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GREEN INVESTMENT FUNDS: ORGANIC FARMING
Netherlands Case Study on Biodiversity Incentive Measures

by T. van Bellegem, A. Beijerman, A. Eijs, M. Boxtel, C. Graveland, and H. Wieringa.

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FOREWORD

This paper is one of a series of 22 case studies that describe practical experiences in OECD Member countries with the use of incentive measures for the conservation of biodiversity and the sustainable use of its components. These case studies were submitted by OECD Member countries to the OECD Working Group on Economic Aspects of Biodiversity as a contribution to the OECD study of the design and implementation of appropriate incentive measures for biodiversity conservation and sustainable use. In order to ensure maximum comparability between the case studies, all were developed under the common methodology described in "Incentive Measures to Promote the Conservation and the Sustainable Use of Biodiversity: Framework for Case Studies" [OECD/GD(97)125].

The practical experiences described in the 22 case studies were used as the basis for the policy advice developed in the Handbook of Incentive Measures for Biodiversity: Design and Implementation (OECD, 1999). This Handbook combines the lessons learned through the various experiences described in the case studies covering a wide range of ecosystems, economic pressures on biodiversity, and utilising various incentive measures with sound economic theory to develop a practical, step-by-step guide for policy-makers on the design and implementation of successful incentive measures for the conservation and sustainable use of biodiversity.

This paper was provided by the Dutch Government and was written by T. van Bellegem, A. Beijerman, A. Eijs, M. Boxtel, C. Graveland, and H. Wieringa. It is released as an unclassified document under the responsibility of the Secretary-General of the OECD with the aim of bringing information on this subject to the attention of a wider audience.

This study, and the other 21 case studies submitted by Member countries, are available on the world wide web at http://www.oecd.org/env.

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EXECUTIVE SUMMARY

This case study examines how the innovative tax exemption on investments in green funds in place in the Netherlands since January 1995 is utilised to support organic farming there. In general, it was found that the economic gains from organic farming in the Netherlands were low, while the risks were high. The special tax exemption on incomes from investments in approved green funds can help alleviate this and close the profitability gap between traditional and organic production. It allows investors in these projects to contract loans at reduced interest rates (usually about 2% less than commercial rates), providing a financial advantage to organic farms over traditional ones. The funds have been heavily supported by the Dutch people. Other incentives which would also help were identified as the removal of various adverse subsidies to traditional agricultural practices, raising public awareness about organic farming, the development and use of a certified eco-labelling scheme for organic produce, and the imposition of the Polluter Pays Principal to agriculture.

Ecosystem studied: arable lands

Incentive measures used: positive tax incentives, removal of adverse incentives, market creation, information provision

Main lessons learned: Successful example of the integration of fiscal and environmental policies; found to be particularly popular with investors; has had a positive effect on the conservation of biodiversity in the Netherlands through encouraging organic farming; however, a very precise definition of the criteria used to define ‘green’ practices was essential.

1. GENERAL DESCRIPTION

1.1 Description of Dutch ecosystems

The Dutch landscape is characterised by a wide variation in soil type, the quantity and quality of water and the amount of nutrients. Differences in relief are limited but nevertheless they do have an impact on the hydrology. The Netherlands is a large delta area where the soil material consists mainly of sediments. The age-old impact of wind, ice and water have resulted in a diversity of landscapes which, in combination with the influence of the North Sea and rivers has produced a wide diversity of environmental situations. These variations in the environment within short distances provide a host of suitable small-scale habitats for many different species and ecosystems (IKC-NBLF, 1994) Being As one of Europe's most densely populated countries, the human influence on Dutch ecosystems is immense. Concomitantly, changes in sorts and types of ecosystems occur. Traditionally, most of the land has been used for agricultural purposes. In the course of the second half of the present century, the increase in scale and intensity of human impact on the landscape led to a substantial loss in biodiversity (AKB, 1996; IKC-NBLF, 1994).

Major ecosystem types in the Netherlands (LNV, 1995) are: river areas, higher sandy soil areas, marine clay, peat soil areas, reclaimed peat areas, dunes and coastal sand areas, hilly land, closed sea channels, tidal areas, the North sea.

The case study will concentrate on alternatives to two types of human activities that harm biodiversity in the Netherlands: the introduction of organic farming and a project dealing with an alternative system for groundwater abstraction to lessen desiccation.

1.2 Description of main impacts

The case study deals with the project to enhance the dissemination of organic farming in the Netherlands. Conventional farming in the Netherlands is highly productive with serious effects on biodiversity through acidification, eutrophication, disturbance, aridification, dispersion of toxic substances etc. etc. The impact on biodiversity is tremendous and widespread. Organic farming has a far less damaging effect on biodiversity. Organic farming of course primarily has certain agricultural production goals, but aims at realising these goals without harming the environment and by respecting and using biodiversity as a productive tool. Organic farming therefore offers prospects for the conservation of biodiversity.

The micro-ecosystem on organic farms often offers good refuge for many animal species (Stroeken et al., 1993). The richness of flora and fauna (including soil life) is usually higher on organic farms than on neighbouring conventional farms (Braat and Vereijken, 1993). Sometimes even threatened species, especially arable weed species, can be found on organic farms (Smeding, 1992). In organic

farming, a wide crop rotation as well different and more crop and animal species result in a potentially high agro-biodiversity and genetic diversity (Lammerts van Bueren, 1993; Baars, 1993).

1.3 Identification of incentive measure: Green investment funds scheme

The Green investment funds scheme is a government scheme combining a fiscal measure with investment in sustainable projects. Private individuals can put their savings or investments into a so-called 'green fund'. Interest and dividend derived from this green fund are exempt from income tax. The money in the green funds has to be invested in green projects. So investors in green projects can contract loans at lower interest rates. Green funds are managed by banks and enable banks to give reduced-interest loans for green projects, e.g. an organic farm. The rate is usually about 2% less than commercial interest rates.

1.4 Identification of economic sectors targeted by incentive measure

The Green investment funds scheme targets the following economic sectors: agriculture, energy supply, processing industry (agricultural non-food products), nature conservation and housing etc. As the green investment funds scheme is not limited to a specific group of projects, it is important to many sectors, depending on the type of project.

In the case discussed in this paper, the scheme particularly targets water companies, industry and agriculture. Moreover, the Green investment funds scheme targets the banking sector and private individuals.

1.5 Identification of the project: Organic farming in the Netherlands

There are currently around 550 organic farms in the Netherlands (covering approximately 14 000 hectares) including some large farms owned by the state and nature conservation organisations (CBS, 1997). Organic farming thus covers about 0.7% of the total Dutch agricultural production area. The area of organic agriculture increases by about 540% since 1986 (see also Figure 1.1).

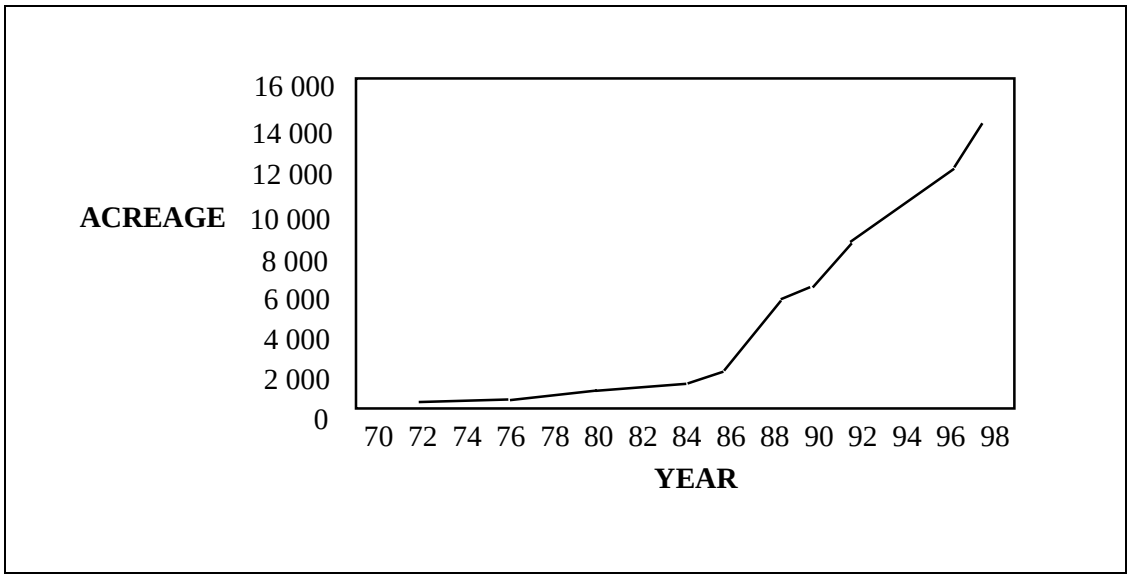
Most organic farms in the Netherlands are situated on young marine clay sediments, peat-grasslands or on sandy soils, mostly in the northern and eastern provinces (Braat and Vereijken, 1993). The predominant organic agricultural production systems are arable farming, dairy cattle farming or a mixed arable-dairy cattle farming system.

Organic farming in the Netherlands comprises two production methods: 'ecological' and 'biodynamic'. Generally 'biodynamic' agriculture focuses more on farm level whilst 'ecological' aims at sustainability at field level.

