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AGRI-ENVIRONMENTAL POLICY MEASURES: OVERVIEW OF DEVELOPMENTS

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FOREWORD

This is the FINAL declassified version of the document, which provides an overview of developments of agri-environmental policy measures in OECD member countries. It was submitted to the JWP for declassification under the written procedure [COM/AGR/CA/ENV/EPOC(2002)95/REV2]. Minor factual changes were made to the text reflecting comments from some member countries.

TABLE OF CONTENTS

AGRI-ENVIRONMENTAL POLICY MEASURES: OVERVIEW OF DEVELOPMENTS	5
Executive summary	5
Introduction	7
1. Background	7
2. Agri-environmental policy measures	9
Economic instruments	10
2.1 Payments	10
2.2 Environmental taxes/charges	16
2.3 Tradable rights	16
Command-and-control measures	17
2.4 Regulatory requirements	17
2.5 Cross-compliance mechanisms	20
Advisory and institutional measures	22
2.6 Research and development	22
2.7 Technical assistance/extension	23
2.8 Labelling /standards/certification.....	24
2.9 Community-based measures	24
3. Recent developments.....	26
BIBLIOGRAPHY	29

Tables

Table 1. Use of cross-compliance requirements in OECD countries.....	21
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Figures

Figure 1. Public expenditure on agri-environmental payments: 1993 to 2001	11
Figure 2. Share of public agri-environmental research expenditure in total public agricultural research expenditure, 1985 to mid-late 1990s	22

Boxes

Box 1. Agri-environmental payments in the European Union	12
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AGRI-ENVIRONMENTAL POLICY MEASURES: OVERVIEW OF DEVELOPMENTS

Executive summary

Agricultural production affects water, air and soil quality, influences eco-systems and biodiversity, and shapes rural landscapes. Many of these environmental effects exhibit the characteristics of negative or positive externalities or public goods, for which private markets do not exist or are poorly functioning. The net effect for society can therefore be too much environmental degradation, and inadequate provision of environmental services.

Technological and economic developments, the closer integration of agriculture into the agri-food sector, and agricultural support measures have raised productivity and output across OECD countries, but with some negative environmental consequences. Increasing public awareness, together with the availability of more information, has led to a heightened demand to improve the environmental performance of agriculture. In response, agri-environmental policy measures have assumed a more prominent role in agricultural policy in OECD countries in the past two decades.

- A number of countries, including the **European Union, Norway, Switzerland** and the **United States**, have substantially increased the use of direct *payments* to farmers to improve environmental outcomes. These include payments to support the adoption of less-intensive farming practices; resource retirement payments; and transitional payments to assist farmers in implementing structural changes for environmental purposes.
- There appears to be only limited application of *taxes and charges* in agriculture to encourage farmers to take account of the environmental costs of agricultural activities in their production decisions, notwithstanding the endorsement of the *polluter-pays-principle* (PPP) by OECD countries. This contrasts with the more common use of environmental taxes and charges in other industries.
- Similarly, *tradable rights* do not appear to play a significant role in agri-environmental policy, though they are applied to some extent in the **Netherlands**, and on a state/regional basis in the **United States** and **Australia**.
- All OECD countries impose *regulatory requirements* to address the negative effects of agricultural activities on the environment, ranging from outright prohibitions, to input standards and resource-use requirements. Over time, these requirements have generally broadened in scope and become more stringent. An increasing number of regulatory requirements also derive from state, provincial, regional or local measures under the framework of over-arching national legislation, in order to accommodate the local nature of many environmental concerns.
- *Cross-compliance* measures, tying minimum environmental standards to agricultural support programmes, are well established in the **United Kingdom, the United States** and **Norway**, and have been implemented more recently in **Korea, Switzerland**, and some other **European Union**

member states. Beyond 2005 cross compliance measures will be used in all European Union member states.

- Many OECD countries have directed greater attention towards improving the *knowledge-base* relating to environmental issues in agriculture in the past fifteen years, through increased spending on agri-environmental *research*, often undertaken in co-operation with private sector interests. One notable trend in this area has been the development of agri-environmental indicators in a number of OECD countries.
- Greater emphasis has also generally been placed on communicating information to farmers on environmental issues via *technical assistance* and *extension*, in order to induce voluntary changes in farming practices to improve environmental outcomes. Such measures feature an increasingly comprehensive array of information, and now employ a wide range of communication tools such as the internet.
- More attention has also been directed at providing *consumer information* on the environmental attributes of products, in order to meet the demands of an increasingly well-informed and discriminating public. In particular, a range of ‘eco-labelling’ standards and certification processes have been employed in OECD countries in the past decade, particularly for organic agriculture.
- A number of countries, including **Australia, Canada and New Zealand**, have placed emphasis on the use of *community-based approaches* to address environmental issues, through supporting collective action to solve environmental problems. These approaches tend to appeal to farmers’ self interest in environmental conservation and make use of local expertise in solving environmental problems.

There is little doubt that agri-environmental policy in many OECD countries will continue to increase in importance in the future, in response to both *domestic* and *international* pressures. This highlights the importance of evaluating policies and the benefits they pledge to deliver relative to their costs. Despite wide ranging and increasing experience with the use of agri-environmental measures, evidence concerning their performance and impacts is often quite limited. However, a number of OECD countries are now turning greater attention to evaluating the effectiveness and efficiency of these measures.

Overall, there is mixed evidence regarding whether the compatibility between agricultural, agri-environmental and environmental policies (*policy coherence*) has improved in the past two decades in relation to environmental issues in agriculture. Some OECD countries have taken steps to streamline agri-environmental policies measures within over-arching *frameworks or action plans* addressing environmental or rural development objectives. In the broader context, however, where agri-environmental policies offset the damaging environmental effects of input and production-linked policies, the costs of improving the environment are higher than they would be in the absence of such support measures.

Introduction

The objective of this paper is to highlight developments in the use of agri-environmental policy measures in OECD countries, including both similarities and differences in the approaches adopted. The paper does not attempt a comprehensive evaluation of the measures outlined in terms of their environmental effectiveness or economic efficiency. However, the information contained in the paper will be drawn upon as part of ongoing OECD work on policy evaluation.

The paper is divided into three main parts. The first part outlines background information on environmental issues associated with agriculture, including the effects of agricultural policies on the environment. The second part provides an overview of developments in the application of policy measures to address environmental issues in agriculture in OECD countries, highlighting the differences and similarities in the approaches adopted. Policy measures are classified and examined in terms of the *type* of policy measure used, drawing on the *OECD Inventory of Policy Measures Addressing Environmental Issues in Agriculture*, and other available sources. The final part of the paper highlights some emerging issues relevant to the application of agri-environmental policy measures.

1. Background

Agriculture is a major user of natural resources, accounting for around 40% of total OECD land use and 45% of water use (OECD, 2001a). In many OECD countries, farmland dominates, and to a large extent shapes, the landscape. In short, agriculture and the ecosystems of which it forms a part, control or interact with various stocks of natural capital – stocks that are of value not only to the sector but also to society as a whole.

Agricultural activities can generate a range of environmental benefits. These include aesthetic value, recreation, water accumulation and supply, nutrient recycling and fixation, soil formation, wildlife protection and flood control, and carbon sequestration by trees and soil. However, major changes in farming practices in the past forty years have brought new pressures to bear on natural resources. To meet increasing food demands the sector has been evolving in general through an industrialisation process characterised by farming practices using more agricultural chemicals, machinery inputs and knowledge. Technological and economic developments have given rise to a marked increase in productivity (more output per unit of land or labour). Moreover, for many decades agricultural policies in many OECD countries have encouraged the expansion of commodity production. These developments have contributed to a wide range of environmental concerns.

Farming is currently a significant source of *water pollution*. The application of fertilisers in agriculture and animal effluent from livestock account for as much as 40% of nitrogen and 30% of phosphate emissions in surface water in some OECD countries, contributing significantly to problems of eutrophication – the depletion of oxygen in water (OECD, 2001a).¹ Pesticide run-off from agricultural land also impairs drinking water quality and harms water-based wildlife. These water pollution problems are very much related to the intensity of agriculture, and are a high priority in **European countries** and in some regions of the **United States**, and also a serious issue at a local level in other countries such as **Australia, Canada and New Zealand**.

Similarly, problems of *air pollution* caused by ammonia (acid rain); methyl bromide (ozone); pesticide drift; crop burning and odours also tend to be pronounced in areas of intensive agricultural production. For example, in several **European** countries it is estimated that agriculture accounts for about 95% of ammonia emissions, leading to significant acidification effects on natural resources, buildings and habitats (Baldock *et al.*, 2002).

Agriculture has also contributed to *soil erosion* through practices that expose soil to the elements by way of land-use conversion, tilling or overgrazing. Soil erosion caused by both wind and water is a major concern in the **United States** and in the **Canadian** wheat belt. Water-related erosion problems are also a major concern in **Australia, Japan** and **New Zealand**, and in some **Mediterranean** countries.

