewardship in agriculture, the conflicts surrounding certain agricultural activities in rural areas illustrate that these incentives are no longer sufficient for meeting society's demand for ecological goods and services.

This observed mismatch between the supply and demand for ecological services is curious. According to neo-classical economic theory, the market in a state of perfect competition should be the best tool for resource allocation and bring about a balance between supply and demand. Within this framework, prices act as a guide in determining the most effective use. However, with some markets, and this is true for environmental goods and services, effective resource allocation is impossible. With public goods or with externalities, we have a market failure and see that the costs and benefits facing players in the economy differ from those for society in general (Besanko and Breutigam 2002). Market failure is also characterized by the inability of the market price to reflect the social value of the traded good and therefore to achieve effective allocation (Baumol and Oates, 1998).

Since the market price for agricultural products does not reflect the impact that farming activities have on the beauty of the countryside or water quality, for example, agricultural producers do not sufficiently consider them in their decisions. To get them to, governments must force producers to internalize the

externalities in their decision-making through regulations or encourage them to change their behaviour through positive incentives (subsidies) or negative incentives (taxes) (Kolm 1971).

However, prior to selecting the means to bring about this internalization of externalities, environmental objectives must be set. Ideally, environmental objectives are defined collectively based on a specific notion of the public good during negotiations in which differing viewpoints attempt to dominate. During this process, environmental groups most often tend to seek a return to a degree of environmental integrity; farmers' neighbours and the rural population are particularly sensitive to annoyances such as noise, odours and deteriorating water quality. Farmers themselves most often argue that they alone are not responsible for the agricultural practices used because they must bend to the agricultural commodities market (Bromley, 2000). Consequently, they are disinclined to alter contentious farming practices. The objectives resulting from the power relationship in a negotiation process involve the creation of programs whose implementation includes environmental objectives that align with society's expectations, namely agri-environmental reference levels.

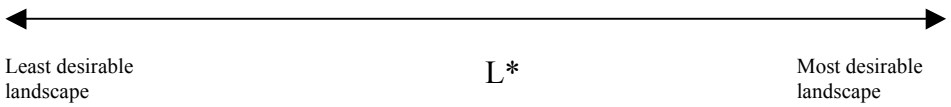
2.1. Establishing Agri-environmental Reference Levels

The issues associated with setting reference levels differ significantly depending on the agriculture/environment relationship category (amenities, impact on habitat or ecological impact).

2.1.1. Amenities

According to Bromley (1996), the mismatch between supply and demand of agricultural amenities, as with all environmental goods and services, exists because there are no markets for agricultural amenities. This means that changes to the agricultural landscape driven by agricultural production imperatives are not always likely to be valued by those who see agriculture as producing both commodities and amenities. If we consider the issue in terms of the collective perception of amenity values, we can imagine a continuum as in Figure 1. The current situation corresponds to L*. From that point, there can be diverging viewpoints on the direction of change from the status quo. If policy pushes farmers to provide a more desirable (higher) level of amenities, they will be reluctant to do so. On the other hand, if farmers seek to provide a lower level of amenities, they might be accused of causing harm.

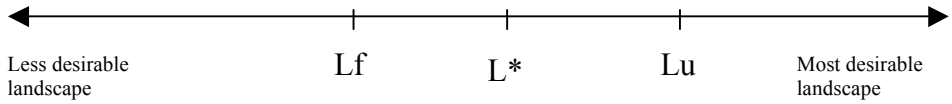
FIGURE 1: COLLECTIVE PERCEPTION OF AMENITY VALUES



Source: Bromley, 1996

We see here the arbitrary nature of the status quo. In the presented case, status quo is the norm against which a change in policy is evaluated. Assume now (see Figure 2) that urban interest starts to advocate a higher level of desirable landscapes (Lu); farmers may insist that Lf is the appropriate level of landscapes. In this case, the Lf—Lu distance becomes the bargaining space.

FIGURE 2: BARGAINING SPACE



Source: Bromley, 1996

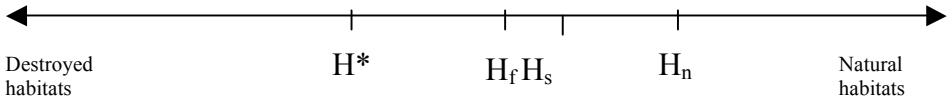
The essence of the policy debate over amenity values from agriculture is that there is no correct level of desirable landscapes. There are landscapes that are more appealing than others, but there are no precise rules for determining the correct level of amenities.

2.1.2. Habitat Implications of Agriculture

Unlike the amenity values discussed above, the habitat implications of agriculture entail more certitude regarding reference levels. Ducks require a minimum area for nesting. Wildflowers and songbirds also require certain minimal well-defined habitats for survival. In these cases, experts can objectively state the minimum thresholds to be met.

To illustrate this, we might imagine a situation as depicted in Figure 3 in which H* represents the experts' view regarding an absolute minimum level of wetlands in a particular agricultural region while H_s represents the status quo. To the right, we see the two reference points, H_f for the farming community and H_n for the naturalists who advocate more wetlands. While farmers seek to reduce wetland level, but not necessarily to H*, their preference would be for less whereas the naturalists favour more.

FIGURE 3: HABITAT IMPLICATIONS OF AGRICULTURE



Source: Bromley, 1996

As with amenities, farmers do not understand why they should be prevented from moving from H_s toward H_f. Indeed, we sometimes see pressures for financial compensation of farmers for lost income from unusable areas. And of course the naturalists seek to have wetlands restored so that H_n is achieved.

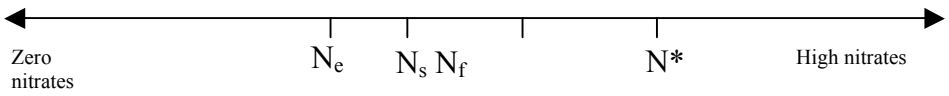
2.1.3. Ecological Implications

Ecological implications are agricultural attributes that positively or negatively affect ecological functions beyond the boundary of the farm, such as waterway contamination by pesticides, soil particles or nutrients. Through their practices, farmers can alter the ecological functions of their environment or undertake land-use practices that improve or restore ecological processes.

The preceding figure can be used to illustrate the problem of policy design. For simplicity, assume that nitrate contamination of waterways is the problem to be addressed. N* represents the upper threshold of nitrate concentrations beyond which experts consider will have serious health effects for the population. Assume that the status quo is N_s and that farmers believe that nitrate concentration will not be a problem until the concentration level reaches N_f. Ecologists, on the other hand, advocate a concentration level much closer to N_e.

We see once again that perceptions of what is correct will differ markedly across interest groups. Farmers will advocate a nitrate level that is higher than the status quo and would certainly resist efforts to reduce it below N_s. They might not feel comfortable advocating moving to close to N*, but would lean towards N_s if not necessarily N_p.

FIGURE 4: ECOLOGICAL IMPLICATIONS OF AGRICULTURE



Source: Bromley, 1996

In general, in the negotiation process that will lead to adoption of a reference level, we can assume that, policy-wise, farmers will take the position that they provide benefits to society. With amenities, this logic is valid. In fact, many city dwellers place higher value on a well-maintained agricultural landscape than on a forest landscape. In this case, we can indeed claim that agriculture provides net amenities compared to a natural landscape. However, if fences, ditches, old buildings and forests are eliminated to allow for more intensive agriculture, the production of agricultural amenities may drop.

Where agriculture impacts habitats or has an ecological impact, it is more difficult to talk about the positive aspects of agriculture. We know that a varied landscape is ideal for a wide range of flora and fauna and that, in certain situations, agriculture can indeed provide a variety of habitats. However, when farmers drain marshes, cut down forests and homogenize the landscape, agriculture has a negative impact on habitat, fauna and flora.

2.2. How Reference Levels Work

According to Scheele (2002), one of the key contributions of the concept of reference level is that it helps distinguish between damage prevention and benefit creation, thereby shedding fresh light on discussions surrounding the application of the polluter-pays principle.

> In providing an operational criterion for distinguishing the provision of positive effects from the avoidance of negative ones, the concept of reference level helps to understand that the polluter-pays principle has different implications depending on the prevailing property rights scheme and the resulting range between reference levels and environmental targets. (Scheele, 2002)

The issue is, in fact, determining what amenity level and what habitat level in the policy process will be considered the reference level used for determining the deviations that should be penalized or rewarded.

To answer this question, Bromley (1996) begins by defining the concepts of benefit and damage. In his view, a benefit is something that draws us closer to a target, whereas a cost is something that pushes us away from it. Therefore, the issue for society is collectively setting goals and objectives because it is through them that benefits and costs are measured. Those objectives in fact define the reference level society uses. This reference level can be defined scientifically or not, through exercising power relationships or not. In any case, it is ultimately a social construct defining what society feels it has a right to expect from agricultural producers.

The following figure shows how the reference level concept works. As with Bromley's continuum, the positions of farmers and naturalists define the bargaining space. Between these two extremes somewhere is the status quo. For our purposes here, we assume that the status quo is the reference level.

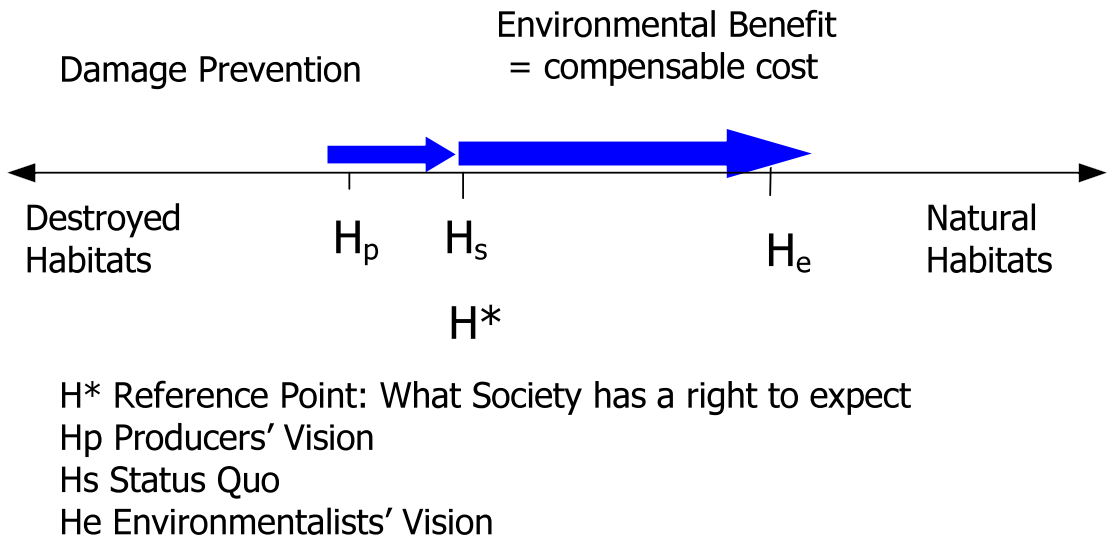
Since the status quo is the reference level, any actions that improve the environmental landscape would give rise to an environmental benefit. However, in this context, producers below the reference level who, by implementing a government policy, voluntarily alter their farming practices to reach the reference level do not provide an environmental benefit strictly speaking, but do prevent damage.

This distinction between damage prevention and benefit creation is very important because, as Scheele (2002) indicates, it clarifies how the polluter-pays and beneficiary-pays principles are applied. Underlying this clarification is a fundamental idea: society will agree to compensate economic agents who alter their practices only if this alteration gives rise to a benefit for society.

Based on that, it is possible to clarify how the costs of achieving agri-environmental performance objectives will be shared between producers and society. Thus, any action resulting in an environmental benefit will entitle the farmer responsible for that action to a monetary compensation from society. In that situation, it is the user (beneficiary)-pays principle that applies. On the other hand, any action that prevents damage does not entitle the farmer to monetary compensation, and that farmer alone is responsible for expenses incurred. In that case, the polluter-pays principle applies.

As can be seen, defining the baseline determines the scope of property rights by setting the threshold up to which the polluter-pays principle applies and beyond which the user (beneficiary)-pays principle applies.

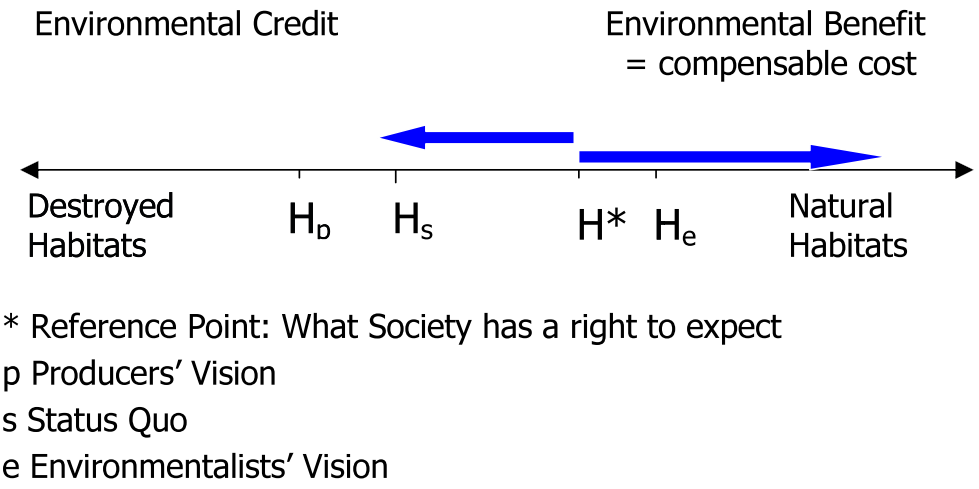
FIGURE 5: DISTINCTION BETWEEN DAMAGE PREVENTION AND ENVIRONMENTAL BENEFITS



Source: Nolet, 2005

The following figure shows the impact of reference level selection on the breadth of the environmental benefit. If the reference level is more stringent, the environmental benefit resulting from the same action is reduced and so is the accompanying compensation. This figure also shows another reality. When the status quo is lower than the reference level, agricultural producers in fact receive a type of environmental credit awarded by a society that tolerates their expectations not being met.

FIGURE 6: REFERENCE LEVEL SELECTION AND EXTENT OF THE ENVIRONMENTAL BENEFIT



Source: Nolet, 2005

One essential element emerging from this discussion on environmental reference levels is the fact that there are no objective measurements that should be the reference level. Some environment protection objectives or levels are suited to producers while others are better suited to environment groups.

2.3. Considerations for Establishing Reference Levels

The complexity of the agriculture/environment relationship complicates the social debate. Bromley (1996) maintains that the task is complicated because the notion of benefit is a societal construct. As we have seen, a wetland for example can be perceived as a benefit by an ecologist and as a source of damage for farmers. This means that different interest groups, with differing visions of the public interest, will have different ideas about what a cost is and what a benefit is. Moreover, this vision changes over time, as Fletcher (1966) indicates: "The morality of an act is a function of the state of the system at the time it is performed."

Concretely speaking, when public managers are selecting an appropriate reference level for agri-environmental issues, they must consider various societal context elements. These elements include the property rights system, the time-dependent nature of reference levels, the level of scientific knowledge and economic considerations.

2.3.1. Role of the Property Rights System

Differing views about land ownership rights are a source of misunderstandings between farmers and environmentalists. On one hand, agricultural producers will argue that they own the land they cultivate and therefore if use changes are imposed on them, they should be compensated. On the other hand, environmentalists will maintain that merely refraining from destroying a habitat should not entitle them to compensation. This brings us to the role of property rights in the distinction between environmental benefit creation and environmental damage prevention.

Basically, the debate can be summarized by saying that absolute private property rights would entitle farmers to total compensation for any infringement of those rights. In the following figure, this situation corresponds to using "absence of environmental restrictions" as a reference level. Conversely, the absence of property rights or very limited property rights would mean that the farmer must bear all costs associated with measures for mitigating the impact of agriculture on the environment. In the following figure, this situation corresponds to using "world best technology", a reference level that is economically unavailable to producers.

FIGURE 7: PROPERTY RIGHTS AND REFERENCE LEVELS

Source: Adapted from Doyon and Nolet (2006)

As such, we can state that, in general, agricultural producers enjoy more "absolute" property rights than most other landowners. As an example, landowners in urban areas are used to dealing with regulations that significantly limit their property rights. Those regulations vary from one municipality to the next, but can be very restrictive. For example, many municipalities regulate the cutting of trees, the use of clothes lines, pet ownership, the size and location of sheds, etc. Farmers face much fewer constraints.

When we compare the environmental requirements imposed on farmers to other industries, we see the same asymmetry. In general, environmental requirements outside agriculture often seem much more restrictive than those placed on farmers. Also, the costs of complying with the standards are more often

borne by the polluters in industry than in the agricultural sector. This implicitly reflects the fact that society's requirements for farmers, their reference level, are lower than the requirements for other industries.

2.3.2. Time Dependency

We noted that the concept of property rights is not entirely absolute and that it changes. As environmental issues become more of a concern for society, farmers' private property rights are increasingly limited and the ordinary citizen's right to a clean environment expands.

In fact, with the development of the environmental conscience, society's expectations for individuals and companies are evolving and becoming ever more demanding. Behaviours once accepted and considered normal are now viewed as unhealthy and antisocial. This again raises the issue of reference points and leads to the conclusion that the policy reference point is movable.

This changing reference point leads to the conclusion that the environmental cost is defined through policy. The impermanence of policy leads to the conclusion that environmental benefits based on a reference point established through policy are necessarily temporary. Indeed, what is today considered an environmental benefit, given the exceptional nature of the promoted action, could soon no longer be perceived as an environmental benefit when the actions giving rise to the benefit are considered integral to the new reference.

2.3.3. Level of Scientific Knowledge

The main purpose for agri-environmental policy, and therefore for selecting reference levels, is to reduce the range of relatively direct risks that could affect the public. Indirect risks are those impacts that affect the environment, biodiversity, fauna and flora. Direct risks are those that affect environment degradation, which impact the survival of agriculture, quality of life and human health.

Determining the various types of risk requires scientists from several fields, and in all cases they are faced with difficulties associated with the vague nature of agriculture's impact on the environment. Therefore science, with the ability to shed light on scientific standards to be met in order to prevent different levels of risk, often provides a range of potential reference levels, making it difficult for the layperson to follow.

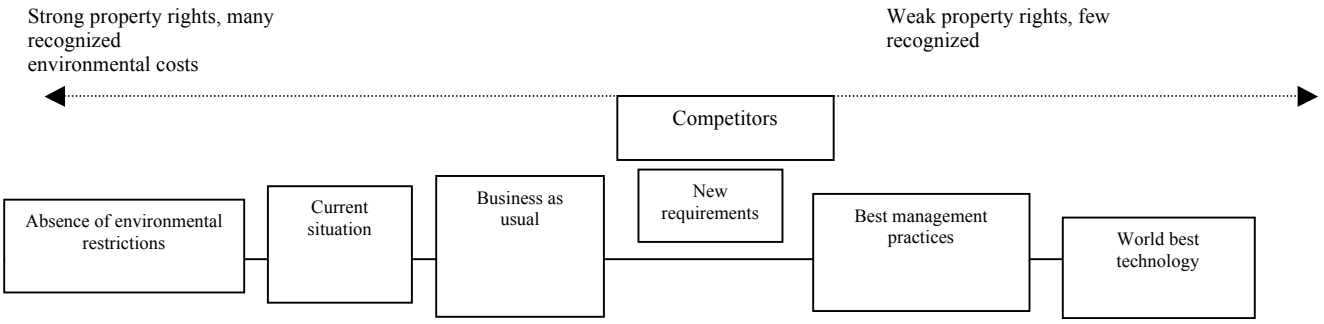
Viewpoints on a single issue can vary among scientists, and the direction from which the subject is approached can differ greatly. For example, biologists might be interested in manure spreading in terms of its impact on fauna and flora in streams and rivers; agrologists may come at it from the perspective of

agricultural yields, and physicians from the point of view of pollution and impact on public health. All viewpoints can be supported scientifically, yet without providing any scientific consensus in terms of desirable practices.

2.4. Operationalizing the Concept of Reference Level

The challenge now is to put the concept of reference level into operation. In this connection, Doyon and Nolet (2006) say that there are several options for defining reference levels: the current situation (status quo), new requirements, business as usual, best management practices (BMPs) and the competition. These possibilities fall somewhere between our two extremes.

FIGURE 8: SUMMARY AND CLASSIFICATION OF THE REFERENCE POINTS STUDIED



Source: Adapted from Doyon and Nolet (2006)

2.4.1. Current Situation

Most often, businesses targeted by an environmental requirement, whether agricultural or industrial, implicitly consider the current situation as their benchmark.

2.4.2. The New Requirement

Another possibility is to consider the new requirement as the best expression of society's expectations regarding the condition and quality of the environment.

In economics, the hypothesis of revealed preferences in the policy process is used to develop the effectiveness criterion in international or interregional resource allocation. According to this logic, we can

see the most recent "environmental requirement" as the best expression of society's expectations and consider it the reference level.

2.4.3. Business as Usual

Another way of establishing the reference level is to start not with the current situation, but with what it would be assuming that farmers would adopt a certain number of best environmental practices without any constraints imposed from outside.

Like the rest of the populace, farmers are becoming increasingly aware of environmental issues. They are covered in governmental and other education and awareness programs. Farmers are invited voluntarily to alter some of their practices, and the market sets new practices for them. Indeed, consumers are ever more demanding and are indirectly expecting agricultural producers to alter some of their practices. The growing popularity of organic foods illustrates the type of pressure that consumers are putting on agricultural producers. Producers also experience social pressure from their community to alter certain ways of doing things.

For all these reasons, producers are driven to change their behaviour voluntarily. As such, when the time comes to invest in or upgrade equipment, environmental issues are taken into consideration. Therefore, it can be assumed that, even without legislative restrictions, agricultural producers change their behaviour to reduce the negative impact their practices have on the environment.

2.4.4. Best Management Practices (BMPs)

The literature on agri-environmental issues refers a great deal to BMPs. In other fields, they are usually called trade practices. These are the recognized practices in that milieu and usually incorporate an economic component in that the practices are justified from an environmental as well as economic perspective. In general, when new regulations are introduced, they are based on BMPs.

2.4.5. The Competition

It is difficult to compare environmental standards across regions or countries because of differences in ecosystem sensitivity, the public's preferences and population density.

Despite the reality of these limitations, it is still true that, with some care, comparisons can be made among regions with characteristics in common. Thus, in North America the level of wealth, although uneven, is high everywhere, and the public's environmental conscience is comparable. A number of

environmental problems are also comparable. Whether we consider water quality, the odour problem or soil erosion, there is no reason to believe that certain problems and issues are dissimilar from one region to the next. Therefore, with some care, the environmental standard that a representative competitor uses could be the reference level.

Certain findings can be drawn from analysing the different ways of defining the reference level. For example, it is interesting that most potential benchmarks are not based on scientific observations. Among the benchmarks mentioned, only best management practices and world best technology involve a high degree of scientific objectivity. The other possible benchmarks are true social constructs that, depending on the case, may or may not incorporate a scientific component.

2.4.6. Agricultural Producer's Context – Economic Considerations

As we have seen, the concept of reference level essentially helps answer the question: should governments compensate businesses for acting in the public interest? When should the polluter-pays principle apply and when should the user (beneficiary)-pays principle apply? However, applying the concept requires some subtleties.

Very concretely speaking, in this connection, Roger (1999) found that if the goal is to limit polluting activities or the use of certain natural resources, the introduction of a producer compensation process can be used jointly with compensating the "victim" of the annoyances. He also noted that paying subsidies to motivate producers to control their pollution has been a favoured route to date. In the transition phase, the State often decides to assist agricultural producers who agree to make accommodations or improve farming practices, thereby implicitly adopting the beneficiary-pays principle.

Concretely speaking, some criteria could be set for determining what portion of the expense of standards compliance to compensate. Thus, the decision to compensate producers following infringements or amendments to certain property rights is not merely a legal issue directly relating to property rights, it is also a policy matter involving fairness issues. Although the concept of fairness is subjective and vague, Doyon and Nolet (2006) introduce two criteria for clarifying the concept:

- the unpredictable nature of the burden;
- the unreasonable nature of the burden placed on the polluter.

2.4.6.1. Unpredictable Nature of the Burden

The criteria of burden unpredictability refers to the idea that the State could agree to compensate the costs that its intervention causes if investments made by businesses or legislation would have been developed in a context where government action was unforeseeable.[1] Thus, an agricultural producer who buys a wetland for the purpose of draining it and putting it into production 10 years later cannot foresee that the government would, in the meantime, introduce regulations prohibiting the draining of wetlands. The farmer therefore loses part of his production potential while a portion of the private good that he legitimately owns takes on public good status and has value for society in general, but from which he himself can derive no value.

Introducing the concept of unpredictability therefore entails the concept of responsibility. In fact, we are trying here to define the context within which the agricultural producer could be considered responsible and the context within which he would not be responsible for any losses he incurs. What remains to be determined is the time frame within which the unpredictability criterion applies.

Responsibility

The question to be asked here is: are agricultural producers responsible for environmental damage for which there is a cost that he must bear today?

One aspect of the costs of standards compliance is that they vary greatly from one operation to the next and that, unlike most other production costs, the extent is often independent of farm size, efficiency or performance.

Indeed, depending on their situation, some farmers face compliance costs that are much higher than others. For example, some farmers are located near a waterway, others are surrounded by neighbours who may be bothered by odours, and others may be near particularly sensitive ecosystems. In such cases, unless the producer settled in a suburb, the producer is not responsible for the damage he does. He has no control over the context or consequences of his choices. After all, not all producers have to install fences, respect riparian areas or adhere to separation distances.

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[1] Unpredictability here means that, at the time of the action, there was no signal from government or civil society suggesting a legislated change. Therefore, unpredictability must not be taken in a context of uncertainty with respect to more short-term actions, as Isik discusses (2004).

Producers facing costs such as these are, in a way, victims of circumstance. They are not always responsible for that.

2.4.6.2. Reasonableness of the Imposed Burden

The concept of "reasonableness" of the burden refers to the extent of the cost for agricultural producers to meet the requirements of the new regulations. If a farmer or group of farmers determines that a government policy results in a disproportionate income shortfall or jeopardizes the operation's survival, compensation could be considered in that case. Since the issue of "reasonableness" is subjective, other criteria need to be introduced to clarify it:

- ability to pay;
- need, necessity, relative state of development;
- competition.

Ability to Pay

The concept of ability to pay refers directly to the relative wealth of agricultural producers. For example, even if regulations are foreseeable and a producer is responsible for the environmental damage done, the burden imposed may be unreasonable if the producer cannot cover the costs associated with the obligation placed on him.

It is conceivable that, in an area where potential crop alternatives are very limited (e.g. sandy soil for potatoes), additional requirements in a difficult economic context may prove disastrous. In this case, compensation could be considered.

Need, Necessity, Relative State of Development

Agriculture is becoming more industrialized in North America. Without judging the value of new production models, we can still state that some types or sizes of operation have a greater need and they are given breathing room to allow them to catch up to the average operation in terms of productivity. Imposing environmental restrictions on those operations could jeopardize that goal. Therefore, compensation could be considered for operations that are in catch-up mode (family farms) to take their need for growth into account.

Competition

Competitiveness is very often used to justify lenient environmental standards or producer compensation for environmental standards considered too stringent compared to those of the competition.

It follows that one key aspect for having different environmental standards across regions is industry competitiveness in a different environmental context. It must be asked to what degree does an increase in production costs associated with a new environmental policy influence an industry's competitiveness in domestic or international markets.

Thus, countries or regions at the forefront of the environment protection movement will, in an open market context, tend to be adversely impacted competitiveness-wise, and producers in those regions will suffer the most. However, the impact on producers will vary widely across industries. Two main factors can determine how sensitive the industry is to environmental policies (GTPE, 2000):

- the possibility of passing on standards compliance costs to consumers;
- the degree of competition within the industry.

Obviously the first factor is greatly determined by the second. It can indeed be maintained that agricultural producers operate in competitive markets and that passing along the costs to consumers is therefore impossible.

It can then be argued that stricter environmental standards than those of competitors involve a competitive disadvantage, so compensation would serve to restore the balance and prevent being disadvantaged.

2.5. Conclusion

In summary, it is understood that reference levels set the boundary between damage prevention and benefit creation. In doing so, the reference level defines the scope of farmers' property rights and citizens' right to a clean environment.

The concept of reference level also helps operationalize the polluter-pays principle by spelling out the limits of its applicability. It is understood that polluters will pay as long as their actions are intended to prevent damage. If they create benefits that society does not have a right to expect, the user (beneficiary)-pays principle applies, and the producer deserves to be compensated.

Reference levels may be based on different standards such as the current situation, the new requirement, absence of environmental restrictions (profit maximization), business as usual, best management practices (BMPs), world best technology (WBT) and the competition.

Beyond the principle however, using the reference level concept to determine the validity of producer compensation requires taking the producer's context into account. Specifically, the decision whether to compensate agricultural producers must consider the predictability or unpredictability of the burden and the weight of that burden.

As such, applying the polluter-pays principle when deciding whether to compensate will depend not only on the definition of property rights induced by the reference level, but also, temporarily, by society's view of fairness.

If the general public were to see that agricultural producers have converging interests with society as a whole, the public would see no need to regulate agricultural production and thereby oversee producers' property rights.

However, given that agricultural producers have been adopting an industrial production approach, with all the associated environmental impacts, society has been gradually facing the need to view agricultural activities as industrial activities. This has naturally led to tension. Unspoken social contracts have been broken, and the role of trustee of the environment that has traditionally and implicitly belonged to agricultural producers has gradually been brought into question. Throughout the West, the State has had to step in and arbitrate between producers' individual property rights and the public's right to environmental quality.

3. CASE STUDIES

It is with this conceptual framework in mind that the various case studies were conducted. The aim in studying them was to attempt to understand how different countries facing various problems had defined reference levels within some of their programs. Concretely speaking, we were just as interested in the process that led to reference level selection as we were in the definition of the reference levels themselves. The objective was to identify, within the context and process, those aspects that assisted the decision-making process regarding these reference levels and to identify specific aspects pertaining to the sharing of the economic burden of the measures implemented within the programs presented.