Organic agriculture emphasises biological relationships and natural processes and so is able to acknowledge the value of biodiversity. Organic crop production is based on the structure and the fertility of the soil and surrounding ecosystems, and serves as well as to provide a diversity of species. This is achieved by organic manuring, versatile crop rotation and no use of synthetic fertilisers or pesticides. Organic animal husbandry aims at respecting the physiological and etiological needs of the animals by providing sufficient amounts of organic fodder and keeping systems according to the animals' behavioural needs. Organic farmers also aim at mixed arable-animal farming systems, minimising environmental degradation and closing of nutrient cycles (IFOAM, 1996; see also table 3.1 chapter 3).

Organic agriculture is a strictly controlled and certified production system. Skal, the Dutch certifying agency, controls primary production as well as processing and sales, and licences farmers to sell their produce under the organic EKO hallmark (Skal, 1996).

Figure 1.1 **The increase in total acreage (hectares) of organic farming in the Netherlands since the early seventies**



Source: CBS, 1997; IKC agriculture, 1995

2. IDENTIFICATION OF CAUSES AND SOURCES OF PRESSURES

2.1 Identification of causes and sources of pressure on biodiversity in the Organic Farming Project

Conventional agriculture in the Netherlands is highly productive and characterised by very intensive land-use and high input use (LNV, 1995). Inputs used include fertilisers, pesticides, antibiotics, food concentrates for cattle and energy (Stolwijk, 1992). Agricultural production areas are mostly strictly separated from nature conservation areas (Stroeken et al., 1993).

2.1.1 Causes of agricultural impacts on biodiversity

Agriculture in the Netherlands has a large, often negative impact on the environment and thus on biodiversity because of (IKC-NBLF, 1994; RIVM, 1991):

- acidification;
- eutrophication through high fertiliser use;
- aridification through drainage, ground water abstraction and irrigation purposes;
- fragmentation, splitting up of areas and homogenisation of biodiversity.

The strict splitting up of agricultural land as oppose to nature conservation areas makes it difficult for animal and plant species to migrate causing isolated and vulnerable populations (AKB, 1996). Increasing production and efficiency increases the pressure on agricultural areas. An intensive agricultural system like the conventional Dutch system tends to be quite homogenous in appearance and uses a small number of crops, thus creating a small basis for agro-biodiversity. Homogenous agro-ecosystems offer little refuge for animal species (Stroeken et al., 1993; Braat and Vereijken, 1993; Kalverkamp and Hoytema, 1990).

- greater homogeneity of domestic biodiversity (agro-biodiversity);
- dispersion of toxic substances like pesticide residues or heavy metals;
- disturbance.

Most of these causes interact and enhance each other. Especially acidification, eutrophication (nitrogen and phosphates) and aridification have a cumulative impact on biodiversity (IKC-NBLF, 1994). The Dutch government is currently implementing policies to reduce emissions of certain substances and to

decrease eutrophication, like the ‘Long term plan for crop protection’ and ‘mineral registration system’, but negative effects on nature and the environment will persist for many years to come.

2.1.2 Land-use and land conversion

Conventional Dutch agriculture is an intensive and specialised system using only a few crops, usually in mono-cropping. Specialisation of the agricultural sector was aimed at higher productivity to improve competitiveness in global agricultural markets. The most important crops grown are maize, potatoes and sugar beet. Maize, grown for cattle fodder, is tolerant of high nutrient levels. Potatoes are grown in a narrow 1:2 to 1:4 rotation, requiring soil fumigation and high pesticide use. Sugar beet is vulnerable to weeds and requires high herbicide inputs whilst having a negative impact on soil structure (AKB, 1996). The vulnerability of crops to hazardous disease and weather influences increases in intensive mono-cropping systems (RIVM, 1988). Since organic agriculture uses wider rotations and a larger number of crops, organic manure and no pesticides, the vulnerability of crops to pests and diseases tends to decline (see chapter 3).

The conversion of natural areas into land for agricultural use, human settlement or industry currently does not occur in the Netherlands. The acreage of nature conservation areas has recently shown a slight increase after a long period of land being converted from nature to us for agricultural and other purposes (RIVM, 1996). This increase is due to the implementation of the 'Nature Policy Plan'.

The National Ecological Network is an important instrument for shaping nature policy. It is a coherent network of areas, forming a durable basis for the survival of ecosystems and species. This network will eventually cover 700 000 hectares of which 130 000 are nature reserves. The remaining area will consist of semi-natural or multi-functional units, in which agriculture and the protection of biodiversity are combined e.g. through special management schemes.

The EU recently introduced a different land conversion scheme; the MacSharry reform of 1992 pays farmers for set-aside of agricultural land. In the Netherlands around 6.4% of the base area is set-aside (LNV, 1995). Set-aside schemes offer farmers the opportunity to grow a crop using little or no fertiliser or pesticides whilst widening the crop rotation (Slangen et al., 1996). Set-aside schemes can have a positive effect on agro-biodiversity as well as on wild biodiversity.

2.1.3 Non-sustainable use of natural resources

In the conventional Dutch agricultural system three main natural resources are used non-sustainably. These resources are: the soil, water, and agro-biodiversity.

Soil use

In conventional agricultural soil use, the short-term benefits take precedence over the long term build-up of soil fertility, even though the soil is mostly farmers’ private property. The quality of the soil changes and the possibilities of conserving soil biodiversity are reduced. Continued eutrophication and acidification of soils leads to a loss of soil structure and changes the soil fauna. Use of artificial fertilisers, which are relatively cheap (low VAT category), compensates the need for an active soil fauna to provide nutrients. A continued decline in soil organic matter content in arable fields has been observed (RIVM, 1991). Organic matter has a positive effect on soil fauna, soil structure and water retention as well as nutrient releasing capacity (van der Werff, 1992). These changes in soil quality cause leaching of nutrients and make soils more vulnerable to wind erosion (RIVM, 1991).

Water use

Because water is managed as a common property, short-term benefits are generally favoured. The diversity of water-related ecosystems very much depends on the quantity and quality of available water. Since water withdrawal for agricultural, industrial and household use is quite high and land-use requires well drained fields, water-related ecosystems are threatened by aridification. The quality of available water depends on the concentration of nutrients and residues like pesticides. Eutrophication of surface water occurs, causing a shift towards nutrient tolerant species. Residues of pesticides, for instance, in water resources may reduce fertility or life expectancy of both plant and animal species (IKC-NBLF, 1994). Environmental policy regulations have brought some improvement recently.

Agro-biodiversity

Farmers in the Netherlands use pure crop species and lines. Biodiversity of in agricultural crops used is totally absent. See section 2.2.3.

2.2 Identification of underlying causes of biodiversity loss

It is impossible to describe all the underlying causes of biodiversity loss in this report. Only the most important ones will be mentioned below.

2.2.1 The value of biodiversity: missing markets and non-existent property rights

One of the major causes of the biodiversity loss is its low economic value. This is discussed in another OECD case study: Green Investment Funds: PIM project

2.2.2 Information failure: Lack of information about biodiversity

One of the problems to be addressed in the field of biodiversity is the lack of information and the lack of knowledge. The lack of information and knowledge about biodiversity helps to ensure that biodiversity is not appropriately valued. Lack of information exists at two levels: the lack of scientific knowledge and the lack of public awareness about biodiversity.

Lack of scientific knowledge

A lack of knowledge has been observed in the Netherlands with regard to the functional importance of biodiversity indicators, stress on stress reactions, the dynamics of diffusion and relationships between species (Sprengers et al., 1995). A lack of insight into the dynamics, resilience or vulnerability of species or whole ecosystems, makes it difficult to value the efforts required to keep biodiversity at a high level. There is however enough knowledge about biodiversity to pursue a sensible policy even now. The social acceptability of these policies is being hampered because uncertainties and lack of knowledge are seized upon as being a legitimate excuse for not taking the necessary steps (Sprengers et al., 1995).

Since knowledge on useful species for future use is also lacking, it is difficult to value biodiversity in terms of its gene-pool function. Lack of knowledge is not only limited to biological facts: the economic and social value of biodiversity is limited. This lack of scientific knowledge generally is a drawback in the field of protecting biodiversity.

Lack of public awareness and public information

Political decisions on biodiversity are very important. These decisions are not only based on the knowledge of detailed scientific facts but on public awareness. So protecting biodiversity is not only a matter of collecting scientific reports. The dissemination of information and knowledge is as important as the generation of this knowledge. The importance of dissemination of knowledge is often neglected in the field of biodiversity.

Education of the general public, as done by nature conservation organisations, about protected, threatened or keystone species, contributes to the awareness of the value of biodiversity. It is however apparent that the Dutch education system fails to teach people about thinking in cycles and whole ecosystems, thus making it difficult for people to evaluate the effect of their actions. Currently, nature and environmental education are being introduced in primary schools so that now more attention is being paid to this subject.

2.2.3 Institutional failure causing biodiversity loss.

Water drainage authorities

Loss of biodiversity is caused, for one thing, by the low groundwater levels. The organisations responsible for the water levels of surface water are important in this context.

Water has traditionally been very important in the Dutch society. The old struggle against the threat of the water gave rise to strong local organisations to protect man, land and property from water. Protection against water is not the responsibility of the provincial or local authorities but of specific water drainage organisations. These organisations see protection against water and the removal of water as their first priority. Moreover, the boards of these water drainage organisations are not elected democratically, by the one-man one vote system. Landowners have more votes than the other inhabitants of the area. As farmers own most of the land, their interests are taken well into account in the decisions of the water authorities. Biodiversity is not generally one of farmers' prime concerns. Changes in the election system have improved this situation but not completely remedied it.

Agro-biodiversity/ crop varieties list ("rassenlijst") etc.

