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Multifunctionality: Applying the OECD framework
A review of literature in the Netherlands

by
Pieter H.Vereijken

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MULTIFUNCTIONALITY: APPLYING THE OECD FRAMEWORK
A REVIEW OF LITERATURE IN THE NETHERLANDS

by
Pieter H.Vereijken*

Introduction

1. The OECD has launched a series of empirical studies to try to answer the questions identified in its conceptual analysis of multifunctional agriculture (OECD, 2001). One of these is a study of multifunctional agriculture in the Netherlands. It should initially answer the three basic questions posed by the conceptual analysis, based on expert knowledge, literature and ongoing policy and research. These questions concern: 1) the nature and extent of jointness in agriculture of commodity and non-commodity outputs (positive externalities of a more or less public good character), 2) the possible occurrence of market failure to match production to demand for the non-commodity outputs, and 3) institutional options for creating or supporting a market for the non-commodity outputs. The three questions in full are:

1. Is there a strong degree of jointness in agriculture of commodity and non-commodity outputs (so that change in one output affects the other) that cannot be altered, for example, by changes in practices or technologies or by pursuing non-agricultural provision of the non-commodity outputs (possibly at lower cost)?
2. If so, is there some market failure associated with the non-commodity outputs?
3. If so, have non-governmental options (such as market creation or voluntary provision) been explored as more efficient strategies?

2. These questions should provide the insights needed to achieve a multifunctional agriculture, as much as possible led by the market, with a minimum of additional policy interventions. The author is aware of the fact that this vision of multifunctional agriculture has still not proven itself and is therefore controversial - even in his own country, the Netherlands (NL). So, as a researcher striving for objectivity, he cannot subscribe to this vision in advance. But in considering this market-oriented vision as an interesting option, he may contribute to an analysis of its feasibility by answering the three basic questions and various subquestions for NL. Besides, the answers may enable him to draw general conclusions about the actual and potential roles of market and policy in NL concerning multifunctional agriculture, or rather multifunctional land use in case of de-linked commodity and non-commodity production.

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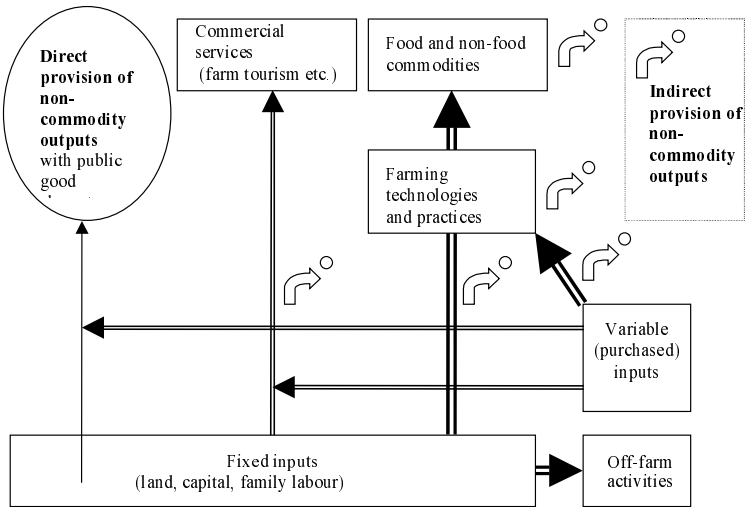
1. To what extent is NL agriculture jointly producing commodity and non-commodity outputs?

3. Before answering this question, the conceptual framework of multifunctional agriculture provided by OECD is discussed, as far as is necessary.