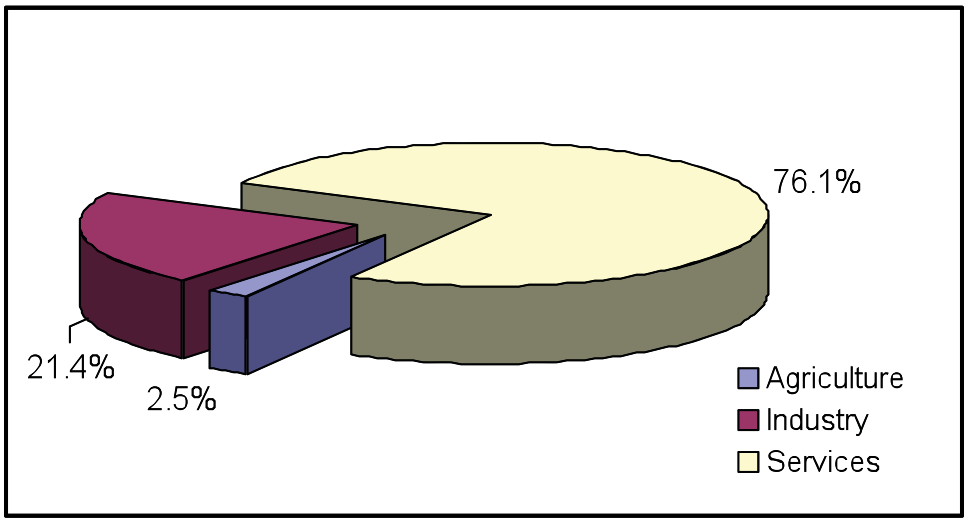
The agri-environmental programs examined have commonalities as well as differences that should be identified to be able to draw valuable lessons from them. From this viewpoint, we will present some features of the programs introduced in various countries with respect to reference level selection.

3.1. France - Sustainable Agriculture Contract (CAD)

3.1.1. Context

France has the highest volume of agricultural production in the entire European Union. The agriculture sector accounted for 2.5% of its GDP in 2005 (CIA 2005).

FIGURE 9: FRANCE – GDP BY SECTOR



Source: CIA World Factbook: France, 2005

The main agricultural products (in terms of production volume) are grains (wheat, corn), sugar (sugar beets), wine, and fruits and vegetables. For animal products, dairy products are first in terms of quantity, followed by beef cattle and poultry production.

Arable land in France takes up two thirds of the usable agricultural area (UAA). The main crop in terms of space used is grains, covering nearly half the arable land, followed by artificial pasture (16% of arable land), oilseeds (10%), forages (8%) and finally fallow lands, which take up 7% of arable land.

Permanent crops cover approximately one third of the UAA. Permanent grasslands take up nearly 90% of the land dedicated to permanent crops, followed far behind by vineyards, which occupy 9% of land dedicated to those crops. (Agreste, Statistiques Agricoles en France, 2006).

Nationally, the main environmental issues identified are biological diversity, soil quality, natural risks, water resource quality, water resource quantity management, air quality, landscape and cultural heritage.

3.1.2. Description of the Program

France, the top agricultural country, was a pioneer in establishing voluntary agri-environmental measures in Europe. The agricultural landscape contract (CTE) program, the precursor to the sustainable agriculture contract (CAD) program, is an excellent example. Given that CADs were heavily based on CTEs, we will briefly describe the program in question.

The agricultural landscape contract (CTE) program was essentially a voluntary five-year commitment between a farmer and the French State for implementing environment-friendly farming practices on the farm in exchange for monetary compensation. The CTE used a contractual approach that applied to the entire farm and was based on recognition of the multi-functionality[2] of agriculture. This is one of the key provisions of the French *Loi d'Orientation de l'agriculture* (LOA) of 1999.

There were two mandatory components to the CTE: one was a socio-economic component (production of added value and employment) and the other involved the development of environment-friendly farming practices.

For implementing it, a national catalogue and regional catalogues of measures were prepared and approved by the European Commission. Specifications for the measures listed in the catalogues were required to meet the following criteria:

- clear, auditable definition;
- demonstrated technical effectiveness;
- compensation calculated as fairly as possible.

Although executed individually, CTEs could be part of a collective process, coordinated by territory or within a territorial system [*filière territorialisée*]. Farmers belonging to the same territory or territorial system could use a standard CTE when preparing their CTEs. The purpose of this territorial approach was to achieve greater effectiveness in terms of landscape management, water quality and economic development.

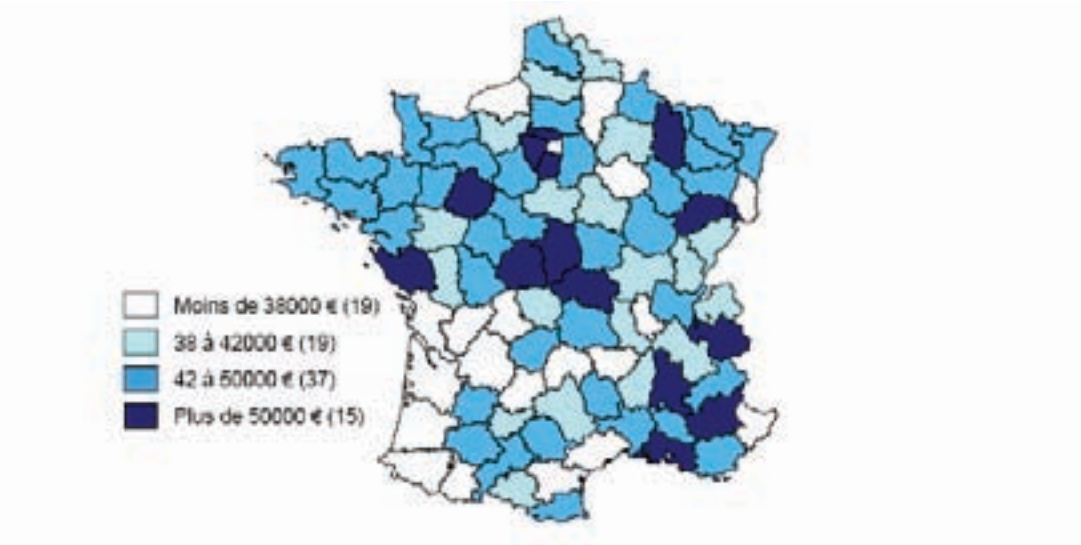
2 According to the OECD, "The core elements of multi-functionality [...] recognized by Member states are: i) the existence of multiple commodity and non-commodity outputs (NCO) that are jointly produced by agriculture; and ii) the fact that some of the non-commodity outputs exhibit the characteristics of externalities or public goods, with the result that markets for these goods do not exist or are poorly functioning."

Implementation of a CTE was contingent on project approval from the prefect of the *département*, who in some cases could suggest amendments and even reject it.

According to the Ministry of Agriculture, 2002 saw a sudden increase in CTE contracts. The lack of budget monitoring led to the mechanism being suspended initially on August 6, 2002 before being re-opened for a transition phase." The large number of CTEs signed combined with there being no cap on the amount allocated per project led to the pre-established budget being exceeded in 2002 and a temporary suspension on the signing of new contracts.

The following figure shows the geographic distribution by *département* of average amounts paid for CTEs.

FIGURE 10: GEOGRAPHIC DISTRIBUTION OF AMOUNTS PAID FOR CTES



Source: Urbano, G. and Vollet, 2005 D. L'Évaluation du Contrat Territorial d'Exploitation

In 2003, a CTE mid-stream evaluation was conducted in France. This identified the imbalance across regions with respect setting regional issues and adapting the national catalogue to the regional context. As such, the regional catalogues could all be very different, particularly in content and number of measures. One reason for this imbalance was the differing degree of environmental awareness or knowledge among the groups involved in selecting regional issues and measures.

According to the synthesis report from the CTE midstream evaluation in France, (Urbano, G. and Vollet, D. 2005), the launch of the (CTE) program had been somewhat hasty, and in most cases did not allow for territorial and individual diagnostics to be conducted in advance under suitable conditions.

The CAD program was created in 2003 by Decree No. 2003-675 of July 22, 2003, to replace the agricultural landscape contract (CTE) program in effect until that date. CTEs still in effect in 2003 would continue to exist until the end of the five-year period for which the commitments had been made. The CAD program replaced the CTE program in an attempt to simplify, lighten and better monitor the budget and administrative process.

Reference levels under CADs are almost identical to those under the CTEs. The environmental objectives sought through implementation of CADs are also very similar to those established for CTEs:

> [TRANSLATION]
>
> The preservation of natural resources, intelligent land use and development of rural areas, primarily to control erosion and preserve soil fertility, water resources, biological diversity, nature and landscapes. It may also include socio-economic objectives pertaining to diversification of agricultural activities, development of quality systems and employment. (Decree 2003-675).

From an economic standpoint, financial assistance in exchange for environmental commitments under CADs is paid annually. It is intended to cover losses incurred by implementing environment-friendly practices. The money that goes to farmers comes from the French State, which funds 50% of the costs of implementing the CADs, and from the European Union through the European Agricultural Guidance and Guarantee Fund (EAGGF), which contributes the remaining 50%. Additional contributions may also come from local communities.

In fact, with increasing frequency, local communities or *établissements publics de coopération intercommunale* (EPCIs) become CAD co-signers by contributing funding.

Concretely speaking, a CAD provides for two methods for funding agri-environmental practices:

- Material and immaterial assistance, relating to investments or expenses (for example, an additional cost for a quality approach). Maximum amount: 15,000 euros for the length of the contract. This type of assistance fits into the socio-economic component of the CADs.
- Assistance per hectare or per livestock unit (LU). According to the CNASEA. the level of assistance is based on loss of earnings and additional costs resulting from agri-environmental commitments.

Additional compensation is provided for young farmers whose operations are located in disadvantaged areas or for parcels in a Natura 2000[3] site.

The average amount per contract within a *département* must be less than or equal to 27,000 euros over five years. With CTEs, the average amount per project was not limited, and it was estimated at approximately 44,400 euros per farm for the length of the project (five years), 11,000 euros of which were investments.

At the national level, the *Centre National pour l'Aménagement des Structures des Exploitations Agricoles* (CNASEA) manages the payments and conducts appropriate audits to ensure that the terms of the contract are met. Within the *départements*, management is handled by the *Associations Départementales pour l'Aménagement des Structures des Exploitations Agricoles* (ADASEA).

To summarize, below are the main differences and similarities between the CTE and CAD programs.

TABLE 1: COMPARISON OF THE CTE AND CAD

Agricultural Landscape Contract (CTE)	Sustainable Agriculture Contract (CAD)
▪ Voluntary five-year contract between a farmer and the French State. The farmer agrees to develop a set of environment-friendly practices for his farm in exchange for monetary compensation.	▪ Definition and objectives remain the same for CADs.
▪ Assistance amount set by European Regulation 1257/99 based on the environmental requirements of the measures implemented.	▪ Same for CADs
▪ The assistance came from: o 50% European Agricultural Guidance and Guarantee Fund (EAGGF) o 50% French State	▪ The assistance comes from: o 50% Agricultural Guarantee Fund (EU) o 50% French State ▪ More and more local communities are providing additional contributions, thereby becoming co-signers of the CADs.

Source: ÉcoRessources Consultants Compilation

[3] According to the definition by the Ministry of Ecology and Sustainable Development, Natura 2000 is a set of natural sites throughout Europe identified for the rarety or fragility of the wild animal or plant species and their habitats. Parcels located within a Natura 2000 area are entitled to a 20% upward adjustment in the amount of assistance received. Environmental requirements for Natura 2000 areas are often greater.

TABLE 2: COMPARISON OF THE CTE AND CAD (CONT'D)

Agricultural Landscape Contract (CTE)	Sustainable Agriculture Contract (CAD)
▪ Budget per CTE not capped at the *département* level. In 2002, the average amount per CTE was approximately 42,000 euros. The overbudgeting led to the signing of new contracts being temporarily suspended.	▪ Average amount per CAD limited to 27,000 euros.
▪ National catalogue prepared by Minister of Agriculture officials. ▪ Regional catalogues, based on the national catalogue and resulting from discussion among stakeholders (agricultural and agri-environmental).	▪ Same national and regional catalogues as for CTEs.
▪ For identifying measures on a per-farm basis: farm diagnostic	▪ The farm diagnostic still exists for CADs.
▪ Number of measures to contractualize per farm: unlimited	▪ Number of measures limited to 6 (maximum of 3 measures for a maximum of 2 issues per farm)

Source: ÉcoRessources Consultants Compilation

TABLE 3: COMPARISON OF THE CTE AND CAD (CONT'D)

Agricultural Landscape Contract (CTE)	Sustainable Agriculture Contract (CAD)
▪ The two components (economic and environmental) are mandatory	▪ Economic component optional. Only the environmental component is mandatory. With the cap on average amount of the project per *département*, setting aside the mandatory economic component helped reduce the budget allocated for the program
▪ Existence of territorial CTEs and system CTEs	▪ Standard territorial CAD and standard *département* CAD. The system approach was eliminated for the sake of "territorializing" the measures.
▪ Cumbersome administration	▪ The CAD administrative framework was simplified mainly by reducing the number of items to include in the file and eliminating the two mandatory components (today only the environmental component is mandatory)

Source: ÉcoRessources Consultants Compilation

3.1.3. Geographic Scale at which the Reference Levels are Applied

For CTEs, the Ministry of Agriculture had prepared a list of national environmental issues and measures that is still valid for CADs. The national catalogue identifies environment-friendly practices that go beyond good agricultural and environmental conditions, entitling implementers to subsidies.

As well as describing a wide range of measures to contractualize, the national catalogue also contains an environmental rationale for the measures, by target issue. For example, for measure 0304A, no chemical or mechanical weeding in the row spacing of perennial crops for a period defined by a *département* technical committee (usually between August 15 and February 1), the environmental rationale is as follows:

[TRANSLATION]

> Leaving the weeds in the row spacing of perennial crops during autumn and early winter provides physical protection for the soil and preserves its structure with the root system, limiting erosion and leaching from the autumn rains (objectives: erosion control and water protection). (*Plan de Développement Rural National*, PDRN, *Annexe B*, 2002).

Using the national catalogue, each region must indicate which measures are best suited to the environmental issues in their area, as well as the measure specifications and amount of assistance granted, justifying it in terms of shortfall. The amount of assistance was determined with reference to European Commission Regulation 1257/1999.

For CTEs, environmental issues were identified regionally through a consultation process among stakeholders in the agricultural and environmental spheres. Regional issues and practices to implement were selected from among all proposals from the various stakeholders and based on knowledge of the regional area and the main problems.

Today, with CADs, regionally established reference levels are heavily based on those established for CTEs.

Note that adjustments are possible within a *département*, with the selection of more restrictive measures. The *Commission départementale d'orientation de l'agriculture* (CDOA) develops the *projet agricole départemental* (PAD), which must by approved by the prefect of the *département*. The PAD establishes the *département*'s main socio-economic and agri-environmental issues as well as the priorities for action.

At the farm level, issues are identified through a farm diagnostic. This diagnostic is performed by farmers themselves with assistance from various organizations: agricultural councils, rural economy centres, unions, *Associations Départementales pour l'Aménagement des Structures des Exploitations Agricoles* (ADASEA), cooperatives and local project holders. From among the established priority actions, farmers select a maximum of six agri-environmental measures to develop (maximum two measures per issue for a maximum of three environmental issues identified during the farm diagnostic).

3.1.4. Process Establishing the Reference Levels

At the national level, informal negotiations were held, involving a number of organizations: the *France Nature Environnement* (FNE) federation, representing environmental groups, the Ministry of Agriculture, agricultural councils (APCA- *Assemblée Permanente des Chambres d'agriculture*), etc. Those informal national negotiations helped Ministry of Agriculture officials develop the national catalogue of measures.

Regional negotiations were held as well. The preparation of the regional catalogue of measures, establishing the reference levels in effect under the CADs, was the result of discussion among the players in the regional agricultural and environmental sphere: the *Direction Régional de l'Agriculture et de la Forêt*, the *Direction Régionale de l'Environnement*, agricultural councils, representatives from environmental groups, etc.

The negotiations were conducted very differently in each region, depending on the agricultural context, existing environmental problems and the level of involvement from the players. Even so, we can still identify elements that helped or hindered reaching consensus during the negotiations for preparing the regional catalogues.

In the discussions with stakeholders involved in the negotiation processes, several things facilitated the negotiating and decision-making:

- Existence of a national framework previously validated by stakeholders (European Commission, Ministry, farmers, environmentalists) helped the bases for negotiation be accepted regionally.
- The extensive national catalogue proposed a wide range of measures that could be adapted to a host of regional situations, enabling regional stakeholders to build on the detailed work done by national officials.
- Regional negotiations were facilitated by previous agri-environmental programs, including local environmental agricultural operations (OLAEs). OLAEs gave local players (agricultural technicians, environmentalists and territorial communities) the freedom to choose a set of agri-environmental measures to apply to their territory based on a territorial diagnostic. A bargaining space was then created to facilitate mutual knowledge among participants and subsequent exchanges. The territorial communities were not very active in the talks for selecting CTE measures because they did not feel overly affected by negotiations that went beyond the strictly local framework.

- Farmers' voluntary contractualizing of measures helped agricultural stakeholders more readily accept more stringent measures proposed by environmental groups. Since this allowed other measures to be included in the regional catalogue, less well paid of course, but also less stringent and essentially aligning with existing practices, meaning that the farmer's work load did not increase. These "status quo" measures were the most contractualized in practice. According to the 2003 evaluation conducted in Languedoc Roussillon by Guihéneuf et al. (2003), among the numerous measures to do with hectarage included in the regional catalogue, 12 measures alone cover 90.4% of contractualized hectares. Among the "frontage" measures (involving hedges, ditches, low walls and waterways), the concentration is greater because only three measures account for 91.1% of contractualized frontages. Vast amounts of money were directed to highly contractualized measures with low environmental impact. One example is the measure regarding shredding and the incorporation of mature vine shoots, intended solely to increase organic matter in the soil and widely used by vintners.
- However, the strategy of environmental groups was to include in the catalogue certain measures that were "exemplary" from an environmental perspective. These were highly compensated measures that met the expectations of "model" farmers who were already developing very environmentally advanced practices. But those measures were contractualized only in very marginal instances.
- The *Direction Régionale de l'Agriculture et de la Forêt* (DRAF) was responsible for harmonizing all proposed measures. According to Guihéneuf et al. (2004), to prevent conflicts and reconcile differing expectations, a certain amount of free rein was given, which allowed very different measures into the catalogue, some stringent in terms of modified farming practices and environmental outcomes, others less restrictive and akin to maintaining what exists.
- Finally, according to François Léger (researcher with the *Institut National d'Agronomie Paris-Grignon* – INA-PG), agri-environmental measures were able to be implemented through the establishment of corresponding communities of interest. When the various interest groups agreed, in advance, on common positions, the negotiating process was simplified. Indeed, the limited number of differing positions helped in reaching consensus.

According to the stakeholders consulted, other aspects made the decision-making process more difficult:

- In some intensive agriculture areas (central area, Parisian Basin) or areas with significant agricultural pollution problems (Brittany), environmental groups made fewer concessions, and negotiations were more intense. However, in southern regions, where the main environmental problems identified were suburban sprawl and destruction of littoral zones, the impacts of agriculture, often perceived as an activity in difficulty, were considered by environmental groups as a minor problem. Environmental groups were convinced that keeping agriculture in those areas was vital to the region's socio-economic fabric and were more conciliatory during negotiations. This was also seen in areas of agricultural abandonment and mountain areas without the major farming-related environmental problems.
- Some items were the subject of conflict between agriculture players and environmental groups, for example bog management in the Languedoc Roussillon region with issues such as drain depth, which was negotiated "down to the centimetre". The environmental value placed on the various natural spaces, or the perception of their rarity, also appears to have influenced the negotiations.

3.1.5. Established Reference Levels

Given the wide range of measures in the national catalogue, we will present a few examples here to illustrate the nature and stringency of the practices giving rise to payments under the CAD program.

First, here are two examples of CADs giving an idea of regional issues that may be selected by farmers in the Languedoc Roussillon region:

"Grove" Standard Contract

- Water issue: action "planting ground cover to prevent bare soil in winter"
- Landscape issue: action "hedge maintenance"

Cotentin Marsh Standard Contract

- Water issue: action "ditch maintenance once every five years"
- Biodiversity issue: actions "extensive grass management zero fertilization" and "cutting after July 25"

We also provide an example of the specifications for the "conversion of arable land into extensive grasslands" measure:

- On a strip of land at least 10 m wide parallel to the shore of the waterway, the contractor shall plant grass cover maintained mechanically. The boundary of this strip along the waterway shall meet the regulatory requirements for passage, maintenance and access to the shores:
  - ⇒ Grazing is prohibited,
  - ⇒ No nitrogen applications (mineral or organic),
  - ⇒ No chemical phytosanitary treatments,
  - ⇒ The product of mowing is removed from the parcel,
  - ⇒ With shredding, the product of shredding may be left on site;
- On complete parcels or groups of parcels where the parcels are adjacent to a waterway, apply the provisions from the previous clause, on a strip at least 10 m wide. On the rest of the parcel, the following specifications apply:
  - ⇒ Maintaining natural grassland:
    - Keep all permanent grassland parcels on the farm as permanent grassland,
    - Renewal of grassland maximum over five years with simplified tillage (direct sowing), after assessment by the local technical committee, no levelling, drainage, full afforestation,
    - Feeding from the parcel[4] authorized without degradation, in conditions defined by the local technical committee,
    - Keep and maintain landscape elements (hedges, borders, isolated trees, shrubbery, watering holes, wet depressions, fencing, etc.) and animal pathways,
    - Keep and routinely maintain canals and tertiary ditches;
  - ⇒ Extensive grassland management:
    - Total fertilization limited to 60-60-60 N-P-K,
    - Phytosanitary treatments prohibited, except for spot applications of products for controlling thistles, sorrel and nettles,

[4] Production technique that involves keeping livestock in the barn permanently and bringing the forage to them.

- Annual maintenance by mandatory cutting or grazing (average stocking rate between 0.6 and 1.4 LU/ha),
- Mandatory cutting or shredding of waste,
- Involvement in collective action for invasive species control and restoration of tertiary ditches,
- Possibility of early spring grazing[5],
- Keeping a record book of grazing, cutting and fertilizer spreading for all parcels committed,
- Cutting on the parcel delayed to June 1 for the Poitevin Marsh and May 20 for Charentes Marshes (10-day delay), except where special exemptions are issued under specific climate circumstances and upon notice from the local technical committee,
- Moderate winter grazing is acceptable subject to non-degradation of the parcel, in conditions established by the local technical committee.

Maximum per-measure amounts are set Europe-wide under the provisions of Regulation 1257/1999 of May 17, based on the intensity of obligations. They are adapted to the regions by the *Directions Régionales de l'Agriculture et la Forêt* (DRAF) using the same criteria (required stringency level).

In 2004, 10,011 CADs were signed (CNASEA, 2005. 2004 Activity Report) with 250.4 million euros committed, for an average per-project amount of approximately 25,000 euros.

For illustration purposes, we provide below some examples of subsidies granted for specific measures under the standard Poitevin Marsh contract in the *département* of Deux Sèvres.[6] As can be seen, the subsidy amount varies according to the stringency of the measures involved. Concretely speaking, the amounts granted are increased by 20% for farms in Natura 2000 zones.

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[5] Grazing of grasses in early spring.

[6] Here are the links to two current CADs in the *département* of Deux-Sèvres with all measures giving rise to monetary compensation:
Préfecture des Deux-Sèvres, 2003. Arrêté portant création du Contrat-Type Territorialisé (CT-ENV01), Marais Poitevin. 21 p.
http://www.fnsea.fr/dossiers/cad/contrattypemarais.pdf
Préfecture des Deux-Sèvres, 2003. Arrêté relatif à la mise en oeuvre des Contrats d'Agriculture Durable Contrat-Type "Départemental" (CT-DEP01). 12 p. http://www.fnsea.fr/dossiers/cad/contrattype1.pdf

TABLE 4: EXAMPLES OF SUBSIDIES FOR SPECIFIC MEASURES

Measure	Amount (€/ha/year)
Conversion of arable land into extensive grasslands	375 outside Natura 2000 zones 450 within Natura 2000 zone
Maintenance of the marsh's permanent grassland	153 outside Natura 2000 zones 183 within Natura 2000 zones
Preservation of old natural grasslands with high biological value	228 outside Natura 2000 zones 274 within Natura 2000 zones

Source: Préfecture des Deux-Sèvres, 2003. Arrêté portant création du Contrat-Type Territorialisé (CT-ENV01), Marais Poitevin

3.1.6. Monitoring Mechanisms

The *Centre National pour l'Aménagement des Structures des Exploitations Agricoles* (CNASEA) conducts audits of farmers who have signed a CAD. According to the CNASEA, recipients undergo an annual on-site audit conducted by the CNASEA to ensure that contract commitments in exchange for assistance are being met.

Every year, farmers must submit a declaration on meeting CAD commitments (DARE - CAD) as well as the annual area map for agri-environmental commitments, which shows the areas declared on the farm's parcel register. Thus, all of a farmer's commitments must be "territorialized", i.e. mapped out on the farm.

Audits are conducted for all commitments, not just for individual measures, and involve three components: the administrative component, conducted annually by two authorities: regionally by the *Direction Régionale de l'Agriculture et la Forêt* (DRAF), and nationally the *Centre National pour l'Aménagement des Structures des Exploitations Agricoles* (CNASEA), which annually ensures that commitments are being met. There is the socio-economic audit, involving invoices for eligible purchases under the socio-economic component. Finally, there is an "on-site" audit of at least 5% of recipients of each measure and for all existing measures.

If a farmer refuses to undergo the audits, assistance is suspended for the year in question and the contract may be terminated, with the producer required to reimburse subsidies received plus applicable lawful interest.

Misrepresentation or failure to meet commitments leads to sanctions, ranging from contract termination and assistance payment suspension to relatively significant reductions depending on the extent of the

failure to meet commitments. For example, if the committed hectarage is not met, three sanctions are possible:

- If the difference varies from 0% to 3% of the hectarage, the sanction is reimbursement of the difference plus lawful interest;
- If the difference is 3% to 20%, the sanction is reimbursement of the difference, plus lawful interest and penalties equal to twice the difference;
- If the difference is greater than 20%, the penalty is reimbursement of all assistance plus lawful interest.

For further information about sanctions, see FNASEA, web site. CAD – *Les Sanctions*.

3.1.7. Environmental Performance Assessment

Monitoring and evaluation of the CAD measures to determine level of achievement of socio-economic and environmental objectives is done through assessment of the national rural development plan (PDRN). In 2003, a PDRN midstream evaluation established a detailed profile of the socio-economic impact and environmental effects of the PDRN (Vindel and Gergely, 2005), including those resulting from agricultural landscape contracts (CTEs).

The 2003 midstream evaluation identified that the results from agri-environmental practices were moderate because certain issues, such as water protection and erosion prevention, are difficult to achieve if there is no cooperative management between farmers whose operations are located downstream and upstream of the same watershed (Urbano, G. and Vollet, D., 2005).

One of the indications from the midstream evaluation is the need for more effective targeting of agri-environmental measures to meet sustainable development objectives. According to Urbano et al. (2005), that would be done by establishing a set of mandatory measures, along with a strong economic incentive, that would specifically meet target environmental objectives. Another evaluation is planned for the near future to prepare the next phase of the PDRN for the 2007-2013 period.

3.1.8. Summary and Analysis

In France, reference levels take many forms, based on the problems and specific issues encountered regionally. They are defined within agri-environmental programs. Since the CAD program is voluntary and a variety of measures are available to producers, reference levels are not absolute. Producers in a way

choose the reference level they want applied to their operation, in light of their analysis of the requirements involving them in exchange for subsidies.

In the negotiation process, the public policy-maker's fairly obvious intent seems to have been to achieve practice improvements along the lines of BMPs; environmental groups have generally sought to achieve best practice modifications, similar to what we have called "world best technology" in the conceptual framework, but with more generous compensation for producers. Producers themselves have proven to be open because the program is voluntary. However, the reality seems to be that they favour the status quo.

It is particularly interesting that, when looked at more closely, stakeholders as a whole essentially seem to have been in agreement in choosing the status quo as a reference level. Indeed, the basic principle of the CAD is to compensate producers for losses incurred by implementing agri-environmental measures. Ecologists have proposed more stringent measures, but with greater compensation.

Nevertheless, a number of important points are worth bearing in mind regarding the negotiation process. Specifically, sound knowledge of environmental problems, the preparation of a national catalogue of measures, the fact that stakeholders are used to working together and voluntary contracts are all aspects that made it much easier to define reference levels.

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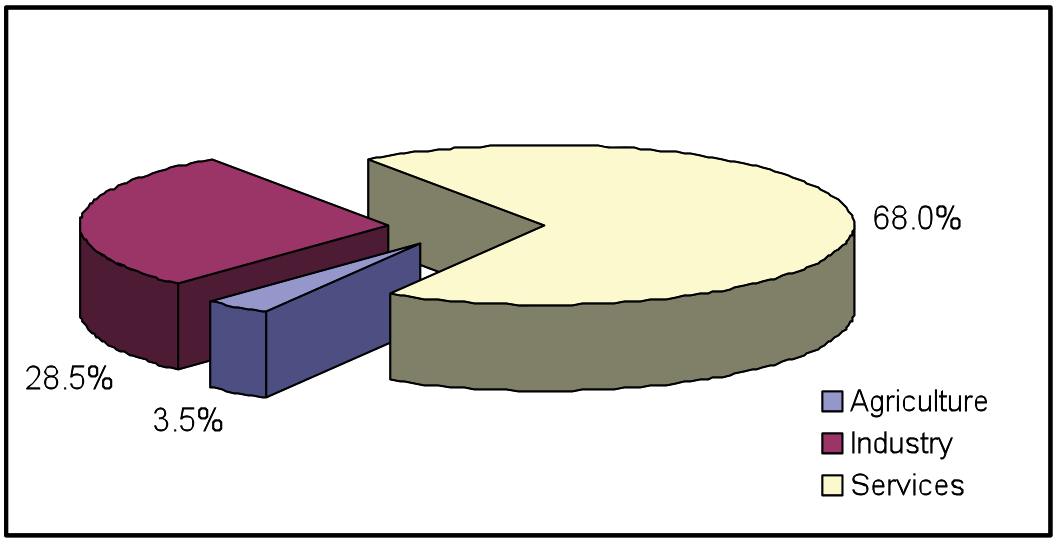
3.2. Spain – Environmental Cross-Compliance

3.2.1. Context

Spain's economy, with a GDP of 900,300 million euros in 2005 and an annual growth rate of 3.3%, is the fifth largest economy in the European Union. The contribution that the various sectors, including agriculture, make to GDP is as follows:

FIGURE 11: AGRICULTURE'S SHARE IN SPAIN'S GDP



Source: Ministerio de Economía y Hacienda, 2005

The wide variety of climate and soil conditions in Spain results in a broad diversity of agricultural production. There are crops specific to temperate climates (cereals, protein crops, etc.) as well as Mediterranean crops (citrus fruits, olives, vineyards). Some areas in the country also produce tropical crops (bananas, sugar cane) (Ministerio de Agricultura Pesca y Alimentación - MAPA 2005).