Most institutions in the Netherlands aim at keeping conventional agriculture in place, trying to solve environmental and biodiversity degradation by using more advance technical solutions. The government for example lists the crop species that are allowed to be traded on a crop species list. This list only includes general breeder varieties, pure lines with little genetic variability, of a limited number of crops. Farmers are thus not encouraged to use more genetically diverse varieties or species adapted to their specific environment (AKB, 1996). The current large-scale application of artificial insemination of cattle is reducing agro-biodiversity in cattle.

The agro-industry aims at whole chain management, where products are grown in special contracts with farmers and the industry can determine the species and breeding line grown. This results in mono-cultures with the same species of similar genetic make up.

Lack of certification systems

Organic agriculture usually has a less severe impact on biodiversity as compared to conventional agriculture. An increasing number of consumers want to buy environmental-friendly produced food and other products. In the past it was difficult for these consumers to identify the products they preferred. The lack of a labelling system was remedied at a time when several labelling systems coexisted which made for a rather confusing situation. Now a good labelling system for environmental products has been introduced (Skall-label, Skal, 1996).

Few financial resources

Since organic agriculture aims at long term sustainability, it has been quite difficult to invest in organic agriculture. In the past, economic returns from organic farming were low and the risks were high. Little money for investment was available from banks that considered this sector to be risky with low profits. Traditional farming was regarded as economically more robust and a much more attractive proposition for the banks. The green investment funds scheme may alleviate this difficulty for organic farmers.

2.2.4 Enforcement failure

Polluter pays principle

As already mentioned, in practice the value of biodiversity is considered to be low. We also indicated that often there are non-existent property rights or in some situations biodiversity is considered to be a public good and consequently a public responsibility. In society it is normal for a person who damages property to be held liable for that damage. This principle does not apply to damaging biodiversity, the reason being that the value of biodiversity is considered to be low and non-existent property rights obstruct the way to the civil court for citizens. Considering biodiversity a public good, the government should defend biodiversity in the civil court. In practice this almost never happens in the Netherlands.

Not only does the civil law system fail to protect biodiversity, the same applies in the administrative system of law. In theory, environmental laws in the Netherlands generally apply the polluter pays principle. This principle is also codified in the EU system of law. Clearly, there is a difference between the theory and the practice. With regard to the protection level needed to protect biodiversity, the polluter pays principle is only implemented and enforced on limited scale. It is generally not applied in the case of emissions of low concentrations of minerals into groundwater, emissions of low concentrations of polluting substances, air pollution with low concentrations of acids, behaviour that has effect on the groundwater level etc.. All of this can result in harm to biodiversity without a real and viable opportunity of legally stopping the breakdown of biodiversity.

The lack of application of the polluter pays principle allows some economic sectors to go on producing far beyond the real price of their products. For example the environmental damage of the agricultural sector is estimated in the Netherlands to amount NLG 4-7 billion. (CE, 1996) (See Chapter 4, Table 4.2)

Detection problems

The enforcing of biodiversity conservation is hampered by the fact that biodiversity cannot be easily measured, making enforcement of incentives aiming at the conservation of biodiversity difficult.

Lack of enforcement

As biodiversity has hardly any value for farmers, spontaneous protection of biodiversity is not always likely. In the Netherlands there is a reasonably well-working enforcement system for environmental pollution but this enforcement is not targeted at the many types of pollution that are important for preventing loss of biodiversity. Currently there is only a low level of enforcement on the conservation of biodiversity.

2.3 Identification of adverse incentives

The numerous different kinds of financial support to agriculture is important. Some of these subsidies still favour intensive farming methods. In the discussion in the Netherlands on the environmental effects of the agricultural sector, such support is used as a argument to claim application of the polluter pays principle. In this discussion very different figures are given on the total amount of the support. In a controversial paper (Sijtsma , Strijker 1994), total support was estimated at 9 billion Dutch guilders a year. Most scientist don't agree with this high estimate (Stolwijk 1994, Oskam 1994). The various types of adverse incentives with negative impact on the biodiversity are:

2.3.1 Market protection/indirect subsidies

Dutch arable and dairy farmers operate within the context of the market and pricing policy for agricultural products of the European Union (EU). The EU market operates as a single market with one common border. Prices of agricultural products are maintained at a high level compared to world market prices. This protects farmers within the EU against cheap imports from outside the EU. Within the EU, production levels are kept high because of these high prices, causing high pressure on agricultural land and biodiversity. Recently, this protective policy has become harder to maintain because of the intervention of the World Trade Organisation (GATT negotiations) (Slangen et al., 1996).

Since the 1980s, agricultural policy in the EU has been reformed, for budgetary as well as political reasons. The EU tried to reduce surplus production of certain agricultural products, like milk. Since 1984 a quota system for milk has been introduced, only allowing for a limited production of milk on each EU dairy farm. The designated milk quota for a farmer was based on the production level of each individual producer in 1983. The milk quotas were obtained free of charge. Milk quotas are tradable among farmers so as not to restrict farm development. Since milk quotas are now very expensive, the free distribution is considered an important increase in property.

Other support takes the form of state-financed R&D and education. Agricultural research in the Netherlands is heavily backed by the state. Most of this research is aimed at increasing production. Education in the agricultural sciences in the Netherlands is at a high level. The costs of the Agricultural schools and the Agricultural University are borne by the government. Some agricultural activities use high amounts of energy. The main examples are the companies producing flowers and vegetables in green houses. The low price of natural gas in the Netherlands is often considered to be indirect support for this sector.

2.3.2 Direct subsidies

In the recent past farmers were able to obtain investment subsidies for machinery or buildings. This scheme also tried to stimulate environmentally-friendly investment, for example manure storage or

specific pesticide spray-equipment with low pesticide use. These subsidies have been one of the causes of the 'over'-mechanisation of the Dutch agriculture (Slangen et al., 1996).

The 1992 MacSharry reform to EU policy has different objectives: to recover the market-balance for agricultural products, to strengthen the competition position (especially for EU grains compared to imported cattle fodder), to improve the environment and to maintain employment in the countryside. Fundamental to this reform is the change from a product-bound market and price support to direct income support combined with lower product prices (Slangen et al., 1996).

The price decreases, especially for grain and cattle beef, are compensated by hectare payments and premiums. There is change from intervention and export restitutions to premiums and extra direct-payments. The total agricultural budget will not decrease, because since the MacSharry reform a bigger part of income-support is paid from the EU budget and less by consumers (Slangen et al., 1996). As a condition for income support, farmers need to set-aside a part of their cropped area. This can have a positive effect on biodiversity.

The MacSharry reform has certain positive impacts on biodiversity. Lower internal grain prices make it attractive to use EU grain for fodder. Less fodder needs to be imported from outside EU, reducing the pressure on the environment in the EU and reducing the potential damage to agricultural areas or forests elsewhere arising from the production of animal fodder (Slangen et al., 1996). Premiums to compensate decreasing product prices are based on average production-levels for a member state or region. Compensation payments are given to growers of grain, maize, cole seed and a few protein crops (Slangen et al., 1996).

2.3.3 Tax incentives in agriculture and their effect on biodiversity

The Dutch economic system has some fiscal facilities that encourage environmentally friendly investment in conventional as well as organic agriculture. These fiscal facilities include an accelerated depreciation scheme for environmental equipment. There is also an Environmental Impact Assessment income tax relief scheme for investments in energy saving equipment. These investments can reduce environmental degradation and might have a positive effect on biodiversity, especially if compared to terminated fiscal measures aiming at investment in agriculture in general or to promote mechanisation (Investment relief scheme and investment premium WIR) (Slangen et al., 1996).

2.3.4 VAT differences

There is currently a big difference between the VAT levels of 'inputs' for agriculture within the European Union. In the Netherlands inputs like fertilisers, pesticides, antibiotics have a low VAT level of 6%, making these inputs relatively cheap. The highest VAT percentage in the Netherlands is 17.5%. The difference is 11.5%, meaning that for the inputs a change to the higher VAT-level will cause a significant price increase for farmers. Implications for pesticides, if one assumes a price elasticity of demand for pesticides of -0.4, might be a decrease in pesticide-use of 4.6% (Oskam et al., 1997). Agricultural inputs in the Netherlands are only lightly taxed, whilst impacts on the environment and biodiversity are not taken into account.

Organic farmers use no artificial fertilisers or pesticides at all in their farming system, thus causing less damage to natural resources. Organic farmers are thus unable to profit from low VAT tariffs on agricultural inputs.

3. IMPACTS ON ECOSYSTEMS: ORGANIC FARMING PROJECT

3.1 Biodiversity in the Netherlands

3.1.1 Ecosystem biodiversity

Agriculture and other sectors have caused a considerable change in the biodiversity of Dutch ecosystems (see also section 2.1 Causes of agricultural impacts on biodiversity). Little data are available of impacts on ecosystems as a whole. In general there has been an increase in woodland area over the past decades, while the amount of wetland (due to conversion to agricultural land), heaths and peat soils has been reduced (IKC-NBLF, 1994).

It should be noted that the Netherlands is an intensively used country with a high population density; as a consequence almost no land is left to nature alone. The landscape has been formed by human actions. The trend towards mono-cropping larger areas and clearance of field-side vegetation gives the agricultural landscape an increasingly homogenous appearance (AKB, 1996).

Dutch ecosystems tend to be quite varied on a small-scale due to large differences in environmental circumstances because of differences in soil type (sand, loam, sand, peat), hydrology, lime content, organic matter content, acidity (pH), nitrogen-, phosphorous- and salt content, temperature and light. The environmental gradients influence vegetation types and richness through the amount of nutrients, for instance as well as through the balance between certain substances. In the Netherlands the gradients in water quantity and quality have a major impact on the type of ecosystem developing.