Relevant concepts of multifunctional agriculture

4. OECD uses a simplified model to show how a farm generates a bundle of commodity and non-commodity outputs (Figure 1). The fixed inputs (family labour, land and other fixed capital goods) can be allocated to produce food and other commodities, to provide for commercial services such as farm tourism, or to provide for non-commodity outputs with a public good character such as natural habitats and landscape elements (for example ponds and hedges). The latter may not be strictly joint with commodity production, but they are nevertheless joint products because they are generated from the same pool of fixed inputs. However, the major use of fixed inputs is for production of food and non-food commodities. For that purpose the fixed inputs are combined with variable (purchased) inputs based on the available farming technologies and practices (including relative prices and policies). This production of commodities may be joint with (indirect) production of non-commodity outputs at every stage of the production process (see curved arrows) based on common fixed and variable inputs and the use of a wide array of farming technologies and practices. A jointly produced non-commodity output is called an externality (of the production of a commodity) if it means an appreciable benefit (positive externality) or damage (negative externality) for persons not, or not fully, involved in the decisions to produce the commodity. The basic problem is that a commodity with a positive externality tends to be under-provided because the market does not incorporate the benefit to society. If the commodity is joint with a negative externality, then over-provision is likely. Producers of the commodity set the level of production at maximum profit while a higher or lower level of production might be necessary to maximise social welfare. So there is a divergence between producers' interests and society's interests. Policies to correct this "market failure" basically require that producers be given incentives to incorporate the benefits into their decision-making process when producing the commodity, or be taxed (or regulated) to incorporate the costs. In this case, an externality is "internalised".

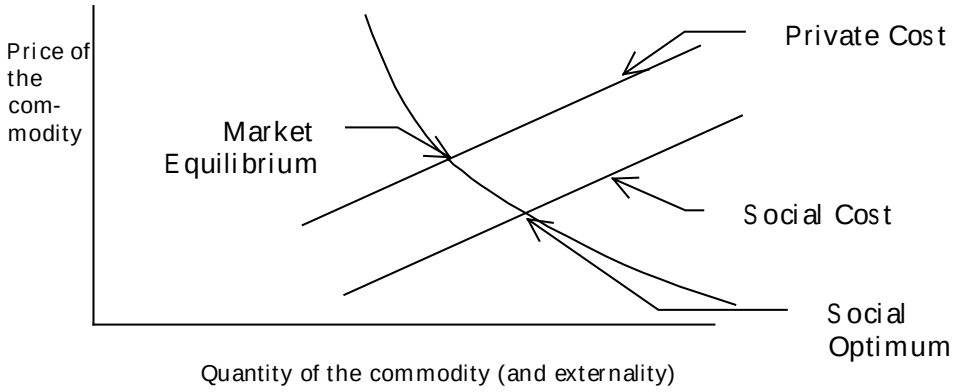
Figure 1. A schematic representation of economic activities on the farm



Source: OECD, 2001.

5. One of the most effective ways to discuss the divergence between producers' and society's interests is through the concept of private and social costs. Private costs are the costs that producers incur to produce a commodity that is joint with an externality. Social costs are obtained by subtracting the social benefits of the positive externality from the private cost (or by adding the social costs, in the case of negative externalities). This reflects the true cost to society of producing the commodity when there is an externality. (Net) social costs are, therefore, lower than private costs if the externality is positive. Both private and social costs are usually expressed in marginal terms. Private (marginal) costs are the costs required to increase production by one unit while social (marginal) costs are the difference between the private (marginal) costs and the (marginal) benefits of the externality (if it is positive) resulting from the increase by one unit of the product generating the externality. The two costs can be illustrated by a graph showing the relationship between the price and the quantity of the commodity in question (Figure 2).

Figure 2. Under-provision of a commodity with a positive externality



Source: OECD, 2001.

6. The market equilibrium lies at the intersection of the private cost curve and the demand curve of the commodity. However, a socially optimal point would lie at the intersection of the social cost curve and the demand curve of the commodity. In case of a positive externality (Figure 2), the commodity should be produced in greater quantity than the market equilibrium because the true cost of producing the good is smaller than that which producers face (*i.e.* the private cost curve). To obtain the alternative figure illustrating over-provision of a commodity with a negative externality, the curves of private cost (with market equilibrium) and social costs should just change places in Figure 2. With this brief reference to the OECD framework, the four sub-questions under the first question can be answered for NL-agriculture.