Fruit and vegetable production, mainly in the Mediterranean area and the islands, accounts for about 50% of total agricultural production. Production is intensive, intended primarily for export.

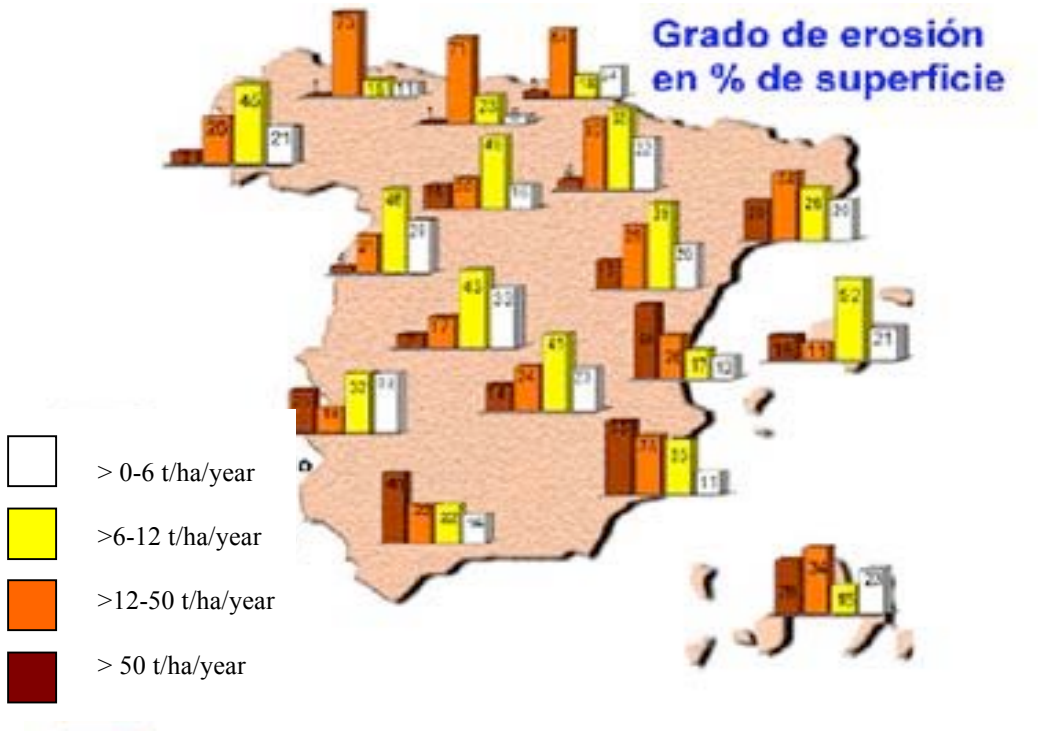
In terms of space occupied, according to MAPA data (2001) cereals cover nearly 50% of the country's area under crops, followed well behind by fruit trees and olive orchards.

The main agri-environmental issues identified in Spain are the risk of soil erosion, soil loss and the risk of desertification, preservation of the soil's organic and mineral resources and improvement of soil structure,

fire prevention, biodiversity preservation and increase, and the protection of landscape elements. One of Spain's major problems is soil loss from erosion primarily in the country's Mediterranean regions.

The following figure shows the distribution of erosion levels, expressed as a percentage of areas affected by relatively serious soil loss problems:

FIGURE 12: DISTRIBUTION OF EROSION EXTENT IN SPAIN



Source: Emilio J González Sánchez, Armando Martínez Vilela,
Asociacion Española Agricultura de Conservación / Suelos Vivos (AEAC/SV)

Brown represents land with very high erosion problems, with annual per-hectare soil losses of over 50 metric tonnes. Orange shows land with high soil erosion, with annual soil losses between 12 and 50 tonnes. Yellow indicates land with medium erosion, with annual per-hectare soil losses between 5 and 12 tonnes. Finally, white represents land with minimal erosion, with annual per-hectare soil losses from 0 to 5 metric tonnes.

Even though there are erosion problems everywhere in Spain, they are greatest in the Mediterranean area. This area has the highest percentages of land experiencing a high or very high degree of soil erosion.

The erosion problems are due, among other things, to the characteristics of the Mediterranean climate, including precipitation concentrated at specific times of the year, mainly fall and spring. Significant amounts of water fall in a relatively short time. The erosion problems are exacerbated by the country's uneven topography, lack of sufficient plant cover to limit soil losses, and fire.

The *Inventario Nacional de Erosión de Suelos* (INES) program was launched in 2005 to profile the soil erosion situation in Spain's provinces. The preliminary conclusions from that study, scheduled to end in 2012, are alarming for some provinces in the Mediterranean area, seven of which have severe soil erosion problems on 90% of the land.

3.2.2. Description of the Program

Cross-compliance measures are not new in Europe, but until 2003 they were applied voluntarily by member states and involved environmental aspects only. Cross-compliance today has broadened to include other aspects as well, such as public health, animal and plant health, animal welfare and maintenance of agricultural land.

"Good agricultural and environmental conditions" were introduced in Europe during the last reform of Europe's Common Agricultural Policy (CAP). The Luxembourg Agreement, signed by member states in June 2003, added two new principles to the Common Agricultural Policy: decoupling of assistance and cross-compliance.

Spain's current cross-compliance measures resulted from applying Europe's reformed Common Agricultural Policy, primarily Regulation EC 1782/2003, to Spain's specific framework. In Spain, this regulation was adapted through the issuing of a *Real Decreto* (No. 2352/2004) establishing, among other things, "good agricultural and environmental conditions" (GAECs) specific to Spain.

In Spain, good agricultural and environmental conditions address erosion problems, maintenance of agricultural areas and habitat protection.

The costs of adopting or implementing cross-compliance measures are borne entirely by farmers. Access to European direct payments is dependent upon compliance with these practices, and there is no economic consideration for compensating shortfalls incurred.

Recall that direct payments (by hectarage or by livestock unit) are granted to farmers based on a ceiling established by the European Union and allocated to each member state. A farmer submits a single request for all direct payments he/she is entitled to (lump sum). Spain must then send the European Community

(EC) the report of all assistance requests received. Funds from the European Community then go through the Spanish Agricultural Guarantee Fund (FEGA), which manages direct payments to agriculture.

In Spain, the percentage of producers' total income from these direct payments depends on the production sector. In general, percentage of total income from direct payments is 20% to 30%, depending on the sector (COAG, personal communication).

In Spain, the process for applying agri-environmental standards, which was voluntary in Europe until 2005, was much slower than in other countries. The transfer of agricultural expertise to the administrative regions (*Comunidades Autónomas* - CCAA) characteristic of Spain's administrative structure, slowed down the process. Beyond the lack of policy coordination across the levels of government, there was widespread scepticism in Spain regarding the effectiveness of this type of measure, which hindered implementation.

3.2.3. Geographic Scale at which the Reference Levels are Applied

The "good agricultural and environmental conditions" were developed for all of Europe and adapted to Spain's situation by officials from the Ministry of Agriculture (*Ministerio de Agricultura, Pesca y Alimentación*). The requirement to follow the "best practices" developed by Spain's Ministry of Agriculture (MAPA) officials pertains to the entire country. However, regional adaptations can be implemented by the appropriate agencies in the administrative regions (Autonomous Communities) through *órdenes*, i.e. regional legislation. The goal is to adapt the practices to the local context, particularly to the climate, soil conditions and farming systems in each region. If the Autonomous Community does not establish regional regulations, the national regulations are applied. In practice, most Autonomous Communities have taken on the measures set out in the national *Real Decreto*, without significant changes.

Finally, the unit for applying the cross-compliance measures is the farm, specifically the crop parcel.

3.2.4. Process Establishing the Reference Levels

European regulation (EC 1782/2003) introduced the requirement to follow certain practices as a condition for access to direct payments from the European Agricultural Guidance and Guarantee Fund (EAGGF).

European negotiations were held as part of the reform of Europe's Common Agricultural Policy in 2003, resulting in the Luxembourg Agreement, which introduced the requirement for cross-compliance measures for all member states as of January 1, 2005.

The Spanish government had sent negotiators for this to ensure the best possible outcome for Spanish farmers in terms of assistance. Pressure from agricultural producer groups (COAG[7], UPA, ASAJA and CCAE) was very strong at the time. However, once the Luxembourg Agreement was signed, the agricultural producer groups expressed their dissatisfaction with the CAP reform, particularly the reduction in direct payments for rural development.

Nationally, a *Real Decreto* (No. 2352/2004) set out the good agricultural and environmental conditions to be complied with in the Spanish context in order to receive European assistance. The national practices included in that *Real Decreto* were defined by Ministry of Agriculture officials, based on scientific (agronomic) criteria. To do so, working groups were formed with officials working in different departments. They pooled their knowledge to prepare the list of good agricultural and environmental conditions that were relevant for Spain. Those practices would form the body of *Real Decreto* (RD) 2352/2004.

Prior to approval from the European Commission, the preliminary version of the *Real Decreto* was sent to agricultural producer organizations. Two workshops were held between the Ministry of Agriculture (MAPA) and producer representatives (COAG, UPA and ASAJA) to discuss the mandatory standards. The agricultural producers' position rested on two main elements: they wanted measures that could be easily and objectively monitored (with specific indicators) and measures that did not result in additional costs for farmers. The Ministry of Agriculture (MAPA) wanted to include in the *Real Decreto* measures that would be readily accepted by the Minister of the Environment and the European Commission.

As such, a measure prohibiting the application of phytosanitary products on preferential wind routes and on days with strong winds was removed because that practice was difficult to monitor.

Another example of a measure that was eventually removed because it resulted in additional expense for farmers was the requirement to cover the ground in storage areas for phytosanitary products with a waterproof structure. Therefore, storage structures for phytosanitary products are allowed to have dirt floors because there is no measure compensating farmers for the additional cost of such an investment.

Measures for erosion, a major problem in Spain, have been the subject of much discussion, mainly pertaining to the gradient from which tilling in the direction of the maximum gradient would be prohibited.

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[7] *Coordinadora de Organizaciones de Agricultores y Ganaderos* (COAG), *Unión de Pequeños Agricultores* (UPA), *Asociación Agraria Jóvenes Agricultores* (ASAJA) and *Confederación de Cooperativas Agrarias Españolas* (CCAE)

Likewise, some water management measures that farmers considered very stringent (such as installation of flowmeters for controlling water consumption) were not modified because water availability and quality are major issues in Spain.

In general, according to representatives of the *Coordinadora de Organizaciones de Agricultores y Ganaderos* (COAG), the two cross-compliance workshops arranged by the Ministry of Agriculture and agricultural producer organizations proceeded in an atmosphere of mutual cooperation and the search for solutions.

The *Real Decreto* document, with modifications made during meetings with producer groups, was sent to the Ministry of the Environment and the European Commission for approval.

Pressure from farmers was felt primarily at the regional level because of easier access to regional institutions than national organizations. As mentioned earlier, in the Autonomous Communities, the regional regulations (*órdenes*) can take the national provisions and adapt them to the specific characteristics of each region. Agricultural advisers from the agricultural *Consejerías* of each Autonomous Community are responsible for adapting the farming practices to the specific regions. With cross-compliance, pressure from farmers was targeted at maintaining national agreements with producer organizations. Thus, in practice, few adaptations were made, and the regional mandatory measures are often identical to the national standards.

Following discussions with stakeholders involved in the process, some conclusions could be drawn from the Spanish process for establishing reference levels under the cross-compliance program:

- Existence of a reference document proposed by the Ministry of Agriculture established the bases for negotiation and facilitated discussion.
- In Spain, the Ministry of Agriculture must consult agricultural producer organizations when developing any legislation directly affecting agricultural production. Meetings between Ministry of Agriculture technicians and representatives from producer organizations have become the "norm". Mutual knowledge through previous dialogue has created an atmosphere of understanding. Note that only two meetings were needed for reaching consensus on each cross-compliance point.
- The Ministry of Agriculture's openness and attentiveness to proposals from producer organizations helped with reaching consensus.
- The absence of a purely "environmental" opinion helped remove barriers to consensus. However, environmental considerations were defended solely by Ministry of Agriculture

(MAPA) officials, which caused an imbalance between the agricultural position, strongly defended by producer organizations and well understood by MAPA technicians, and the environmental position, which was defended by only one agricultural agency (MAPA).

- MAPA's position was more firm, so few modifications could be made to national measures involving major issues such as water management and erosion control.
- National acceptance of cross-compliance measures smoothed the way for regional acceptance from producer organizations. In addition, it was the agricultural producers at the regional level who worked to have the Autonomous Communities keep the same practices as those established nationally.

3.2.5. Established Reference Levels

According to *Real Decreto* 2352/2004, there are three types of mandatory practices in Spain for accessing European direct payments: soil protection practices, agricultural area maintenance practices and habitat protection practices.

A. Soil protection farming practices

The mandatory soil protection practices for receiving direct payments from the European Union are as follows:

1) Tilling:
   a. Parcels dedicated to herbaceous crops: do not till in the direction of the slope if the average slope of the parcel is greater than 10%.
   b. Parcels dedicated to viticulture, olive trees and dry fruit trees with a slope greater than or equal to 15%: tillage is prohibited except on terraces. For terraces, only conservation tillage is permitted. This measure does not apply to parcels under one hectare or with a complex shape.
   c. Terraces: avoid tillage that could negatively impact the structure of the slopes.
   d. Plant crops as quickly as possible to prevent erosion.
2) Minimum soil coverage:
   a. In areas with high risk of erosion, restrictions apply: crop rotation is mandatory, with the incorporation of organic matter and maintaining plant cover to prevent soil and habitat degradation and loss.

b. With winter herbaceous crops, tillage is prohibited between the date of the final harvest and September 1. Dates more suited to local conditions may be set by the appropriate authorities.

c. Pulling out individual plants of any ligneous crop is prohibited when they are located on non-irrigated parcels with a slope greater than 15% (unless otherwise provided for by the appropriate local authority). Also, in olive orchards where the bases around trees are cleaned with herbicides, alleys in the direction of the maximum gradient should be grassed.

d. Fallow or set-aside[8] land: only traditional cultivation techniques are permitted, with minimum tillage and maintaining of plant cover. This measure is intended to minimize the risk of erosion and fire, prevent the proliferation of weeds, pests and disease. Low-hazard herbicides that leave no residues in the soil are authorized.

e. Uncultivated parcels not used for grazing and that are not eligible for set-aside land assistance must meet the same requirements as for fallow land, except regarding herbicide use. Only mechanical weed control is permitted.

f. Incorporation of organic matter: maximum 20 t/ha of solid manure or 40 m³/ha of liquid manure for a three-year period, while complying with water protection standards relating to nitrate run-off from agricultural activity.

B. Maintaining agricultural areas

To ensure that agricultural areas are maintained, Spain has three axes for action: protecting permanent grasslands, controlling weed invasion and keeping olive orchards in good vegetative condition. Farmers must comply with established farming practices to be eligible for European direct payments.

1. Maintaining permanent grasslands: the rules set out by Ministry of Agriculture officials for maintaining permanent grasslands are as follows:

    a. Do not burn or till grasslands except for plant regeneration activities.

[8] Set-aside land involves not cultivating a portion of the area of a farm's arable land based on a percentage set annually by the Council of the European Union for the entire community.

b. The use of burn-beating techniques[9] requires prior approval and monitoring by the appropriate authority.

c. For effective management of permanent grasslands, farmers may:

- maintain a livestock density of 0.1 livestock unit (LU) /ha or more,
- if a livestock density of 0.1 LU/ha or more is not reached, farmers may perform grassland maintenance tillage to prevent soil deterioration and brush invasion.

2. Weed control

The national government and the Autonomous Communities establish which plant species to eliminate for each area. Farmers and breeders must clear their parcels of the weeds on the government's list.

3. Maintaining olive orchards in good vegetative condition

The main measure is the ban on pulling up olive trees.

Regions may also establish practices more suited to local conditions for maintaining olive orchards in good vegetative condition. The Andalusian region, Spain's primary olive region, has developed a good practices plan for the olive tree sector. The document is a compilation of all good farming practices from the cross-compliance program applicable to the olive tree sector. Those practices are very similar, if not identical, to those established nationally, and there has been only one compilation effort.

C. *Habitat protection measures*

Measures for protecting habitats are as follows:

1. Maintenance of soil structure by maintaining structural elements (roads, hedges, etc.)
2. Wise use of water resources:

a. installation of irrigation water measuring systems and recording the amount of water used;

[9] Traditional farming method consisting of burning the surface layer of soil of a rough pasture or field and uniformly spreading the ash over the ground to fertilize it prior to cultivation.

b. not applying phytosanitary products, fertilizers or sewage sludge and liquid or solid manure on flooded or snow-covered land, waterways or standing water, except for rice crops.

3. Storage of animal wastes:

   a. use watertight storage systems;

   b. storage system capacity must be appropriate for the size of the farm. However, there are no standards defining a required minimum capacity.

There is no monetary compensation provided for losses incurred by implementing cross-compliance practices. Finally, a technical support program for farmers was established to guide farmers on how to incorporate good practices into their production process.

3.2.6. Monitoring Mechanisms

European Commission Regulation (EC) No. 1593/2000 sets out cross-compliance monitoring mechanisms through the Integrated Administration and Control System (IACS). This regulation requires member states to develop a digital graphic system for agricultural parcel identification as well as a graphics database of all crop parcels digitized to a 1:10,000 scale.

The purpose of this system is to facilitate administrative and on-site audits enabling "virtual visits" and faster locating of parcels.

In Spain, the Spanish Agricultural Guarantee Fund (FEGA) is responsible for managing the monitoring measures established nationally. The Autonomous Communities (CCAA – administrative regions) then apply the monitoring mechanisms regionally and locally. The FEGA, jointly with the CCAAs, develops the National Monitoring Plan to set out the bases for the administrative and on-site audits.

Audits are conducted on 1% of all direct assistance recipients for each Autonomous Community. If the audit results reveal a high degree of non-compliance with the standards, the number of audits for the next year increases by 5%. For Spain, this amounts to an average of roughly 11,400 farms audited.

Regulation No. 1782/2003 contains provisions regarding penalties for non-compliance with cross-compliance measures. For non-compliance with statutory management requirements or good agricultural and environmental conditions, the amount of direct assistance is reduced, even cancelled. The reduction varies from 1% to 15% for negligence and from 15% to 100% for deliberate non-compliance with the

standards. Sanctions for non-compliance with the various standards are cumulative. In 2005-2006, none of the audits led to sanctions being imposed for non-compliance with cross-compliance measures.

3.2.7. Environmental Performance Assessment

European Regulation 1257/99 sets the bases for assessing the environmental impact of applying agri-environmental measures in general. The assessment uses indicators developed by the European Union and more recently under its IRENA program (Indicator Reporting on the Integration of Environmental Concerns into Agriculture Policy) of the European Environmental Agency.

The assessment is a complex, multi-stage process:

- problem analysis;
- identification of objectives;
- determination of possible options;
- impact study.

However, there have not yet been any assessments on the environmental impact of good agricultural and environmental conditions.

3.2.8. Summary and Analysis

Awareness of the complex relationship between agriculture and the environment has led to environmental concerns being incorporated into European standards. Agriculture can have a positive impact on the environment, such as by preserving habitats and landscapes, but it can also have a negative impact (point source or non-point source pollution from agricultural activities). Cross-compliance programs incorporate into agricultural policy the requirement to comply with minimum environmental standards intended to limit agriculture's negative impact on environments and strengthen the positive impact.

In Spain, reference levels are clearly established through conditions that agricultural producers must meet to be entitled to support payments from the European Community. BMPs are the basis of all reference levels. In fact, from the outset, officials imposed BMPs as the reference level; producers have not objected to them, and environmental groups have not had the opportunity to express a preference.

The negotiation process in Spain is characterized by the following:

- It was imposed from outside by the European Community;

- Thinking and decision-making occurred at the national level first, with little participation from regional authorities, which were not very involved in the negotiations;
- Consultations were very close and limited to producer associations. Civil society in general and environmental groups in particular were not consulted.

In Spain's case, the ability to arrive at a reference level definition was greatly facilitated by the fact that the negotiation process had been open to only a few stakeholders that are used to negotiating with each other and the fact that the negotiation process was very structured at the national level from the outset.

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We would like to thank

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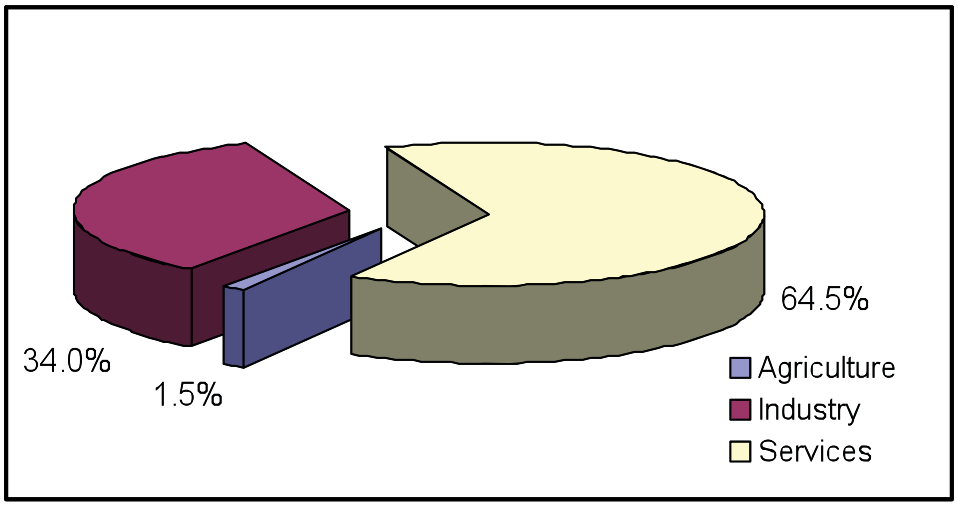
Ms. Marta Piqueras, COAG

3.3. Switzerland: Ecological Direct Payments

3.3.1. Context

Switzerland, located in central Europe, is one of the region's wealthiest countries, with over US$30,000 of per capita GDP in 2003, according to the Federal Statistical Office estimate. The contribution of various sectors, including agriculture, to Switzerland's GDP is as follows:

FIGURE 13: SWITZERLAND – GDP BY SECTOR



Source: CIA World Factbook: Switzerland, 2003

Sixty percent of Switzerland is taken up by mountains: in the country's southern and southeastern areas are the Alps, in the west and northwest are the Jura mountains, and between them lies the Swiss Plateau where most of the large agglomerations are concentrated.

The main crop in terms of production volume is sugar beets (1.4 million tonnes in 2004), followed by cereals (1 million metric tonnes of cereals were produced in 2004), fruits and vegetables (670 million tonnes) and potatoes (518 million tonnes).

For land use, natural grasslands and pastures take up 80% of the usable agricultural area (UAA), followed by artificial grasslands, covering approximately 15% of the UAA with a net increase since the 1990s. Vineyards (1.7% of UAA) and fruit crops (1% of UAA) come last.

The main agri-environmental objectives are water protection, soil protection, biodiversity, landscape and reducing energy use in agriculture.

For water protection, there are three specific objectives: 1) reducing nitrates from agricultural activities in groundwater; 2) reducing phosphorus concentrations in lakes; 3) eliminating the release of phytosanitary products into waterways.

For soil protection, two objectives express the government's intentions: controlling erosion and reducing phosphorus content in the soil.

Biodiversity and landscape are key in agri-environmental policy, with the specific targets being preservation of the diversity of Switzerland's wild species and maintaining the diversity of habitats and landscape elements.

As the following table shows, "ecological requirements" were defined as part of this new agricultural policy.

TABLE 5: ECOLOGICAL REQUIREMENTS IN SWITZERLAND

<table>
<tr><th>Biodiversity</th><th>Nitrogen</th><th>Phosphorus</th><th>Phytosanitary Products</th></tr>
<tr><td>Humankind's impact on nature and the landscape must be reined in so that no further species get added to the Red Lists.</td><td>Reduce groundwater nitrate levels to below 25 mg/l</td><td rowspan="3">Water quality must be such that phosphorus content is within the natural concentration range.</td><td rowspan="3">Water quality must be such that PTPs[10] are present only in virtually zero levels.</td></tr>
<tr><td>Maintain threatened species and their habitats so that no species is threatened more than it already is and so that the number of species on the Red List is reduced by 1% every year</td><td rowspan="2">Reduce ammonia emissions long term from 40% to 50% (1995 basis) 40% and 45% (2000 basis) respectively.</td></tr>
<tr><td>In the near future, achieve 65,000 ha of quality ECAs[11] in the plains to promote biodiversity</td></tr>
</table>

Source: Flury, C., 2005. Rapport Agroécologie et bien-être animal 1994-2005

3.3.2. Description of the Program

The move from agriculture that is largely protected by State intervention to agriculture based on the concept of multifunctionality began in 1992 due to a number of factors. First, the GATT negotiations dealt with agricultural topics for the first time because, until then, agriculture had remained outside trade negotiations. Second, there were country-specific factors that also existed in many European countries at

[10] PTP: plant treatment products
[11] Ecological compensation areas

the time: agricultural overproduction resulting from the price support policy, significant pollution from agricultural activities, and a growing difference between large and small farms and between plain and mountain farms.

In light of that and the need to find other ways to support farming decoupled from production and prices came the new multifunctional view of agriculture. This concept recognizes that agriculture has functions other than simply production. It was then that general and ecological direct payments were instituted.

Under Switzerland's ecological direct payments program, farmers voluntarily agree to participate in one or more programs such as biodiversity protection and maintaining structural landscape elements.

There are a variety of conditions that producers must meet in order to receive ecological direct payments; this includes general conditions (legal form of the farm operation, operator's residence and age, etc.), structural conditions (minimum size of the farm, labour requirements) and economic conditions (farmer's income). In addition, there are mandatory agri-environmental practices for access to general direct payments as well as more restrictive practices that differ by program and give rise to ecological direct payments.

The first condition for having access to direct payments (general or ecological) is providing certain required ecological services (*prestations écologiques requises* – PERs). The Federal Office for Agriculture (FOAG) then grants ecological direct payments only to those farmers who develop practices that go beyond the PERs. PERs are comparable to Europe's good agricultural and environmental conditions. They are prerequisites for access to direct payments.

The required ecological services are as follows:

- Species-appropriate housing of commercial animals: compliance with the provisions of the Animal Protection Order;
- Balanced fertilizing[12]: maximum tolerance of 10% manure or inorganic fertilizer for nitrogen and phosphate fertilizers;
- Equitable share of ecological compensation[13] areas: 3.5 % of the UAA for special crops, 7% for the remaining UAA;

[12] Fertilizing: quantity of manure or inorganic fertilizer applied to a given area.
[13] For ecological direct payments, the FOAG uses "compensation" to refer to subsidies granted to farmers for developing farming practices that go beyond the required ecological services.

- Regular crop rotation for farms with more than 3 ha of open land: at least 4 different crops per year, compliance with maximum crop portions and pauses between crops;
- Appropriate soil protection for farms with more than 3 ha of open land, Mountain Zone I included: for crops harvested before August 31, requirement to put in (a) a fall crop, or (b) an intercrop or green fertilizer before September 15 (must be left at least until November 15);
- Targeted selection and use of plant treatment products: restriction on pre-germination herbicides, pellets and insecticides. Compliance with tolerances and recommendations from forecasting and warning services. Untreated control if using growth regulators on cereals or fungicides on rapeseed and when special permission is given.
- Erosion: in addition to the ground cover requirements, parcels must not have visible soil loss on a frequent basis. If this must be the case, however, the farmer is responsible for taking appropriate steps and developing a multi-year plan to prevent erosion.

There are several ecological payment programs: first, there is the program involving annual per-hectare payments for extensive grasslands, litter meadows,[14] hedges, groves and wooded shorelines; there are also per-hectare subsidies for low-intensity grasslands, and programs for floral and rotating fallow, for extensive crop strips and for maintaining pip and stone fruit trees.

There is no monetary consideration provided for PERs because they are the mandatory conditions that must be met for access to general direct payments.

Ecological direct payments vary greatly. In all cases, farmers must meet both the required ecological services (essential for access to general direct payments) and the specifications established by the FOAG in order to have access to ecological direct payments.

According to the FOAG, 87 % of areas giving rise to ecological compensation in 2002 were dedicated to grasslands, particularly extensive grasslands (which accounted for 48.2% of areas dedicated to ecological compensation programs) followed by low-intensity grasslands that, in 2002, took up 38.7% of areas. Natural grasslands and pastures in Switzerland take up 80% of the usable agricultural area (UAA), with litter meadows (6.9 %), floral fallow (2.4%), rotating fallow (1.4%), and groves and wooded shorelines (2.4 %) accounting for the rest.

[14] Litter meadows are extensively cultivated areas located on wet or marshy lands that are cut a maximum of once a year or a minimum of every three years, and the harvest is used solely as forage on the farm.

The December 7, 1998 order regarding direct payments to agriculture established standards for subsidies under direct payments in general and ecological direct payments in particular. Ecological direct payments accounted for an average of 17% of total direct payments for the 1999-2002 period. Subsidies were paid by the FOAG through the cantons.