Irrigation accounts for a major share of water use in most OECD countries and *excessive groundwater extraction levels* are a concern in many areas, particularly in the drier regions of the **Australia, Southern Europe** and the **United States**. Problems of *salinisation* associated with land-clearing and irrigation also continue to accumulate in several countries, including **Australia**.

In many OECD countries agriculture has also been identified as a significant contributing factor to the *loss of biodiversity*, in particular due to habitat degeneration and land use changes caused by changes in farming practices. In **Europe**, many of the most valued areas for wildlife tend to be *semi-natural* habitats, where species have co-evolved with traditional agricultural practices over many centuries. Such habitats have come under increasing pressure from changes in farming practices – including increased field size, reduced crop rotations and increased fertiliser and pesticide use. In the **European Union**, for example, it is estimated that more than a third of bird species are in decline (Baldock *et al.*, 2002). By contrast, in countries such as **Australia, New Zealand** and **North America**, valued habitats are predominantly associated with *natural* areas including grasslands, wetlands, native forests and bush; areas which have in some cases been placed at risk by the development of agriculture – for example, in the **United States**, the conversion of grasslands and wetlands to cropland has been attributed with contributing to the decline of a number of rare species.

Competitive pressures and the adoption of more intensive farming practices have led to concerns in some OECD countries relating to the *preservation of landscapes* associated with traditional agricultural practices, particularly in **European** countries and **Japan**, where such landscapes are often viewed as culturally significant. In other OECD countries, such as the **Australia, New Zealand** and **North America**, the preservation of rural landscapes are generally not considered a priority, although there are concerns relating to the loss of rural land to urban development in certain areas, for example in some regions of the **United States**.

Looming large over these issues is *climate change*. Gaseous emissions from agriculture – in particular methane and nitrous oxide – are a significant contributing factor to global warming, and it is estimated that agriculture currently accounts for around 8% of total OECD greenhouse gas emissions, though certain agricultural activities have the potential to have a significant mitigating effect on the process of global warming, particularly the sequestration of atmospheric carbon in the soil and the production of energy crops (OECD, 2001a).

As already noted, the environmental problems caused by agriculture have often been exacerbated by *agricultural support policies*. The predominant forms of agricultural assistance in OECD countries in the past forty years have been closely linked to outputs and the use of inputs. These policies have in many cases provided incentives to producers to increase the intensity of production and to expand farming onto environmentally sensitive land, thereby contributing to a number of environmental problems, such as the pollution of water, soil and air, and the over-use of scarce resources – particularly water (OECD, 2001c). It has been argued by some members, that such policies have also helped to maintain certain agricultural production activities that a number of OECD countries associate with environmental benefits.

By the early 1990s a number of OECD countries had begun reforming their agricultural policies with the long term aim of moving to policies less linked to production, in order to reduce production and trade distortions. These reforms have in some cases reduced pressures on the environment – e.g. through lowering the demand for chemical and mechanical inputs and reducing grazing pressures and manure

surpluses. Pressures on the environment have been further reduced in some cases where reforms have been accompanied by restrictions on outputs (e.g. quotas and supply management schemes).²

Overall however, progress in agricultural policy reform across the OECD has only been modest. For the OECD as a whole, support to farmers as a share of total farm receipts, as measured by the Producer Support Estimate (PSE), was estimated at 31% in 2002, compared with an average of 38% over 1986-88 (OECD, 2003a). Support also remains very high for several key commodities – such as milk, sugar and rice – and the subsidisation of some inputs remains significant. For example, the prices farmers are charged for water remains substantially below that paid by industrial and household users in some OECD countries, even when differences in water quality and the costs of distribution systems between agriculture and other users are considered.

The most significant progress in reducing agriculture's adverse effects on the environment in the past two decades has generally occurred where environmental pressures have been greatest. For example, there has been a decrease of over 10% in both nitrogen and pesticide use in many **European** countries and **Japan**, and associated improvements in water quality and lowering of greenhouse gas emissions, since the mid-1980s. Soil erosion rates have also declined in **Australia**, **Canada**, and the **United States**, and progress has been made in adopting farming practices that enhance environmental performance, such as the shift to using nitrogen management plans, integrated pest management and conservation soil tillage (OECD, 2001b).

However, the environmental performance of agriculture has also deteriorated in some cases, with the expansion of farm production on smaller areas of land and the regional concentration of activities such as livestock farming. This in turn has resulted in higher levels of nutrient surpluses, ammonia and greenhouse gas emissions, with consequent increases in water and air pollution in regions of a number of countries, including **Canada**, **Europe**, **New Zealand** and the **United States**. There is also growing competition for scarce water resources both between agriculture and other users and also for meeting the water needs of aquatic ecosystems for recreational and environmental purposes, particularly in the drier regions of **Australia**, the **United States** and **Southern Europe** (OECD, 2001b).

2. Agri-environmental policy measures

Increasing public awareness, together with the availability of more research and information, has heightened the demand to improve the environmental performance of agriculture in OECD countries over the past two decades. In response, since the mid-1980s, a large number of policy measures have been introduced addressing environmental issues in agriculture. Some of these policy measures have been specific only to the agricultural sector, while others have been part of broader national environmental programmes affecting many sectors including agriculture. In this paper all such policy measures are broadly categorised as *agri-environmental policy measures*. Other policies that may affect environmental outcomes but are introduced primarily for other reasons – such as supply control measures – are beyond the scope of this paper.

The sections below outline some of the major developments in agri-environmental policy measures across OECD countries, highlighting the differences and similarities in the approaches adopted. In compiling this information extensive use was made of the *OECD Inventory of Policy Measures Addressing Environmental Issues in Agriculture* (hereafter the Inventory). The Inventory was established to collect information and data on agri-environmental policy measures in OECD countries, and classifies this information, *inter alia*, according to the *type* of policy measure used. The sections below use this classification system.

It is important to note that some agri-environmental programmes have a number of component parts to them, which may include a range of inducements, regulations and supporting measures. Programmes of this sort may therefore traverse a number of the categories used. Further, the Inventory is not yet comprehensive, and significant information gaps exist. Data in the Inventory currently exists for **Belgium; Canada; Denmark; the European Union; Japan, New Zealand; Switzerland, the United Kingdom (England)** and the **United States**. For some other countries (Australia, Austria, Finland, Germany, Ireland, Mexico, the Netherlands, Norway, Portugal, Sweden) the data for the Inventory are in the process of preparation and checking with the member countries concerned.

It should also be noted that a number of OECD countries do not appear to feature prominently in the use of agri-environmental policy measures. For example, in some countries, such as **Mexico** and **Turkey**, the relatively high share of agriculture in the economy and employment, and relatively low GDP, may impede the use of those agri-environmental policy measures that incur high budgetary costs.

Economic instruments

Economic instruments affect costs and benefits of alternative actions open to farmers, with the intended effect of influencing behaviour in a way that improves environmental outcomes. These instruments typically involve either a monetary transfer – i.e. *payments* (section 2.1) and *charges/taxes* (section 2.2.); or the creation of new markets – i.e. *tradable* rights or permits for the purpose of environmental protection (section 2.3).

2.1 Payments

Many OECD countries offer monetary payments (including implicit transfers such as tax and interest concessions) to farmers and other landholders to address environmental problems and/or to promote the provision of environmental amenities. In practice, many agri-environmental payments tend to be linked to land or other factors of production, while payments directly tied to environmental outputs – such as ‘improved landscape’ or ‘more diversity’ – are rare.