1.1 What physical linkages exist between commodity outputs, non-commodity outputs and negative externalities in current agricultural activities? Do these linkages depend on production levels of the commodity output, technologies and structures, and other factors? Do spatial factors affect the physical nature and degree of possible jointness?

7. Agriculture in NL involves five main activities with a wide range of commodity outputs. They are listed in Table 1a, in diminishing order of share in a bundle of six main non-commodity outputs. Dairy farming has all six and arable farming has three, though to a lesser extent. Horticulture out- and indoors and pig and poultry farming have only two non-commodity outputs: food security and rural employment. Horticulture and stable husbandry of pigs and poultry together use only 10% of national farmland. Therefore they do not have the other four non-commodity outputs, which require lots of land. In Table 1b the five main activities are listed in the same order. Of the bundle of seven main negative externalities,

dairy farming has six, arable farming four, horticulture out- and indoors each have three and pig and poultry farming have five. The overall picture (Tables 1*a* and 1*b*) seems complicated, but for each main activity it will be clear that the linkages between commodity- and non-commodity outputs and negative externalities are based on a limited number of factors. Also, it will be clear that intensification of commodity production implies increasing negative, and decreasing positive, externalities. So overall, social costs have increased with production levels and initial positive jointness probably has even turned negative. However, only the tendency of jointness can be estimated. The actual state of joint production cannot be estimated: it is probably impossible to estimate the social costs or benefits of the single externalities at current production levels and subsequently to calculate the sum of positive and negative externalities with sufficient accuracy.

Table 1a. Main farming activities in NL with joint production of commodity and non-commodity outputs

Main activities (gross production value in billion Euro)	Dairy farming (4.4)	Arable farming (2.1)	Horticulture outdoors (3.2)	Horticulture indoors (4.0)	Pig and poultry farming (3.9)
Commodity Outputs	dairy, beef	Potato, sugar beet, vegetables, cereals	flower bulbs, trees, shrubs, fruit, vegetables	Flowers, pot plants, vegetables	pig and poultry meat, eggs
Linkages to 6 main non-comm. Outputs: **a.** Food security (% self-supply)	a. milk 80, butter 150, cheese 320, beef 170	a. potato 140, sugar 190, cer. 25, veg. 260	a. veg. 260, fruits 60	a. veg. 260	a. pig 270, poultry 210, eggs 250
b. Employment[1]):	b. 110 000 (at least 12 hours /week)	b. 35 000	b. 45 000	b. 50 000	b. 25 000
-share in nat. empl. (total of agr=3.6%)	- nat.1.5%	Nat. 0.5%	nat.0.6%	nat.0.7%	-nat.0.3%
-share in rural empl. (total of agr. =27 %)	- rural 11%	- rural 3.5%	-rural 4.5%	- rural 5%	-rural 2.5%
c. Agro-historical landscape	c. pastures, ditches, hedges, farm buildings	c. arable fields, ditches, farm buildings			
d. Environment for rural recreation	d. in addition to c.: openness, quietness, silence (1.2 million ha, included 0.2 million ha of maize for silage)	d. in addition to c.: openness, quietness, silence (0.6 million ha)			
e. Natural habitats and biodiversity	e. pastures for migratory birds (a.o. more than a million geese)				
f. Ground- and surface waters management	f. pastures (1 million ha), ditches (100 000 km)(scope is limited because of intensive grazing)	f. (no scope because of intensive cropping)			

Source: data from LEI-DLO, RIVM and CBS, 2000.