3.1.2 Species biodiversity

Gradients in water availability, a determining factor in the type of ecosystem developing in the Netherlands, have been greatly reduced over the last decades because of aridification and a change in the quality of water available. This causes a general reduction in the dispersion of all species, whilst some species become extinct (IKC-NBLF, 1994). A summary of the developments for different groups of species in the last decades is given below (IKC-NBLF, 1994). It should be noted that agriculture is an important pressure, but not the only pressure.

- Very negative development for *dragonflies and butterflies*:
  The total number of species decreases whilst no new species are found, the dispersion of most species reduces whilst for butterflies no species and for dragonflies only some species grow in numbers.

- Negative development for *mushrooms, lichens, amphibians and reptiles*:
  More species disappear compared to new species found, the dispersion of most species reduces (mushrooms and lichens), or the number of species stays the same whilst the

dispersion of an important part of species reduces, and no species increase in number or dispersion (amphibians and reptiles).

- Moderately negative development for *grasshoppers* and *fishes*:
  More species disappear as compared to new species found, there is an equilibrium between species disappearing and new species found (fish); or the number of species stays the same, but the number of individuals as well as the dispersion of most species decrease (grasshoppers). The situation for fish has been improving over the past decade.

- Neutral development for *mosses, higher plants* and *mammals*:
  About as many species disappear as new ones are found and the number of individuals increase or decrease in an equal number of species. The situation for mammals has been improving slightly over the past decade.

- Moderately positive development for *birds*:
  More new species are found than disappear and the number of individuals and dispersion of most species is increasing.

3.1.3 Genetic biodiversity and Agro-biodiversity

The reduction in biodiversity in ecosystems and species also has its impact on genetic biodiversity. Genetic agro-biodiversity is reducing due to developments in breeding plants (e.g. hybrid breeders lines) and animal species (e.g. through artificial insemination) for agricultural use (Lammerts van Bueren, 1993; Baars, 1993; AKB, 1996).

Agro-biodiversity has been greatly reduced due to the introduction of the government 'Descriptive list of varieties' (Rassenlijst), listing available breeder varieties with little genetic variability for agriculture, and because of current cattle breeding practices (including artificial insemination) with only a few high yielding cattle breeds (AKB, 1996). The government list, introduced in 1941, lists the seeds and plant materials which are allowed to be traded in the Netherlands and are considered safe for human consumption. This list was introduced to protect specific breeder varieties and to guarantee breeders a financial reward for their breeding practices. It also protected customers from buying unsafe products, e.g. potatoes with a high toxic solanine content. Farmers are only allowed to use the varieties given on the list. The list only offers genetically homogenous breeder varieties yielding high with proper artificial fertilisation and chemical crop protection. Organic farmers are not able to create a uniform environment through artificial fertiliser and pesticide use. The varieties on the list will therefore yield less on their farms. Organic farmers would also prefer to use site specific varieties, but these varieties are often not listed on the list and cannot therefore be used. The conservation of agro-biodiversity on organic farms is thus hampered by the government list (AKB, 1996).

3.2 Organic farming in the Netherlands

Most organic farms in the Netherlands are situated on young marine clay sediments, peat grasslands or on sandy soils, mostly in the northern and eastern provinces (RIVM, 1993). There are currently 554 organic farms in the Netherlands (14 334 hectares) including some large farms owned by the state and nature conservation organisations. Organic farming thus covers about 0.7% of the total Dutch agricultural production area (CBS, 1997).

The predominant organic agricultural production systems are arable farming, dairy cattle farming and mixed arable-dairy cattle farming systems (Skal, 1997a). Organic agriculture emphasises biological relationships and natural processes and is thus able to acknowledge the value of biodiversity. Organic crop production is based on the structure and the fertility of the soil and surrounding ecosystems, and serves as well as to provide a diversity of species. (Tables 3.1a and 3.1b).

Table 3.1a **General characteristics of organic agriculture and its effect on biodiversity**

Characteristics of organic agriculture	**Effect on biodiversity**
emphasis on biological relationships and natural processes	acknowledges value of biodiversity
no chemical pesticides/herbicides nor fertilisers	more numbers and species survive, balance
licensed farming method	acknowledges value of biodiversity
low energy/fossil fuel use	less pollution
labour-intensive and capital extensive	
soil-bound production systems	care for a ‘living soil’
mixed/diversified farming systems	higher agro-biodiversity and refuge for different species
farmers’ attitude	ability and need to value biodiversity

Table 3.1b. **Characteristics of organic agriculture (crop production, animal husbandry and nature conservation) and its effect on biodiversity as compared to conventional agriculture**

Characteristic organic agriculture	**Effect on biodiversity**
Crop production systems	
fertilisation	soil organisms
use of organic fertilisers	larger number
use of leguminous, nitrogen fixating crops	more species
special care for a 'living soil'	abundant top predators
	less pollution
weed control	plant species
no use of herbicides	larger number
use of crop rotations mitigating weeds	more species
thermal and mechanic weed control	survival of rare arable weed species
pest and disease control	balance between pests and predators
no use of pesticides/fungicides	higher species variability
choice of plant varieties grown	
use of crop rotations mitigating pests and disease	
crop rotation	
1 in 6 rotation	higher agro-biodiversity
less mono-cropping	genetic variability
crop choice	
Animal production systems	
fodder	
less concentrates	less fodder import (e.g. soya bean) needed
mostly on-farm and organically grown	diversified agricultural production system
extensive and soil bound (1 GVE/ha)	possibilities in nature conservation through low livestock densities
housing	
designed to meet animals behavioural needs	healthier farm animals
breeding	
choice of species	higher agro-biodiversity
breeding system	higher genetic variation amongst
no use of hormones nor antibiotics	

Nature conservation	
creating natural networks on-farm	interaction between individuals of species
woody networks	refuge possibilities
wet networks	migration possibilities
flowering networks	
less intensive use of field and water borders	more room for different species
set-aside nature	refuge and migration of species on farm

3.3 Biodiversity in organic agriculture

Organic agriculture influences biodiversity in two ways:

- on-farm: the organic farming method leaves room for flora, fauna and micro-ecosystem elements like e.g. bushes and hedges,
- off-farm: the organic farming method has a less polluting impact on the environment compared to conventional farming.

The possibilities for conservation of biodiversity in organic agriculture will be treated in subsequent sections.

3.3.1 Natural resource use: soil and water resources

Soil

Organic agricultural systems are always soil-bound (Skal, 1997), so good soil care is a must. Organic farmers aim to sustain a 'living soil'; thriving soil fauna are obtained through organic manuring and the use of green manure crops. Organic agriculture is therefore able to achieve a more efficient use of nutrients compared to a conventional system, causing less eutrophication of the environment. Both organic arable farming and dairy farming already qualify for the target restrictions on nutrient surpluses the government has set for 2008 (Table 3.2) (Braat and Vereijken, 1993; Eleveld and Wieringa, 1989). Organic manuring has a positive effect on the grassland flora and soil fauna.

Table 3.2. **Nutrient surpluses/hectare (including deposition, mineralisation and N-bonding) of organic arable and dairy farms**

	Nitrogen (N)	Phosphorous (P)	Potassium (K)
Arable farming	98	18	31
Dairy farming	136	8	45
Government standard for 2008	180	20	not applicable

Source: Newsletter for manure and anhydrous ammonia policies, 1996.

Water

In the Netherlands quite a number of water resources are polluted through pesticides or eutrophication (IKC-NBLF, 1994; Kraaij and Verstappen, 1995). Organic agriculture uses no pesticides and no artificial fertiliser while organic manure is used sparingly. This leaves opportunities for ecosystems dependent on nutrient poor situations. Drainage water from organic farms and surrounding surface waters is generally of better quality (see e.g. Table 3.3). The effect of organic agriculture cannot be expected to be very large: water is a resource usually shared with neighbouring conventional farms and/or industry.

Table 3.3. **Nitrate content of drainage water from a conventional and an organic farm, averaged 1984-1986. (Farms OBS at Nagele, Noordoostpolder)**

	Conventional	Organic
mg NO3-N/litre drainage water	12.4	5.0

Source: van der Werff, 1988 in PAGV, 1988.

3.3.2 Agro-biodiversity

Agro-biodiversity on organic farms is usually higher compared to conventional farms because:

- Organic farmers are not allowed to use genetically engineered crops or animal breeds, which generally are constructed from inbred family lines with little genetic variability (Skal, 1997; AKB, 1996).

- The genetic variability between different individuals of a certain crop or animal species is valued because it offers more protection against hazardous pests and diseases (AKB, 1996), and thus an organic farmer tends to grow a crop which is more genetically diverse.

- The cropping pattern is generally more varied to sustain soil fertility. Organic cropping patterns includes several green manure species and other more unusual crops like pumpkins or flax (AKB, 1996; Eleveld and Wieringa, 1989).

- Animals are considered an important part of the farm nutrient cycles. Some organic farmers therefore aim at a mixed farming system with arable crops and cattle, sometimes through alliances with neighbouring organic farms from a different sector.

3.3.3 Micro-ecosystem elements: landscape appearance

On organic farms the soil type gets reflected in the land use, resulting in a large number of agricultural habitats, since it is not possible to eliminate the differences in soil potential through the use of artificial fertilisers (Stroeken et al., 1993). The organic farming system has room for creating micro-ecosystem elements like bushes, hedges or cesspools. These small elements have a great potential value as a habitat for all sorts of plant and animal species (Braat and Vereijken, 1993; Stroeken et al., 1993). A large number of diverse habitats are very valuable to the organic farmer, since it provides him with a source of pest predators for example. Organic agriculture also aims at interaction between nature and agricultural functions and is not in favour of a strict separation between the two (AKB, 1996; Eleveld and Wieringa, 1989). About 10% of the organically farmed area is managed under the restrictions of a special nature conservation protocol (Braat and Vereijken, 1993).