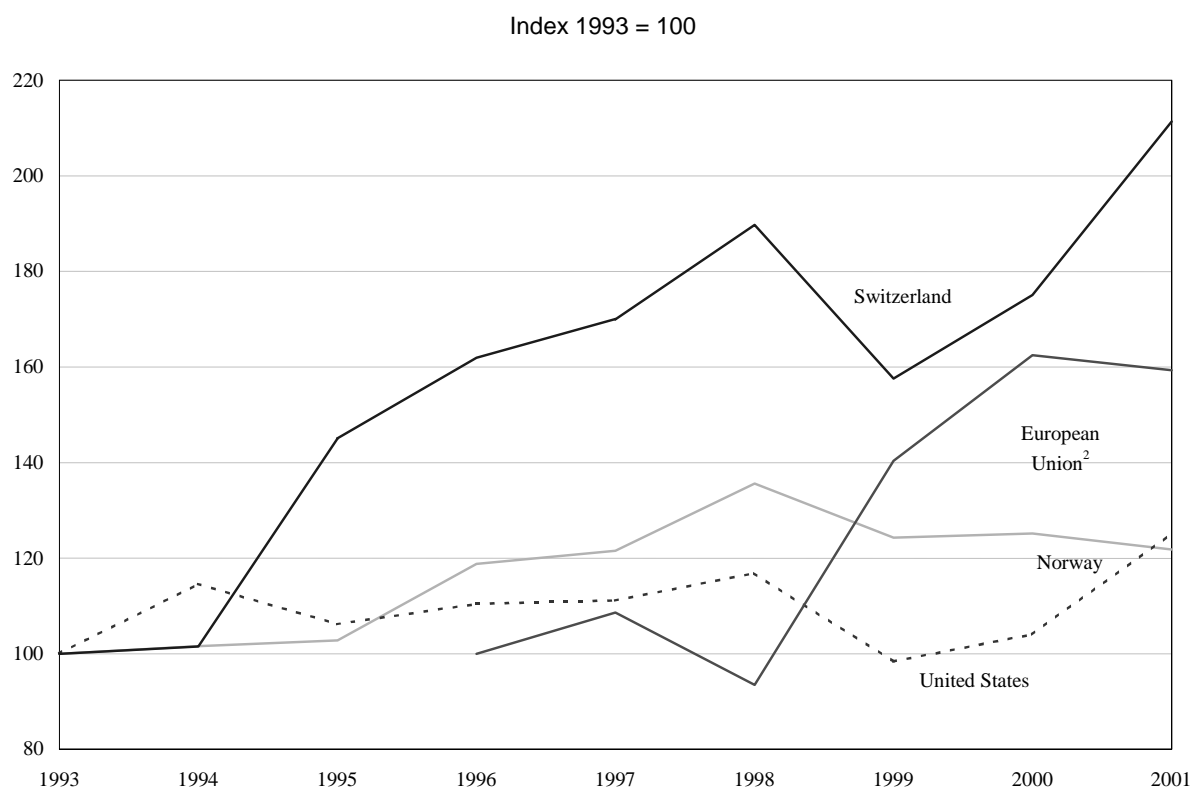
The **European Union, Switzerland, Norway** and the **United States**, in particular, have substantially increased the use of agri-environmental payments. The use of these measures originated in the mid-1980s with a significant expansion taking place through the 1990s (Figure 1). It should be stressed, however, that agri-environmental payments still only represent a modest proportion of agricultural support across the OECD as a whole – increasing from 1% to around 3% of the total OECD producer support estimate (PSE) from the mid-1980s to 2002 (OECD 2003a).

In the **United States**, the first step was the emergence of erosion control and water quality as independent objectives of agricultural policies with the introduction of a range of conservation payments under the *1985 Food Security Act*. This was followed by the *1990 Farm Act*, which expanded agri-environmental objectives with a greater emphasis on water quality, air quality and wildlife habitat objectives. More recently, the *2002 Farm Security and Rural Investment (FSRI) Act* featured a major boost in funding for agri-environmental purposes, and a range of new programmes.

The **European Union** first introduced wildlife and landscape conservation payments under the *Environmentally Sensitive Areas (ESA)* scheme in 1986. Later, in 1992, the reform of the *Common Agriculture Policy (CAP)* required EU member states to implement agri-environmental payment programmes. This policy was later reorganised with other rural development policies as part of the new ‘*Second Pillar*’ of the *CAP* under the *Agenda 2000* reforms. The European Commission’s proposals for further *CAP* reforms beyond 2006 also include further enhancements of the ‘*Second Pillar*’. **Norway** introduced a number of resource protection and landscape payments in the late 1980s and early 1990s. In

Switzerland, the *Federal Agricultural Law* was first reformed in 1992 to target subsidies towards ecological practices, and then amended in 1996, following a national referendum, to offer a wide range of payments tailored to different environmental standards. A number of other OECD countries, including **Australia, Canada, Japan** and **Korea**, have also implemented agri-environmental payment programmes to varying degrees over the past decade.

Figure 1. Public expenditure on agri-environmental payments: 1993 to 2001



Notes:

1. Figures for 2001 for Switzerland, European Union and United States are estimates.

2. 1996 = 100. EU funding (not including EU member state funding) of Agri-environmental payments under Regulations 2078/92 and 1257/99

Sources: OECD Secretariat; European Commission; USDA; Norwegian Ministry of Agriculture; Swiss Federal Office for Agriculture.

The main types of agri-environmental payment programmes, classified according to the categories used in the Inventory, are outlined in sections 2.1.1 – 2.1.3 below.

2.1.1 *Payments based on farming practices*

Payments based on farming practices are policy measures granting annual monetary transfers (including implicit transfers such as tax and credit concessions) to farmers to encourage them to implement more environmentally friendly farming practices.

Box 1. Agri-environmental payments in the European Union

In 1992, EU member states were required to implement agri-environmental payment programmes under the *Agri-environmental Regulation (No. 2078/92)*. In 2000 this policy was integrated with other rural development measures under the *Rural Development Regulation (No. 1257/99)*. These regulations have provided the over-riding framework within which the European Union's agri-environmental payment programmes have been shaped within each member state. Although implementation of programmes is obligatory at the member state level, farmers may choose whether to continue their normal farming practices or to join – usually by contract – particular programmes.

The programmes supported fall into several broad categories:

- ways of using agricultural land which are compatible with the protection and improvement of the environment, the landscape and its features, natural resources, the soil and genetic diversity;
- environmentally favourable extensification of farming and management of low-intensity pasture systems;
- conservation of high nature-value farmed environments which are under threat;
- the upkeep of the landscape and historical features on agricultural land; and
- the use of environmental planning in farming practice.

Programmes are required to achieve environmental benefits that go beyond those obtained through the application of 'good farming practices' (which are defined as levels of environmental quality that should be achieved at the farmer's own expense). Often farmers may select particular activities from a complementary 'menu' of programmes. The payment rates are calculated based on the costs incurred or income foregone by farmers as a consequence of entering into these activities, sometimes with the addition of an incentive element. Payments are made to farmers in relation to the environmental obligations taken on, with support based on the area of the holding to which agri-environmental commitments apply. In general, the programmes are for a minimum duration of 5 years, except for long-term set-aside, which is for a period of at least 20 years. The Community co-funds up to 75% of the cost of programmes in Objective 1 areas (defined as less-developed regions), and up to 50% in other regions.

In response to the *Agri-environment Regulation (No. 2078/92)* and the *Rural Development Regulation (No. 1257/99)*, EU member states have adopted a wide range of agri-environmental programmes (see sections 2.1.1 – 2.1.3). These programmes are often established at different administrative levels (national, sub-national, and regional). By the late 1990s, coverage had reached around 20% of the EU's total farmland, with coverage in excess of 70% in some member states and regions – notably Austria and Finland, as well as some German Länder – and under 5% in Belgium, Denmark, Greece, the Netherlands and Spain. (Baldock *et al.*, 2002).

Total EU and national annual expenditure under this policy is projected to increase by 68%, from an average of EUR 2.2 billion per annum in the 1994-99 period, to EUR 3.7 billion per annum over the 2000-06 period (OECD, 2002a). However, it should be stressed that this still represents only a modest proportion of the total CAP budget, which is fixed for the 2000-2006 period at around EUR 40.5 billion per annum (CAP Monitor, 2002).

Detailed rules for monitoring of the application of the *Rural Development Regulation (No. 1257/99)* are outlined under the *Common Indicators for Monitoring Rural Development Programming Regulation (No. 445/02)*, which specifies that monitoring is to be carried out by reference to pre-agreed specific physical and financial indicators. Member states are required to submit *ex ante*, *mid-term* and *ex post* evaluations for measures implemented under the Regulation for the period 2000-2006, based on European Commission guidelines.

The European Union co-finances with EU member states a wide range of agri-environmental payment programmes based on farming practices under a policy first established in 1992 under the Agri-environment Regulation (No. 2078/92), and later encompassed under the Rural Development Regulation (No. 1257/99) (Box 1). Prominent among these measures are payments to support the adoption of less input-intensive farming practices. For example, by the mid-1990s most EU member states had introduced a variety of national or regional programmes to support organic agricultural production. These schemes generally provide area-based support to farmers for at least 5 years to encourage the conversion from

conventional to organic farming. Most member states, with a few exceptions (France and the United Kingdom), also offer ongoing support for the maintenance of organic farming beyond the initial conversion period. Many EU member states – including Austria, Belgium, Denmark, Finland, France, Germany, Greece, the Netherlands and Spain – have also implemented a variety of other payment programmes to encourage less input-intensive and/or more environmentally friendly farming practices. These include, for example, programmes to promote the extensification of crop production and livestock farming and the adoption of integrated crop production.

Most EU member states also offer agri-environmental payments based on farm practices under the *Rural Development Regulation (No. 1257/99)* targeting biodiversity and landscape objectives. For example in the **United Kingdom**, under the *Environmentally Sensitive Areas Scheme (ESA)*, incentive payments per hectare are offered under 10 year contracts to farmers who adopt agricultural practices to safeguard and enhance in areas of particularly high landscape, wildlife or historic value – there are now 22 ESAs in England, covering some 10% of agricultural land. A variety of payment programmes also exist under the *Rural Development Regulation (No. 1257/99)* in **Finland, France, Germany, Greece, Ireland, the Netherlands, Portugal, Sweden and Spain** to encourage farm practices to preserve specified cultivated areas, rare animal breeds or other flora and fauna.