In the interest of distributing direct payments to as many farmers as possible, the FOAG established a graduated scale of subsidies based on farmer income, farm size and quantity of livestock, measured in livestock units (LUs).

The area- and animal density-based payment scale is in effect until December 2007. Payments are reduced as indicated in the following table:

TABLE 6: AREA- AND ANIMAL DENSITY-BASED PAYMENT SCALE

Area	Total Animals	Reduction
Up to 30 ha	Up to 45 LUs*	0%
Over 30 ha up to 60 ha	Over 4 LUs up to 90 LUs	25%
Over 60 ha up to 90 ha	Over 90 LUs up to 135 LUs	50%
Over 90 ha	Over 135 LUs	100%

***** LU: livestock unit

Source: FOAG, 2005. Résumé des paiements versés à l'agriculture en 2005

Moreover, if a farmer's taxable income is greater than 80,000 CHF, direct payments are reduced. The reduction is equal to 1/10 of the difference between the farmer's income and the established amount [(Taxable income – 80,000 CHF)/10]. If taxable income is greater than 120,000 CHF, the reduction is equal to at least the difference between the farmer's income and 120,000 CHF.

Subsidies under ecological direct payments are awarded on a per-hectare-of-farmland basis and on a per-tree basis in the specific case of the tree maintenance program.

The amount of ecological direct payments varies in some cases (contributions for extensive grasslands, litter meadows, hedges, groves, wooded shorelines and low-intensity grasslands, etc.) depending on the zone in which the parcel is registered. The most productive zones (field crop zones and intermediate zones) receive higher per-hectare payments, whereas the mountain zones are granted amounts up to three

times lower than those for the cereal zones. This is to compensate farmers for shortfalls caused by greater productivity losses in the most productive zones incurred by implementing these measures.

However, for general direct payments, parcels in mountain zones with the lowest gross yields receive higher subsidies than parcels on the plains. The purpose is to compensate mountain farmers for operating a farm in regions that are disadvantaged in terms of production.

The amount of money granted per hectare also depends on the constraint level imposed by the FOAG. We have seen how amounts allocated per hectare of low-intensity grassland can be up to 60% lower than those per hectare of extensive grassland, hedges, groves or wooded shoreline.

Therefore, despite the fact that fallow lands (floral and rotating) are awarded the highest per-hectare subsidy amounts, they are not the most contractualized (in terms of area) measures under ecological direct payments.

In fact, everything seems to indicate that farmers try to strike a balance between money received and constraints imposed by the specifications, including the labour requirements for the new tasks, reduced productivity, time allocated to developing these practices and the knowledge required to implement them.

3.3.3. Geographic Scale at which the Reference Levels are Applied

Practices established under the ecological direct payments program apply to all of Switzerland. However, measures can differ depending on the zone: cereal zones, intermediate zones, hill zones and mountain zones (I, II, III and IV) in the interest of adapting them to the specific conditions of the local environment. Even where practices implemented are identical for different zones, the per-hectare amounts allocated can vary depending on zone. The actual unit for applying the measures is the farm, specifically hectare of agricultural land.

3.3.4. Process Establishing the Reference Levels

Switzerland's process for adopting these measures reflects the country's long democratic and public consultation tradition. First, during a referendum on June 9, 1996, Swiss society, by popular vote, approved a new constitutional article establishing the pillars of the new agricultural policy based on direct payments, including ecological compensation. The *Conseil de la Confédération Helvétique* had also unanimously approved this agricultural policy reform, which testifies to the tremendous consensus on these topics within Swiss society in general and within its political circle in particular at this point in Swiss history.

Increasingly strong social demand for preserving biodiversity and protecting water, soil and structural landscape elements helped start the agricultural policy reform. It also gave FOAG officials, responsible for establishing reference levels, enough flexibility to put in place measures that were more stringent than before.

As to reference levels for existing practices under Swiss agri-environmental programs, FOAG officials worked on a preliminary proposal based on scientific criteria (agronomic and ecological) that was then submitted to stakeholders involved. Representatives from the cantons, producer organizations, researchers and civil society agencies (environmental groups, consumer organizations, etc.) participated in the working sessions arranged by the FOAG.

Stakeholders were asked to agree with or suggest changes to the proposals from the State representatives, who then had to decide whether to consider them. If the proposals from the various organizations were not accepted, the FOAG had to provide a rationale for rejecting them.

Negotiations within the working groups were relatively tense depending on the topic under discussion: in general, when it involved existing environmental problems in certain regions, the discussions were often difficult. One example is the "balanced use of fertilizer" that is mandatory under the required ecological services. This point gave rise to intense discussions between producer and civil society organizations from the regions affected by eutrophication of lakes and streams. In that case, the FOAG took a mediator position to keep the discussion moving.

Other measures elicited more moderate reactions. For example, with floral or rotating fallow measures, the farmers' claims involved reducing the work load. Specifically, farmers' proposals dealt with the possibility of treating an entire area instead of plant-by-plant and extending the time limit for maintaining fallow lands established by the FOAG to six years. The producers' proposals in this case were not accepted because, according to FOAG staff, it would have led to fallow of lower environmental quality.

The FOAG reviewed the proposals made during the working sessions, and either did or did not incorporate them, and then forwarded them to the government for approval before the program was presented to Parliament. In Parliament, the program in general was discussed, particularly the allocated budget, but the details of the practices were not addressed.

Some lessons can be drawn from the process for establishing reference levels for ecological direct payments in Switzerland:

- The social context and civil society's expectations regarding the relationship between agriculture and the environment helped spur the policy process for proposing measures in order to solve identified problems and change the status quo.
- The process was based on Switzerland's strongly rooted democratic culture requiring the mobilization and active participation of stakeholders involved: agriculture, civil society organizations, etc. Civil society organizations usually do not have many resources and could be excluded from negotiations for establishing reference levels.
- Environmental objectives and the target dates for achieving them were clearly set out early in the negotiations. This negotiating framework facilitated discussions on the practices that would be used to achieve the objectives.
- The negative impact of farming on the environment in certain zones increased the pressure from civil society representatives for more stringent measures. Tensions arose, particularly in the zones affected by these environmental problems, and negotiating became more difficult. State representatives then became mediators between the other parties to help reach consensus.
- According to the FOAG, voluntary measures and incentive payments enable the State to propose more environmentally stringent measures.
- Having a negotiation process helps measures be accepted by farmers.
- Finally, the main problem identified in a process such as this, where negotiation has a large presence, is the length of the process, especially in a federal system where there can be a great deal of back-and-forth between the cantons and headquarters.

3.3.5. Established Reference Levels

The various ecological payment programs are as follows:

A. Annual per-hectare payments for extensive grassland, litter meadows, hedges, groves and wooded shorelines

First, there is the program involving annual per-hectare payments for extensive grassland, litter meadows, hedges, groves and wooded shorelines. The amount is the same, for example, for one hectare of hedges or one hectare of extensive grasslands. Program length is six years.

The requirements for access to ecological payments are as follows:

- For extensive grasslands:

⇒ Fertilizers and plant treatment products may not be used. Plant-by-plant treatments are allowed,

⇒ In principle, at least one cut per year; moderate fall grazing. Fall grazing after September 1 and until November 30 at the latest;

TABLE 7: DATES OF FIRST CUT, BY ZONE

Zone	Date of First Cut
Field crop and intermediate zones	June 15
Mountain zones I and II	July 1
Mountain zones III and IV	July 15

- For litter meadows:
  - ⇒ No fertilizers or plant treatment products,
  - ⇒ First cut no earlier than September 1 or upon approval from the nature protection service;
- Hedges, groves and wooded shorelines:
  - ⇒ No fertilizers or plant treatment products,
  - ⇒ In general, there must be a grassy strip 3 m wide on either side of hedges and groves,
  - ⇒ The grassy strip must be cut at least once every 3 years,
  - ⇒ Cut date identical to that for extensive grasslands,
  - ⇒ Grazing on the grassy strip possible on grasslands. Use-dates identical to those for extensive grasslands.

The per-hectare amount under this program depends on the zone in which the parcel is located. Farmers receive the highest amounts for parcels in field crop zones and intermediate zones (1,500 CHF/ha*year). Parcels in hill zones give rise to 1,200 CHF/ha*year, whereas mountain zones are granted the lowest amounts (700 CHF for mountain zones I and II and 450 CHF for mountain zones III and IV). Thus, the most productive zones receive the greatest monetary compensation, while the least productive zones, such as the mountain zones, receive the lowest subsidies.

B. Per-hectare subsidies for low-intensity grasslands

Another ecological direct payment program is the per-hectare subsidy program for low-intensity grasslands. Program length is also six years. The practices allowing access to ecological direct payments for maintaining low-intensity grasslands are defined as follows:

- No plant treatment products. Plant-by-plant treatments are allowed;
- Nitrogen fertilizer in the form of solid manure or compost. If the entire farm is equipped with complete liquid manuring systems: small applications of diluted complete liquid manure are allowed (max. 15 kg N/ha per spreading) after the first cut; max. 30 kg N/ha per year.
- Exemption clauses possible issued by the canton's nature protection service.

Subsidies also vary depending on the parcel's location: a single per-hectare payment for low-intensity grassland is granted for parcels in the cereal, intermediate and hill zones (650 CHF/ha*year), while parcels in the mountain zones receive lower amounts (450 CHF/ha for mountain zones I and II and 300 CHF/ha for mountain zones III and IV).

The amounts under this program are lower than those under the previous program because the measures to implement in this case are less restrictive. The most significant reductions in amounts granted are for parcels in the cereal and intermediate zones, with a more than 60% reduction in the subsidy amount compared to the previous program.

C. Floral and rotating fallow

Sections 50 and 53 of the order on direct payments to agriculture (OPD) provides for a single payment of 3000 CHF per hectare dedicated to floral fallow after field crops or perennial crops on the plains. The commitment period for this measure varies from a minimum of two years to a maximum of six years. These amounts are conditional on adhering to certain practices set out by the FOAG:

- Minimum width of 3 m;
- Sowing with seed mixtures of wild domestic plants, recommended by federal agronomic research centres;
- No fertilizers or plant treatment products;
- Spot treatments for problem plants authorized, when mechanical control is not reasonably possible;
- Floral fallow must be left at least until February 15 of the year after the contribution year;

- After floral fallow, the same parcel cannot be used again for that purpose until at least the fourth vegetation period. The canton's nature protection service may approve reseeding or leaving it in the same place for an extended period of time;
- Mowing half the area possible from the second year on, but only between October 1 and March 15;
- Clean-up cutting authorized during the first year in the event of weed invasion.

Single payments of 2500 CHF per hectare of rotating fallow on open land or areas of perennial crops on the plains are also provided for. The requirements for access to these payments are as follows:

- Minimum 6 m wide, minimum 20 acres;
- Areas must be seeded between September 1 and April 30 and be left until February 15 of the year after the contribution year (one-year rotating fallow) or until September 15 of the second year of contributions (two-year rotating fallow);
- Recommended mixture: the canton's nature protection service may approve self-seeding or seeding with a special mixture;
- After rotating fallow, the same parcel cannot be used again for that purpose until at least the fourth vegetation period;
- No fertilizers or plant treatment products. Contact herbicides upon special approval;
- Fertilizers and plant treatment products may not be used;
- Spot treatments are authorized for problem plants, when mechanical control is not reasonably possible;
- Mowing only between October 1 and March 15; in feeding areas in accordance with the order on water protection, the canton may approve an additional cut after July 1.

We see that these two measures (floral fallow and rotating fallow) receive the highest subsidy amounts per hectare of agricultural land. These programs had been launched in 1994 during liberalisation of the cereals market when, according to Switzerland's Federal Office for Agriculture, floral and rotating fallow had become an interesting alternative to field crops from a subsidies perspective. For fallow lands (floral and rotating), there is also an additional premium arising from Switzerland's nature protection legislation. This accounts for the higher per-hectare amounts over other programs.

D. Extensive crop strips

Another practice that receives subsidies (1,500 CHF/ha*year) is planting extensive crop strips. The strip width must be a minimum of 3 m to a maximum of 12 m. These strips must be maintained for at least two consecutive field crops. Insecticides and nitrogen fertilizers are prohibited. The strips can be seeded with cereals (excluding grain corn), rape, sunflower or grain legumes. Also, in accordance with FOAG provisions, grain threshing on extensive crop strips must be done at maturity. The canton authorities may approve mechanical weeding, but it would result in elimination of subsidies for that year.

E. Maintaining pip and stone fruit trees

Finally, maintaining pip and stone fruit trees and hazelnut and chestnut groves also gives rise to subsidies. The amount received is 15 CHF per tree for a minimum of 20 trees per farm. The conditions for access to these subsidies are as follows: minimum trunk height must be 1.2 m for stone fruit trees and 1.6 m for the others. Herbicides may not be applied at the bases of trees, except those younger than five years.

3.3.6. Monitoring Mechanisms

For conducting audits to ensure that commitments under direct payments are met, the FOAG's *Système d'information sur la politique agricole* (SIPA) is used. This is a database that collects information on each farm: structural data, which the cantons send to the SIPA, and direct payment data.

The cantons conduct the audits, sometimes along with independent or certified agencies. The audit method used is the survey, and it is conducted on various aspects: the truth of data provided by farmers and compliance with the conditions and specifications giving rise to direct payments.

Audits are performed on:

- all farms applying for contributions for the first time;
- all farms with faults noted during the previous year's audits; and
- at least 30% of the other farms selected randomly.

This calls for a reliable registration system as well as human and financial resources. Given the number of farming operations that received direct payments in 2002 (58,013 farms, which is 86% of registered farms), at least 17,400 farms were audited. For comparison, in Spain even though the audit rate was set at 1% (farms audited by the Autonomous Communities), it was roughly equivalent to an average of 11,407 farms. Therefore, monitoring coverage is lower in Spain owing to the much higher total number of farms to monitor and the low percentage of farms audited.

Finally, there are sanctions for non-compliance with established conditions and specifications.

3.3.7. Environmental Performance Assessment

Through its Agroscope unit, the FOAG is responsible for assessing the effectiveness of ecological measures applied to agriculture. Agroscope is comprised of five federal agronomic research centres in Switzerland: Liebefeld-Posieux, FAL Reckenholz, FAT Tänikon, FAW Wädenswil and RAC Changins.

The indicators used to determine agriculture's impact (positive or negative) on the environment come from the IRENA (Indicator Reporting on the Integration of Environmental Concerns into Agriculture Policy) project, which were developed by the European Environmental Agency, which stems from the DG-VI (Directorate General for Agriculture of the European Commission). These scientifically established indicators are used to assess environmental performance in order to determine level of achievement of environmental objectives.

The criteria for assessing environmental effectiveness of ecological farming measures are as follows: increased biodiversity on agricultural land and reduced nitrate and phosphate content in ground and surface water.

Agroscope has two research projects on these topics. The first is to identify the impact of ecological farming practices on the reduction of excess fertilizers in agriculture. This 10-year project will end in 2007.

The second is a program for assessing ecological measures for biodiversity. This project analyzed the connection between the introduction of ecological practices in agriculture and the diversity of flora and fauna in three zones encompassing 40 communes in the Swiss Plateau. The final report was published in 2005.

The results attained under these two projects will be used to refine agricultural policy instruments.

In 2005, the FOAG published a synthesis report covering all existing assessment projects (see references). The report presents the results from the assessment of agri-ecological and animal welfare practices over a 10-year period, from 1994 to 2005.

The main finding from the report is that ecological compensation areas must be maintained. Even so, according to the study, the target environmental objectives required more advanced, results-based measures adapted to regional and local contexts. Farmer involvement and compliance with specifications appear to be essential for the measures to produce the desired results. To accomplish that, Flury (2005) says that regular monitoring, sanctions and credible communication help legitimize direct payments.

In general, there is a positive impact from implementing these measures and a reduction in the negative externalities of farming on the environment. In 2005, 98% of the usable area was farmed using environment-friendly practices, 10% of which were ecological compensation areas (extensive grasslands, litter meadows, hedges, groves, wooded shorelines and low-intensity grasslands). The objectives for reducing nitrate and phosphorus concentrations in waterways and those regarding the use of phytosanitary products were achieved.

3.3.8. Summary and Analysis

In Switzerland, reference levels are very clearly defined by what are called required ecological services (PERs). The voluntary program giving rise to additional subsidies involves specific practices that go beyond the PERs and is intended to compensate producers for the costs associated with those measures.

PERs are defined consensually. They are established scientifically, taking both ecological and agronomic aspects into consideration. Reaching consensus is facilitated by Switzerland's democratic culture at the various levels of the decision-making process.

Ultimately, if we refer to our conceptual framework, we see that, like elsewhere, agricultural producers try to get reference levels to be as low as possible, especially where agri-environmental issues are more prevalent. Civil society, however, is not as organized for expressing a differing viewpoint.

It is interesting to note, however, that in Switzerland, the positions taken by stakeholders do not really seem too far removed from what we call BMPs in our conceptual framework. As such, Switzerland does not shed any light on the power relationship between agricultural producers and civil society, which seems to exist to a stronger degree in other OECD countries. This is no doubt partially explained largely by civil society's and agricultural producers' recognition of the multifunctional role of agriculture and the merits of compensating this contribution to society's well-being.

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We would like to thank

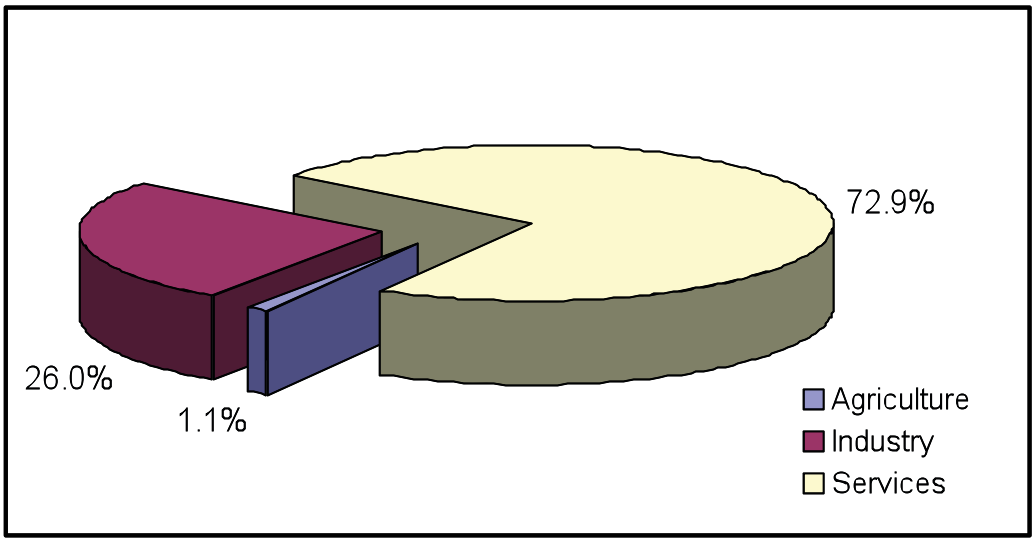
Mr. Kasseler of Switzerland's Federal Office for Agriculture

3.4. United Kingdom Nitrate Sensitive Areas Scheme

3.4.1. Context

The United Kingdom has an efficiently productive agricultural sector, in relation to other European countries, characterized by intensive cultivations and mechanization. Despite making up a small fraction of total GDP, as seen in Figure 14, the agricultural sector is able to produce approximately 60% of food consumed nationally with fewer than 2% of the labour force (DEFRA, 2000). Agricultural production focuses largely on animal husbandry (including cattle, sheep, poultry, as well as fish) however it also includes cereals, oilseed, potatoes and vegetables (DEFRA, 2000). It is also known to be very dependant on government subsidies.

FIGURE 14: UK GDP PER SECTOR



Source: CIA World Factbook: United Kingdom, 2005

In the 1960s and 70s, environmental issues were not concerns in the UK agriculture. The 1980's began to take notice of the damaging effects of non-point source agricultural pollution (Skinner et al. 1997). In 1991 the European Community[15] (EC) member states adopted the Nitrate Directive (Archer 1994). Under this legislation, member states are obliged to identify water polluted by nitrates from agriculture in order to delineate vulnerable watersheds. For these areas, action plans were then devised to elaborate measures that reduce the nitrates lost by agriculture (Archer 1994).

[15] European Union was known as European Community prior to 1992.

Particularly in the UK, it was found that rising levels of nitrate contamination had caused the water supplies to increasingly exceed the limits set under the Directive (Davies and Williams 1995). In fact, the number of groundwater sources found to be over the EC limit increased by 137% between 1970 and 1987 (from 60 to 142) (Davies and Williams 1995). Around the same time, the EC also developed the Drinking Water Directive, mentioned above.

Agricultural land is recognized as the main source of nitrates found in ground and surface waters in the UK (Archer 1994). They are derived from fertilizers, which were increasingly being used since the 1960s. Nitrates are also released, to a lesser degree, when established grasslands are ploughed (Skinner et al. 1997). Water supply companies found themselves with much higher water treatment costs, as it became increasingly difficult to meet the 50mg/l nitrate limit in drinking water from groundwater sources. To a lesser extent surface water can also exceed the limit, however, mostly in the autumn, when there is less dilution from rainwater (Archer 1994).

Within this climate of concern for Nitrate Vulnerable Zones (NVZ) and meeting EU legislation, the Ministry of Agriculture, Fisheries and Food (MAFF which later became known as DEFRA and will be referred to as such for the remainder of the paper) developed the Nitrate Sensitive Areas (NSA) program in areas most vulnerable to nitrate pollution as the primary program to reduce nitrates below the EU requirements. Similarly to the United States' CSP, the NSA is an agri-environmental program which offered farmers monetary compensation for adopting practices believed to support the attainment of a higher level of environmental protection at a level higher than legislation required. The NSA Scheme was launched in 1990 and is one of the main ways the UK government responded to the rising levels of nitrates in the water supply (Davies and Williams 1995). This program is an example of a voluntary national scheme, which helps farmers in meeting obligatory nitrogen (N) use reductions under European Union (EU) Drinking Water Directive (91/976) (Hanley and Whitby 2003).

All NSA are within NVZ, or designated areas where nitrate levels exceed, or are likely to exceed, the EC limit of 50mg/l. NSAs are areas within NVZs where water is abstracted for human use. These areas are, therefore, considered more at risk in terms of the negative effects of nitrate pollution on human health. Under this scheme, farmers with agricultural land within NSAs may choose to significantly change their land-use practices in order to reduce the quantity of nitrates lost through runoff.

3.4.2. Description of the Program

Due to the significant problem of high nitrate content in drinking water, in 1996 the UK government designated areas where nitrate levels exceed, or are likely to exceed, the EC limit of 50mg/l as NVZ

(ENTEC 1998). The NSA Scheme pays farmers to adopt and maintain over a period of five years certain farming practices in order to reduce nitrate loss. These farming practices go beyond mandatory measures for NVZ (outlined in Appendix C). The reference level farmers must achieve are variable, and based on the land use change they opt for within in the scheme, they consist, for example of: reduced fertilizer inputs, optimal timing of fertilizer application, compulsory use of cover crops over autumn-winter, reduced incidence of ploughing-in of grassland, and conversion of arable land to low intensity grassland or woodland (premium version of the scheme) (Davies and Williams 1995).

Figure 15 below, displays which portions of the country are designated NVZs, making up about 55% of the country (DEFRA 2004) and within that, the NSAs shown in red (Magic 2004). As part of the EC Nitrate Directive (91/676/EEC), farmers within the NVZs are mandated to comply with the Action Program measures; the key aspects are described below in Box 1, as to avoid nitrate pollution from agriculture to infiltrate the groundwater and surface water (DEFRA 2005). This involves mandatory and uncompensated measures intended to limit nitrate leaching (ENTEC 1998).

BOX 1: FOUR KEY ASPECTS OF ACTION PROGRAM

1. Limit inorganic nitrogen fertiliser application to crop requirements, after allowing fully for residues in the soil and other sources.

2. Limit organic manure applications to 210kg/ha of total nitrogen each year averaged over the area of the farm not in grass (reducing to 170kg after four years), and 250kg/ha of total nitrogen each year averaged over the area of grass on the farm.

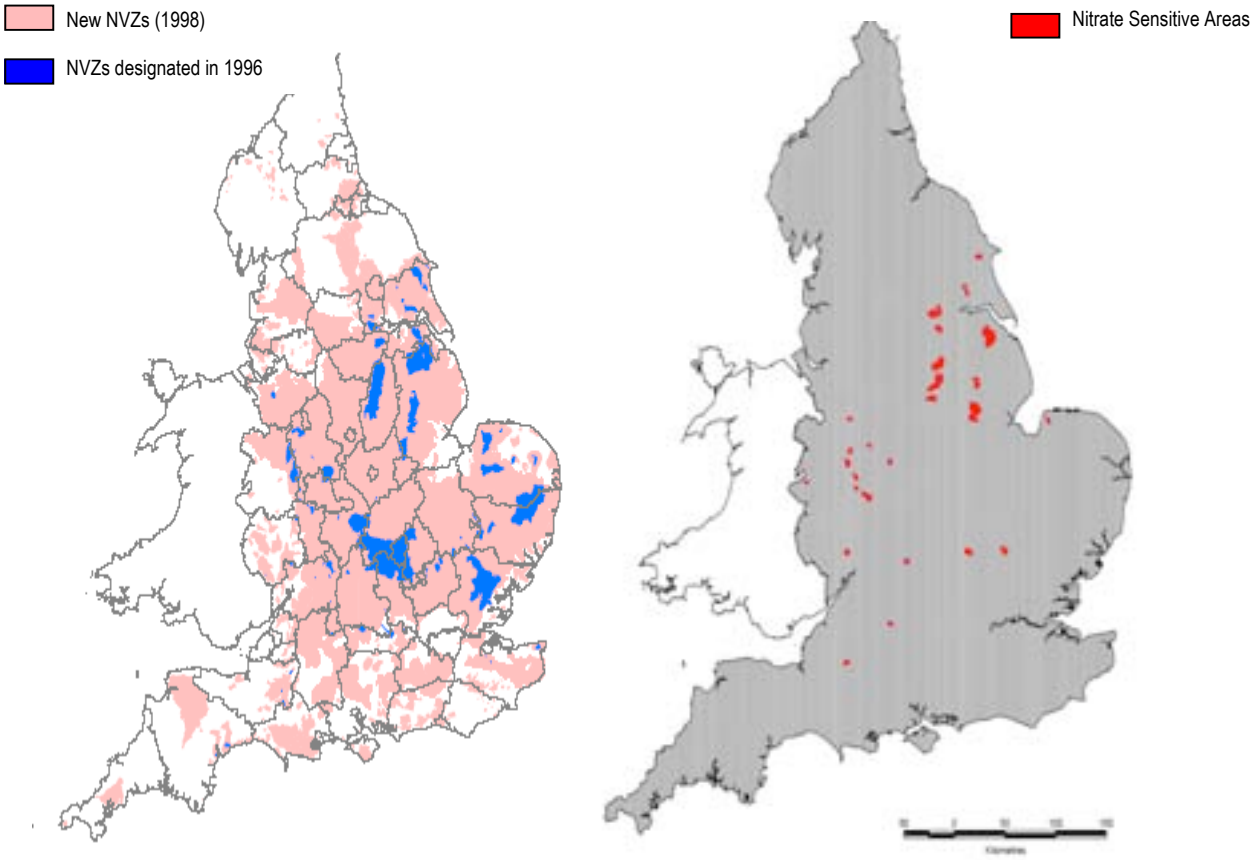
3. On sandy or shallow soils do not apply slurry, poultry manures or liquid digested sludge between 1 September and 1 November (grassland or autumn sown crop) or 1 August and 1 November (fields no in grass without autumn sown crop). The storage capacity available for those animal manures which cannot be applied during the autumn closed period must be sufficient to cover these periods unless other environmentally acceptable means of disposal are available.

4. Keep adequate farm records, including cropping, livestock numbers and the use of organic manures and nitrogen fertilisers.

Source: DEFRA, 2004

Within the NVZ, 32 areas were selected as Nitrate Sensitive Areas (NSA) (DEFRA 2005). These are areas in which levels of nitrates exceed, or at a risk of exceeding, the limit of 50 milligrams per litre (mg/l) in sources of public drinking water, as stipulated in the 1980 EC Drinking Water Directive (ENTEC 1998).

FIGURE 15: NITRATE VULNERABLE ZONES AND NITRATE SENSITIVE AREAS IN THE UK



Sources: DEFRA, 2002 and Magic, 2004

Under the NSA Scheme, farmers must meet the reference level by committing to significant changes in farming practices above and beyond good farming practices in order to make sure the 50 mg/l limit for nitrate stipulated in the EC Drinking Water Directive (80/778/EEC) is met (DEFRA 2002) (see Appendix C for measures). The mandatory NVZ measures, on the other hand, are mostly equivalent to good agricultural practices, and thus uncompensated. These changes aim to restrict the quantity and timing of applications of nitrogen fertilizers and livestock manures (DEFRA 2002).

Farmers within a NSA may choose to enter the scheme on a field-by-field basis, for a minimum of four hectares, during a period of five years (ENTEC 1998) within any of the scheme options. Farmers are responsible to keep records of fertilizer input onto their land if they are in NVZ (DEFRA 2002a). As delineated by DEFRA, the three schemes into which farmers can participate are as follows:

1. Premium Arable Scheme - involves the conversion of arable land into extensive grassland under one of the following management systems:

Option A: unfertilized, ungrazed grassland,

Option B: unfertilized, ungrazed grassland with a species-rich seed mixture,

Option C: unfertilized grassland with optional grazing,

Option D: grassland with optional grazing and the application of up to 150kg/ha of N fertilizer per year (kg of nutrient),

Option E: grassland with woodland (available only to entrants who had planted woodland under the Pilot NSA scheme),

Option S (Set-Aside): unfertilized, ungrazed grassland that can count towards meeting set-aside obligations under the Arable Area Payments Scheme (AAPS) (available from July 1995 only).

2. Premium Grass Scheme - involves the extensification of existing intensively managed grassland. To be eligible the grassland must have been receiving more than 250kg/ha per year of inorganic N in each of the previous three years. Fertiliser N inputs must be reduced to no more than 150kg/ha per year with any organic manure having been produced on a holding within the NSA.