Currently, initiatives are being undertaken to increase the amount of interlinked nature on organic farms in the Netherlands. Several arable farms in the Flevopolder try to set-aside 5% of the production area for nature purposes (Vereijken et al., 1994). On different farms throughout the country, farmers are developing woody, flowering and water networks for different plant and animal species on-farm (van Almenkerk and van Koesveld, 1997). These are both pilot projects in developing a protocol for nature conservation in organic agriculture. Organic farmers will thus be able to demonstrate the positive effect of their farming method on biodiversity through a less polluting farm management and conscious nature conservation.

3.3.4 Floral biodiversity

Arable weed species

Crop protection measures with synthetic herbicides and the large amounts of fertilisers used in conventional farming have greatly reduced the number and species of arable weeds. In organic agriculture weeds are removed mechanically (or thermally) and organic manure is applied more sparingly. More species of arable weeds find a habitat in organically managed fields, especially in field-borders (Table 3.4). Rare or threatened species are almost exclusively found on organic farms (Braat and Vereijken, 1993; Smeding, 1992).

Table 3.4. **Arable weed species on organic and conventional farms with different soil types.**

	Young marine clay	river clay	sand
Average number of species			
- organic	55	77	27
- conventional	28	62	25

Source: Smeding, 1992.

Grassland species

Organically managed grasslands get less manure resulting in different and more species as compared to conventional farms (Braat and Vereijken, 1993). On organic farms influences of soil, water and salt (Na) content are visible in the type of grassland developing (Table 3.5), whilst on conventional farms only one grassland type was found. Some organic farms, especially dairy farms, have permanent meadows, which are used extensively. These meadows have species of 'kamgrasweiden', and less common rye grass species.

Table 3.5. **Average number of species/100m2 in organic and conventional grasslands on different soil types in North Holland.**

Grassland type	Total species	herb species	grass species
- organic farm, clay soil	23.8	12.1	11.7
- organic farm, clay-sandy soil	17.6	8.0	9.6
- organic farm, peat soil	16.3	7.8	8.5
- conventional farms	15.3	7.7	7.7

Source: Braat and Vereijken, 1993.

3.3.5 Faunal biodiversity

Soil fauna

Promoting an active soil life is very important to the organic farmer. An active soil life reduces pests and diseases naturally and stimulates the soil processes that build soil structure and deliver nutrients to crops. Organic farms offer suitable opportunities for the development of an active soil fauna (Table 3.6).

Table 3.6. **Activity of soil fauna on an organic and a conventional farm (OBS at Nagele, Noordoostpolder) averaged over 1980-1985 for different crops.**

Soil fauna	crops grown	conventional	organic
Earthworms	sugar beets	2.7	13
VAM (Mycorrhiza fungi)	wheat	16	47
	potato	7	16
Nematodes	wheat	2405	3260
	potato	2035	1945
	sugar beets	3720	3835

Units: Earthworms: number/m^2 in 1980; VAM: per cent infected root length in 1981/82;
Nematodes: number/100 ml soil

Source: Zadoks, 1989.

Insects

Since organically managed grasslands have more herbal species, better coverage and more flowering, organic agriculture offers great potential in conservation of pollinating insects like bees and butterflies. Organic arable fields harbour more flowering arable weed species. These also attract pollinating insects (Braat and Vereijken, 1993).

There are approximately 1.5 times more artrophod beetle species on organic arable fields as compared to conventional fields, indicating suitable possibilities for the development of insect species (Table 3.7). Most insect species are also attracted to organically managed fields because no insecticides are used (Braat and Vereijken, 1993).

Table 3.7. **Number of species and individuals of artrophod species on organic and conventional arable fields in 1984 and 1985 (OBS at Nagele, Noordoostpolder).**

		Conventional		Organic	
		1984	1985	1984	1985
Carabidae[1]	species	27	28	26	39
	individuals	118	177	183	257
Staphylinidae[2]	species	24	23	23	19
	individuals	245	328	174	336
Spiders	individuals	234	216	472	480
Total	individuals	588	721	829	1073

1 Carabidae, order Coleoptera (beetles and bugs), approximately 350 spp in the Netherlands

2 Staphylinidae, order Coleoptera (beetles and bugs), approximately 800 spp in the Netherlands

Source: PAGV, 1985.

Larger animals

Larger animals like birds, amphibians, reptiles or small mammals find suitable habitats on organic farms because of a larger number of agricultural ecosystems and natural habitats like hedges or cesspools (Stroeken et al., 1993). Predator species profit from the abundant availability of food, e.g. insect or small animal species (Braat and Vereijken, 1993).

4. IMPACTS ON ECONOMY AND WELFARE

4.1 Direct economic losses

As mentioned before in the case of the PIM project it is hard to make an economic valuation of damages to biodiversity. Since biodiversity hardly has an economic value in the current Dutch economic system (see also section 2.2.1), little data are available on the costs of biodiversity loss to the Dutch society.

In 1989 a study was conducted estimating the costs of environmental damage, reduced production and rehabilitation costs through conventional agriculture at 3 billion guilders (Kalverkamp and Hoytema, 1990).

These costs are mainly due to:

Aridification

The aridification in the Netherlands has caused a drop of the groundwater table. A dropping groundwater table makes it increasingly difficult for crops to get enough water. In dry years the amount of water will not be enough, especially on vulnerable soils, like sandy soils with little organic matter. Farmers will have to irrigate or be satisfied with a reduced yield, a direct economic loss to the agricultural sector.

The quality of the water available is also important. If surface water resources are polluted, farmers will have to buy tap water to give to their cattle or crops. The reduced quality of surface water, due to a surplus of nutrients and/or pesticides, has damaged the ability of micro-organisms to regenerate the quality of the water resources. This loss of water biodiversity causes water to be unsuitable for different purposes. Polluted water can also cause a very direct economic loss to the organic farmer. Examples of products produced in an organic way being rejected as organic because of high pesticide residues are known, in this particular case the pesticides were spread on the product with irrigation water extracted from polluted surface water streams. Publicity on these cases causes a drop in consumer trust in organic products.

Acidification

The acidification of soils has a direct impact on the yield of certain crops, e.g. sugar beets or N-binding green manure crops. An added disadvantage of a acidifying soil is that nutrients will easily leach out beyond the reach of crops into the groundwater. On grassland and arable land, a decrease in pH-value stimulates weed growth. This reduces the yield or makes it necessary to increase weeding efforts. To prevent these losses, farmers try to halt acidification through liming, a costly procedure to repair damage to the soil.

Eutrophication

The high fertiliser use on conventional arable and dairy farms results in nutrient emissions, depositions and leaching causing eutrophication of the environment. Conventional farmers are required by government regulations to invest heavily in technical solutions to eutrophication problems, like sealing off manure pits (RIVM, 1991). Recently regulations for nutrient registration have been developed. Intensive animal husbandry will thus have to pay for the eutrophication it causes, because the farmer has to pay a levy if certain target levels of nutrients are not met: 'the polluter pays'.

Organic agriculture is usually less extensive and has no difficulty meeting the set nutrient targets (see also Table 3.2).

Dispersion of pesticides

The Dutch government is trying to reduce the dispersion of pesticides with the introduction of the Long-term plan for crop protection (LCPP), which was approved in 1991 (Oskam et al., 1992). In the late 1980s, Dutch crop protection experts indicated that a 50% reduction in kilograms of pesticides was feasible. The LCPP intends to reduce use, risk and dependence on pesticides by a set of measures like stimulating integrated arable farming, closed systems in greenhouse horticulture, change of regulations on soil fumigation and the banning of certain compounds. The plan included a financial levy, which has been converted into a covenant between the Agriculture Board and the government. An important aspect of this policy instrument is that it is well specified and combines clearly targeted reductions and instruments. However at a 50% reduction in pesticide use, still significant use and emissions remain and will continue to have a negative impact on biodiversity. The economic effects of pesticide use on biodiversity are still hard to quantify.

In organic agriculture no pesticides are used. Since pesticide residues also harm pest predators, organic as well as conventional farming obtain reduced yields through thriving pest organisms.

4.2 Potential benefits from utilisation of genetic resources

The gene pool for crops and animal species, a public good for possible future use, is not managed sustainably in conventional Dutch agriculture. The list of breeder varieties for example only allows farmers to grow a limited amount of approved species bred on a small genetic base (AKB, 1996; Lammerts van Bueren, 1993).

Organic farmers demand different characteristics from a crop, especially resistance to all kinds of pests and diseases and a tolerance to a lower nutrient level. Furthermore the crops or cultivars used in organic farming will be well adjusted to more dynamic circumstances. Organic agriculture can thus, on a small scale, conserve genetic diversity in crops and animal species by growing varieties that are well adjusted to local circumstances. Organic farming thus contributes to the safekeeping of the genetic resource base of agricultural crops and animals (AKB, 1996; Baars, 1993).

4.3 Effects of adverse incentives on efficiency

4.3.1 Efficiency

Low VAT tariffs of 6% on inputs like pesticides, artificial fertiliser and part of the energy, instead of the higher consumer goods levels of 17.5%, do not stimulate a cautious use of these inputs. More

abundant use of these inputs through lower prices has a negative impact on environmental quality and biodiversity.