Payments based on farming practices have also been implemented in a number of other OECD countries. For example, Switzerland's Federal Agricultural Law, most recently amended in 1996, now offers a range of payments based on different standards of agricultural practices: tier one is for specific biotypes, such as extensive grasslands high stem fruit trees, and hedges; tier two supports integrated production with reduced inputs; while tier three is support for organic farming. Norway introduced payments to support organic farming in 1989, and currently offers an organic conversion payment, which is paid per hectare, together with on-going area and headage payments for organic farmers. In 1990 payments were also introduced to support summer dairy farming in order to contribute to the maintenance of the cultural landscape through animal grazing, and a headage payment was introduced in 1998 to stimulate the use and management of outlying fields to maintain biological diversity. In 1999, Korea introduced direct payments to farmers restricting the use of fertilisers and pesticides in drinking water conservation areas. The programme was revised in 2002 to expand the application of incentive payments to the whole country. The eligible areas were classified into four environmental quality categories based on the amount of chemicals used (organic, organic-conversion, pesticide-free and low pesticide).

In the **United States** the *Environmental Quality Incentives Program (EQIP)* was established by the *1996 Farm Act* to provide financial and technical assistance to farmers to promote the adoption of environmentally sensitive practices in environmentally sensitive areas. *EQIP* provides assistance of up to 75% of the costs of certain conservation practices, such as nutrient management, manure management, integrated pest management, irrigation water management, and wildlife habitat management. Farmer contracts are for 5 to 10 years (see also sections 2.1.3 and 2.7). Over USD 200 million is spent under *EQIP* annually, and this is budgeted to increase to around USD 1.2-1.5 billion annually under the *2002 FSRI Act*. Under the *FSRI Act*, total payments are limited to USD 450 000 per farm over the five years period. In addition, the *Conservation Security Programme (CSP)*, which was recently announced as part of the *2002 FSRI Act*, is to provide several tiers of payments to farmers based on different levels of conservation practices, and is expected to go considerably beyond established programmes such as *EQIP* – it is estimated that around USD 2 billion will be spent on this program over the next ten years (CBO, 2002).

2.1.2 *Payments based on resource retirement*

Programmes under this category provide incentive payments to remove land or other factors of production from production for environmental purposes. Such programmes have dominated agricultural

conservation expenditures in the **United States** since the mid-1980s. The major land retirement programme is the *Conservation Reserve Program (CRP)*, which was introduced under the *1985 Food Security Act*. The *CRP* provides farmers an annual rental payment to farmers who enrol in 10-15 year contracts to retire land from production. The main purpose of the *CRP* was initially to combat soil erosion, but, as the programme evolved, other objectives were added, including habitat and water quality improvements, carbon sequestration and air quality improvements. Since 1996, *CRP* rental payments have averaged more than USD1.5 billion a year, or around 96% of the total spent on land retirement by the USDA (ERS, 2001). As part of the *2002 FSRI Act*, the maximum acreage eligible for *CRP* payments was increased from 14.7 million hectares to 15.8 million hectares.

In 1993, **Switzerland** introduced land retirement payments under its *Green Fallow* and *Floral Fallow* programmes, in order to promote biodiversity and habitat protection. Agri-environmental land retirement payments are also common in the **European Union**. Most EU member states have implemented various land retirements programmes for various environmental purposes – particularly to protect water supplies and biotope reserves – under the *Agri-environment Regulation (No. 2078/92)* and the *Rural Development Regulation (No. 1257/99)*. For example, as part of the *PDRN programme (2000-2006)*, **France** offers a range of land retirement payments targeting a variety of environmental objectives, including the conversion of arable land to grassland, and the introduction of grassland buffer strips around watercourses. As part of **Denmark's** *Action Plan for the Aquatic Environment (1998-2003)*, farmers are offered compensatory payments to take former wetlands out of agricultural production and re-establish them.

In 1992, the **European Union** also introduced a forestry scheme (*Council Regulation No. 2080/92*), later encompassed under the *Rural Development Regulation (No. 1257/1999)*, granting support for planting costs for the afforestation of agricultural land. Its objectives are to improve forest resources, reduce the shortage of wood in the EU, encourage forms of countryside management more compatible with the environment, and combat the greenhouse effect. Co-financed by the EU, payments may also cover forestry management costs over a period not exceeding 5 years; and income compensation up to a period of 20 years. Between 1993 and 1997, the total Community contribution to afforestation measures under this scheme was ECU 1.27 billion, and over 500,000 hectares of agricultural land had been afforested, with **Ireland, Portugal, Spain** and the **United Kingdom** accounting for some 80% of this area (European Commission, 2002).

Finally, measures to reduce the negative impact on the environment of certain farming practices by financing the exit of farmers have been recently implemented in some countries. In 2000, the **Netherlands** introduced a package of measures budgeted at EUR 800 million to buy out pig production quotas. It is anticipated that this buy-out scheme will reduce the Dutch national manure surplus by around 12 million kg phosphate by 2003. In Flanders, **Belgium**, a scheme was introduced in 2001 with the aim of reducing pig numbers by 10%, budgeted at EUR 75 million. Under this scheme, farmers who stop pig farming completely are eligible to receive exit money for a limited time period (OECD, 2003b).

2.1.3 *Payments based on fixed farm assets*

Payments based on farm fixed assets are policy measures granting a monetary transfer (including implicit transfers such as tax and credit concessions) to farmers to offset the investment cost of adjusting farm structure or equipment to adopt more environmentally friendly farming practices. A wide range of such payments have been implemented in OECD countries in the past fifteen years.

In the **United States**, the *Environmental Quality Incentives Program (EQIP)* grants payments to farmers covering up to 75% of the investment cost of installing or implement structural changes to promote environmental objectives, with a particular emphasis on addressing environmental problems associated

with the livestock sector – e.g. building animal waste management facilities and creating filter-strips (see also sections 2.1.1 and 2.7). In 2000, *Agriculture Management Assistance (AMA)* was also made available in fifteen states to provide cost-share payments to farmers to carry out activities to address environmental issues, including the construction or improvement of water management structures, irrigation structures, and the planting of trees for windbreaks or to improve water quality. In addition, the *Wildlife Habitat Incentives Program (WHIP)*, which was introduced in 1996, provides payments to farmers covering up to 75% of the costs of developing upland, wetland, riparian, and aquatic habitat areas.

A number of structural payment programmes have also been implemented in the **European Union** under the *Rural Development Regulation (No. 2057/99)*. For example, the **Netherlands** offers payments to farmer for improving land and water quality by leaving land along watercourses free from manure and agricultural production and instead for promoting nature management. **Denmark** offers payments for the establishment of shelterbelts, while **Spain** offers payments to farmers to improve the husbandry of irrigated water. **France** offers a range of agri-environmental payments designed to introduce, maintain and restore specific landscape features, such as hedges and trees, as part of its *plan de développement rural national (PDRN) 2000-2006*. Since 2000, **Belgium** has also offered payments to farmers to preserve and maintain landscape features and biodiversity, such as hedges, strips of woodland, old standard fruit trees in pastures, and ponds. In the **United Kingdom**, under the *Countryside Stewardship Scheme* payments are provided to encourage the enhancement and restoration of targeted landscapes, wildlife habitats and historical features, and to improve opportunities for public access to these areas.

Tax and credit concessions are sometimes used to offset the investment cost of adjusting farm structure or equipment to promote environmental improvements. For example, under the *Agricultural Improvement Fund*, which was introduced in 1999, **Japan** provides concessionary loans and tax relief to farmers for capital expenditure to promote more environmentally sustainable farming. Supported projects are administered by prefecture authorities and include the purchase of agricultural machinery, such as compost spreaders, and infrastructure improvements, such as manure storage facilities. To date, around 16 000 farmers have participated in this scheme. Commonwealth tax concessions were introduced in **Australia** in the 1980s in order to promote a range of environmental objectives, including the prevention of land degradation and water conservation. Payments in kind have also been introduced in some countries. For example, in **Canada**, under the *Shelterbelt Program*, trees and shrubs are distributed (free of charge) to qualifying landowners in the Prairie Provinces for shelterbelt planting in agricultural areas, in order to enhance environmental sustainability and biodiversity. This programme was supplemented in 2001 with the introduction of the *Shelterbelt Enhancement Programme*, which is aimed at improving shelterbelt planting success to promote the sequestration of greenhouse gas emissions, as part of Canada's *Action Plan 2000 on Climate Change*.