3. Basic Scheme - allows a continuation of arable cropping under conditions designed to reduce nitrate leaching:

Option A: low nitrogen arable cropping - restricted rotation (i.e. potatoes or vegetable brassica crops not to be grown); up to 150kg/ha/year of nitrogen,

Option B: low nitrogen arable cropping - standard rotation; up to 150kg/ha/year in four out of five years, with up to 200kg/ha in the fifth year.

http://www.defra.gov.uk/erdp/schemes/pre_erdp/nitrate.htm - top

Farmers must completely fund the cost of implementing the NVZ requirements (which are outlined in Appendix C). For the NSA Scheme participants, however, payments were dependant on the level of income foregone from commodity production as a result of participation in the scheme, i.e. the opportunity cost of the land taken out of production, and the cost of implementation. These payment levels

were reviewed every three years and would have increase or decrease, dependently. This is fully funded by the UK government.

As an example of what payments may represent, an economic assessment of the scheme from 1998 evaluated the program in 32 locations; the approximate payment rates for the different options of commitment throughout the five years of participation.

3.4.3. Geographic Scale at which the Reference Levels are Applied

Nitrate Sensitive Areas (NSA) and Nitrate Vulnerable Zones (NVZ) policies have been applied to the entire country, within which there were 32 areas designated as NSAs in the United Kingdom with an additional 10 areas as part of the pilot program (Hanley and Whitby 2003) as was seen above on the right side of Figure 15. There are two aspects when designating NSAs. Firstly areas with elevated nitrate levels, determined through chemical tests; and secondly areas that are a source of drinking water. As a natural consequence, NSAs tend to be consistent with watershed delineations, although this is not a steadfast rule. In the case of groundwater reservoirs, for instance, they may not follow watershed lines exactly. The ultimate scale at which practice-based reference levels are applied is the farm or the field (left to farmer's choice) with a minimum of four hectares.

3.4.4. Process Establishing the Reference Levels

In order to determine the reference level, specialists and universities conducted various studies, which established the agricultural practices that would best palliate the problem (Reaston 2006 and Lord et al. 1999). Through scientific testing, the scheme was developed and then implemented in pilot studies. Reference levels were thus not defined through stakeholder negotiations, but alternatively they were primarily done through internal evaluation of pilot studies and interviews with participants (Lord et al. 1999).

Similarly to the United States, the process of negotiations was not as necessary because the program is voluntary and based on scientific data, therefore the largest debate is done over the cost paid to the farmers which would make this scheme effective. Farmers will enter the scheme if they feel that the payment levels cover the money forgone plus the implementation costs. As seen in Table 8, even with just a 5% reduction in payments, less than half of the participants in the pilot study or other NSA areas would not adopt the scheme.

TABLE 8: PROPORTION OF RESPONDENTS WHO WOULD RE-ENTER THE SCHEME, EVEN AT LOWER PAYMENT RATES

	Former Pilot Areas %	New Areas %
No change in rate	78	84
Payment rate reduced by:		
- 5%	25	39
- 10%	12	19
- 15%	4	11
- 20%	4	8
- more than 20%	4	7

Note: % stated relate to proportion who would re-enter at individually identified changes in payment. They are neither cumulative nor add to 100.

Source: ENTEC, 1998

This program went beyond the Good Agricultural Practices to control nitrate loss, which is mandatory in NVZ and voluntary on other land (MAFF 1998). These practices aim to minimize the risk of contaminants going into surface water and groundwater by reducing the quantity of chemicals handled, spread and stored (MAFF 1998) The NSA scheme was therefore a government initiative to meet legislation requirements. After putting the NSA program into place in 1994, the Ministry of Agriculture Fisheries and Food produced an economic evaluation of the scheme, in July of 1998, to gauge the effectiveness of the financial rewards on nitrate control and to ask farmers using the scheme and those who chose not to participate what influenced their choices. Based on feedback from the farmers, the economic evaluation concluded that most farmers in NSAs, that is 72% of eligible farmers making up 80% of eligible land (DEFRA 1995), chose to participate in this scheme and outcomes showed a significant reduction in nitrates as a result (ENTEC 1998). Nitrate input into the soil, as fertilizers, was reduced by 75% (ENTEC 1998). Due to the complexity and long-term nature of the water cycle, it is difficult to say how much the program reduced nitrates in the water.

Other stakeholders were involved, however, in supporting the implementation of the NSA scheme and lobbying the government to develop a program to reduce nitrate contamination from agricultural land. In addition to preventing eutrophication of water bodies, this policy had the main purpose of reducing nitrates in future drinking water sources as means to decrease the costs of water treatment for water suppliers. Water companies were thus primarily involved in the national lobby to encourage the government to set-up nitrate reducing policy, yet they had no direct hand in the implementation of the NSA (Reaston 2006).

1998 was the last year in which new farms were able to join the program. In 1999 concerns about nitrates from farmland and measures to address them, were combined within the England Rural Development Plan (DEFRA 2000) and thus the NSA scheme was discontinued finally in 2003 as its goals were incorporated into other policies (Beckwith, DEFRA 2006).

3.4.5. Established Reference Levels

The NSA Scheme defined reference levels primarily inspired by environmental standards specified within EU regulations. The reference level was explicitly defined based on "best management practices", the scheme even goes beyond best practices defined in Appendix C. Science was used to determine reference levels as scientific studies were consulted in order to determine the most effective land use changes in NSAs to reduce nitrates entering groundwater and surface water which may be used as drinking water (Reaston 2006).

The science used to determine the reference level had a central aim of reducing nitrate levels in drinking water to decrease risk to human health and thereby, possibly reducing eutrophication damage where nitrate is the limiting nutrient (although in fresh water it is usually phosphates) (Hanley and Whitby 2003). Limiting nutrient refers to the nutrient that when not present prevents plants from growing. Excessive nitrates, for instance may encourage over-growth of plants if that is the limiting nutrient. A 1980 EC Directive on the Quality of Water Intended for Human Consumption (CEC 1980) set a maximum allowable concentration of 50mg/l of nitrate in drinking water. An increasing number of water sources in the UK, prior to the NSA mainly, were exceeding this concentration (Archer 1994). This level is considered safe to prevent the negative effects of nitrate pollution on human health, for example blue-baby syndrome and gastric cancer (also affects fauna) (Skinner et al. 1997).

Reference levels also aim to ensure that the following parts of the mandatory Code of Good Agricultural Practice (COGAP) for the Protection of Water are followed on land within the NSA:

- No applications of any organic manure within 10m of a watercourse or within 50m of a spring, well or borehole that supplies water for human consumption, or for use in farm dairies.
- Applications of organic manures not to exceed 250kg/ha of total nitrogen (N) in any 12-month period. (ENTEC 1998)

Other than go beyond meeting EU legislation and certain environmental levels, the NSA Scheme has also been defined in order to sustain and enhance the countryside. Farmers were also required to maintain desirable characteristics around field in scheme (e.g. Hedgerows) if they were to participate in the scheme (ENTEC 1998). All undertakings included the requirement not to damage, destroy or remove environmental features, such as walls, hedges, trees, lakes, ponds, streams, traditional weatherproof farm buildings and features of historical or archaeological interest on or bordering the land entered into the scheme (ENTEC 1998). The UK countryside is not only important for the provision of resources and environmental services, but is also significant as a cultural landscape and preserver of biodiversity. High nitrate areas tend to favour invading species over leafy indigenous flora.

3.4.6. Monitoring Mechanisms

The impact of the NSA Scheme was monitored in three ways:

1) data on cropping and husbandry practices was collected for each field. A computer model of nitrate leaching was then used to calculate, from this information, estimated nitrate losses;
2) actual nitrate leaching from the soil zone from a representative sample of fields was measured by means of porous pots; and
3) nitrate levels in water pumped from the boreholes within NSAs were monitored.

The monitoring program demonstrated that the changes to normal agricultural practices made under the Scheme have been successful in reducing nitrate leaching (ENTEC 1998). Farmers were responsible for these monitoring measures on fertilizer use and husbandry practices, yet the concentration of nitrates in groundwater within NSAs was being measured in England and Wales by the National Rivers Authority (Archer 2004). As mentioned above, it is often difficult, when dealing with running water, to take samples from boreholes and associate that to a particular action because it takes a long time for water and runoff to travel through the water cycle, especially in groundwater measurements. The better way that was found for monitoring in the short-term is for farmers to monitor their own use of nitrates and then extrapolating to how that will affect the content of nitrates.

One way the government was able to ensure that farmers were meeting their engagements was in the elaboration of an initial pilot program and a cost-benefit analysis. In the later report, on location interviews are held with a very large sample of participating farmers (over 60% of total) (ENTEC 1998).

3.4.7. Environmental Performance Assessment

The main performance indicator to evaluate the effectiveness of the NSA Scheme was clearly the level of nitrate in sources of drinking water. In the Cost-Benefit Analysis, completed by ENTEC to analyze the NSA Scheme, participants sampled where found to have reduced their use of inorganic N fertilizer (applications down by just under 600 tons of nutrient), and adopt management practices on arable land that contribute to reducing N leaching from farmland (establishing around 2,300 ha of winter cover crops, avoiding early spring ploughing) (ENTEC 1998). It can be concluded that the scheme should have contributed significantly to meeting the objectives of reducing nitrate concentrations in sources of public drinking water, which were over 50mg/l prior to the scheme (Archer 1994). In fact, in the late 1980's nitrate concentrations in groundwater was expected to reach 150-200mg/l if no measures had been put into place (DEFRA 2000). The most severely affected river in Eastern England was up to 100mg/l of nitrate in the late 1970's (Skinner et al. 1997). In large part due to the NSA Scheme, many of the areas have slowly been decreasing over time, although NVZ still need to be treated with caution. Nitrate inputs, which are easier to accurately measure, have been reduced by 75% (ENTEC 1998).

In conclusion, the changes in land use under the scheme reduced nitrate levels in drinking water. Nevertheless, relationships between leached nitrate and applied nitrogen, atmospheric inputs of nitrogen, and the production of nitrate from organic nitrogen in the soil under different land management systems are complex (Francis et al. 1995). Specific agricultural activities contribute substantially to losses of nitrate. These include the ploughing of permanent pasture, which releases large amounts of nitrate through the mineralization of soil organic matter, leaving land fallow over the winter (Skinner et al. 1997; Francis et al. 1995), and application of animal manures or nitrogen fertilizers during the autumn when plant uptake is low and over winter rainfall will increase leaching. Nitrate losses are also influenced by the type of cultivations used (Skinner et al. 1997). The true effect of this policy is difficult to fully understand, since water must travel through groundwater depositories before being extracted. This may take several years and is extremely complex; therefore, a straightforward correlation cannot always be made.

3.4.8. Summary and Analysis

As is the case in Spain, in the UK reference levels are established based on obligatory conditions which must be met in order to comply with EU regulations regarding nitrate levels in drinking water. The reference level was explicitly defined based on "best management practices". Science was used to determine reference levels as scientific studies were consulted in order to determine the most effective land use changes in NSAs to reduce nitrates entering groundwater and surface water which may be used for drinking water abstraction.

Similarly to the United States, the process of negotiations was not as necessary because the program is voluntary and based on scientific data; therefore the largest debate is done over the cost paid to the farmers which would make this scheme effective.

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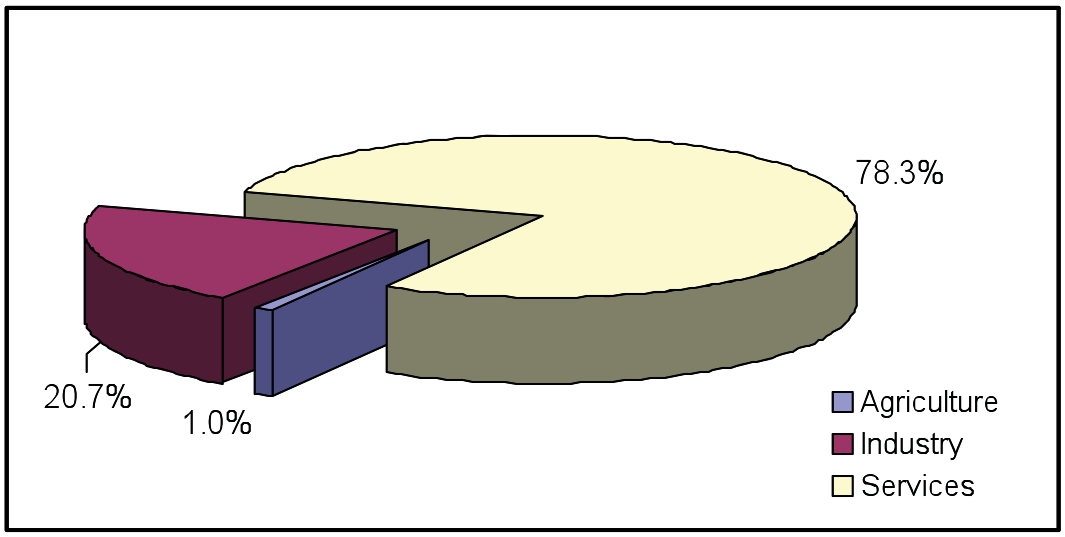
3.5. USA Conservation Security Program (CSP)

3.5.1. Context

In the United States, the wealthiest country in the world, only 1% of the GDP is derived from agriculture. Nevertheless, it has one of the most productive agricultural sectors of any country and is a net food exporter. The main agricultural products are wheat, corn, other grains, fruits, vegetables, cotton, beef, pork, poultry and dairy products (CIA World Factbook 2006). This production employs approximately 1.7% of the labour force. However, nearly half of all land is dedicated to agriculture (OECD 2005). Below, in Figure 16, GDP is broken down by economic sector. Despite taking up much space and having a very significant agricultural output on a global level, it is a tiny sliver of American GDP.

FIGURE 16: USA GDP PER SECTOR



Source: CIA World Factbook: United States, 2005

Because the US is a very large country with diverse agricultural productions there are a large variety of environmental issues that must be addressed through policy. Some of the main concerns in agriculture and environment have to do with the effects of pollution on human and ecosystem health. For instance, contamination from pesticide and fertilizer runoff is the leading source of water pollution (ERS USDA, 2000). Besides fuel emissions and energy production emissions, agriculture remains a major source of toxins (News Batch, 2006). Other concerns in the United States include animal waste nutrients, soil conservation and the conservation of natural habitats (particularly wetlands) (ERS USDA, 2000).

The Farm Security and Rural Investment Act of 2002 (2002 Farm Act) provides the basic legislation governing farm policy for the period 2002-07. Prior to this Farm Bill, most agri-environmental policies in place provided funds for farmers to retire environmentally sensitive land from production or offered funds as part of a cross-compliance measure (OECD 2005). This would involve sharing the cost of compliance to legislation if the measures where in place. The Conservation Security Program (CSP) was introduced as an extension of the Farm Act and was put forth by Congress within the 2002 Farm Bill due to public pressure for a policy, which would compensate conservation, practices which were not required by law.

3.5.2. Description of the Program

The CSP is a highly alterable program, which can cover a wide variety of environmental practices. The reference level to be met by program participation is likely to vary between producers, as coordinators are interested in qualitative conservation achievements. Outcomes can be reached through different means, mostly because environmental concerns are outlined per watershed. There is a set of eligibility requirements, outlined below, which must be met in order to apply. Once a producer has applied, through a self–evaluation form (USDA-NRCS 2005), they must choose a level of participation categorized by one of three tiers. This determines the minimum conservation requirement or lower range of the reference level. The tier determines the length of the contract; basic payment rates and the maximum total payment and depends on how much a farmer has done prior to applying. Once within a tier, farmers can receive a larger portion of funds by enhancing the conservation practices already in place. This section will list the minimum requirements for eligibility, describe each tier, and give examples of enhancements that can be made.

Producers must meet these basic eligibility criteria before applying:

- The land must be privately owned or Tribal land and the majority of the land must be located within one of the selected watersheds;
- The applicant must be in compliance with highly erodible land (HEL) and wetland provisions (HEL, sodbuster, and swampbuster) of the Food Security Act of 1985, have an active interest in the agricultural operation, and have control of the land for the life of the contract (For further reading this act is available at: http://www4.law.cornell.edu /uscode/16/ch58.html):
  - ⇒ Discourage the conversion of wetlands into not wetlands (CRE 1996);
- The applicant must share in the risk of producing any crop or livestock and be entitled to a share in the crop or livestock marketed from the operation.

Once these have been met, farmers must meet a minimum conservation requirement, which will place them in one of the three tiers. These conservation requirements are not usually specific, such as a farming practice or a specific environmental outcome. Conservation requirements are gauged by general categories of activities. For example, in terms of sediment, farmers must demonstrate they have engaged in practices that protect surface water from sediment (from Conservation Security Program: Self-Assessment Workbook, USDA-NRCS 2005). This is a qualitative measure and can be achieved by a variety of farming practices, such as terracing, diversion of waterway, reduced tillage, contour farming, buffers, vegetative barriers, etc. None of these practices are mandatory. CSP fieldworkers will evaluate if the combination of methods in place, in fact, aim to protect waterways from sediment.

In order to be considered for Tier I, the producer must address soil and water quality to a minimum level described for each watershed, in part of the agricultural operation. For Tier II they must meet soil and water quality minimum levels in the entire agricultural operation. Lastly, to be considered for Tier III the producer must address all applicable resource concerns for the entire agricultural operation (Iowa State University 2002).

In order to verify that the self-assessments are correct, farmers participating in this program are required to provide records of the environmental indicators on their land (or a portion of their land if they are in Tier I) and tests/analyses results for at least two of the three years prior to the application. The complete checklist of required information can be found in Appendix A (USDA-NRCS 2005). Appendix B gives an example, for the state of Oregon, of Quality Criteria for Soil and Water Quality (which need to be met for Tiers I and II) and the additional categories, Air, Plants and Animals (which also need to be addressed for Tier III). The environmental criteria are listed in Section III of the NRCS Field Office Technical Guide (FOTG).

Within the CSP, farmers can participate on four levels, which determine which percentage of the total amount of receivable money they can receive, depending on the tier they are in. These payment levels are:

- **Stewardship**: this represents the conservation work the farmer has already done, all farmers applying receive this payment;
- **Existing practice**: additional payment is given for maintaining conservation measures that had previously been put into place;
- **Enhancements**: additional payment for going beyond what is already done, enhancement payments may allow a farmer to exceed the level of conservation required by his tier. A real life example, from Oregon, of how an irrigation enhancement is assessed is presented in a supporting document CSP_06_IWM_Assessment_Tool. Enhancements are

available for each watershed, depending on the issues of importance. Even within an enhancement there are different levels of activity for which different payments are given, for example they can include pilot projects or regional cooperation (CRE 2003);

- **New Practice:** additional payment for a new conservation practice, which may allow a farmer to progress to a different tier (USDA-NRCS 2005b).

As previously mentioned, the CSP is extremely complex, resulting in an equally complex and idiosyncratic payment scheme, evaluated by regional USDA authorities interviewing CSP candidates. Some general rules of payment always apply, however. Once the producer has fulfilled a certain level of environmental protection, the government fully pays for the level of conservation the farmers had achieved without government help and for any further level of environmental achievement (CRE 2003).

This program is particular, in terms of reference levels, because the payments are made specifically to go above and beyond any legislation, more of an incentive program. Farmers participate at a tier depending on their environmental performance before joining the program, as described above. They also participate at a level of activity- also described above- that determines the payments they will receive. The payments are made to farmers according to the Scheme summarized in table 9. Farmers must finance the original conservation schemes already present on their land and the monitoring that must be documented prior to get admitted into the program.

TABLE 9: SUMMARY OF CSP PAYMENTS BY PARTICIPATION LEVEL

Participation Level								
	Stewardship				*Existing Practices*	*New Practices*	*Enhancements*	
Tier	*Base Pay Rate**	*Length*	*Maximum Stewardship Payments*	*Minimum Requirements***	Receive additional payment of a % of avg 2001 county cost of maintaining land management system OR Use % of stewardship payment to maintain existing practice, but not more than 75%	Up to 50% of avg 2001 county cost of installing new practice	State CSP managers decide	*Maximum Annual Pay*
I	5%	5 years	$5,000	Address soil and water resources of concern on enrolled portion				$20,000
II	10%	5-10 years	$10,500	Address soil and water resources of concern for entire farm				$35,000
III	15%	5-10 years	$13,500	System for all resources of concern for entire farm				$45,000

*Base payment is 2001 national average rental rate for a specified use or an appropriately adjusted rate to ensure regional equity.
** Resource of concern determined at the state level.
Source: Based on data from Iowa State University, 2002 and USDA-NRCS, 2004

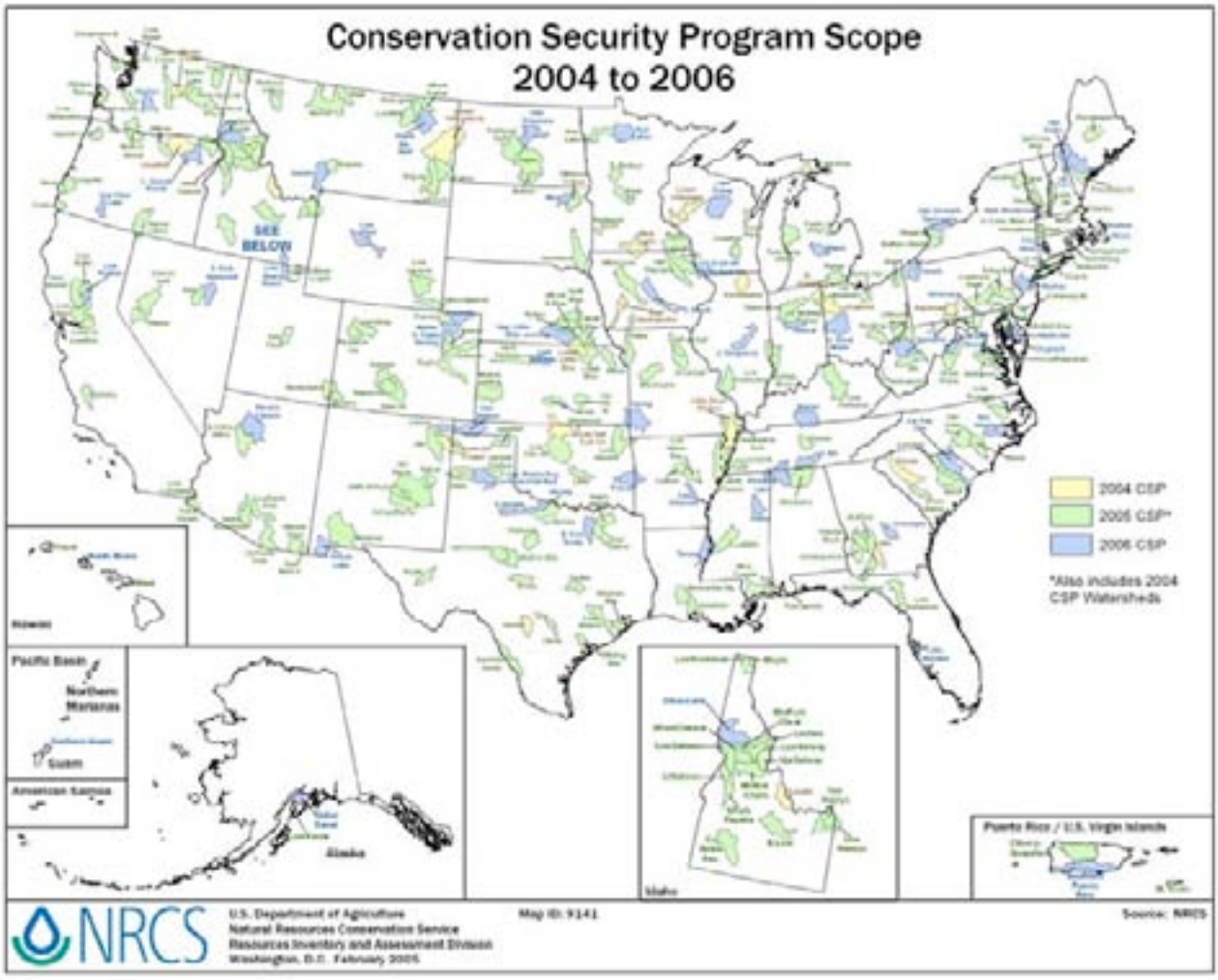
As can be seen from the table, the tier a farmer is in is dependant in minimal requirements of conservation. Tiers also determine the base pay rate, length of CSP participation, maximum payment for stewardship and maximum total annual payment. The amount received by farmers is achieved by adding the payments from the base pay, stewardship, existent practices, new practices and enhancement payments. This value must be less than or equal to the maximum annual payment

3.5.3. Geographic Scale at which the Reference Levels are Applied

CSP will be applicable on a farm-by-farm basis; however, the criteria to meet are determined by watershed. This approach makes sense, since watersheds tend to have particular environmental concerns. From the nationwide soil and water quality criteria, regional authorities are able to determine the most appropriate measures a farmer can have in place. Furthermore, regional authorities can decide which enhancements are considered within a watershed. CSP is available in designated watersheds of all

50 states, the Caribbean area (i.e. Puerto Rico and the U.S. Virgin Islands) and the Pacific Basin area. The number of watersheds selected for participation in any year depends on funds allocated by Congress. To be eligible for CSP, a majority of your agricultural operation must be within one of the selected watersheds. For all producers there is equitable access to benefits regardless of the size of the operation, crops produced, or geographic location (USDA-NRCS 2005a). As can be seen in Figure 17 below, the number of watersheds chosen has been increasing since the project began in 2004. In 2005, for instance, 60 watersheds were selected; this included 380 counties, parishes and municipios (11). More than 75,000 farms and ranches are within these watershed boundaries and they cover more than 25 million acres. About half of the farmland is cropland and half is grazing land.

FIGURE 17: SELECTED WATERSHEDS 2004-2006



Source: USDA-NRCS, 2006

3.5.4. Process Establishing the Reference Levels

The process of establishing reference levels in the CSP program was characterized as a voluntary measure done by watershed and based on the best science available; therefore there was not much conflict between the interests of environmentalists and farmers. When establishing various reference levels a broadscale view was taken. The program was not developed to target any specific kind of production, according to CSP specialist, Gregorio Cruz. It is aimed at any type of agriculture or land use including crops, pasture, livestock, etc. It was, according to Craig Derickson (Conservation Security Program Manager and someone who has been involved in the development of CSP since the beginning) originally developed to

address certain environmental issues. Prior to project development, much scientific data was gathered with a specific interest in soil and water quality, with a focus on carbon sequestration, greenhouse gas emissions and global warming.

The original idea for such a program was brought about due to public pressure. According to Craig Derickson, land users were looking for a conservation program that would benefit those who had been successful at implementing conservation measures on their land. For other conservation programs in existence, if a farmer had good conservation practices, he or she was no longer eligible to receive funding.

In the US, debate on implementation was more prevalent on the program level rather than on a reference level. Sponsors of the CSP tried to introduce it at various times in Congress before it was finally approved (Johnson 2004). As there are many stakeholders in favour of CSP, the government was encouraged through this pressure, to implement this policy. In Congress, the program found widespread support in the Senate (half of the US legislative branch, besides the House of Representatives). Also there was much support expressed by both farm groups (such as National Association of Wheat Growers and the National Corn Growers' Association) and environment/conservation groups (such as the Sierra Club and the Natural Resources Defense Council) (Johnson 2004). The CSP is an extension of the Farm Act and was finally put forth by Congress within the 2002 Farm Bill. The Farm Security and Rural Investment Act of 2002 (2002 Farm Act) provides the basic legislation governing farm policy for the period 2002-07.

The main point of contention came about on the total cost of the program, having been modified six times over three years due to congressional disagreements on the amount at which the program's budget would be capped. There are various interest groups, which are either for or against an increased budget, of mostly divided along party lines. The current government has plans to fund the CSP until 2013.

There are several factors that helped in having a less contentious reference level. First, since this program is done at a watershed level, reference levels were varied and adapted to local situations depending on the scientifically shown concerns for the area. Also, this program is voluntary and largely rewards farmers for actions they have taken already, regardless of the funding (as well as encouraging them to have more conservation measures). This means there is not much of an economic or labour burden on farmers to enter the program, as, for the most part, it is actions already taken. The process of negotiations is hence less necessary and done on the costs of the program.

Once the funding for the program was compromised upon and the CSP put into place, reference levels were then established by each watershed, falling more or less within particular states. Studies were conducted to decide which aspects of environmental care were of most concern. Conservationists see

establishing such a program at the watershed level, as beneficial to address local concerns. Stakeholders appreciate the broad eligibility criteria and that the program will fund all eligible applicants, regardless of acreage or funding (Johnson 2004). Also, the voluntary nature of the program and progressive attitude of compensating measures in place and those above the legal requirements, appeal to farmers (Derickson 2006).

On the other hand, due to its multifarious character, eligibility into the program can be met by a variety of practices and watershed needs are described in different ways. CSP staff must, therefore, evaluate participants on a case by case basis. This program, therefore, is somewhat costly and staff-intensive. This may make it vulnerable to changes in government and budgetary reform, for example to divert funds to disaster relief (ASA 2006).

3.5.5. Established Reference Levels

The main objective of this project is to ensure that private and Tribal agricultural lands remain viable working enterprises (USDA-NRCS 2005a), by rewarding producers that maintain conservation stewardship and implement additional conservation practices that provide added environmental enhancement, while creating powerful incentives for other producers to meet those same standards of conservation performance (USDA-NRCS 2005b). Theme specific reference levels to be met depend on which environmental needs are most pressing in each watershed. Watersheds are, therefore, chosen by identifying several factors, such as:

- Vulnerability of surface and ground water quality;
- Potential for excessive soil quality degradation;
- Condition of grazing land. (USDA-NRCS 2005c).

The conservation practices, defining the reference level, that are eligible for payment depend on the watershed and its environmental needs; the needs of each watershed are listed when they are chosen (USDA-NRCS 2005c). Some examples of environmental concerns which can receive enhancement payments are soil quality and water quality and quantity, air quality, and plants and animals, both domestic and wildlife. Qualified applicants can receive enhancement payments for addressing these additional concerns (USDA-NRCS 2005c) above any legislation that may be in place already.