Government investment premiums to promote mechanisation in agriculture, like relief on investment (investerings-aftrek) and the investment premium (WIR), have been abolished already. Schemes aiming at a more sustainable investments, like the accelerated depreciation on environmental investment scheme and relief on energy investment have recently been set up. These schemes so far are having a positive effect on environmental quality and might also influence biodiversity in a positive manner.

Biodiversity is not well accounted for in the price of agricultural products. Organic agriculture contributes to the conservation of biodiversity, especially agro-biodiversity, but organic products are relatively expensive. Conventional agriculture is able to produce cheaper products, because the cost of damage to the resource base is not taken into account. If the 'polluter pays' principle were to be introduced for agricultural products, conventionally grown products would be significantly more expensive than organic ones (Kalverkamp and Hoytema, 1990; see also Table 4.2).

4.3.2 Budget

The EU protected common market and concurrent high producers prices still cause a high production level within the EU. Further reduction of market protection would relieve some of the pressure on land use and hopefully improve the allocation of production.

4.4 Employment

Most incentives aiming at industrialisation and mechanisation in agriculture, as well as emphasising specialisation, reduce the amount of labour needed in conventional farming. Employment in the agricultural sector has therefore decreased significantly over the past decades to 4.6% of Dutch people currently employed in primary agricultural production (Slangen et al., 1996).

Organic farming is labour intensive compared to conventional farming. A large amount of labour is needed in the mechanical weeding of arable crops, managing all sorts of different crops or manuring. Organic farming is also a knowledge intensive method. The farmer needs to have an insight into crop rotations, mitigating weeds and diseases, crop varieties, animal well-being and management of organic manuring. Since artificial inputs like pesticides and fertilisers are not allowed, organic farming is capital extensive compared to conventional farming (Eleveld and Wieringa, 1989).

Organic agriculture requires less capital investments in inputs but it has higher labour costs, estimated to be 10 to 15% higher (Kalverkamp and Hoytema, 1990). Table 4.1 shows the higher labour requirement of some of the more important arable crops. Organic dairy farming also requires more labour, the costs for labour are NLG 46.75 per kilogram of organic milk as compared to NLG 39.32 for conventionally produced milk. Because an organic farmer cannot keep as many cattle as a conventional farmer, more cattle and therefore labour is needed to produce a similar amount of milk. These higher labour costs are compensated for by the added value of higher retail prices as well as through saving on costly inputs.

Table 4.1. **Labour required (hours per hectare) to grow a certain crop on an organic as compared to a conventional farm.**

Crop grown	Organic farming	Conventional farming
consumption potatoes	185	30
beet-root	235	25
consumption carrots	1140	1000
leek	1150	1000
white cabbage	700	500
red cabbage	600	400

Source: PBLV, 1997

Some organic products are exported. Forty percent of the potato-vegetable-fruit range is actually sold abroad (LEI, 1990). Organic producers mostly try to sell their products direct to consumers on-farm or on a local market. This gives them the opportunity to educate the consumer about products and the method of production. The provision of information is an extra source of added value generated in the countryside. The marketing of the organic products on a local or regional basis means that extra labour is generated near the place of production.

This contrasts with conventional trading, where products are sold to (big) retailers or processing industries and most labour is transferred to other economic sectors. This may involve a lot of transport, processing and retailing and thus lead to loss of environmental quality and biodiversity.

4.5 Total economic effect of organic farming

Kalverkamp and Hoytema (1990) compared the economic aspects of conventional versus organic agriculture:

Table 4.2. **Comparing the economic aspects of conventional versus organic (biodynamic) agriculture**

	Conventional (billion guilders)	Organic[1] (billion guilders)
Gross production value	32.6	19.8
Purchasing raw materials/services to 3rd parties	18.3	8.0
Added value	14.3	11.8
Labour	10.6	11.9
Capital expenses etc.	6.7	5.7
Economic result	**-3.0**	**-5.8**
Environmental damage 1 (measures)	1.8	0
Environmental damage 1 (reduced production)	1.3	0
Result 2	-6.1	-5.8
Environmental damage 2	3.0	0
Result 3	**-9.1**	**-5.8**

[1] Amounts for organic agriculture are calculated as if Dutch agriculture as a whole would have converted to the organic production method.

Source: Kalverkamp and Hoytema, 1990.

An important point is that the labour output was estimated to be about 10% higher for organic agriculture at a strongly lower gross production value. But this bigger gross production value of conventional farming arises from purchase of raw materials from third parties and from polluting the environment without paying for it. The authors took into account three types of environmental damage by conventional agriculture. The application of the polluter pays principle changes the total result of agricultural activity. Organic agriculture has a considerable advantage. As long as the polluter pays principle is not fully applied, the organic sector only will survive if consumers pay a higher price for the products or the government supports this sector. The beneficiaries of current inaction are farmers carrying out activities that cause environmental degradation and loss of biodiversity, but who are not required to pay for these losses. But not only farmers are 'beneficiaries'; the same goes for people who use resources in an unsustainable way and fail to pay for the cost of the damage to nature and the environment. So present-day society as a whole, which pays low prices for its food, is leaving the bill to be picked up by the next generations. Society pays the cost of loss of biodiversity, as will future generations.

5. IMPLEMENTATION OF INCENTIVE MEASURES AND CONTEXT

5.1 Identification of incentive measures

5.1.1 Green investment funds scheme

The initiative for tax-free green investment was taken by Parliament in the Netherlands, which considered it desirable to encourage Dutch citizens to become more involved in investing in green projects. The reasoning was that by offering fiscal incentives, more savings would be made available for these green projects. Such projects are difficult to finance, since they do not always provide the rate of returns the market expects. By ensuring that investors' returns on such projects are untaxed, this allows them to compete with the returns of regular investment funds on the market.

Possibilities of tax-free investing in green investment funds have been available in the Netherlands since 1 January 1995. This means that private investors are not taxed on their interest and dividend income, provided that this derives from investment in certain green investment funds. These green investment funds, in turn, have to invest in certain green projects. The aim of this tax concession is to encourage investment in major environmental projects, involving forests and nature areas, sustainable energy supplies and environmental technology.

Green investment funds will be required to meet the criteria the Dutch Central Bank normally sets for Dutch investment and credit institutions. The object and actual activities of green investment funds must primarily be the provision of funds to green projects: projects, which are important to the environment. To this end at least 70% of the total assets of green investment funds have to be invested in green projects. Green investment funds are not allowed to run green project themselves.

The Tax Authority assesses, on request, whether a credit or investment institution meets the criteria that have been set and whether they can therefore be designated as Green investment funds.

The legal provisions for Green projects give a definition of what a green project entails. It is defined as a cohesive whole of assets, including fixed and floating assets, which are technically necessary and solely serve to achieve and maintain the project. The projects have to be new projects, though a fundamental improvement to an existing project can also be regarded as a new project. For each project an individual statement (a Green Statement) will have to be applied for by the investment institution. These statements are being issued by the Ministry of Housing, Spatial Planning and the Environment and are valid for a maximum of ten years. They can though be renewed. The statement indicates the nature of the project and the project's assets as well as the period of validity.

If a project falls into one of the designated categories, those seeking funding for this can apply to a Green investment fund, frequently a bank. If the investment fund is prepared to provide the money, it

then applies for a Green statement for the project in question to the Minister of Housing, Spatial Planning and Environment. The Green statement is the basis on which the institution can award tax-free payments deriving form its investment in the project. This is different to normal saving or investment funds where interest received above f 1 000, is taxed as income, with rates of 35%, 50% or even 60%. The Green investment fund submits an annual report to the Tax Authority.

The main aim of the incentive was:

- To create new projects in the field of nature conservation.

- To promote a change in economic activities so that these activities are performed in harmony with the surrounding ecological world. The idea was that the conservation of biodiversity involves more than the creation of national parks. Biodiversity is only guaranteed if society is able to perform its economic activities in such a way that nature is incorporated into it activities rather than being rejected.

- To promote the dissemination of technology for sustainable energy.

- To promote public involvement in environmental projects.

The projects under the scheme are not restricted to one economic sector. Many green projects can be found in the agricultural sector. But entrepreneurs and organisations outside this sector may also profit from the scheme: estate and nature reserve administrators, developers and manufacturers of ecological and sustainable energy equipment, public utilities and local authorities. Since November 1st 1996, sustainable construction is also covered by this scheme, enabling project developers, housing corporations, building contractors and private real estate owners to apply as well.

The designated categories are periodically updated. In any event the projects have to be new ones and the have to be in the Netherlands. Consideration is being given to whether projects in a limited number of other countries will be able to qualify in due course.

The following categories apply:

Projects in the field of nature, forestry, landscape and organic farming
- projects aiming to develop and maintain forests;
- projects for the development and maintenance of nature reserves and country estates;
- projects aiming at producing and processing organic farming products;
- projects which aim at the industrial processing of agricultural raw materials into products which are not suitable for human and animal consumption (environmentally friendly agrification).

Projects in the field of sustainable energy
- generation of energy from timber and energy-rich crops (biomass);
- wind energy;
- solar energy;
- the extraction of geothermal energy;
- energy from water power;
- the use of heat pumps;
- storage of heat or cold in an aquifer;
- heat distribution networks for urban heating and the heating of greenhouses for market gardens (use of heat released in generating electricity);

Housing

– with low energy consumption, built from environmentally-friendly building materials. using ecologically benign building processes. An individual owner can thus obtain a so called green mortgage, carrying a relatively low interest burden;

Other projects

– these are project which, in terms of their nature and environmental return, are on a par with those in the designated categories. Market players can put forward projects themselves for assessment.