One further trend has been the introduction of structural cost-share programmes specifically to assist farmers in meeting the costs of environmental *regulatory requirements*. For example, in 2000 the **United States** introduced *Soil and Water Conservation Assistance* to help landowners comply with Federal and State environmental laws and make beneficial, cost-effective changes to cropping systems, grazing management, nutrient management, and irrigation. In 1996 the **United Kingdom** made grants available through the *Farm Waste Grant Scheme* to assist farmers in meeting 40% of the cost of improving or constructing farm waste storage facilities to meet the requirements of the *EU Nitrate Directive (No. 676/91)* (see section 2.4). In 1993, **France** introduced the *farm-source pollution control programme (PMPOA)*, which provides up to 65% funding to assist farmers in bringing buildings and manure storage facilities into line with environmental regulations. Other countries such as **Denmark**, **Germany**, **Norway** and **Sweden** have also provided investment support for the expansion of manure storage capacity to meet regulatory requirements, often on a transitional basis (OECD, 2003b).

2.2 *Environmental taxes/charges*

Environmental taxes and charges are policy measures imposing a tax or charge relating to pollution or environmental degradation, including taxes and charges on farm inputs or outputs that are a potential source of environmental damage. Under the OECD Recommendations on the Polluter-Pays Principle (PPP), the polluter should bear the expenses of carrying out the pollution prevention and control measures introduced by public authorities. This would imply that farmers should bear the costs of complying with regulations addressing pollution or environmental degradation. Imposing charges or taxes on pollution, based on an evaluation of the damage caused is an application of the PPP, as it has evolved over time.³

The implementation of taxes and charges appears to be rare in agriculture, compared to other sectors. This may at least partly reflect practical problems of *measurement* – unlike a factory where pollution can normally be monitored at “point”, the pollution from agriculture is much more dispersed, as it tends to originate from many different farms and in varying intensities. However, such measures are also sometimes viewed as contrary to farmers’ *property rights*, which are often viewed differently relative to other sectors.⁴

A few countries have tackled the measurement problem by imposing a range of levies on *estimated* off-farm emissions of nutrients above set limits. For example, since 1998 the **Netherlands** has required farmers to submit to the authorities an overview of inputs and outputs, leading to a ‘surplus’ of phosphorous and nitrogen produced on their farms via a minerals accounting system (*MINAS*). A prohibitive levy is then charged on estimated losses of nutrients over a certain limits (OECD, 2003b). Similar taxes on the estimated on-farm generation of nutrients over set levels are also in place in **Belgium** and **Denmark**.

More commonly, taxes and charges are charged on the sale of *inputs* identified as having a potentially adverse impact on the environment. For example, various taxes were introduced on *pesticides* in the 1980s in **Belgium, Denmark, Finland, Norway** and **Sweden**, while taxes on commercial fertilisers are now also applied in a few OECD countries, including **Sweden** and some states of the **United States**.

Water-use charges are also now commonly applied in many OECD countries. However water charging in agriculture tends to be less comprehensive than in other sectors, and in many cases is limited only to the cost of administration and delivery (e.g. issuing permits, maintaining infrastructure) rather than the full opportunity cost of waters derived from other potential uses (Brouwer *et al.*, 2000). Some OECD countries have, however, begun to encompass the principle of more comprehensive cost recovery for water in policy. For example, in the **European Union**, the *Water Framework Directive (No. 60/00)*, which was adopted in 2000, requires member states to take account of the principle of cost recovery relating to water services, including both environmental and resource costs.

2.3 *Tradable rights*

Tradable rights/quotas are measures that establish environmental quotas, permits, restrictions and bans, maximum rights or minimum obligations to economic agents which are transferable or tradable. Tradability allows such rights to be transferred to those who value them most highly, which can encourage economically beneficial outcomes. While tradable rights for improving environmental outcomes are gaining favour in a number of contexts in OECD countries their application in agriculture continues to be fairly rare.⁵ This may at least partly be due to the often high transactions costs in setting up and monitoring workable systems of this sort in the context of agriculture – for example, the predominance of non-point source pollution. However, some policy measures of this sort do exist.

To assist in the management of nutrient pollution, a system of manure production quotas was created in the **Netherlands** in 1986, based on historical farm manure production. In 1994, these rights were made tradable with various constraints, including the government taking 25% of the quota involved in each transaction, and geographical restrictions to keep the animal population from further increasing in areas identified as having high concentrations of manure production.

Tradable rights have also been established to assist in the management of natural resources. Tradable water extraction rights for irrigation exist in some regions/states of **Australia** and the **United States**. For example, water entitlements were issued to farmers in the 1980s in the Murrumbidgee Irrigation Area in New South Wales, **Australia**. Farmers may sell excess water on a temporary or permanent basis, either within or outside the region. In 2002 **Australia** announced an intention to further develop a market-based system for water use by 2005, including the introduction of the trading of water across State boundaries.

In the **United States**, under the *Clean Water Act (CWA)*, landowners wishing to develop wetlands on their property are required to offer compensation in order to receive a permit. Options for compensation include "mitigation banking", for which federal guidelines were established in 1995. Essentially, this scheme allows developers to purchase credits in larger, centralised wetland mitigation projects in order to compensate for the effects of their own projects on wetlands. By the late 1990s, 160 operating mitigation banks were identified, with 80 established for the sale of credits. Many are owned and operated by government entities (ERS, 2000).

Command-and-control measures

Measures classified under this category involve a compulsory restriction on the choice of economic agents, i.e. they are left with no choice but to comply with specific rules or face penalties (including the withdrawal of financial support).

2.4 *Regulatory requirements*

Regulatory requirements are compulsory measures imposing requirements on producers to achieve specific levels of environmental quality, including environmental restrictions, bans, permit requirements, maximum rights or minimum obligations. Enforcement mechanisms, such as the courts, police or fines, are used where producers are found to be in breach of regulations or other legal requirements. Some of these requirements are specific only to agriculture, while others are part of broader national environmental legislation affecting many sectors, including agriculture.

Regulatory requirements tend to be less flexible than economic instruments, as they do not tend to allow producers the freedom to determine for themselves the most appropriate way of meeting environmental objectives. However, they also tend to minimise risk and uncertainty, and therefore constitute a vital element of environmental policy in most OECD countries, particularly with respect to *acute* environmental problems.

Regulatory requirements have long been applied in the agricultural sector to deal with problems relating to the pollution of air and water, and protecting environmentally sensitive areas. These range from broad prohibitions or requirements, to very prescriptive details about farm management practices. The scope of these policy measures has generally expanded in OECD countries in the past two decades in response to the increased priority accorded to agri-environmental issues.

An increasing number of regulatory requirements imposed in OECD countries derive from state, provincial, regional or local measures, often under the framework of over-arching legislation. For example, the *Resource Management Act (RMA)*, which was introduced in **New Zealand** in 1991, charges

local government with the responsibility of developing objectives, policies and methods for addressing the environmental impacts of natural resource use, including agriculture. Regional Councils have the major role, being responsible for the management of air and water quality. Since 1991, the **European Union** has addressed issues of water pollution from agriculture through the *Nitrate Directive (No. 676/91)* and the *Drinking Water Directive (No. 778/80)*.⁶ Each **European Union** member is responsible for meeting the targets set by the *Nitrate Directive*, so differences emerge at the country level. Then within **European Union** members, regulations can vary from region to region, particularly where member states have designated certain areas as nitrate vulnerable zones (OECD, 2003b). In **Canada**, the federal government has set standards for nutrients, bacteria and pesticides, while the primary responsibility for the environment regulation of agriculture rests with the provincial and municipal levels of government.

Regulatory measures can tackle agri-environmental objectives in a variety of different ways, imposing differing degrees of restrictiveness on landowners. Three main categories are used below to highlight some of the most prominent policy measures.

2.4.1 *Reducing pollution*

Since the 1980s there has been a general expansion in regulatory measures to protect waterways and groundwater, and to reduce air pollution, particularly in the following areas.

- *Inputs.* An important tool in all OECD countries to reduce pollution generated by the use of agricultural inputs is laws regarding the marketing and sale of inputs, particularly pesticides. Laws have typically been amended over time such that many countries now approve new pesticides for a limited period only (commonly five to ten years). Some requirements relating to inputs have been implemented in response to *international pressures* – for example, the phasing out of the marketing and use of methyl bromide pesticides under the *1987 Montreal Protocol on Substances that Deplete the Ozone Layer*.
- *Use of Pesticides.* The aerial spraying of pesticides is now prohibited in some parts of the **European Union** and **Australia**. It is heavily controlled in many other regions and countries, with licences or permits commonly required. In countries such as the **European Union**, the **United States**, **Canada** and **Australia**, the use of pesticides is also now restricted within a certain distance of watercourses. (Brouwer *et al.*, 2000).
- *Nutrient Management.* While laws prohibiting the *direct* discharge of animal waste to surface waters have existed in most OECD countries since the early 1970s, a large number of restrictions have since been applied in relation to general farming practices associated with pollution from nutrients. In particular, OECD countries have introduced a variety of requirements relating to *manure management* in order to limit nutrient pollution from livestock farming, including restrictions on the quantity of manure that can be spread; seasonal bans on manure application; manure storage requirements; and limitations on livestock densities and on the expansion of livestock units (OECD, 2003b). Such measures have become particularly common in the **European Union**, where the *Nitrate Directive (No. 676/91)* **requires** member states to limit the application of manure in nitrate vulnerable zones to 170kg/hectare/year. Many other OECD countries have also tightened regulatory requirements relating to the application of nutrients, either at the national or state/regional level. In **New Zealand**, Regional Councils place limits on the permissible levels of nitrogen applied in dairy effluent, such that farmers spreading effluent from milking shades are limited to 150-200 kg N/ha/year. In Quebec, **Canada**, nutrient management plans were phased in over the period 1997 to 2001, while in the **United States**, nutrient management plans are now required in 23 States for at least some classes of animal operations, usually in areas affected by groundwater contamination (OECD, 2003b).