As mentioned above the project participants must test the environmental criteria in their farms prior to applying (complete list found in Appendix A). With this information farmers will verify if their levels

meet minimal environmental performance levels. These can be expressed as a combination of methods (e.g.: crop rotation) or a quantitative figure (e.g. soil conditioning index must be positive). The environmental goal of establishing such a broad reference level is an overall increased use of conservation measures. The reference level was explicitly defined based on "best management practices", although instead of setting the policy at a lower level of environmental protection than the best practices, as described in Section 2, the reference level was set beyond the good farming practices.

3.5.6. Monitoring Mechanisms

Monitoring is to be completed primarily through self-assessment including records and tests produced by farmers, described in Appendix A. As stated by Craig Derickson, National CSP Manager, and Gregorio Cruz, each land user must provide a detailed self-assessment in order to apply; these are then reviewed by local authorities and selected based on budget and category payments. A NRCS staff member is sent to verify that they have met the levels of conservation stated in the self-assessments. Although there are not sufficient resources to evaluate all conservation criteria, for each category (e.g. a positive soil conditioning index, water practices, wildlife protection…) some criteria are verified and the rest are estimated from those. For a farmer entering the stewardship program the initial verification would suffice, since the payments are for measures already in place. However, if there were enhancements to be made, that farm would require more than one visit.

3.5.7. Environmental Performance Assessment

A performance evaluation is currently in the works. CSP coordinators have stated, however, that many participating farmers that started at the first Tier (described above) have graduated to another Tier, showing that many enhancements have been made. In addition, a recent study by the Minnesota Institute for Sustainable Agriculture (MISA 2006) found that the CSP Program had worked to reward farmers who had conservation measures in place in three different types of farms, and some were encouraged to improve their soil quality through additional enhancements beyond that which is necessary for that tier (MISA 2006).

Some drawbacks of this program have also been identified. Another Minnesota study (Westra et al. 2004) found that such a broad policy might detract from meeting specific environmental goals. It is important in terms of policy and economics, to identify the intended resource concern for the specific area and then targeting conservation practices and payments to address it, in order to achieve what is most environmentally and economically desirable for a region for the least cost. In the cases studied, protecting fisheries was identified as the most important resource in the region. CSP rewarded and encouraged

practices that conserved soil and water but were not necessarily targeted towards improving fisheries. This resulted in farming practices for which the effects on fisheries were unpredictable (Westra et al. 2004).

From a policy perspective, these results highlight the importance of identifying the intended resource concerns and targeting conservation practices and payments to address them.

3.5.8. Summary and Analysis

The US CSP program is difficult to analyse as a whole from the perspective of our conceptual framework. The difficulty is due to the fact that program management is divided up and is ultimately determined on a watershed basis, each with its own characteristics and problems.

There is virtually no hint of the power relationship between agricultural producers and environmental groups in the dynamic of choosing reference levels for watersheds. The following aspects account for this near lack of conflict in the negotiation process:

- voluntary nature of the measures implemented;
- recognition of measures already implemented;
- factual data existing prior to the program and the use of science to establish reference levels locally;
- copious financial resources for compensating producers for actions they take.

Concretely speaking, in choosing the program's operating criteria, the government implicitly chose to make BMPs the basis for reference levels.

The US program is distinct in that it applies our conceptual framework to the letter. With the reference level being BMPs, producers are compensated when they go beyond it, even where the status quo (no additional action) already exceeds the baseline.

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We would like to thank

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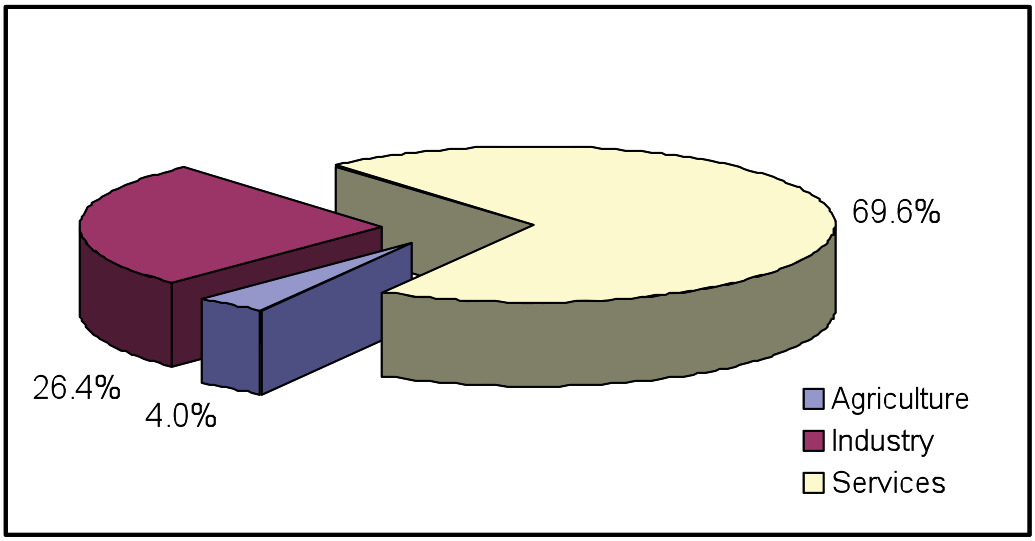
3.6. Australia National Action Plan for Salinity and Water Quality (NAP)

3.6.1. Context

Australia is the driest inhabited continent and therefore appropriately managing its water supply is essential for sustainable agricultural production. It has critical salinity and water quality problems demanding urgent attention. These issues of salinity and deteriorating water quality are seriously affecting the sustainability of Australia's agricultural production, the conservation of biological diversity and the viability of their infrastructure and regional communities (Peck and Hatton 2003). At least 5% of cultivated land is now affected by dryland salinity – this could rise as high as 22%. One third of Australian rivers are in extremely poor condition, and land and water degradation, excluding weeds and pests, currently costs approximately $3.5 billion per year (Council of Australian Governments 2000a).

Despite the dry climate, of the countries analysed, Australia has an agricultural sector, which makes up the most significant part of its economy (4%), as seen in Figure 18. Australia is an internationally significant producer of cattle and dairy products. Furthermore, it has extensive grain (esp. wheat) cultivations and horticultural products are exported to many other countries (Australian Government: DFAT 2006). For the reasons mentioned above, the Australia National Action Plan for Salinity and Water Quality (NAP) was launched in 2000 with the purpose of establishing an arrangement between governments (national, states/territories and regional), in accordance with the National Action Plan on Salinity and Water Quality, that are necessary to motivate and enable regional communities to use coordinated and targeted action.

FIGURE 18: AUSTRALIA GDP PER SECTOR



Source: CIA World Factbook: Australia, 2004

Originally, the NAP program was established along with the Natural Heritage Trust (NHT), as these two programs are delivered together. This reduces administrative and monitoring costs as part of the Australian Governments' plan for natural resource management. The NHT program provides funds for conservation and natural resource management projects. These projects mainly focus on Landcare, Bushcare (focusing on the protection of local indigenous flora and fauna), Rivercare and Coastcare (Australian Government 2005a)

Government funds for the NHT are delivered primarily at a regional level, along with the NAP. Regional committees are able to request funding for projects that address the established targets of specific regional environmental concerns. The NHT program is also delivered, to a lesser extent at a larger scale (national level), for which the government determines which areas or resources need the most funding; also at a smaller scale, communities can apply for NHT funding in order to address local natural resource management issues (Australian Government 2005a). The NHT and NAP programs combine to form a large part of regional natural resource management.

The NAP program works by providing broad national objectives for agricultural lands and each region must devise targets and regional solutions to problems specific to area conditions. The NAP funds projects to enable and motivate them to organize specific actions to target the following issues:

- prevent, stabilize and reverse trends in dryland salinity affecting the sustainability of production, the conservation of biological diversity and the viability of our infrastructure;
- improve water quality and secure reliable allocations for human uses, industry and the environment (Australian Government 2006)

Regions must create a plan to outline regional priorities, or targets, and elaborate projects to which the funds are to be allocated. These vary largely in scope and may be implemented by local governments, for example water management improvements in local towns, or programs may aim at farmers and encourage them to improve water management practices on individual farms as part of a larger water management schemes. This policy is unique, in relation to the other case studies, as it is aimed at not only agriculture and environment but also rural communities and industry. Regional authorities may also develop pilot programs to demonstrate and encourage farmers to engage in certain salinity prevention measures (Australian Government 2004). Farmers would then supposedly see the benefits of these practices and may then be given a portion of the funds if they wish to implement measures on their farm (Australian Government 2004).

3.6.2. Description of the Program

The National Action Plan for Salinity and Water Quality (NAP) was developed to address the extremely severe problem of agricultural land degradation due to high levels of salinity in many parts of Australia. This plan defines extremely broad objectives, which are determined within regional contexts and executed in projects aimed at local concerns. The NAP plan allocated Aus$1.4 billion over seven years to advance these programs in communities across the country (Australian Government 2006). Salinity reduction and improved water quality are the issues of main concern.

The Australian Government first endorsed the NAP on November 3rd, 2000 (Council of Australian Governments, 2000b). In this plan, goals are set for decisive salinity and water quality related actions to ensure that land and water management practices will sustain productive and profitable land and water uses as well as natural environments (Council of Australian Governments 2000b). Regions are primarily responsible for developing an integrated management plan. The requirements for these integrated plans include targets for salt and nutrient levels, water quality and biodiversity that the community can pursue; these determine the reference levels. Each requirement and the money associated with it will depend on the region and its specific needs. Regions in Australia are approximately defined by water catchments. Money is, therefore, provided by both the National and State governments and managed by the regions for specific projects. These projects may include providing money for local governments, regional authorities or individual farmers. Below the different aspects of NAP reference levels are outlined and examples are given.

The aim is for all levels of government, community groups, individual land managers and local businesses to work together in tackling salinity and improving water quality (Australian Government: NAP 2004). To do so, the NAP Action Plan entails the following steps:

1) **Targets and standards for natural resource management,** particularly for water quality and salinity, with the States and Territories, either bilaterally or multilaterally, as appropriate. The targets and standards determine the reference level to be used in a specific project. These should include salinity, water quality and associated water flows, and stream and terrestrial biodiversity based on good science and economics. The country proposes desired outcomes for the implementation of targets and standards on a national level. Regions/watersheds then define which are the main problems that must be addressed to achieve these outcomes. They then allocate the funds for different projects depending on the level of implementation.

National outcomes provide catchments/regional communities with a framework within which they must develop their own targets for salinity and water quality. The set of proposed national outcomes for salinity and water quality are displayed in Box 2(Australian Government: NAP 2001). These are then used to create targets, or reference levels, which are then set within a time scale in which they must be achieved. An example of actual targets can be seen in Box 3 (Australian Government: NAP 2001).

BOX 2: NATIONAL OUTCOMES FOR SALINITY AND WATER QUALITY

Prevent, stabilize and reverse trends in salinity

·reduction in the rate at which land and water resources are affected by salinity

·production systems developed and land and water management practices in place, which prevent and manage salinity

·protect assets of high value

·minimisation of the impact of salinity and degrading water quality on locations and systems which are critical for conservation of biodiversity, agricultural production, towns, infrastructure and cultural and social values

Improve water quality

·surface and groundwater quality which is maintained or enhanced

·reduced frequency and extent of algal blooms

·production systems developed and land management practices in place which enhance or maintain water quality

·the integrity and diversity of stream and terrestrial biodiversity and ecosystems are maintained or enhanced

Secure water allocations

·surface water and groundwater is securely allocated for sustainable production purposes, and to support human uses and the environment, within the sustainable capacity of the water resource

·water quality and quantity which is sufficient to sustain the ecological values of freshwater ecosystems

BOX 3: EXAMPLES OF RESOURCE CONDITION TARGETS DRAWN FROM ACCREDITED PLANS AND INVESTMENT STRATEGIES

·By 2015, reduce salinity in the surface storages of the river system from an average 1000 µs/cm/yr to an average of 700 µs/cm/yr
·By 2020 nitrogen, phosphorous and sediment loads at the end of valley target sites in the four river basins will be 30% less than 2003 levels
·By 2015, increase the cover of all endangered and applicable vulnerable Ecological Vegetation Classes (EVCs) to at least 15% of their pre-European vegetation cover
·By 2020, improve the quality of 90% of existing (2003) native vegetation by 10%

Although these targets are precise, some regions may have very vague targets that resemble desired outcomes seen in Box 1. As mentioned above, reference levels in are extremely variable throughout the country depending on regional needs and methods used to determine these needs;

2) **Integrated catchment/regional management plans** developed by the community, in all highly affected catchments/regions where immediate action will result in substantial progress towards meeting State/Territories and basin wide targets to reverse the spread of dryland salinity and improve water quality. The Commonwealth and States/Territories will need to agree on targets and outcomes for each integrated catchment/region management plan, in partnership with the community, and accredit each plan for its strategic content, proposed targets and outcomes, accountability, performance monitoring and reporting. The cost will be covered 50-50 between the Commonwealth and States/Territories; however, where significant change is required to address salinity, particularly dryland salinity, and deteriorating water quality, potentially affecting the viability of regional communities and this may be very costly and the Commonwealth may be willing to spend more;
3) **Capacity building for communities and landholders** to assist them to develop and implement integrated catchment/region plans, together with the provision of technical and scientific support and engineering innovations; which may include adaptation to more saline land with different types of agricultural production, such as shrimp farming who defines, what they mean;
4) **An improved governance framework** to secure the Commonwealth State/Territory investments and community action in the long term, including property rights, pricing, and regulatory reforms for water and land use;
5) **Clearly articulated roles for the Commonwealth, State/Territory, local government and community to replace the current disjointed Commonwealth State/Territory frameworks** for

natural resource management. This would provide an effective, integrated and coherent framework to deliver and monitor implementation of the Action Plan; and

6) **A public communication program** to support widespread understanding of all aspects of the Action Plan so as to promote behavioural change and community support.

An example of the diversity of regional projects can be seen in the example of Western Australia (see Figure 20). This state was given a total of Aus$2 million to undertake solutions to salinity and water quality (Australian Government 2004). Funds are given to each region of concern and these regions must then make plans for dealing with issues of most concern. In the South Coast the NAP will help manage nutrients, in Ord Irrigation Area funds are to be used for assisting in water management, in the Northern Agricultural Region they will highlight natural resource management issues with local governments and in Avon funds are to be used to "develop integrated town water management plans and demonstrate a pilot water scheme engineering plan" (Australian Government 2004).

Taking for instance the South Coast region/watershed, funds allocated ($350,620) are to be used in salinity management in the West River Watershed in order to "implement sustainable low recharge farming systems in the catchment to stop or reduce the amount of agricultural land affected by salinity. This will give landholders a demonstrated profitable use of saline land in the catchment. The project will also help develop a surface water management plan for the catchment, investigate the use of saline water for aquaculture, and establish woody perennials, which contribute to reduced ground water levels and reduced salinity" (Australian Government 2004). The South Coast Region determined the most important use of the funds and then used them for research projects to develop more effective natural resource management methods. The prevalent objective, in this case, is the decrease of soil salinity. This is a very general desired outcome. In the projects implemented in agriculture the objective is to adapt to saline soil and attempt to not worsen soil conditions. The desired outcome is broadly defined as the implementation of a low recharge farming system that can better utilize saline soil. Farmers are involved in this case simply by being given information from pilot programs in research for profitable use of saline land.

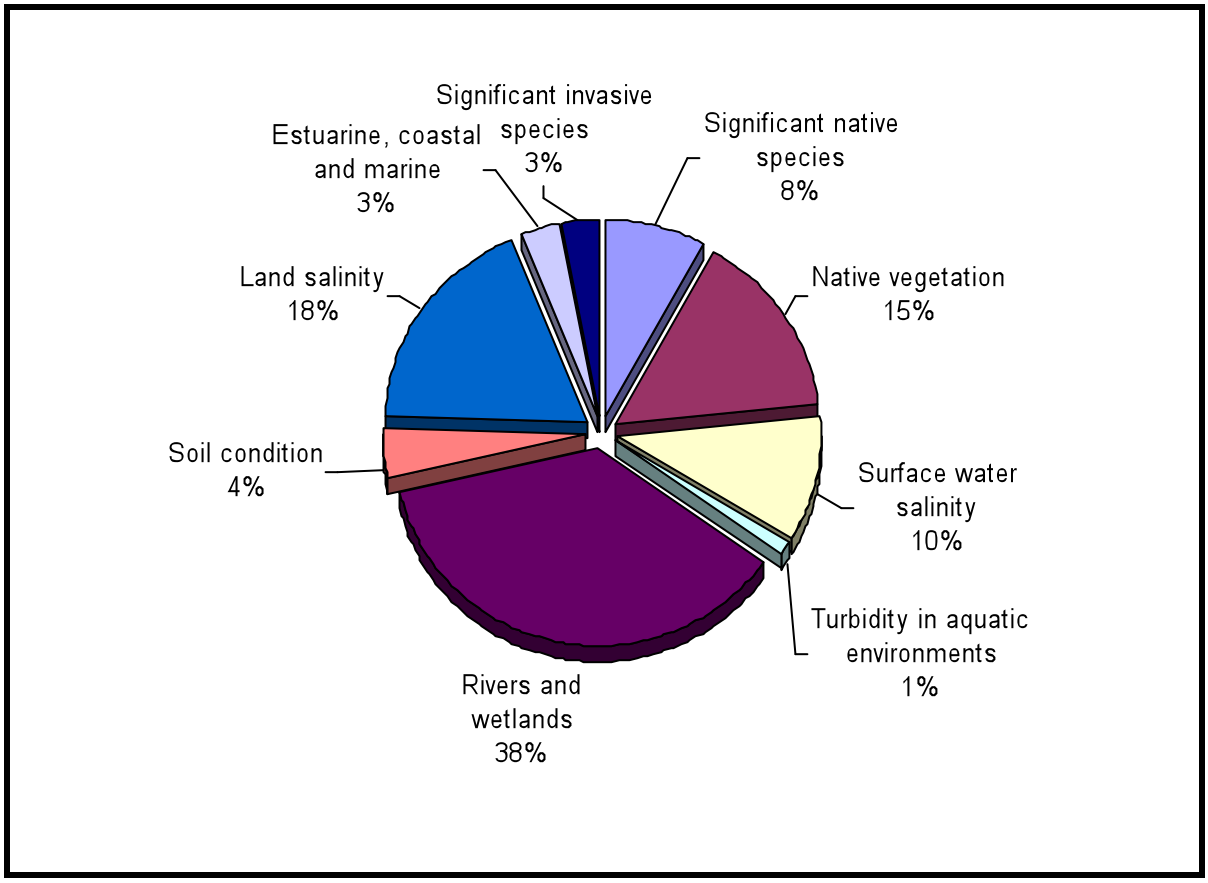
In the Avon region, on the other hand, funds are used to protect town infrastructure and native flora and fauna from the impacts of salinity, and develop alternative water supplies and recycling. This program sets out "how each town may control salinity, produce alternative water supplies, and develop new industries. The pilot water scheme will demonstrate the viability of water management strategies, including groundwater pumping, drainage, surface water harvesting and storage, desalination, mineral extraction, re-

cycling and irrigation, or a combination of these elements" (Australian Government 2004). The specific projects and money allocation are listed in Appendix D.

As is clear from this example, the projects implemented by each region are very diverse. The South Coast is focused on saline agricultural land, whereas Avon is more focused on water use in towns and a more urban water use.

The cost for implementing the projects will be covered 50-50 by the Commonwealth and the States/Territories. In some circumstances where major costs are involved to produce necessary drastic changes, the Commonwealth may pay more. In addition, participating communities may also be expected to make appropriate monetary contributions (Council of Australian Governments 2000b). Payments are to be made for a seven year period (Australian Government: NAP 2004), for up to a total of $1.4 billion (Council of Australian Governments 2000a). States allocate the funds for each region and these are then responsible for the use of the funds to implement projects. The amount paid is highly dependant on the individual projects proposed. The government has established, however, a general allocation of funds as seen in Figure 19. Over 50% of NAP funds are intended for issues dealing with salinity and water quality.

FIGURE 19: PRIORITY ACTION INVESTMENTS APPROVED TO JUNE 2005



Source: Australia Government, 2006

3.6.3. Geographic Scale at which the Reference Levels are Applied

Australia has been divided into 56 regions, which more or less correspond to watersheds or bioregions and were set up in order to develop plans by which to manage natural resource and establish sustainable agriculture priorities (Australian Government 2005b). The National Action Plan targets 21 of these regions in Australia most affected by salinity and water quality problems (Australian Government: NAP 2005a). The targeted regions can be seen in Figure 20. The plans will then be implemented by the various watersheds/regions and occasionally communities within these regions will implement projects. Regional authorities manage funding provided within these regions and project implementation can be on a regional level, community level or farm level, depending on the projects.

FIGURE 20: TARGETED WATERSHEDS/REGIONS FOR SALINITY AND WATER QUALITY MANAGEMENT

1. Darwin-Katherine
2. Ord
3. Northern Agricultural Region
4. Avon
5. South West
6. South Coast
7. Burdekin-Fitzroy
8. Lockyer-Burnett-Mary
9. Condamine-Balonne-Maranoa
10. Border Rivers
11. Namoi-Gwydir
12. Macquarie-Castlereagh
13. Lower Murray
14. Lachlan-Murrumbidgee
15. Murray
16. Avoca-Loddon-Campaspe
17. Goulburn-Broken
18. Glenelg-Hopkins-Corangamite
19. South East
20. Joint Management by Mt Lofty-Kangaroo Island-Northern Agricultural District & Lower Murray
21. Mt Lofty-Kangaroo Island-Northern Agricultural District
22. Midlands

Source: http://www.napswq.gov.au/priority-regions.html

3.6.4. Process Establishing the Reference Levels

In the case of Australia, it is difficult to make conclusions in regards to how reference levels are set due to the vastness and diversity of programs. In order to initially develop the program as a whole, public participation was used. This process started with the release of a discussion paper for four months from December 1999 to March 2000 (called Managing Natural Resource Management in Rural Australia for a Sustainable Future). Public responses to this paper were drawn together in a Steering Committee Report to Australian Governments (Australian Government: NAP 2004).

Once the general program was accepted, however, the regions had to set targets based on the National Framework for Target Setting. These targets influence the projects developed in each region and where reference levels are set. Natural Resource Management (NRM) boards determine targets and thus determine the environmental programs put into place. The makeup of these boards varies by region and may include contracted technical experts, employees, state technical experts, or local volunteers (which may include local land owners, aboriginal group representatives, etc) (Parry 2006). Due to regional inconsistencies in NRM board members and their methods for establishing regional targets and selecting methods to achieve these targets, the NAP looks very different from region to region. In some, consultants were hired to determine the projects that were scientifically sound. While in other regions board members were mostly local NRM employees that used empirical knowledge accumulated from past long-term projects to determine practices that would work.

3.6.5. Established Reference Levels

Reference levels were developed with the recognition of Australia's critical salinity, particularly dryland salinity, and water quality problems (Australian Government: NAP 2005b). Specific indicators were measured, depending on the region, for example the quantity and quality of indigenous flora. Each region must determine what targets these indicators must achieve under this scheme based on their particular ecology. The definition of reference levels is very variable, depending on what programs were devised for a specific region. Some regional priority programs may include, for instance, pilot research projects for different tillage use to decrease salinity levels. This kind of activity would be highly based on the local scientific measurements. For another example of the use of science in the definition of reference levels, listed in Appendix D for South Coast region for the eastern Fitzgerald Biosphere, stakeholders in an area of hydrological risk, are provided with information on the risks and baseline data for resource condition (such as groundwater depth, salinity, etc) to understand the current situation they must deal with. This program helps farmers make informed decisions on resource management and assists them to set targets for salinity in their farms to mitigate potential risks (Australian Government 2004).

In addition to regional priorities, another factor that influences how a reference level is determined is the make-up of NRM boards. As mentioned in the "context" above some boards are made up of consultants who decide on reference levels from a purely scientific perspective, while other boards are made up of local volunteers, farmers and regional NRM employees, which may have broad aspirational resource conditions as a reference level.

The definition of reference levels in the NAP is very variable, yet it can be considered within the "best management practices" category from Section 2. This program aims to improve environmental quality above the current level. Reference levels are set within each regional project to improve environmental outcomes, either directly or indirectly (e.g. by setting up example technologies farmers may choose to implement).

3.6.6. Monitoring Mechanisms

As part of the Accountability requirement for "Improved governance for land and water management" portion of the NAP, ongoing monitoring, measuring and reporting arrangements for the Action Plan building on the work of the National Land and Water Resources Audit undertaken under the NHT and State of the Environment reporting (Council of Australian Governments 2000b). This audit is to be undertaken at various levels of detail and results are shared and accessible. The audit undertakes an independent Mid-term Review to check its progress against the Strategic Plan and the performance indicators listed against each objective (Natural Heritage Trust 2006). Furthermore, State/Territory Agencies and regional bodies have a number of reporting obligations for the agreed upon indicators for each region. At an individual farm level, participation may vary from simply receiving information to aid in decision making, to receiving funds to implement these decisions. Projects and monitoring are to be executed by the regional authorities developing the programs. Projects are often to improve farmers' productivity and for more effective resource management, which would be to their benefit.

3.6.7. Environmental Performance Assessment

A National Natural Monitoring & Evaluation Framework (NM&EF) has been developed by the Australian, State and Territory Governments to help monitor and report on the impact of the NAP. The NM&EF sets out broad "Matters for Target" which are to be reported on using a range of indicators (Natural Heritage Trust 2006).

Through yearly regional reports, the actions achieved by each region are delineated. Last year (2004-2005), for instance, over 200,000 hectares of agricultural land was improved through activities such as

perennial pasture establishment and the application of lime to address acid soils. Sustainable irrigation systems were established on close to 19,000 hectares of land (Australian Government 2006).

A variety of projects were funded throughout the country. For example revegetation and rehabilitation activities have been conducted across 1.2 million hectares of land, 3 million hectares of land has been protected for native species, and almost 200 million hectares managed for pest plants and animals (Australian Government 2006).

Many advancements were made towards national targets in areas of Land salinity, Soil condition, Rivers and wetlands, Nutrients in aquatic environments, Turbidity, Surface water salinity, Native vegetation, Significant native species, Significant invasive species and Estuarine, coastal and marine (Australia Government 2006). This program has been successful at establishing action within a timeframe to achieve Regional goals for larger national targets. Through funding of communities they have been able to focus their resources on issues deemed most important by each region or watershed. It is as of yet unclear, however, if the method used to establish targets and projects is the most effective use of funds for environmental improvement. Consultants are currently investigating the effectiveness of target setting within the NAP and a report will be prepared by the end of this year (Parry 2006).

3.6.8. Summary and Analysis

As with the US CSP, Australia's NAP is difficult to analyse from the perspective of our conceptual framework. Here as well, the difficulty is due to the fact that program management is divided up and ultimately determined on a watershed basis, each with its own characteristics and problems.

In Australia's case, the problems largely go beyond agri-environmental issues, and the power relationship between producers and environmental groups is inadequate for explaining reference level selection, which is done on a per-watershed basis. In fact, the methods for establishing reference levels can vary greatly from one watershed to the next. As mentioned earlier, in some cases, consultants establish them using scientific data, while in others, committees consisting of representatives from society establish them using available science to a varying extent.

Nevertheless, the analysis shows that, in Australia, as elsewhere, BMPs are often used to define reference levels.

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We would like to thank

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4. SYNTHESIS AND VALUABLE LESSONS

In the second half of the 20th century, technological progress combined with market globalization has changed the face of agriculture around the world. Agricultural producers have gradually moved away from a subsistence production approach by increasing productivity and adopting production methods based increasingly on mechanization and manufactured inputs. These market organization and technology advances have gone hand in hand with an abundance of inexpensive foods, which has greatly improved the welfare of the general populace.

However, given that agricultural producers have been adopting an industrial production approach, with all the associated environmental impacts, society has been gradually facing the need to view agricultural activities as industrial activities. This has naturally led to tension. Unspoken social contracts have been broken, and the role of trustee of the environment that has traditionally and implicitly belonged to agricultural producers has been gradually brought into question. Throughout the West, the State has had to intervene and arbitrate between producers' individual property rights and the public's right to environmental quality.

These interventions, in the form of regulations or support programs for certain practices, involve establishing a reference level, which we define as "what society feels it has a right to expect from agricultural producers in terms of environmental protection." Concretely speaking, reference levels often correspond to environmental objectives.

One important aspect that stands out in this definition of "reference level" is that it is a societal choice. This societal choice results mostly from available scientific knowledge on the impact of various farming practices on the environment and the play of negotiations between stakeholders concerned about agri-environmental issues. Very often, at one end of the bargaining space are the agricultural producers, who want as few constraints as possible, and at the other are the environmental groups, who want to see practices change so as to ensure to the extent possible a degree of environmental integrity.

How reference levels are defined depends on the environments in which they are established and on the desired objective. Thus, for reference levels covering amenities, the science is not as strong as that for habitat preservation or ecological functions.

In theory, it seems that different categories of reference levels can be used. Thus, the following possibilities have been catalogued as reference levels: absence of environmental standards; current situation (status quo); best management practices (BMPs) corresponding to good farming practices that

align with good trade practices; business as usual, which starting from the "status quo" assumes continuous improvement in taking environmental issues into account; world best technology, which refers to best practices often economically unavailable; and representative competitor standards. In the agriculture sector, absence of environmental standards, business as usual and world best technology are unlikely to be implemented.

Ultimately, the value of the reference level concept is that, by defining "what society has a right to expect from agricultural producers in terms of environmental protection", we identify the scope of producers' property rights as well as citizens' right to a clean environment. By establishing a reference level, a line is drawn between what society considers damage prevention and what it considers benefit creation. This way, a threshold is established up to which the polluter-pays principle applies and beyond which the beneficiary-pays principle applies. The polluter-pays principle applies to all damage prevention measures, whereas the beneficiary-pays principle applies to benefit creation measures.