The budget available for the scheme started in January 1995 with 25 million guilders, which allowed for Green projects of around one billion guilders. It took ten months to start the first Green Fund. At March 7, 1997 this amount of money had been used for a total of 186 projects. The application procedure for the Green statement and the annual reporting by green investment funds offers adequate opportunities for monitoring the budget. Approved projects are very diverse, with a strong focus on renewable energy, energy saving, organic farming, green mortgages, and nature projects. Also a number of recycling and waste processing projects have been included. More than 500 wind turbines have been issued with a Green statement. More than 230 organic farmers have successfully applied.

At the moment practically all Dutch banks have set up one or more Green investment funds. Investors and savers, too, are displaying a lot of enthusiasm. It is estimated that in practice money obtained from a green fund carries a 2% lower interest rate than the market rate. It is expected that a third billion guilders worth of green projects will be achieved in January 1998.

The total benefit of the scheme is not so easily measured. Of course there are the benefits for the environment and nature. These are difficult to value in economic terms. Next to the obvious advantages, there is also the feeling of consumers who contribute to a environmentally friendlier society. They put their savings into these projects. As interest is lower than from regular funds, they relinquish some of their future income. Even with the tax-relief given, these green investment funds still have a lower rate of return than some other funds. The feeling of doing something for nature and future generations is one of the reasons the scheme has worked. Consumers wouldn't participate in this scheme if it didn't improve their well being.

5.1.2 Farmers converting to organic agriculture and green investment

Green investment will have a positive effect on the number of farmers converting their farms from a conventional production method to organic agriculture. Reasons why farmers convert to organic agriculture vary from personal motivation and idealism (group 1), to defensive reasons to overcome the crisis in conventional agriculture (group 2) to economic reasons (group 3) (Table 5.1). Since the beginning of this century up to the 1980s, farmers converting to organic agriculture did this out of a strong personal motivation. In the 1980s the number of farmers converting increased due to the improved organisation of certification in organic agriculture and the increasing problems in conventional agriculture (see also figure 1.1). Green investment will provide an incentive for farmers to convert to organic agriculture for economic reasons. Such farmers expect a better net result from farming organically.

Table 5.1. **Reasons why farmers convert to organic agriculture and the incentives to promote conversion.**

	Reason for conversion	Incentive for conversion
Group 1	personal motivation/idealism	knowledge of organic agriculture
Group 2	defensive reasons	well organised certification system subsidies/help in conversion process
Group 3	economic reasons	Subsidies/green investment

5.1.3 Incentives for organic farmers

Organic farming is actively stimulated in the Netherlands through a number of direct and indirect incentives. These incentives include: subsidies for farmers converting to organic agriculture, eco-labelling, certain tax incentives like the accelerated depreciation scheme and tax relief on energy investment and 'green' investment.

Arable farmers converting to organic agriculture have to wait a two year period during which they farm organically but are not allowed to sell their products under the EKO hallmark because of the expected residues of inorganic fertilisers and pesticides in the soil. To overcome this gap, subsidies are provided during this conversion period. For dairy farming a similar conversion period is expected to become a law in 1998.

Eco-labelling, the possibility of selling products under the EKO hallmark, provides farmers with a certified system to sell their products at a higher price. However, an annual fee is required to become a member of the Skal organisation and thus obtain the EKO hallmark.

Tax incentives aiming at environmentally sustainable investments provide direct economic opportunities for organic farmers, as well as 'green investment'

Benefits of green investment to the organic farmer

The benefit of a 'green loan' to the organic farmer amounts to around 2% of the loan per year. So far approximately 220 million guilders have been invested in organic agriculture (Table 5.2).

Table 5.2. **Total number of requests for 'green loans' by organic farmers and total amount of money requested.**

	Arable farming	Dairy farming	Mixed farming	Total
total number of requests (till 11-08-1997)	103	105	25	233
total requested sum of green loans (guilders)	88 300 000	99 300 000	33 900 000	222 000 000

5.1.4 Policy failure and green investment fund system

Green investment provides a partial solution to the policy failures analysed in section 2.2. Green investment offers financial opportunities to organic farmers thus creating a more viable organic agricultural sector. Organic agriculture in return offers possible solutions to the following policy failures:

- Market failure: biodiversity is considered a public good, and has as such no market value in the current economic system. If a worthwhile public good is not valued by the market price mechanism, the government introduces other measures: one of these is green investment.

- Information failure: people are unable to value biodiversity. Organic agriculture often combines agricultural production with education of the consumer, giving people a sense of the agricultural production process and the conservation of natural resources. Consumers can become aware of the polluting effects of a conventionally production process and accept if the price of the organic product thus obtained increases. Organic products are expensive compared to conventionally grown products because pollution is not accounted for in the price of conventional products. Consumers thus have less incentive to buy organically grown products.

- Institutional failure: although the situation is improving through the introduction of incentives to promote sustainable investments and direct supportive measures, most institutions are directed at technical solutions to pollution problems and keeping agriculture conventional. Green investment is meant to support organic agriculture for one thing and thus help solve pollution problems through different management strategies.

- Enforcement failure: it has been quite difficult to introduce measures to 'let the polluter pay', like the mineral registration scheme. Enforcement of green investment has been relatively easy, it is a positive incentive measure and not a sanction. Enforcement of 'green investment' only requires a Skal certificate for organic farmers or a green certificate for other projects.

5.2 Process of implementation and distributional effects

Green investment did not develop out of concern for specific biodiversity issues. Green investment does have an effect on biodiversity: all projects aimed at the conservation of the environment can have a positive influence on biodiversity in the conservation and creation of habitats for different species or in the conservation of species or ecosystems as a whole (Sprengers et al., 1995). Green

investment was introduced out of an overall concern for the environment. Green' and sustainable projects are considered very important, but they usually generate lower profits and may have difficulty getting financed.

5.2.1 Beneficiaries of 'green investment'

Beneficiaries of the green investment incentive measure are people who carry out green projects in the agricultural sector - organic farmers. Society as a whole pays the cost of implementing green investment, since the decrease in taxes paid decreases the available government budget.

Society as a whole benefits from green investment because public goods like the environment and biodiversity get attention and may be better conserved. Society as a whole also pays for green investment. Since the people who enjoy the benefits also pay for the conservation of these benefits, green investment is quite efficient in economic terms.

The countryside also profits from the introduction of green investment. The possibilities for local employment increase with a viable organic agricultural sector, since organic agriculture requires more labour.

5.2.2 Participation in establishing green investment

The following groups have participated in establishing green investment:

- the government, ministry of finance, the ministry of the environment, the ministry of agriculture, nature conservation and fisheries;
- parliament, several parties argued in favour of introducing green investment;
- environmental groups, well organised lobby groups working for collective interests;
- organic farmers' associations: relatively well-organised groups representing the interests of organic farmers.

5.2.3 Enforcement of 'green investment'

To obtain a 'green' loan, a Green Statement is required. For organic farming, this is based on a Skal certificate licensing organic agricultural production. Organic agriculture is a fully certified production method. Skal checks farmers and processors of organic products approximately twice a year. Skal licenses farmers and processors to use the EKO hallmark. It was relatively easy for organic agriculture to obtain 'green' funding because as a result of the existing monitoring infrastructure, it was already a certified and controlled production method.

The enforcement of the Green investment funds scheme is fairly simple. The role of the banks is dominant because the risk of losing the Green statement is a real threat. If a project loses its Green Statement and a small part of the money from the funds is not loaned 'green', the fund will lose its green status. The consequences for the fund are dramatic. This threat makes banks very serious in their enforcement task. The banks are obliged to report to the Central Bank and to the Treasury. The results of these reports are checked by a special group of experts.

5.3 The role of information and uncertainty in the implementation process

5.3.1 Information about the value of biodiversity

There is a lack of knowledge about the value of biodiversity in the Netherlands (Sprengers et al., 1995, see also chapter 2). The possibilities of increasing biodiversity in relation to various social functions, including agriculture, housing, a lack of space, have hardly been analysed at all so far. There is enough knowledge about biodiversity to pursue a sensible policy even now. The social acceptability of these policies is being hampered because uncertainties and lack of knowledge are seized upon as being a legitimate excuse for not taking the necessary steps (Sprengers et al., 1995).

5.3.2 Information about economic impacts

Organic farmers get information about 'green investment' through the appropriate government channels and through their own organisations. The most important information channels for the farmers are their banks. The government office normally distributing agricultural subsidies (LASER), is currently sending an informative mailing to all Skal licensed farmers to inform them about the possibilities of green investment. As these become better known among farmers, the number of applications increases.

5.3.3 Use of indigenous knowledge in implementing 'green investment'

Indigenous knowledge has not been used in implementing green investment, but traditional farmers' knowledge has been used in establishing a licence for organic agricultural production.

Organic agricultural management is partly based on traditional local knowledge of resource management and conservation. Organic agriculture uses modern techniques, it is a modern way of agricultural production. But it also builds on old farming knowledge and techniques and tries to find a synthesis between traditional and modern techniques (Goewie, 1995).

5.4 Framework and context of implementation

5.4.1 Legal framework and institutions concerned

Green investment is a government regulation embedded in a legal framework as an amendment to the 1964 income tax law. Implementing green investment required the active participation of the Ministry of Housing, Spatial Planing and the Environment (VROM).

Two groups of projects are important in the framework of the incentive. Organic farming belongs to the group mentioned on a list of eligible projects. These projects are awarded a Green Statement almost automatically.

5.4.2 Cultural, historic and social context

The decision to push for a form of green investment was taken by several members of parliament in 1993. The law was passed on 24 July 1994.