- *Scale of production.* In some OECD countries large-scale livestock production units are controlled through permitting systems, either at the national or regional level. For example, the **European Union Integrated Pollution Prevention and Control Directive**, which has been applied since 1999 to new facilities (and is to be applied to existing facilities in 2007), requires member states to impose emission limits in environmental permits which are mandatory for potentially polluting plants of a given scale – in particular very large pig and poultry facilities. In **Japan**, under the *Water Pollution Control Law* and other associated legislation, upper limits are set for discharges of pollution for specified agricultural facilities, including large-scale pig and cattle facilities, and stables.
- *Buffer strips and catch crops.* Buffer strips around water courses and groundwater sources have become a common requirement to limit nutrient leaching in many OECD countries, including **Australia, Canada, and New Zealand**⁷. Some governments have also established regulations requiring farmers to maintain a minimum level of green cover during certain times of the year (catch crops). Requirements for catch crops are most stringent in **Denmark** and some parts of **Sweden** (OECD, 2003b).
- *Siting rules.* These have become a prominent policy measure to regulate the impact of air pollution from odours. For example, a recent survey in the **United States** found that 44 states enforce distance and siting regulations on odour emissions (OECD, 2003b). In general, concerns about odour are strongly linked to population density (Brouwer *et al.*, 2000). Farm buildings and waste storage facilities are typically required to be beyond certain distances from residential premises or public facilities.

2.4.2 *Use of natural resources: water and soil*

Absolute quantitative restrictions to limit the *extraction of water* for irrigation purposes are becoming increasingly common in regions where water is scarce. For example, in **Australia**, caps on water extractions in many irrigation zones were set in the 1990s, and in some cases embargoes exist on further irrigation licences to extract groundwater. These caps have sometimes also been combined with the creation of tradable rights (see section 2.3). Restrictions on water extraction are now also common in some states in the **United States** – for example, in Florida 5-10 year permits must be obtained to extract water, construct wells and install new water surface management systems. In **New Zealand**, irrigators are required to apply for permission to use water and comply with any conditions imposed, including reductions in usage to protect minimum flows in rivers.

Regulatory requirements regarding *land use* have become increasingly common in relation to soil quality, either at the national or state/regional level. For example, **Switzerland's Act on Soil Damages**, introduced in 1998, requires farming practices preventing long-term soil compaction and soil erosion in order to maintain the long-term fertility of soils. In Sweden, a maximum of 50% of arable land is allowed to be set-aside (if industry or energy crops are grown on set-aside land, 100% of the arable area is allowed to be set-aside). In Queensland, **Australia**, the *Soil Conservation Act 1986* requires land owners to apply for approval of 'property plans', which must specify soil conservation measures and can also relate to land clearing practices and other aspects of land management. In **France**, 25% of marshes and peat bogs of national interest are protected, and in some situations fallow land cannot be left bare.

2.4.3 *Biodiversity*

Most OECD governments at federal and provincial/state level have well established legislation to protect valuable wildlife and habitats, which can influence on-farm practices. These measures have been shaped by international as well as domestic considerations, including the obligations of OECD member

countries to stem the loss of biodiversity under the *International Convention on Biological Diversity* (CBD), which was agreed at the *UN Conference on the Environment and Development* in 1992.

Under the *Birds Directive* (No. 409/79) and the *Habitat Directive* (No. 43/92), **European Union** member states are required to take steps to protect endangered species, as well as the habitats upon which they depend for feeding and breeding. Similarly, in the **United States**, the *Endangered Species Act* (1973) protects endangered species and their habitats, and requires federal permits for certain practices, such as filling wetlands for the purpose of agricultural production. Many OECD countries have also legislated to protect remaining valuable non-farm habitats which are often adjacent to farmland, such as wetlands, hedgerows, bush and forests. For example, in 1997, the **United Kingdom** introduced legislation administered by local authorities to protect important hedgerows bordering agricultural land from deliberate removal. In 1992, **Switzerland** introduced legislation imposing stricter limitations on farm land use, including bans or limitations on the use of agri-chemicals, in specific regions such as marshes and wetlands.

Regulatory measures to protect agriculture from invasive species are well established in OECD countries, and are particularly prominent in countries where farm production and ecosystems are most vulnerable, such as **Australia** and **New Zealand**. In addition, measures regulating the introduction and use of new organisms – including new agricultural biotechnological products – have in many cases been developed or strengthened in the past decade.

2.5 *Cross-compliance mechanisms*

Cross-compliance mechanisms are measures imposing environmentally friendly farming practices or levels of environmental performance on farmers participating in specific agricultural support programmes. Where support payments remain relatively high, cross-compliance may be characterised as *de-facto* regulatory requirements for farmers that are eligible for payments. As part of overall agricultural policy reform, many OECD countries have made general support payments based on output, factors of production or income conditional on farmers respecting certain environmental constraints or achieving a particular environmental outcome (Table1).

Cross-compliance measures were first introduced in the **United States** as part of the *1985 Food Security Act*. Under highly erodible land conservation (*'Sodbuster'*) provisions, producers who bring highly erodible land into production must apply a strict conservation plan to remain eligible for farm programme participation and payments. There are also *Conservation Compliance* requirements on previously cropped highly erodible land, which require farmers to maintain soil conservation systems. Wetland conservation (*'Swampbuster'*) requirements deny farm programme payments to producers who convert wetlands for agricultural production. Because of the broad participation in farm support programs, overall large areas of farmland – some 44 million hectares of highly erodible cropland and 31 million hectares of wetlands – are subject to these requirements (ERS, 2001).

Cross-compliance has also been introduced by a number of **European Union** member states – including **Denmark, Finland, France, Greece, Ireland, Italy, the Netherlands** and the **United Kingdom** – in order to tie environmental requirements to direct support offered under a variety of the *CAP* commodity regimes. To date many of these requirements have been relatively specific, for example relating to pesticide use in starch potato crops in the **Netherlands**, and the obligation to obtain appropriate permits in relation to water abstraction for farmers claiming premia for irrigated maize in **France** (Baldock, *et al.*, 2002). Common rules for the application of cross-compliance requirements across the **European Union** were introduced in 1999 (*Council Regulation No. 1259/99*). Under these rules, payments may be reduced or cancelled in the case of non-compliance, and EU member states may then re-direct funds thus released to finance agri-environmental or rural development measures. Beyond 2005 cross

compliance measures will be used in all European Union member states. Direct aid payments will be reduced in the case of non compliance with basic standards for the environment, food safety, animal health and –welfare.

Since the late 1990s, nearly all direct payments offered to farmers in **Switzerland** have been conditional on farmers complying with environmental standards and farm-management practice requirements – including payments based on historical entitlements, and all area and most headage payments. **Norway** also offers area-based cereal payments and general headage support for livestock on the condition that farmers meet cultural landscape requirements. **Korea** introduced a scheme of direct payments per hectare for paddy field farmers in 2001, conditional on the promotion of environmental conservation – including reduced use of fertilisers and pesticides – and the submission of farming records to the authorities.

Table 1. Use of cross-compliance requirements in OECD countries

Country	Cross-compliance requirements	Commodity/Programme Coverage	Year introduced
Australia	no		
Austria	no		
Belgium	no		
Canada	no		
Czech Republic	no		
Denmark	yes	arable crop area payments beef livestock headage premia	2000
Finland	yes	arable crop, hemp, flax, potato starch and seed area payments all livestock headage premia	
France	yes	maize area payments, for irrigated crops	2000
Germany	no		
Greece	yes	headage payments for sheep and goats, area payments for arable crops in LFAs	2001
Hungary	no		
Iceland	no		
Ireland	yes	sheep premia	1998
Italy	yes	arable crops, grain legumes, flax, hemp, tobacco, seeds, rice, olive area payments sheep and cattle premia	2001
Japan	no		
Korea	yes	area payment for paddy field farmers	2001
Luxembourg	no		
Mexico	no		
Netherlands	yes	silage maize area payments	2000
New Zealand	no		
Norway	yes	arable crops, oilseeds, fruits and vegetables and grassland area payments headage payments for all livestock	1991
Poland	no		
Portugal	no		
Slovak Republic	no		
Spain	no		
Sweden	no		
Switzerland	yes	all payments to farmers (excluding summering headage payments)	1999
United Kingdom	yes	arable area payments; headage payments for beef and sheep	1992-94
United States	yes	arable crops	1985

Sources: OECD Secretariat, Peterson and Shaw (2000).