It is with this conceptual framework in mind that the various case studies were conducted. The aim in studying them was to attempt to understand how different countries facing various problems had defined reference levels within some of their programs. Concretely speaking, we were just as interested in the process that led to reference level selection as we were in the definition of the reference levels themselves. The objective was to identify, within the context and process, those aspects that assisted the decision-making process regarding these reference levels and to identify specific aspects pertaining to the sharing of the economic burden of the measures implemented within the programs presented.

The agri-environmental programs examined have common characteristics as well as differences that should be identified to be able to draw valuable lessons from them. From this viewpoint, we recall here some features of the programs studied in this report with respect to reference level selection.

4.1. Synthesis

For analysis purposes, what follows is a brief review of the programs studied. The French, Spanish, Swiss, English, US and Australian programs are briefly described.

France

France favours a voluntary/contractual approach. The *sustainable agriculture contract* (CAD) is a voluntary five-year contract between a farmer and the French State whereby the farmer agrees to develop a set of environment-friendly practices for his farm in exchange for monetary compensation. In fact, the

reference levels are defined by these best practices. The assistance received is to cover the shortfall incurred by implementing agri-environmental measures.

A general national catalogue of measures per issue is prepared by the Ministry of Agriculture. Regional authorities then establish a list of priority measures for the regions. Finally, using a farm diagnostic, farmers can select up to two issues from those identified by the *département* and up to three priority actions (farming practices) per issue.

In France, reference levels take many forms depending on the problems and specifics encountered regionally. They are defined as part of the agri-environmental programs implemented. Since the CAD is a voluntary program and a variety of measures are available to producers, reference levels are not absolute. In a way, producers select the reference level they want to apply to their operation in light of their analysis of the requirements involved for them in consideration of the subsidy they will receive.

In the negotiation process, the public policy-maker's fairly obvious intent essentially seems to have been to obtain practice improvements along the lines of BMPs. Environmental groups have, in general, sought to obtain changes to best practices, similar to what we have called "world best technology" in the conceptual framework, but with more generous compensation for producers. Producers themselves proved to be open-minded because the program is voluntary. In reality, however, they appear to favour the status quo.

It is particularly interesting that, when looked at more closely, stakeholders as a whole essentially seem to have been in agreement in choosing the status quo as a reference level. In fact, the basic principle of the CAD is to compensate producers for losses incurred by implementing agri-environmental measures. As for environmentalists, they most definitely proposed more stringent measures, yet with greater compensation.

Nevertheless, a number of important points are worth bearing in mind regarding the negotiation process. Specifically, sound knowledge of environmental problems, the preparation of a national catalogue of measures, the fact that stakeholders are used to working together and voluntary contracts are all aspects that made it much easier to define reference levels.

Spain

The current environmental cross-compliance programs in Spain stem from Europe's Common Agricultural Policy (CAP). This is a set of measures that differ depending on the issues and are mandatory for access to direct payments. Erosion is the nation-wide environmental problem determining the good

practices that give rise to cross-compliance payments. There are no complementary programs for financially assisting producers who go beyond the recognized good practices.

Concretely speaking, Spain's reference level could be defined as "good farming practices that farmers should implement to preserve their land." As a result, the costs involved with adhering to good farming practices are at the farmers' own expense.

In Spain, reference levels are clearly established through conditions that agricultural producers must meet to be entitled to support payments from the European Community. BMPs are the basis of all reference levels. In fact, at the outset, officials imposed BMPs as the reference level; producers have not objected to them, and environmental groups have not had the opportunity to express a preference.

As to the negotiation process, there are number of characteristics specific to Spain:

- It was imposed from outside by the European Community;
- Thinking and decision-making occurred first at the national level, with minimal participation of regional authorities, which were not very involved in the negotiations;
- Consultations were very close and were limited to producer associations. Civil society in general and environmental groups in particular were not consulted.

In Spain's case, the ability to arrive at a reference level definition was greatly facilitated by the fact that the negotiation process had been open to only a few stakeholders that are used to negotiating with each other and the fact that the negotiation process was very structured at the national level from the outset.

Switzerland

In Switzerland, environmental objectives (biodiversity, phosphorus, nitrogen and phytosanitary products) are defined nationally. Two programs are used to help achieve these objectives: 1) an environmental cross-compliance program in which ecological requirements called required agricultural services (*prestations écologiques requises* – PERs) must be met in order for producers to receive direct payments; 2) an ecological direct payment program for adopting specific practices that go beyond the PERs. Payments under the latter program vary based on the zone in which the parcel is located.

Thus, the reference level for the programs is defined by the required ecological services (PERs). As such, the practices giving rise to subsidies are very specifically defined and the program is voluntary and contractual.

PERs are defined consensually. They are established scientifically, taking both ecological and agronomic aspects into consideration. Reaching consensus is facilitated by Switzerland's democratic culture at the various levels of the decision-making process.

Ultimately, if we refer to our conceptual framework, we note that, like elsewhere, agricultural producers try to get the reference level to be as low as possible, especially where agri-environmental issues are more prevalent. Civil society, however, is not as organized for expressing a differing viewpoint.

It is interesting to note, however, that in Switzerland the positions taken by stakeholders do not really seem too far removed from what we call BMPs in our conceptual framework. As such, Switzerland does not shed any light on the power relationship between agricultural producers and civil society, which seems to exist to a stronger degree in other OECD countries. This is no doubt partially explained largely by civil society's and agricultural producers' recognition of the multifunctional role of agriculture and the merits of compensating this contribution to society's well-being.

United Kingdom

In the United Kingdom, nitrate contamination significantly impacts the costs of supplying drinking water. Moreover, under the European Union's Nitrate Directive, member states must:

a) identify surface and groundwater sources polluted by nitrates;
b) identify nitrate vulnerable zones (NVZs) (watersheds);
c) devise action plans for meeting the requirements of the Directive; and
d) implement them.

The program put in place in the UK meets this Directive. Vulnerable zones are identified, and additional mandatory farming practices are defined for those zones. They represent the reference level. These practices do not give rise to compensation. However, beyond these practices, payments for specific practices are provided for on a contract basis.

In the UK's case, as with Spain, reference levels are clearly established by conditions that must be met in order to meet the European Community's standards for nitrate concentration in drinking water. The reference level was specifically defined based on best management practices. Science was used for the reference levels since scientific studies were consulted for determining the most effective farming practices for limiting nitrate migration to sources of drinking water.

As in the United States, the negotiation process for defining reference levels was not needed because the program was voluntary and based on scientific studies. As a result, the discussion dealt instead with the amount of compensation to be paid to producers to encourage them to alter their practices.

United States

In the United States, there is the Conservation Security Program along with the Conservation Reserve Program and the Environmental Quality Incentives Program (EQIP). Under this program, watersheds with specific problems are identified. For each watershed, payments are granted for farming practices that address environmental objectives.

The program operates on a voluntary/contractual basis by farm and offers incentives on an increasing scale according to the requirement level the producer selects (three levels – Tier 1, 2 and 3). For access to this program, agricultural producers must also comply with legislation (*Food Security Act*) pertaining to erosion-sensitive land and wetlands.

The US program is unique in that subsidized practices are not specified at the outset. Outcomes are the focus, leaving producers to choose the methods to achieve them. As a result, reference levels vary depending on the watershed and, for the most part, involve the implementation of BMPs. The program is very labour intensive (governmental) and is based on a mechanism requiring a great deal of information and knowledge.

There is virtually no hint of the power relationship between agricultural producers and environmental groups in the dynamic of choosing reference levels for watersheds. The following aspects account for this near lack of conflict in the negotiation process:

- voluntary nature of the measures implemented;
- recognition of measures already implemented;
- factual material existing prior to the program and the use of science to establish reference levels locally;
- copious financial resources for compensating producers for actions they take.

Concretely speaking, in choosing the program's operating criteria, the government implicitly chose to make BMPs the basis for reference levels.

The US program is distinct in that it applies our conceptual framework to the letter. With the reference level being BMPs, producers are compensated when they go beyond it, even where the status quo (no additional action) already exceeds the baseline.

Australia

Australia is facing serious environmental problems due to high soil salinity levels and water quality problems. To deal with this, the program (NAP) targets 21 priority regions out of a total of 56. These areas roughly correspond to either bio-regions or watersheds.

Under this program, each region/watershed defines its own objectives for salinity and water quality. Each region/watershed also prepares an integrated watershed management plan including actions for achieving the established objectives.

For implementation, the program involves bilateral agreements between the Commonwealth and each State. The Commonwealth and the States must accept the integrated plans and certify each strategic objective, the intended outcomes, and the monitoring and reporting methods.

The regions/watersheds plan and carry out projects aligning with the integrated management plan. These projects may involve actions for agricultural producers and methods to compensate for resources used, but not necessarily.

In fact, given that, in Australia's case, the problems largely go beyond agri-environmental issues, the power relationship between agricultural producers and environmental groups is inadequate for explaining reference level selection, which is done on a per-watershed basis. In fact, the methods for establishing reference levels can vary greatly from one watershed to the next. As mentioned earlier, in some cases, consultants establish them using scientific data, whereas in others, committees consisting of representatives from society establish them using available science to a varying extent.

Nevertheless, the analysis shows that, in Australia, as elsewhere, BMPs are often used to define reference levels.

The following table summarizes the information collected from the case studies by presenting aspects that are specific to them. This summary enables us to make some general observations.

- The programs define reference levels. They always begin with an environmental problem. This problem can be:
  - ⇒ national and very specific (Spain, United Kingdom, Australia),
  - ⇒ national with broad themes adapted regionally or locally (Switzerland, France),
  - ⇒ place-based, particularly on a watershed basis (USA, Australia);

- Most programs are administered on a voluntary/contractual basis by farm. In Spain, there are no payments, only environmental cross-compliance. In Australia, the program is intended primarily for catchment/regional authorities that receive funding for projects designed to achieve certified objectives. These projects may involve agricultural producers, but not necessarily;
- In most cases, the programs define reference levels that are in the form of very specific agri-environmental practices (BMPs) except in the United States, where outcomes on farms are the focus, irrespective of practice, and in Australia, where outcomes at watersheds are the focus;
- Payments are received as compensation for practices that go beyond reference levels. In fact, the reference level used is BMPs (Switzerland, France, United Kingdom, USA, Spain). In Australia, catchment authorities define and carry out specific actions;
- Reference levels depend primarily on the ecosystems where farming is done and on specific problems and objectives:
  - ⇒ for example, Switzerland's PERs would be difficult to implement as a "normal" practice in Canada and vice-versa,
  - ⇒ the mandatory requirements for vulnerable zones in the United Kingdom depend on the specific nitrate problem in the UK and pertain to the EU's Nitrate Directive,
  - ⇒ Switzerland's PERs appear to be the only program directly targeting amenities creation and habitat preservation. The other programs target ecological functions (except the United Kingdom, which targets human health).

TABLE 10: SUMMARY OF SPECIFICS FROM THE CASE STUDIES

Country	Definition of the Environmental Problem	Type of Measure	Application
France	▪ National catalogue of issues and measures ▪ Choice of regional issues and measures – Specifications for measures and payments granted per measure ▪ Farm diagnostic	▪ Farm: Choice of two issues and three actions	▪ Per-farm contracts ▪ Payment for supplementary costs only ▪ Payments for specific practices ▪ Application basis: national
Spain	National: Soil erosion	▪ Cross-compliance ▪ Direct payments to agriculture (Spain + EU)	▪ Specific practices ▪ Not compensated ▪ Application basis: national
Switzerland	Definition of national problems/objectives: Biodiversity, nitrogen, phosphorus, phytosanitary products	▪ Cross-compliance: PERs ▪ Ecological direct payments for adopting specific practices that go beyond PERs	▪ Specific practices ▪ Local adaptation (zones) ▪ Per-farm contracts ▪ Application basis: national
United Kingdom	▪ Nitrates in surface water ▪ Contaminated drinking water ▪ EU Nitrate Directive	▪ Identification of vulnerable zones	▪ Mandatory farming practices – not compensated ▪ Payments for specific practices above the legally required levels ▪ Per-farm contracts ▪ Application basis: zone/region
United States	▪ Choice of watersheds with specific problems and restoration or protection objectives	▪ Payments for outcomes addressing concerns and meeting environment restoration or protection objectives for the selected watershed.	▪ Per-farm contracts ▪ Beyond what is legally required ▪ Incentive system – encourages improved conservation practices for achieving environmental objectives on a per-watershed basis ▪ Application basis: watershed

Country	Definition of the Environmental Problem	Type of Measure	Application
Australia	▪ Serious soil deterioration problems due to high salinity levels ▪ Surface water quality problems	▪ Definition of national objectives ▪ Bilateral agreement with each State ▪ The region/watershed develops its own objectives and regional solutions to its own problems under this framework ▪ Policy objectives, desired outcomes, monitoring methods and reporting are approved by the State and the Commonwealth	▪ Project approach ▪ Projects can include measures for agricultural producers and funding them, but may include other measures ▪ Projects are carried out by catchment/regional authorities ▪ Application basis: watershed

Source: ÉcoRessources Consultants Compilation

In the first chapter, in our conceptual framework, we stated that reference level selection had a determinative effect on the sharing of the burden between agricultural producers and the rest of society. In fact, defining the reference level draws the line up to which the polluter-pays principle applies and beyond which the beneficiary-pays principle applies.

However, the case study analysis shows that the various countries differ very little from each other in terms of the reference levels used. In most cases, BMPs are used. The United States and Australia cases are not as clear because objectives are established on a per-watershed basis and practices to implement are not clearly defined. France refers to them, but in reality uses the status quo as the baseline for calculating producer subsidies. This means that, in France, the reference level is the status quo.

Concretely speaking, the case study analysis revealed that, in common practice, it is not so much the reference levels that affect burden sharing but rather the type of program implemented. Essentially, there are a variety of program types:

- mandatory programs with no compensation (Spain);
- mandatory programs with compensation (Switzerland, United Kingdom and France);
- voluntary programs with compensation (United Kingdom, UK and France);
- voluntary programs with compensation that recognize past actions (US).

If we place these programs on a continuum based on generosity to producers, we see that Spain's program is by definition the least generous because it offers no compensation. The UK and Swiss programs come next because they offer compensation. France's program comes further along because it funds new measures based not on exceeding BMPs, but on exceeding the status quo. Finally, the US program appears to be the most generous to producers because it subsidizes even actions already in place.

The following table summarizing the characteristics of the various reference level negotiation processes points up some important lessons on what facilitates the negotiation process. Essentially, two types of process can govern reference level selection: the authoritarian process and the participative process.

The authoritarian process can be based on an external constraint that the country or jurisdiction has no control over. It may also stem from a sound scientific basis regarding knowledge of agri-environmental problems and solutions. Such a process leads to the desired outcome more easily because certain stakeholders in conflicting positions are not consulted.

With a participative process, beyond a democratic culture like that found in Switzerland, things that help it run smoothly are: sound knowledge of the problem, a national catalogue of measures and stakeholders who are used to working together. These appear to make up the basic premises of a constructive participative process during reference level selection.

Our case study review also teaches us that other things greatly facilitate the negotiation process for determining reference levels. Introducing a voluntary program seems to be a guarantee of success. When the program is voluntary, agricultural producers do not object to implementing it and do not say much about reference levels. Environmental groups can see measures of their choosing included. Agreement on the list of possible voluntary measures could turn the discussion away from reference level selection towards a discussion on the amount of financial incentives for compensating agricultural producers.

In this regard, it is worth reviewing the lessons that can be drawn from the French case study. With CADs, French producers almost systematically chose to implement measures that change the status quo very little, even though compensations associated with them are lower. This suggests that, beyond a shortfall, producers are motivated by the desire to focus on activities they can master. Thus, compensating producers for their opportunity cost of implementing a given agri-environmental measure is not enough to make them adopt that measure. They prefer instead to devote their time and resources to activities they are better at mastering.

The US CSP completes the profile. As with the other case studies, this one shows that a voluntary program helps reach consensus on the definition of reference levels, but also shows that if the necessary financial resources are made available, it is possible to overcome stakeholders' natural resistance to change. In the US's case, the fact that practices already in place are funded brought producers on board and subsequently resulted in the adoption of even more desirable behaviours from an agri-environmental perspective

More broadly, the Swiss case shows that recognition, by civil society and agricultural producers alike, of the multi-functional role of agriculture in society and the merits of compensating this contribution to society is rich ground for any negotiation process for determining reference levels.

TABLE 11: SUMMARY OF THE NEGOTIATION

PROCESS CHARACTERISTICS FROM THE CASE STUDIES

Country	Negotiation Process
France	▪ Sound knowledge of environmental problems ▪ Preparation of a national catalogue of measures ▪ Stakeholders used to working together ▪ Voluntary/contractual program ▪ Public policy-maker in favour of BMPs ▪ Environmental groups in favour of world best technology ▪ All stakeholders in agreement with status quo as the reference level, but different subsidy levels for different types of requirements
Spain	▪ Reference level imposed from outside by the European Community ▪ Negotiation process very structured from the outset at the national level ▪ Regional authorities not very involved in negotiations ▪ Environmental groups in particular were not consulted ▪ Negotiation process open to only a small number of stakeholders used to negotiating with each other
Switzerland	▪ Reference levels very clearly defined by required ecological services (PERs) ▪ PERs defined scientifically, agronomically and economically ▪ Consensus facilitated by Switzerland's democratic culture at the various levels of the decision-making process ▪ Producers better organized than civil society for expressing their view ▪ Minimal power relationship between agricultural producers and civil society (agreement on BMPs) ▪ Recognition by civil society as well as producers of the multifunctional role in society and the merits of compensating this contribution to society's well-being
United Kingdom	▪ Reference level imposed from outside by the European Community ▪ Reference level specifically based on science for establishing BMPs ▪ Voluntary/contractual program ▪ Discussion on the size of amounts to pay producers
United States	▪ Factual data existing prior to the program and the use of science for establishing reference levels locally ▪ Voluntary nature of the measures implemented ▪ Recognition of measures already implemented ▪ Copious financial resources for compensating producers for actions they take ▪ Government in favour of BMPs as the basis for reference levels
Australia	▪ Problems largely go beyond agri-environmental issues ▪ Methods from establishing reference levels can vary greatly from one watershed to the next ▪ In Australia, BMPs are used to define reference levels

Source: ÉcoRessources Consultants Compilation

4.2. Applicability to Canada

To understand how the findings can be applied to the Canadian context, we must first understand how responsibility for agriculture and the environment is distributed among the various levels of government in Canada.

The Canadian Constitution does not specifically deal with the environment. Jurisdiction, and therefore legislative power, regarding the environment is shared across the two levels of government according to the distribution of their specific jurisdictions.

In general, the provinces carry out their environmental responsibilities pursuant to the following main jurisdictions:

- property and civil rights (s. 92 (13));
- generally, all matters of a merely local or private nature (s. 92 (16));
- municipal institutions (s. 92 (8));
- management and sale of the public lands belonging to the province and of the timber and wood thereon;
- development, conservation and management of non-renewable natural resources and forestry resources in the province (s. 92A (1)(*b*)); and
- development, conservation and management of sites and facilities in the province for the generation and production of electrical energy (s. 92A (1)(*c*)).

These powers make the provinces the key stakeholders regarding the environment in those provinces. The federal government carries out its environmental responsibilities pursuant to the following powers:

- sea coast and inland fisheries (s. 91 (12));
- criminal law (s. 91 (27));
- such works as declared to be for the general advantage of Canada (s. 92 (10)(*c*)); and
- peace, order and good government (residual jurisdiction) (s. 91, introduction).

These powers are reflected primarily in the *Fisheries Act* and the *Canadian Environmental Protection Act*. The federal government also acts through its spending authority.

The powers of the two levels of government frequent overlap. The following table lists the most obvious instances where shared environmental responsibilities would apply to agriculture.

TABLE 12: ENVIRONMENTAL RESPONSIBILITY SHARED BETWEEN GOVERNMENTS

Area	Federal Government	Provinces
Waste or water, air and soil contamination	▪ *Fisheries Act*: unauthorized deposit of deleterious substances into water frequented by fish is prohibited ▪ *Canadian Environmental Protection Act* (toxic products)	▪ Key stakeholder within the province ▪ Jurisdictions o property and civil rights (s. 92 (13)); o generally, all matters of a merely local or private nature (s. 92 (16)); o municipal institutions (s. 92(8)).
Pest-control products	▪ Pesticide production, import, export and labelling ▪ Product registration under the *Pest Control Products Act* ▪ Some toxic pest-control products are covered as toxic substances in the *Canadian Environmental Protection Act*	▪ Use of pesticides o user education; o aerial spraying subject to the environmental impact assessment system

Source: ÉcoRessources Consultants Compilation

Even though the Canadian Constitution specifically deals with agriculture, jurisdiction for it also shared, and the provinces are usually the champions of what goes on within their territory, while the federal government has more limited responsibility.

In general, the distribution of powers between the two primary jurisdiction levels in Canada does not appear to impose unresolvable limitations on the types of program that can be put in place in Canada or on the establishment of reference levels reflecting regional characteristics. The review of programs in place around the world shows that there are a number of formulae for adapting nationally devised programs to provincial, regional or watershed-specific environmental priorities. In Canada, the federal government could very well define broad directions that would take different forms for the provinces. The federal government could wholly or partially finance these agri-environmental programs. As to the process for defining priorities and reference levels, this naturally should have a major focus on the provinces and subregions that are relatively similar in terms of environmental characteristics.

In more detail, it is meaningful to review the elements we have identified as key in the reference level definition process to examine their implications for potential application to Canada. The following table

summarizes our observations. Upon reading the table, we see that the authoritative approach is not really applicable to Canada because there are no outside constraints to warrant it.

However, the idea of a participative approach for determining reference levels does give rise to its own questions. We see that certain basic elements are there for initiating such an approach. The democratic culture, despite some deficiencies, is fairly strong and the science is there needing only to be consolidated. However, certain elements that are key to the success of this approach are problematic. First, it is unclear whether stakeholders, with opposing views, are used to working together. Also, if the most promising approach for collectively determining reference levels is the voluntary approach, as the analysed cases would suggest, then it is also clear that success is heavily dependent on financial support to go along with it. It is far from clear whether governments are prepared to allocate the monies required for this type of measure. An alternative would be to take monies currently allocated to farm income support and re-allocate them to supporting all of agriculture's functions. However, the agricultural community is fairly closed on this.

Thus, we understand that reference levels are defined within programs; that the negotiation process among stakeholders is greatly facilitated if programs are voluntary; however, for a voluntary program to bring people on board, it must provide for funds to compensate producers for their opportunity costs. This element is lacking, and the alternative of re-allocating monies allocated to agriculture would very likely be unpopular.

TABLE 13: PROGRAM CHARACTERISTICS AND POTENTIAL APPLICATION TO CANADA

Elements Assisting the Reference Level Definition Process	Application to Canada
Existence of an external constraint regarding agriculture's impact on the environment	▪ No constraints of this type for Canada. ▪ Federal government can impose conditions on the provinces as part of the support it provides to producers. It is conceivable that some of these conditions would define reference levels.
Sound scientific basis demonstrating agriculture's impact on the environment	▪ Great deal of work done on this in Canada. No objective reasons why the science could not be acquired for defining agri-environmental reference levels.
Democratic culture	▪ Canada's democratic culture is sound. Governments are used to consulting the public on social issues affecting them. However, our institutions have a credibility deficit.
National catalogue of measures	▪ Such a catalogue does not exist. It could be prepared. It would likely be more logical to do so at the provincial level given the diversity of environments and issues characteristic of Canada.
Stakeholders used to working together	▪ This situation likely varies across regions. In general, however, relationships are rather tense between agricultural producers and other stakeholders.
Voluntary program	▪ Nothing preventing the provinces and government from taking this route. However, to be effective, it must go hand-in-hand with significant financial tools.
Financial incentives for compensating agricultural producers	▪ Canada does not allocate as much money as European Union countries or the United States to supporting its agriculture. This money is largely allocated to income support for agricultural producers. Unclear whether governments have the money for financing additional measures addressing agri-environmental practices.
Recognition by civil society and agricultural producers alike of the multifunctional role of agriculture	▪ In Canada, this perspective is not yet part of our behaviour. Civil society has difficulty seeing agricultural producers as the "stewards of the landscape" in a context where producer discourse is fairly lukewarm about multifunctionality and where producers claim to want to be remunerated through the market.

Source: ÉcoRessources Consultants Compilation

In this context, developing programs and defining reference levels would likely need to be done in stages. Canada's various governments could indeed put the question forward by:

- encouraging the development of a sound scientific basis demonstrating agriculture's impact on the environment and the potential of various solutions;

- establishing national and provincial catalogues of measures;
- creating opportunities for stakeholders to meet so that they develop the habit of working together and discussing agri-environmental problems;
- ensuring that civil society and agricultural producers alike begin to recognize the multifunctional role of agriculture.

Actions in line with these directions would be valuable for promoting a collective approach to defining agri-environmental reference levels in Canada.

4.3. Conclusion on Applicability to Canada

In European Union countries, the different approaches for preparing BMP codes shows how member states have taken advantage of the flexibility available to them for developing BMPs adapted to specific regional/national situations. This suggests that member states have used this measure in a targeted manner, in that they have defined standards for specific environmental topics by focusing on those of concern to them. Overall, BMP codes are considered useful for guiding farm management and developing agri-environmental measures.

The six cases studied reveal a number of highly interesting components that could be incorporated into a Canadian approach. To be given a chance to succeed, that approach should be designed to adapt to the problems specific to each province and require their involvement. Australia is interesting in this regard. Note, however, that these approaches require significant specialized human resources. Hence the reason why they are structured and driven at the national level (economies of scale).

A scenario similar to that used under the Agricultural Policy Framework would probably be appropriate. The federal government's role would be to oversee, develop and disseminate knowledge and provide a portion of the financial incentives. The provincial and territorial governments would be responsible for program delivery in partnership with the regional agencies.

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Appendices

Appendix A

APPLICATION CHECKLIST		
☐	1.	Completed Self-Assessment Workbook
☐	2.	Conservation Plan OR a map delineating your agricultural operation:
	☐	An aerial photo, or overlay of the land you wish to enroll showing the land use, acreage, approximate location, and type of practices installed on each field you wish to enroll
☐	3.	Records - You must have at least 2 years of written records for each of the following practices you apply:
	☐	Nutrient Management Records should include: yields, soil analysis, dates and application rates of all inorganic and organic fertilizers, including animal waste
	☐	Pest Management Records should include: target pest, crop or forage type and the type of pesticide used, dates and application rates or the cultural or biological control method used and dates implemented, including spot treatments
	☐	Grazing Management Records should include: total acres, production per acre, number of livestock, grazing schedules, maps showing existing practices, such as fences and watering facilities, and aerial photos showing the condition of the grazing land
	☐	Irrigation Schedule/ Water Management Records should include: crop type, rainfall amounts (if appropriate), irrigation dates and amounts applied
	☐	Waste Utilization Records should include crop type, projected yields, soil analysis, waste analysis, dates and application rates of all animal waste applied
☐	4.	Tests/Analyses - You must provide a record of the following tests, as applicable:
	☐	Soil Test If you are applying nutrients (includes all types), you must provide historical records of a soil test conducted within the last 5 years at a minimum. If you are traditionally applying at or below the recommended rates for your soil and cropping system, this requirement may be waived.
	☐	Animal Waste and/or Sludge Analysis If you are applying animal waste or sludge, you must provide records of an analysis conducted within the last 5 years at a minimum
☐	5.	Control of the Land Control means possession of the land by ownership, lease, or agreement; and authority to make decisions about the management and operation of the land
☐	6.	Form CCC-526, Payment Eligibility Average Adjusted Gross Income Certification (Appendix B)
☐	7.	Form AD-1026, Highly Erodible Land Conservation and Wetland Conservation Certification (Appendix C)
☐	8.	Form CCC-1200, Conservation Program Application/Contract (Appendix D)

Appendix B

SOIL

Natural Resource Concern	Description of Concern	State Quality Criteria
Soil Erosion - Sheet and Rill	Detachment and transport of soil particles caused by rainfall splash and runoff degrades soil quality.	Sheet and rill erosion does not exceed the Soil Loss Tolerance "T".
Soil Erosion - Wind	Detachment and transport of soil particles caused by wind degrades soil quality and/or damage plants.	Wind erosion does not exceed the Soil Loss Tolerance "T" or, for plant damage, does not exceed Crop Damage Tolerances.
Soil Erosion - Ephemeral Gully	Small channels caused by surface water runoff degrade soil quality and tend to increase in size. On cropland, they can be obscured by heavy tillage.	Surface water runoff is controlled sufficiently to stabilize the small channels and prevent reoccurrence of new channels.
Soil Erosion - Classic Gully	Deep, permanent channels caused by the convergence of surface runoff degrade soil quality. They enlarge progressively by headcutting and lateral widening.	Surface water runoff is controlled sufficiently to stop progression of headcutting and widening.
Soil Erosion - Streambank	Accelerated loss of streambank soils restricts land and water use and management.	Accelerated streambank soil loss does not exceed a level commensurate with upstream land use and normal geomorphological processes on site. The land user's management activities do not contribute to the streambank erosion problem.
Soil Erosion - Shoreline	Soil is eroded along shorelines by wind and wave action, causing physical damage to vegetation, limiting land use, or creating a safety hazard.	Shoreline erosion is stabilized to a level that does not restrict the use or management of adjacent land, water or structures The land user's management activities do not contribute to the shoreline erosion problem.
Soil Erosion – Irrigation-induced	Improper irrigation water application and equipment operation are causing soil erosion that degrades soil quality.	Irrigation-induced erosion does not exceed the Soil Loss Tolerance "T".
Soil Erosion - Mass Movement	Soil slippage, landslides, or slope failure, normally on hillsides, result in large volumes of soil movement	Shallow slumps, slides, or slips are prevented or minimized so that the mass movement of soil material does not exceed naturally occurring rates.
Soil Erosion – Road, road sides and Construction Sites	Soil loss occurs on areas left unprotected during or after road building and/or construction activities.	Sites are adequately protected from soil loss during and after construction. Roadbanks are stable, with no visible erosion. Scour areas are stabilized.