Green investment is quite popular among Dutch investors, the money invested in green funds proved too much to spend on green loans in the Netherlands alone. The possibilities for investing in 'green' projects has therefore been widened to include projects abroad. Because of the popularity of green investment and the public's increased awareness of environmental issues, it can be concluded that 'green investment' fits well into the Dutch social context.

5.4.3 Internal evaluation and remedial process

The green investment scheme can be amended. The scheme is quite successful. It has been successfully changed this year to include investment abroad and will be applied in 1998 in developing countries loan to organic farms obtained before 12 June 1994.

6. RELEVANT POLICY CONCLUSIONS

6.1 Assessment of green investment

In the following section green investment is assessed against five sets of criteria (Table 6.2) .

6.1.1 Effectiveness

To assess the effectiveness of green investment the following question should be answered: does green investment meet the objective of saving biodiversity? The impact of green investment on biodiversity can be divided into:

1. the effect of green investment on organic farming,
2. the effect of organic farming on wild and agro-biodiversity.

Table 6.1. **The effectiveness of green investment in meeting biodiversity conservation objectives in organic farming.**

	Effect of green investment on organic agriculture	Effect of organic agriculture on biodiversity	
		non-domestic biodiversity	agro-biodiversity
Effectiveness	good	moderate/good	high

Green investment has a good effect on organic agriculture because:

- Green investment allows organic farmers to reduce their annual interest payments by around 5 000 to 10 000 guilders for a long-term period (10 years). Green investment gives positive attention to organic farming and can be an incentive for some farmers to convert to organic agriculture. Green investment is easily monitored through the Skal certified organic production system.

Organic agriculture has a moderate effect on wild biodiversity because:

- Organic agriculture has certain production objectives, it is not a nature conservation land use practice, but the farming method offers possibilities for different species in creating habitats on the farm. On top of that organic agriculture causes hardly any pollution.

Organic agriculture has a high effect on agro-biodiversity because:

- Organic agriculture needs and values (agro)-biodiversity in the production process and it offers good potential in the conservation of agro-biodiversity, especially in the variety of crops grown and animals kept with high genetic variability, in arable weeds, soil life and small landscape elements.

6.1.2 Efficiency

Economic efficiency of green investment is defined as: the cost of green investment to achieve the objective of conservation of biodiversity. Green investment has been introduced to call a halt to environmental degradation. Biodiversity is largely dependent upon a healthy and sustainable managed environment and would therefore profit from environmental conservation activities. Since not all environmental effects generated by organic farming are relevant to biodiversity, green investment can be deemed to be moderate to good in terms of economical efficient (Table 6.2).

6.1.3 Equity

Are certain groups of people advantaged or disadvantaged by the introduction of green investment? No group of people is greatly disadvantaged and organic farmers are advantaged. Organic farmers give in return: they are able to promote wild biodiversity to some extent and agro-biodiversity to a large extent. Green investment enables loans to be provided at lower interest rates, and is consequently only available to farmers using capital from a bank, a potentially inequitable situation. Moreover, farmers requiring a larger loan get a better interest deal from the banks providing the green loans. Overall, green investment qualifies as good (Table 6.2).

6.1.4 Administrative feasibility and cost

Administrative feasibility and cost are defined as the cost of implementing and sustaining green investment? They qualify as good since the legal framework (tax laws etc.) was already in existence and only required some modification. The costs of checking compliance with the rules of the green investment scheme in organic farming are low, since the certification and monitoring system was already in place.

6.1.5 Acceptability

Acceptability is defined as the degree to which green investment is accepted among the general public, organic farmers and investors? Acceptability of green investment is very good, because it fits well into overall Dutch policy strategies, it is popular with investors, banks and farmers and is well accepted by the general public as a good measure to promote investment in ‘green’ projects.

Table 6.2. **Evaluation of green investment against five aspects**

Policy aspect	Effect in relation to organic farming	Effect in relation other projects
Effectiveness	Good	Good
Economic efficiency	Moderate-good	Good
Equity	Good	Good
Administrative costs	Good	Good
Acceptability	Very good	Very good

(Assessment range from very bad, bad, moderately bad, neutral, moderately good, good to very good).
Source: OECD, 1996.

6.1.6 General assessment

Green investment is popular among investors (more money in green funds than can be invested) and opens up financial opportunities to organic farmers. Green investment provides organic farmers with a relatively small reduction in the interest rates they have to pay, but the loans provided are long-term. Farmers are not explicitly asked to pay extra attention to the conservation of biodiversity. Organic agriculture, however, offers good opportunities to help in the conservation of biodiversity, especially agro-biodiversity. Agro-biodiversity is a valuable part of the organic farm management system, providing the organic farmer with a 'living soil' which helps to release nutrients and builds soil structure, resistant plant and animal species, pest predators and a large variety of agro-ecosystems. In conservation of wild biodiversity organic agriculture creates habitats for certain species. Arable weed species are almost exclusively found on organic farms (Braat and Vereijken, 1993; Smeding, 1992). Organic agriculture also offers good prospects for the conservation of different animal species, especially terrestrial animals (Braat and Vereijken, 1993).

Green investment also offers a farmer funding for several years, initial interest reductions are valid for approximately 10 years. Conservation of biodiversity will definitely benefit from this long-term strategy, as will organic agriculture. Green investment provides farmers with indirect income support since it relieves the financial burden on primary production goods. Green investment thus has a positive effect on the conservation of biodiversity in the Netherlands

6.2 Transferability of the experience

6.2.1 Representativeness

This case study is fairly representative of the situation in OECD countries, since many of them have a well-organised organic agricultural sector (IFOAM, 1997), which has an equally positive effect on biodiversity (Braat and Vereijken, 1993).

6.2.2 Obstacles

The concept of green investment is transferable to other OECD countries. However it requires a taxation scheme in which interest and dividend are taxed. Failing this, the advantages of the scheme can be exploited in a different way. Another very important point is the attitude of public. You need a public that is willing to offer money at a moderate rate of interest. The co-operation of the banks was no problem at all; their contribution was essential.

6.2.3 Minimum requirements

Organic agriculture can have similar positive impact on biodiversity in other countries (Braat and Vereijken, 1993). For organic agriculture to be a viable sector, it requires:

1. A trustworthy monitoring and certification system.
2. A market and distribution system for organic produce.
3. Growth potential (otherwise investors would not want to invest).
4. A similar effort of organic farmers in the conservation of nature, including biodiversity.

Green investment has a positive impact on organic agriculture. To implement green investment the following is required:

- a legal framework;
- political willingness to implement this kind of policy;
- a taxation system with income tax;
- a certification system for 'green' projects;
- co-operating financial institutions like banks and investors.

6.3 Policy advice for implementation

The incentive scheme scored well on efficiency, effectiveness and other policy aspects so it can be recommended to other policy makers. A green investment funds scheme needs to be carefully introduced. Before starting, a long period is needed to convince all the participants and to develop a properly working scheme. The scheme will be an optimum success if applied as an incentive together with other instruments.

The most important benefit of the green investment funds scheme is that the market generates a tremendous amount of money that is available for environmental projects. This amount of money could never be generated by the government or by the project owners. Moreover it is money generated at moderate expense to the government.

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Country	Case study title
Australia	A Revolving Fund for Biodiversity Conservation in Australia
Austria	Austrian Case Study on Economic Incentive Measures in the Creation of the National Park Neusiedler See - Seewinkel: Summary
Austria	The Austrian Programme on Environmentally Sound and Sustainable Agriculture: Experiences and Consequences of Sustainable Use of Biodiversity in Austrian Agriculture
Canada	Revealing the Economic Value of Biodiversity: A New Incentive Measure to Conserve and Protect It
Canada	Using the Income Tax Act of Canada to Promote Biodiversity and Sensitive Lands Conservation
Denmark	Economic Incentives for the Transformation of Privately Cultivated Forest Areas into Strict (Untouched) Forest Reserves
Finland	The Act of the Financing of Sustainable Forestry and the Development of Forest Certification
France	A Cost-Benefit Analysis of Biodiversity Conservation Programmes in the Garonne Valley
Germany	UNESCO Biosphere Reserves Schorfheide-Chorin and Rhön
Greece	Incentives for the Conservation of the Nesting Grounds of the Sea Turtle *Caretta caretta* in Laganas Bay, Zakynthos, Greece
Japan	The Case of Oze Area: Case Study on the Japanese Experience Concerning Economic Aspects of Conserving Biodiversity
Korea	Case Study on Korean Experiences Relating to the Conservation of Biodiversity in Mount Chiri, with Special Attention to the Poaching of Bears
Mexico	Incitations Economiques pour la Protection des Especes de la Vie Sauvage au Mexique: Le cas de l'Espece *Ovis canadensis*
Netherlands	Green Investment Funds: Organic Farming
Netherlands	Green Investment Funds: PIM Project
New Zealand	Conservation of the Pae O Te Rangi Area
Norway	Valuation of Benefits Connected to Conservation or Improvement of Environmental Quality in Local Watercourses in Norway
Poland	Case Study on the Polish Experiences Relating to the Implementation of Economic Incentive Measures to Promote the Conservation and Sustainable Use of Biodiversity in the Biebrza Valley, with Special Attention to the Biebrza National Park
Turkey	The Development of Appropriate Methods for Community Forestry in Turkey
UK	Heathland Management in the UK
US	US Experiences with Incentive Measures to Promote the Conservation of Wetlands
US	Individual Transferable Quotas as an Incentive Measure for the Conservation and the Sustainable Use of Marine Biodiversity