Advisory and institutional measures

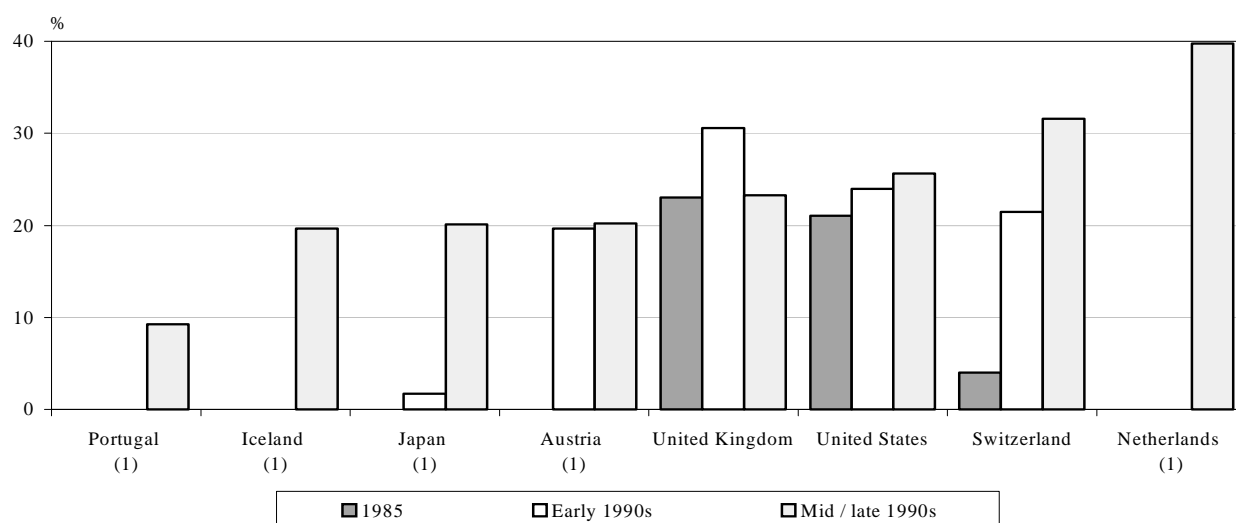
Advisory and institutional measures include collective projects to address environmental issues and measures to improve information flows to promote environmental objectives. This information can be provided to both producers, in the form of technical assistance and extension, and to consumers, via labelling.

2.6 Research and development

Across all OECD countries, governments fund *research* into the relationship between agriculture and the environment. This research is often undertaken in order to establish best management practices to be communicated to farmers through on-farm technical assistance, or to establish the most appropriate regulations or other policy measures. It covers a broad range of scientific enquiry including ecology, engineering, farm management practices, farmer behaviour, and economics.

Continuing innovation in the agricultural sector is generally recognised as crucial to meeting environmental goals in agriculture. Spending on agri-environmental research as a proportion of total agricultural research has increased in a number of countries since the mid-1980s (Figure 2). In some countries, research funding is increasingly being channelled through joint agreements with industry. For example, **Australia** and **New Zealand** have created special research institutes jointly funded by government and industry to conduct research, with a specialised agricultural research focus. Similar co-operative research programmes are in place in the **Denmark**, the **Netherlands** and the **United Kingdom**.

Figure 2. Share of public agri-environmental research expenditure in total public agricultural research expenditure, 1985 to mid-late 1990s



Notes: Early 1990s: 1991 (United Kingdom, United States, Switzerland); 1993 (Japan); 1994 (Austria)

Mid / late 1990s: 1995 (United Kingdom); 1996 (United States); 1997 (Switzerland, Portugal);

1998 (Austria, Iceland, Japan, Netherlands)

1. Data not available for all periods.

Source: OECD Secretariat.

2.7 *Technical assistance/extension*

In the past decade a growing number of national initiatives have been implemented to more closely monitor the environmental performance of agriculture. A key trend has been the development of *agri-environmental indicators* in many OECD countries, including **Australia, Canada, Denmark, France, New Zealand**, the **Netherlands, Switzerland** and the **United States**, as well as regional initiatives carried out by **European Union** institutions and under the **North American Free Trade Agreement (NAFTA)**.

One emerging trend is the number of new initiatives to promote research into *climate change* issues. For example, in 2000, **Canada** introduced the *Climate Change Funding Initiative for Agriculture (CCFIA)* to improve the scientific understanding of the agricultural sector's contribution to greenhouse gas emissions. *Research Model Farms* were also established in 2001 to improve estimates of potential carbon sequestration and greenhouse gas emission reductions associated with different farm practices. In the **United States**, as part of the *2002 FSRI Act*, a new *Biomass Research and Development* programme was announced to promote research and development leading to the production of bio-based industrial products. These measures are commonly supported by comprehensive on-farm technical assistance programmes.

These measures provide farmers with on-farm information and technical assistance to plan and implement environmentally friendly farming practices. Most OECD countries have long-established programmes for assisting farmers to adopt technology and improve agricultural practices. These programmes have traditionally focussed on improving on-farm productivity, but in the past two decades much greater emphasis has been placed on increasing farmers' understanding of resource and environmental issues, in order to induce voluntary changes in farming practices to improve environmental outcomes.

For example, in the **United States** the *Conservation Technical Assistance (CTA)* programme provides farmers assistance with planning and implementing soil conservation and water quality practices. Technical assistance and extension is also provided as part of major environmental cost-share assistance and conservation programmes, such as *EQIP* and the *CRP* (see also section 2.1). Overall, spending on technical assistance and extension has increased since the 1980s, and amounted to USD 600 million in 2000 (ERS, 2001).

A wide range of technical assistance programmes are also offered in the **European Union**. For example, in **Sweden**, programmes to promote awareness of environmental issues have been in place since 1986. These programmes include individual services, field and farm courses and demonstration sites. Training and demonstration projects have also been introduced by member states – co-funded by the EU – as part of measures under the *Agri-environment Regulation (No. 2078/92)* and the *Rural Development Regulation (No. 1257/99)* (see also section 2.1). In **Netherlands** the government has set up an extensive demonstration and information programme (EUR 70 million over four years) to assist farmers to comply with the Mineral Accounting System (MINAS) standards. In some countries, including **Australia, Canada** and **New Zealand**, local community and farmers' groups have become more involved in co-operating to disseminate information and promote cost-effective solutions to environmental problems (see also section 2.9).

A common feature of technical assistance in recent years in the OECD is the increasing use of the *Internet* as a tool to distribute information and best management practices to farmers. For example, in the **United States** the federal government maintains databases on a wide range of subjects, from insect infestations to soil types, and provides network access to them over the internet. In **Canada**, *ManureNet* is a national information resource and co-ordination centre for the manure/nutrient management, with over

7 000 site links, and an online database with over 4 500 records (CARC, 2002). In the **United Kingdom**, farmers can now access comprehensive *Codes of Good Agricultural Practice* for soil, water and air via the internet (DEFRA, 2002).

Over time, the provision of information has also tended to encompass an increasingly comprehensive range of information; for example, *Environmental Farm Plans* in **Canada**, which focus on developing *risk-management* strategies for farmers, and **Australia's** *Environmental Management Systems*, which integrate individual environmental farm objectives with *regional targets*.

2.8 *Labelling /standards/certification*

Labelling standards/certification are voluntary participation measures defining specific eco-labelling standards that have to be met by farm products for certification.

In order to help customers distinguish products grown without chemical fertilisers or pesticides from conventionally produced agricultural products, a number of OECD countries have established standards for “ecolabels” and have set up bodies to certify their authenticity. In the **United States**, there are now at least 25 major labelling schemes for goods produced using environmentally friendly practices. Various third party certifiers have emerged to ensure consumers that the environmental quality claims are accurate. Certification schemes can be private (such as “Eco-OK”), or public, such as the first national standards for the labelling and processing of organic food adopted in 2000 (OECD, 2001d).

Many governments in other OECD countries – including in the **European Union, Japan, Norway** and **Switzerland** – have also introduced government-enforced national organic labelling standards in the past decade. **Canada's** *National Standard for Organic Agriculture*, which was introduced in 1999, was implemented by the government but the labelling criteria were developed by industry, while in **New Zealand** industry groups are steering labelling activities for organic products.

2.9 *Community-based measures*

Community-based measures are measures that involve government support to community-based groups implementing collective projects to improve environmental quality in agriculture. Since the 1980s, **Australia, Canada**, and **New Zealand**, in particular, have come to make widespread use of community-based approaches to resource management in rural regions, with the purpose of mobilising and motivating citizens to take on greater responsibility for addressing environmental issues. Much emphasis is placed on improving the flow of information and using peer pressure to attain results.