Soil Condition - Organic Matter Depletion	Soil organic matter has or will diminish to a level that degrades soil quality.	The desired use of the soil will not be impaired due to management activities that result in poor soil tilth, soil crusting, reduced water infiltration, or declining soil organic matter. On cropland, a Soil Conditioning Index is positive.
Soil Condition – Compaction	Compressed soil particles and aggregates caused by mechanical compaction adversely affect plant-soil-moisture relationships.	The desired use of the soil is not impaired by compaction.
Soil Condition – Subsidence	Loss of volume and depth of organic soils due to oxidation caused by above normal microbial activity resulting from excessive drainage or extended drought.	The timing and regime of soil moisture is managed to attain acceptable subsidence rates.
Soil Condition - Contaminants - Salts and Other Chemicals	Inorganic chemical elements and compounds such as salts, selenium, boron, and heavy metals restrict the desired use of the soil or exceed the soil buffering capacity	The soil will have no observable or measurable detrimental effect on the suitable use of the soil and adapted plant production.
Soil Condition - Contaminants - Animal Waste and Other Organics	Nutrient levels from applied animal waste and other organics restrict desired use of the land.	No observable or measurable adverse effect from animal waste or other organic nutrients on the suitable use of the soil or adapted plant production. A state approved management plan and site permit is required when domestic sewage is applied to agricultural lands.
Soil Condition – Contaminants - Commercial Fertilizer	Over application of nutrients degrades plant health and vigour, or exceeds the soil capacity to retain nutrients.	Soil nutrient levels do not exceed crop needs based on realistic yield goals and appropriate pH levels are maintained.
Soil Condition - Contaminants - Residual Pesticides	Residual pesticides in the soil have an adverse effect on non-target plants and animals.	Pesticides are applied, stored, handled, and disposed of so that residues in the soil do not adversely affect non-target plants and animals.
Soil Condition - Damage from Soil Deposition	Sediment deposition damages or restricts land use/management or adversely affects ecological processes.	Sediment deposition is sufficiently reduced to maintain desired land use/management and ecological processes.

WATER

Natural Resource Concern	Description of Concern	State Quality Criteria
Water Quantity - Excessive Seepage	Subsurface water oozing to the surface restricts land use and management.	Subsurface water is managed to limit periods of saturation that are unfavourable to the present or intended land use. Management complies with wetland policies.
Water Quantity - Excessive Runoff, Flooding, or Ponding	The land becomes inundated restricting land use and management.	Excess water amounts and/or rates of flow are controlled consistent with desired present or intended land use goals and wetland policies. Assessments will use a 2-year 24-hour storm event.
Water Quantity - Excessive Subsurface Water	Water saturates upper soil layers restricting land use and management.	Subsurface water is managed to limit periods of saturation compatible with the present or intended land use and wetland policies.
Water Quantity - Drifted Snow	Wind-blown snow deposits and accumulates around and over surface structures restricting ingress, egress and conveyance of humans and animals.	Snowdrifts are reduced or prevented to allow ingress, egress, and conveyance of humans and animals.
Water Quantity - Inadequate Outlets	Natural or constructed outlets too small to remove excess water in a timely manner.	Outlets are designed, installed, upgraded or maintained to adequately convey water for present or intended uses. Assessments will use a 2-year 24-hour storm event.
Water Quantity - Inefficient Water Use on Irrigated Land	Limited water supplies are not optimally utilized.	Land and water management is planned and coordinated to provide optimal use of natural and applied moisture. Irrigation systems operate at 80% of potential efficiency. Water delivery beyond the irrigator's control is not considered when evaluating quality criteria for irrigation water management.
Water Quantity - Inefficient Water Use on Non-irrigated Land	Natural moisture is not optimally utilized.	Management provides optimum use of natural moisture for the present or intended land use.
Water Quantity - Reduced Capacity of Conveyances by Sediment Deposition	Sediment deposits in ditches, canals, culverts, and other water conveyances reduce the desired flow capacity.	Conveyance structures are upgraded or maintained to adequately convey water for present or intended uses.
Water Quantity -Reduced Storage of Water Bodies by Sediment Accumulation	Sediment deposits in water bodies reduce the desired volume capacity.	Water bodies and contributing source areas are treated to allow sufficient water storage for present and intended uses.
Water Quantity - Aquifer Overdraft	Water withdrawals exceed recharge rates.	Land and water management are coordinated to conserve aquifer water levels.
Water Quantity – Insufficient Flows in Water Courses	Water flows are not consistently available in sufficient quantities to support ecological processes and land use and management.	Authorized uses and management of water are coordinated to minimize the impacts on water course flows. Water and soil moisture relationships are similar to natural conditions for the site.

Water Quality - Harmful Levels of Pesticides in Groundwater	Residues resulting from the use of pest control chemicals degrade groundwater quality.	Pesticides are applied, stored, handled, disposed of, and managed so that groundwater uses are not adversely affected. Oregon Water Quality Decision Aid: Low or Very Low Rating Pesticide Storage, Handling, and Disposal Worksheet: Rating of Low to Low-Moderate Risk
Water Quality - Excessive Nutrients and Organics in Groundwater	Pollution from natural or human induced nutrients such as N, P, S (including animal and other wastes) degrades groundwater quality.	Nutrients and organics are stored, handled, disposed of, and applied such that groundwater uses are not adversely affected. Application is in balance with plant requirements considering all nutrient sources, soil characteristics, realistic yield goals, and climatic factors. Nitrogen Index: Low or Medium Rating Fertilizer Storage and Handling Worksheet: Low to Low/Moderate Rating. Livestock Manure Storage Worksheet: Low to Low/Moderate Rating. Livestock Yard Management Worksheet: Low to Low/Moderate rating.
Water Quality - Excessive Salinity in Groundwater	Pollution from salts such as Ca, Mg, Na, K, HCO_3, CO_3, Cl, and SO_4 degrades groundwater quality.	Salts are stored, handled, disposed of, applied, and managed such that groundwater uses are not adversely affected. Water Test: Drinking water 0.7 Plants: 3.0 dS/M or crop tolerance.
Water Quality - Harmful Levels of Heavy Metals in Groundwater	Natural or human induced metal pollutants present in toxic amounts degrade groundwater quality.	Materials containing heavy metals are stored, handled, disposed of, applied, and managed such that groundwater uses are not adversely affected. If domestic sewage sludge (biosolids) is to be applied to agricultural lands a state approved biosolids and domestic septage management plan and NPDES permit for the site is required.
Water Quality - Harmful Levels of Pathogens in Groundwater	Kinds and numbers of viruses, protozoa, and bacteria are present at a level that degrades groundwater quality.	Materials that harbour pathogens are stored, handled, disposed of, applied, and managed such that groundwater uses are not adversely affected.
Water Quality - Harmful Levels of Petroleum in Groundwater	Fuel, oil, gasoline and other hydrocarbons present in toxic amounts degrade groundwater quality.	Petroleum products are used, stored, handled, disposed of, and managed such that groundwater uses are not adversely affected. Petroleum Product Storage Worksheet: Low or Low to Moderate Rating.

Water Quality - Harmful Levels of Pesticides in Surface Water	Pest control chemicals present in toxic amounts degrade surface water quality.	Pesticides are applied, stored, handled, disposed of, and managed such that surface water uses are not adversely affected. Field Sheet 4B: Rating of Good to Excellent. Pesticide Storage, Handling, and Disposal Worksheet: Rating of Low to Low-Moderate Risk
Water Quality - Excessive Nutrients and Organics in Surface Water	Pollution from natural or human induced nutrients such as N, P, S (Including animal and other wastes) degrades surface water quality.	Nutrients and organics are stored, handled, disposed of, and managed such that surface water uses are not adversely affected. Phosphorus Index: Balance for P if appropriate. Field Sheet 2B 1&2: Good to Excellent Rating Field Sheet 3B: Good to Excellent Rating Fertilizer Storage and Handling Worksheet: Low to Low/Moderate Rating. Livestock Manure Storage Worksheet: Low to Low/Moderate Rating. Livestock Yard Management Worksheet: Low to Low/Moderate rating.
Water Quality - Excessive Suspended Sediment and Turbidity in Surface Water	Pollution from mineral or organic particles degrades surface water quality.	Movement of mineral and organic particles is managed such that surface water uses are not adversely affected. Field Sheet 1A or 1B: Good to Excellent Rating.
Water Quality - Excessive Salinity in Surface Water	Pollution from salts such as Ca, Mg, Na, K, HCO_3, HCO_3, CO_3, Cl, and SO_4 degrades surface water quality.	Salts are stored, handled, disposed of, applied, and managed such that surface water uses are not adversely affected. Field Sheets 5A and $5B_1$: Ratings of Good to Excellent
Water Quality - Harmful Levels of Heavy Metals in Surface Water	Natural or human induced metal pollutants are present in toxic amounts that degrade surface water quality.	Materials containing heavy metals are stored, handled, disposed of, applied, and managed such that surface water uses are not adversely affected. If domestic sewage sludge (biosolids) is to be applied to agricultural lands a state approved biosolids and domestic septage management plan and NPDES permit for the site is required

Water Quality - Harmful Temperatures of Surface Water	Undesired thermal conditions degrade surface water quality.	Use and management of land and water are coordinated to minimize impacts on surface water temperatures. The land user's management activities do not contribute to the temperature problem.
Water Quality - Harmful Levels of Pathogens in Surface Water	Kinds and numbers of viruses, protozoa, and bacteria are present at a level that degrades surface water quality.	Materials that harbour pathogens are stored, handled, disposed of, applied, and managed such that surface water uses are not adversely affected.
Water Quality - Harmful Levels of Petroleum in Surface Water	Fuel, oil, gasoline and other hydrocarbons present in toxic amounts degrade surface water quality.	Petroleum products are used, stored, handled, and disposed of such that groundwater uses are not adversely affected.

AIR

Natural Resource Concern	Description of Concern	State Quality Criteria
Air Quality - Particulate matter less than 10 micrometers in diameter (PM 10)	Particulate matter less than 10 micrometers in diameter are suspended in the air causing potential health hazards to humans and animals.	Land use and management operations comply with PM 10 requirements of the State or Federal Implementation Plan and all applicable Federal, Tribal, State, and Local regulations.
Air Quality - Particulate matter less than 2.5 micrometers in diameter (PM 2.5)	Particulate matter less than 2.5 micrometers in diameter are suspended in the air causing potential health hazards to humans and animals.	Land use and management operations comply with PM 2.5 requirements of the State or Federal Implementation Plan and all applicable Federal, Tribal, State, and Local regulations.
Air Quality - Excessive Ozone	High concentrations of ozone (O_3) are adversely affecting human health, reducing plant yields, and leading to the creation of smog.	Land use and management operations comply with requirements of the State or Federal Implementation Plan and all applicable Federal, Tribal, State, and Local regulations.
Air Quality - Excessive Greenhouse Gas – CO_2 (carbon dioxide)	Increased CO_2 concentrations are adversely affecting ecosystem processes.	Land use and management operations comply with requirements of the State or Federal Implementation Plan and all applicable Federal, Tribal, State, and Local regulations.
Air Quality - Excessive Greenhouse Gas – N_2O (nitrous oxide)	Increased N_2O concentrations are adversely affecting ecosystem processes.	Land use and management operations comply with requirements of the State or Federal Implementation Plan and all applicable Federal, Tribal, State, and Local regulations.
Air Quality - Excessive Greenhouse Gas – CH4 (methane)	Increased CH4 concentrations are adversely affecting ecosystem processes .	Land use and management operations comply with requirements of the State or Federal Implementation Plan and all applicable Federal, Tribal, State, and Local regulations.
Air Quality - Ammonia (NH3)	Animal waste and inorganic commercial fertilizers emit ammonia that contributes to odour, is a PM2.5 precursor, and contributes to acid rain.	Land use and management operations comply with requirements of all applicable Federal, Tribal, State, and Local regulations.
Air Quality - Chemical Drift	Materials applied for pest control drift downwind and contaminate/injure non-targeted fields, crops, soils, water, animals and humans.	Land use and management operations comply with all applicable Federal, Tribal, State, and Local regulations, and applicable label directions.
Air Quality - Objectionable Odours	Land use and management operations produce offensive smells.	Odour-producing facilities and activities are planned and sited to mitigate potential nuisance impacts and meets all applicable Tribal, State, and Local regulations.
Air Quality - Reduced Visibility	Sight distance is impaired due to airborne particles causing unsafe conditions and impeded viewing of natural vistas especially in Class I viewing areas (primarily national parks and monuments).	Land use and management operations comply with all applicable Federal, Tribal, State, and Local regulations including state and local smoke and/or burn management plans.

Air Quality -Undesirable Air Movement	Wind velocities (too little or too much) reduce animal or plant productivity, impact human comfort and increase energy consumption.	Devices and practices are sited and planned to mitigate excess or deficient air movement.
Air Quality - Adverse Air Temperature	Air temperatures (too cold or too hot) reduce animal or plant productivity, impact human comfort and increase energy consumption.	Devices and practices are planned and sited to mitigate temperature extremes.

PLANTS

Natural Resource Concern	Description of Concern	State Quality Criteria
Plants not adapted or suited	Plants are not adapted and/or suited to site conditions or client objectives.	Selected plants are adapted to the soil and climatic conditions, or the site is modified to make it suitable for the desired plants. Plants are sustainable, do not negatively impact other resources, and meet client objectives. Additional criteria: Cropland: A healthy stand with vigorous growth. Rangeland: Plants are listed in applicable Ecological Site Descriptions (ESD) Pastureland: Plants have a site adaptation score greater than 3 using Pasture Condition Scoring (PCS) and are listed in applicable Forage Suitability Groups (FSG) reports. Hayland: Plants are listed in applicable Forage Suitability Groups (FSG) reports. Forestland/Agroforest: Plants are listed in Ecological Site Descriptions (ESD)
Plant – Condition – Productivity, Health and Vigour	Plants do not produce the yields, quality, and soil cover to meet client objectives.	Selected plants on or planned for the site are sufficiently productive to meet or exceed client needs. Additional criteria: Cropland: Stand produces at least 80% of site potential or client expectations. Rangeland: The plant community has a similarity index of at least 60% or an upward trend for similarity indices less than 60%. Pastureland: Stand produces at least 80% of site potential or client expectations. Hayland: Stand produces at least 80% of site potential or client expectations. Commercial Forestland: Stand density with 25% of optimum stocking on a stems/acre basis. Agroforest: Growth of plants consistent with potential cited in Conservation Tree and Shrub Groups (CTSG).
Plant Condition – Natural Plant Community Fragmentation	Natural plant communities have insufficient structure, extent, and connectivity to provide ecological functions and/or achieve management objectives.	Wildlife Habitat Evaluation Guide (WHEG) scores: Rangeland - 50%; Forestland - 50%; Wildlife land - 75%; All other land uses - 30%.

Plant Condition - Threatened or Endangered Plant Species	Plant populations and /or habitat quantity and quality have reached a level that one or more plant species are in danger of or threatened with extinction.	Threatened and endangered plant species and/or habitats they occupy are managed to avoid actions that would reduce their current population, health, or sustainability.
Plant Condition - Noxious and Invasive Plants	The site has noxious or invasive plants present.	The site is managed to control noxious and invasive plants and to minimize their spread.
Plant Condition - Forage Quality and Palatability	Plants do not have adequate nutritive value or palatability for the intended use	Forage plants are managed to produce the desired nutritive value and palatability for the intended use.
Plant Condition – Wildfire Hazard	The kinds and amounts of fuel loadings (plant biomass) pose risks to human safety, structures, and resources should wildfire occur.	Fuel loadings are reduced and/or isolated to meet client needs in minimizing the risk and incidence of wildfire.

ANIMALS

Natural Resource Concern	Description of Concern	State Quality Criteria
Fish and Wildlife - Inadequate Food	Quantity and quality of food is unavailable to meet the life history requirements of the species or guild of species of concern	Food availability meets the life history requirements of the species or guild of species of concern.
Fish and Wildlife – Inadequate Cover/Shelter	Cover/shelter for the species of concern is unavailable or inadequate. For aquatic species, this includes lack of hiding, thermal, and/or refuge cover	The ecosystem or habit types support the necessary plant species in the kinds, amounts, and physical structure; and the connectivity of fish and wildlife cover is adequate to support, over time, the species of concern.
Fish and Wildlife – Inadequate Water	The quantity and quality of water is unacceptable for the species of concern	The quantity and quality of water meets the life history requirements of the species of concern.
Fish and Wildlife – Inadequate Space	Lack of area and fragmentation of areas disrupt life history requirements of the species of concern	Adequate area and connectivity of areas meet life history requirements of the species of concern. (Examples: staging areas for rest and feeding, lekking areas for breeding, migratory movement corridors)
Fish and Wildlife - Imbalance Among and Within Populations	Populations are not in proportion to available quantities and qualities of food (plants, predator/prey), cover/shelter, water, and space and other life history requirements.	Land and water use and management are consistent with direct population management activities conducted by fish and wildlife agencies.
Fish and Wildlife - Threatened and Endangered Species	Fish and wildlife populations and/or habitat quantity and quality have reached a level that one or more species are in danger of or threatened with extinction.	Threatened and endangered fish and wildlife species and/or habitats they occupy are managed to avoid actions that would reduce their current population, health, or sustainability.
Domestic Animals – Inadequate Quantities and Quality of Feed and Forage	Total feed and forage is insufficient to meet the nutritional and production needs of the kinds and classes of livestock	Feed and forage including supplemental nutritional requirements are provided to meet production goals for the kinds and classes of livestock. Native grazers are factored into the total feed and forage balance computations.
Domestic Animals – Inadequate Shelter	Livestock are not protected sufficiently to meet the production goals for the kinds and classes of livestock	Artificial and/or natural shelter is provided to meet production goals for the kinds and classes of livestock.
Domestic Animals – Inadequate Stock Water	The quantity, quality and distribution of drinking water is insufficient to meet the production goals for the kinds and classes of livestock	Sufficient water of acceptable quality is provided and adequately distributed to meet production goals for the kinds and classes of livestock. To reduce potential for water contamination, watering facilities are constructed or modified to minimize mortality to indigenous wildlife.

Domestic Animals - Stress and Mortality	Animals exhibit illness or death from disease, parasites, insects, poisonous plants, or other factors	Land and water use and management are consistent with activities conducted to alleviate stress and mortality factors.

Appendix C

Mandatory Measures Contained in NVZ Action Program

Organic manures

1 Livestock manures and organic wastes such as sewage sludge contain different amounts and forms of nitrogen. When you apply them to the soil, the soluble nitrogen is turned into nitrate in a few weeks. The rest of the nitrogen takes longer to break down and be converted to nitrate.

2 Because of the different forms of nitrogen and the different rates at which they can be used by the crop, the risk of losing nitrate by leaching can be higher than from inorganic fertilisers. To reduce potential leaching losses from manures do not apply more than 250 kg/ha of total nitrogen in organic manure in any 12 months. You should not apply more available nitrogen than the crop needs.

The concentration of available nitrogen in slurries can be measured on the farm using portable equipment. Alternatively, a simple hydrometer can be used to measure the slurry dry matter content from which the approximate available nitrogen content can be estimated using standard figures.

3 Apply organic manures which have a lot of available nitrogen when this can be used by the crop. This type of manure includes cow slurry, pig slurry, poultry manures and liquid digested sewage sludges. To cut down the risk of nitrate leaching, application to arable land in the autumn or early winter, including forage maize fields, should be avoided whenever practicable. To comply with this advice, additional storage may be required. Guidance on the storage of slurries is given in Section 4 and on dirty water in Section 5.

4 You can apply organic manures that do not contain much nitrogen that can easily be converted to nitrate at any time as long as runoff risk is minimised. These include farmyard manure and sewage sludge cake.

5 You should not apply livestock manures and other organic wastes when the soil is:

- waterlogged;
- flooded;
- frozen hard;
- snow-covered.

You should not apply these materials to steeply sloping fields or within 10 metres of surface water, including field ditches.

6 Both solid and liquid organic manures should be spread as accurately and uniformly as practically possible. All application equipment should be suitable for the type of manure being spread and should be capable of producing a reasonably uniform spreading pattern over the appropriate range of application rates. Equipment should be adjusted according to the manufacturer's instructions and kept in good condition.

Inorganic nitrogen fertiliser

7 To keep the amount of nitrate lost from the soil as low as possible, carefully work out the amount of inorganic nitrogen fertiliser you need. Work out how much nitrogen is in the soil and how much the crop needs. Take into account the type of soil, previous cropping and use of animal manure and other organic wastes when you are working out how much nitrogen a crop can get from the soil itself. In situations of high soil nitrogen supply, such as land receiving regular applications of organic manures or recently ploughed from intensively managed grass, soil analysis for soil mineral nitrogen can provide a more precise guide to soil nitrogen supply and fertiliser requirement.

Do not apply extra fertiliser to be on the safe side. The amount of nitrogen fertiliser applied should not exceed the crop requirement as this increases the amount of nitrate lost by leaching and is a waste of money. Recommendations are given in MAFF Reference Book 209 *Fertiliser Recommendations for Agricultural and Horticultural Crops*. If you receive professional advice on fertiliser use make sure that the person giving advice is certified by FACTS (Fertiliser Advisers Training Scheme).

8 The time you apply nitrogen fertiliser is also important. Apply the fertiliser when the crop can make best use of the nitrogen. Do not apply nitrogen fertilisers to fields in grass between 15 September and 1 February and to fields not in grass between 1 September and 1 February unless there is a specific crop requirement at this time e.g. for winter brassicas. Cereals that are sown in the autumn do not have a requirement for nitrogen fertiliser to be applied in these periods. Cut down the amount of fertiliser you apply to grass from mid-season onwards. Cut down the amount of nitrogen you apply to grass if the growth will not be used fully or if the growth is limited by drought. Do not apply more fertiliser to the seedbed of crops that are sown in the spring than the amount that will be used by the crop at that time.

9 Records of the amounts and dates of applications of fertilisers, livestock wastes and other organic wastes should be kept to help you to work out how much nitrogen fertiliser is needed.

10 Spread nitrogen fertiliser accurately, at the right rate, and without applying it to uncropped areas, hedges and ditches. Keep machinery that spreads fertiliser in good condition. Adjust all fertiliser spreaders carefully, following the makers instructions, to apply the amount you want. Get the spread pattern tested regularly. You should only use fertiliser of a quality that you can spread accurately and evenly.

11 Take special care when applying any inorganic fertiliser on fields where there is a risk of runoff to surface water. You should not apply fertiliser when the soil is:

- waterlogged;
- flooded;
- frozen hard;
- snow-covered.

You should not apply inorganic fertilisers to steeply sloping fields.

12 Avoid applying fertiliser to a watercourse. Full width distributors such as pneumatics will not generally cause any problems if you use them carefully. Spinning disc and oscillating spout machines are more difficult to operate so that the full application rate is spread right up to the edge of the field. Attempting to achieve this can cause some fertiliser to go into a watercourse. You can adjust some newer machines by fitting headland discs or tilting the tractor linkage to avoid this happening. Otherwise the machine should be driven further away from the watercourse, leaving an area next to the water where the application rate is lower. Use liquid fertiliser applicators in a way that avoids the wind blowing droplets into watercourses.

Crop cover

13 If the soil is bare and at field capacity, there is a risk of losing nitrate. If you grow a crop in the autumn and early winter it will reduce the amount of nitrate in the soil, and so reduce the amount that could be lost by leaching.

14 Sowing crops in the autumn so they are growing by early September will reduce the amount of nitrate lost by leaching. Sow crops as early as possible. Sowing crops after mid- October will have little effect in reducing the amount of nitrate lost through leaching in the winter.

When the decision on which crop to grow is evenly balanced, preference should be given to crops sown in the early autumn as these are more effective at taking up residual nitrate than crops sown in the late autumn or spring.

If possible, cover or catch crops should be sown in fields that would otherwise be bare over the autumn and winter. To be effective cover crops need to be established in early autumn. Winter green cover is particularly important on one-year set-aside fields.

Field capacity

Field capacity is when the soil is fully wetted and more rain would cause water loss by drainage.

Frozen hard

This term is used when the soil is frozen for more than 12 hours. Days when soil is frozen overnight but thaws out during the day do not count.

Crop residues

15 Crop residues that do not contain much nitrogen, such as cereal straw, will help reduce the amount of nitrate leached if you mix them into the soil in autumn, especially if you also sow a crop.

Crop residues that contain a lot of nitrogen such as those from most non-cereal and vegetable crops, can release nitrogen quickly. It is best to avoid mixing these residues into the soil until just before you sow the next crop.

Autumn cultivations

16 To delay the build up of nitrate in the soil in the autumn, put off cultivating the land for as long as possible without delaying when the next crop is sown.

Cultivation after the early harvest of a crop, such as vining peas or oilseed rape, which leave a residue that contains a lot of nitrogen, can often be put off without affecting when the following winter cereal is sown.

You can often leave residues of crops that are grown on sandy soil and harvested late, such as sugar beet, undisturbed until just before you sow the following spring's crop.

Managing grassland

17 The risk of losing nitrate from grassland that is intensively grazed is high, especially if grazed with cattle throughout the autumn. If the intensity of grazing is reduced, particularly in the autumn, the amount of nitrate lost will be cut down.

Where possible, grazing cattle should not have direct access to watercourses.

Ploughing up grass

18. A lot of nitrate is released if permanent grassland is ploughed up and changed to arable. Nitrate will be lost by leaching for several years. This practice should be avoided if possible.

The amount of nitrate released can be reduced by minimising soil disturbance. If permanent grassland needs reseeding, aim to do it with as little cultivation as possible and try to ensure that grass covers the field by early October.

19 If grass leys are grown in rotation with arable crops, it is best to sow the first crop as soon as possible after the grass has been ploughed up. Following winter cereal crops should be drilled as early as possible. When you are reseeding leys, aim to do it with as little cultivation as possible and try to get the crop to cover the land by early October.

Irrigation

20 Good irrigation practice will generally reduce the amount of nitrate lost by leaching by making sure that the crop makes good use of the fertiliser you apply. If you apply too much water, or you apply it unevenly, the amount of nitrate lost could be high. Use a reliable scheduling system to help avoid this. The system should not need the soil to be returned to field capacity during the growing season.

(Ministry Of Agriculture, Fisheries And Food, 1998)

Appendix D

Excerpt from a document by the **European Environmental Agency entitled "Integration of environment into EU agriculture policy - the IRENA indicator-based assessment report"**[16]

Agri-environment schemes, for example, build on GFPs by requiring farmers to undertake farming practices that go beyond the baseline requirements defined by GFPs at the national or regional level.

Good Farming Practices

IRENA No. 2 aimed to understand the extent to which codes of good farming practice cover the most important "driving forces" of environmental concerns. The key messages from this indicator are as follows (see also Table 5.1):

- Member States have chosen a variety of approaches to defining codes of good farming practice (GFP) ranging from a fairly limited selection of requirements to a broad coverage of categories of agricultural practices. In most Member States, mandatory standards of GFP consist of existing EU, national and/or regional legal obligations. Only a few countries define standards at farm level going beyond legislation, or covering issues such as biodiversity and landscape.
- The codes of Greece, Portugal and the United Kingdom are the most comprehensive with a high coverage of agricultural practices considered as having particular relevance for the environment. France, Luxembourg, the Netherlands, Sweden and Finland have the most targeted codes for certain agri-environmental issues covering less than half of the total number of agricultural practices.
- Most Member States have defined standards in the field of fertilisation and pesticide management. However, there is a clear emphasis on these aspects in Austria, Denmark, Germany, Italy, the Netherlands and Luxembourg. All the countries include requirements for plant protection while these are particularly detailed and strict in Germany and Ireland.
- Many standards for soil management have been included in the codes of Portugal and Greece. Good farming practices in relation to irrigation methods and equipment are addressed in the codes of all Mediterranean countries. The United Kingdom and Ireland

[16] EEA (2005) "Integration of environment into EU agriculture policy - the IRENA indicator-based assessment report". Luxembourg: Office for Official Publications of the European Communities, 2005, 64 p. - http://reports.en.eea.europa.eu/eea_report_2006_2/en/index_html_local

place high emphasis on practices relative to pasture management, field boundaries, biodiversity conservation and landscape elements. Limits on stocking density to avoid overgrazing and undergrazing are also set out in Spain, Portugal, Greece and France. Moreover, some recommendations for maintaining uncultivated strips in field boundaries and hedgerows are provided in Portugal, Greece and Luxembourg.

- Greece and Portugal have followed an advisory approach in drafting their codes, with half of the good farming practices not being legally binding. On the other hand, the codes of some of the Member States where the whole territory is designated as zones vulnerable to nitrate pollution (Austria, Denmark, Finland, Germany, Luxembourg and the Netherlands) mainly consist of legally binding standards. In Sweden and the Flanders region of Belgium, existing legislation has also been chosen as the basis for GFP. Italy (region Emilia-Romagna), Spain, France, Ireland and Germany have chosen a mixed regulatory/advisory approach and their codes also include standards going beyond legislation (in the form of recommendations or verifiable standards).

Table 5.1 Assessment of environmental issues covered by national codes of GFP

Farming practices	BE-Fl	BE-Wa	DK	DE	GR	ES	FR	IE	IT-ER	LU	NL	AT	PT	FI	SE	UK
Soil management	▫	■	▫	▫	■	▫	—	▫	▫	—	—	▫	■	▫		▫
Water use: Irrigation	—	—	—	—	■	■	■	—	—	—	—	—	■	—	—	—
Fertiliser management	■	■	■	■	▫	▫	■	■	■	■	■	■	■	■	■	■
Pesticide management	■	■	■	■	▫	■	▫	▫	■	■	■	■	▫	■	■	■
Waste management	—	▫	▫	—	▫	▫	▫	▫	▫	▫	▫	—	▫	▫	—	▫
Pasture management	—	▫	—	—	▫	▫	■	■	—	■	—	—	▫	—	—	■
Biodiversity and landscape	▫	▫	▫	—	■	▫	▫	■	—	▫	—	▫	▫	▫	▫	■

■ Priority issue — Issue not covered ▫ Issue addressed

Note: In Sweden, the mandatory requirements aiming at biodiversity and landscape conservation are eligibility criteria exclusively for the specific agri-environment measures aiming at the conservation of biodiversity and cultural heritage. Austria, Sweden and Germany have national legislation on waste, not included in the codes of GFP.

Source: Based on assessment of national/regional codes of good farming practice included in rural development programmes (period 2000–2006).