Australia's *National Landcare Programme (NLP)*, which originated in the mid-1980s, supports group activities that address environmental issues through research, planning, technical assistance and extension. The aim of the *NLP* is to encourage community groups to develop a self-help attitude and capacity in planning, promoting and using sustainable land, water and vegetation management practices. Around one-third of farming families now participate in *Landcare* groups. A number of more recent community-based environmental programmes are also being applied with implications for farming regions. For example, in 2000 the Commonwealth, States and Territories introduced the *National Action Plan for Salinity and Water Quality*. This programme builds on the success of the *NLP*, focussing on regional/catchment plans, developed by local communities in 21 priority regions supported by “block” funding of strategic actions, technical assistance and skills training. Spending on this programme is budgeted at AUD 65 million in 2001-02, with a total funding package of AUD 1.4 billion to be spent over seven years. Similarly, the *Murray-Darling 2001 Programme* and the *National Rivercare Programme* (1997) also both fund community-based initiatives to address regional water resource problems.

In **New Zealand**, a number of farmer-based *Landcare* groups have also formed over the past decade to address issues connected with sustainable agriculture, some of which receive administrative or financial support from regional **authorities**. In addition, the *Sustainable Management Fund (SMF)*, which was launched in 1994, provides cost-share support for community-oriented projects promoting environmental management, while the *Sustainable Farming Fund (SFF)*, launched in 2000, provides funding on a similar basis towards projects aimed at improving the financial and environmental performance of the land-based sectors. These programmes encourage the transfer of information and technology from technical experts to communities, including farmers. To date the government has spent around NZD 31 million on more than 310 practical projects under the *SMF*, with NZD 38 million of investment leveraged from the private sector, while it is to spend NZD 23 million on 183 projects under the *SFF* over 2000-2005, with a further NZD 22 million contributed by the private sector (MAF, 2003).

In **Canada**, coalitions of farm groups are also working together to promote local, farm-level action to address environmental issues. A variety of initiatives have been adopted in various Provinces, including the formation of rural conservation clubs and the development of guides to help in environmental farm planning, sometimes with government support. For example, the *Agricultural Environmental Stewardship Initiative (AESI)* is a three-year (2000-2003) Federal programme funded by the *Canadian Adaptation and Rural Development Fund* which supports projects addressing regional environmental issues through education and awareness, technology transfer, and stewardship tools, including environmental clubs.

Other OECD countries also support community-based initiatives to varying degrees. In the **United States**, support is provided for a range of local resource conservation projects affecting agriculture. For example, under the *Small Watershed Rehabilitation Program*, up to USD 35 million is provided annually in support to projects initiated by local groups to protect watersheds less than 100 000 hectares, including cost-share support for structural and non-structural improvements to reduce erosion, sedimentation and run-off. Funding under this programme is budgeted to increase significantly under the *2002 Farm Security and Rural Investment (FSRI) Act*. Community-based support for environmental purposes in rural regions is also available in some **European Union** member states under the *Rural Development Regulation (No. 1257/99)*. For example, in **England**, the *Rural Enterprise Scheme*, which was introduced in 2000, provides support to local projects involving farmers, rural businesses and rural community groups intended to protect the environment in connection with agriculture, forestry, landscape and animal welfare.

It is also important to note that producer groups in a number of OECD countries have taken the initiative to work with community groups and non-government organisations to improve environmental outcomes, both with and without government involvement. For example, in **Australia**, an agreement between the *Australian Conservation Foundation* and the apple and pear industry has resulted in environmental improvements through reductions in pesticide use in the industry. In the **Netherlands** pig farmers, nature groups (including the *Foundation for Nature and Environment*), pig processing firms and government representatives are working together in order to promote farm practices that take into account community concerns, including the environment. In **New Zealand**, a number of producer groups have taken initiatives in response to growing public concern on environmental issues – for example in May 2003, the Fonterra dairy company concluded a *Dairying and Clean Streams Accord* with the local authorities and the government to minimise the impact of dairying on streams, rivers, lakes and wetlands. The main focus of the Accord is on the voluntary uptake of sound farming practices known to improve water quality, with an emphasis on information and education.

3. Recent developments

There seems to be little doubt that agri-environmental policy will continue to increase in importance in many OECD countries in the future. For example, in the **United States**, the *2002 Farm Security and Rural Investment (FSRI) Act* provides for an 80% increase in funding for agri-environmental purposes over six years, while the reforms of the **European Union's Common Agricultural Policy**, concluded in June 2003, strengthen funding for *Rural Development* measures – including agri-environmental programmes – beyond 2006. Also cross compliance rules will be obligate for all European Union member states beyond 2005. In 2002, **Australia** launched a number a new agri-environmental strategies, including a *National Market-Based Instruments Pilot Programme* to investigate the application of market-based instruments in addressing environmental issues, while **Canada** is to implement a range of new environmental policy in 2003 under the *Framework Agreement on Agricultural and Agri-Food Policy for the 21st Century*.

Many of the agri-environmental policy measures described above have been introduced in response to domestic, regional or local environmental issues. However, *international pressures* look likely to exert a growing influence over agri-environmental policy in the future. Such pressures include a range of international environmental agreements to address trans-boundary environmental issues. These include the *1997 Kyoto Protocol* – which specifies greenhouse gas (GHG) emission targets for 2008 to 2012 – and the *International Convention on Biological Diversity (CBD)* – which requires signatory countries to develop national strategies for the conservation and sustainable use of biological diversity.

The likelihood that agri-environmental policy will become a more dominant part of the rural scene is inviting growing scrutiny, both domestically and internationally, of the benefits they are intended to deliver relative to their associated costs. However, many agri-environmental policies are at a relatively early stage in their development, and evidence concerning their performance and impacts is often very limited. Prudent evaluation centres on assessing both the *environmental effectiveness* and the *economic efficiency* of measures, including their impacts on production and trade. Such evaluations present significant challenges. Environmental outcomes can be subject to a multitude of influences of which the policy to be evaluated is only one. There are also often high costs of measuring environmental outcomes, and in many cases a lack of immediacy in the manifestation of environmental outcomes. Furthermore, it is often very difficult to assign monetary values to the impacts of agri-environmental policy measures, which is necessary to fully assess the associated costs and benefits.

Nonetheless a growing number of OECD countries are setting in place frameworks and procedures to enhance the environmental effectiveness and efficiency of agri-environmental policies measures, including both *ex ante* and *ex post* processes. For example, in the 1990s the **United States** introduced the *Environmental Benefits Index (EBI)*, which targets land for enrolment under the *Conservation Reserve Program* by weighting the expected environmental gains relative to the respective rental costs. Enhanced policy monitoring is now also beginning to be utilised in the evaluation of agri-environmental policies in a growing number of countries. For example, the **European Union** has recently imposed more comprehensive monitoring obligations with respect to agri-environmental programmes under the *Rural Development Regulation (No. 1257/99)*, requiring EU member states to monitor programmes with reference to pre-agreed specific physical and financial indicators. Agri-environmental indicators are also to be used to evaluate the implementation of environmental policies from 2003 under **Canada's Framework Agreement on Agricultural and Agri-Food Policy for the 21st Century**.

Overall, there is mixed evidence regarding whether *policy coherence* has improved in relation to environmental issues in agriculture over the past two decades. As noted in this paper, a number of OECD countries have taken steps to streamline regionally differentiated agri-environmental policies measures within over-arching *frameworks*. *Action plans*, which integrate a mix of different policy instruments to

serve particular objectives, are also becoming more common place – for example, some European countries (including **Denmark, England, Finland, Germany, the Netherlands, Norway, Sweden and Wales**) combine the use of direct payments, producer information, consumer information and infrastructure support to promote organic agriculture (Lampkin, 2003). On the other hand, agricultural policies in some OECD countries continue to conflict with agri-environmental measures in cases where *output* and *input-linked support* measures contribute significantly to environmental degradation. This makes the attainment of environmental objectives less effective and more costly than would otherwise be the case.

The OECD is currently undertaking work on the evaluation of agri-environmental policy measures. This work programme includes several sector-specific case studies, and is intended to contribute to identifying the characteristics of “good policy practice” for achieving environmental objectives while minimising unintended effects on agricultural production and trade.

NOTES

- 1 Unlike the case of the agricultural sector, the contribution of industry and households to water pollution from phosphates and nitrates across OECD countries has declined over the past two decades – see OECD (2001a).
- 2 However, quotas and supply management schemes often tend to set arbitrary targets which can still result in excessive production, with flow on environmental consequences.
- 3 See “The Polluter-Pays-Principle as it relates to International Trade – COM/ENV/TD(2002)44/FINAL.
- 4 It has been argued that farmers’ property rights over natural resources tend to be more presumptive than those in other sectors, and that this may hinder application of such measures in agriculture – see for example, Bromley, D. in OECD, 1997c.
- 5 For more on this see OECD (1999).
- 6 These directives are now implemented under the *Water Framework Directive (No. 60/00)*, which sets out the overall objectives for EU water policy.
- 7 In New Zealand, the buffer strips are a requirement in the dairy industry and are highly recommended in other sectors.

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