Table 1b. Main farming activities in NL with production of commodity outputs and negative externalities

Main activities	Dairy farming	Arable farming	Horticulture outdoors	Horticulture under glass	Pig and poultry farming indoors
Commodity outputs	Dairy, beef	Potato, sugar beet, vegetables, cereals	flower bulbs, fruits, trees, shrubs, vege-tables	flowers, pot plants, vegetables	pig and chicken meat, eggs
Linkages to 7 main negative externalities: **a.** Environm. Pollution by excessive mineral inputs in manure on feed and cash crops: -share in N excess input (total =45%[2]) -share in P excess input (total=30%[3])	a. Feed import for more and higher productive cows than own feed allows, so excessive manure on own feed crops: - cattle 30% - cattle 15%	(a. use of pig and poultry manure)	(a. use of pig and poultry manure)		a. Import of most feed, so most manure goes to land-based activities - pigs 10%, poultry 5% - pigs 10%, poultry 5%
b. Acidification of natural habitats by ammonia volatilisation[4] -share in national acidification (total of agr.= 45%)	b. Ammonia emission from stables and slurry injected in the land -cattle 30%				b. Ammonia emission from stables and slurry injected -pigs 10% -poultry 5%
c. Desiccation of natural habitats (0.6 million ha) (agriculture causes 60%)	c. intensive drainage of grass and maize land to maximise period for growing and grazing	c. intensive drainage of land for max. prod.	c. intensive drainage of land for max. prod.		
d. Environm. Pollution by pesticides on feed and cash crops: -share in total input (act. ingredients 6025 ton, disinfectants excluded))	d. silage maize 7%	d. total 63%: -pot. 40% -s.beet 7% -cereals 7%	d. total 25%: -flower bulbs 14% -fruits 9%	d. total 5%	
e. Global warming by greenhouse gases[5]: -share of nat. emissions (total of agr.=11%, electricity excluded)	e. CH_4 from rumen and N_2O from manure and N-fertiliser -cattle 6%	e.N_2O from manure fert -total 0.5%		e. CO_2 from heating -3% (lighting excluded)	e.N_2O from manure (from stable and land) - pigs 1% -poultry 0.5%
f. Environm. Disturbance by ugly and smelly buildings, light emission				f. 10 000 ha of glasshouses	f. 10 000 ha of stables, scattered over the country
g. Reduction of animal welfare	g. the more production efficiency, the less chances for natural behaviour of the animals				g. the more production efficiency, the less chances for natural animal behaviour

Source: data from LEI-DLO, RIVM and CBS, 2000.

Dairy farming

8. This is the main activity in NL in terms of land use (1.2 of 2 million ha farmland), gross economic output and share in rural employment. Its focus is on cheese production, as appears from the 320% self-supply figure. Though only 1 million ha of grassland is available, much cheese still can be produced for the lucrative export-markets by using highly productive cows (8 000 kg milk/year on average) and providing them with a rich diet including nutritious roughage and an ample quantity of imported concentrates. Most of these concentrates originate in the United States, Latin America and other European countries and are imported through the harbour of Rotterdam. As a result, dairy farms have 30-50% more cows than their own feed production would allow and generate excess manure. This excess cannot be recycled properly by arable farming and horticulture, since these enterprises prefer to recycle the excess from practically landless pig and poultry farming. So the export success of Dutch cheese has led to an oversized dairy herd, largely dependent on feed import and producing a large excess of manure. Therefore, the oversized dairy herd is the main agronomic cause of nitrate and phosphate-based water pollution and ammonia-based acidification of weakly buffered natural habitats. It is also the main agronomic cause of desiccation of natural habitats by intensive drainage and of global warming. The latter conclusion is based on the emission of methane, 21 times as big a contributor to global warming as carbon dioxide. In spite of these negative externalities due to intensification and scaling- up during the last decades, dairy farming still has four major non- commodity outputs, based on its almost 2 million ha of pastures, which are intersected by more than 100 000 km of ditches. It also still has many thousands of km of hedges (Table 1a). However, scaling- up and intensification have strongly reduced the levels of non-commodity outputs. The loss in agro-historical landscape cannot easily be restored. But the remaining non-commodity outputs can still be restored to their former levels by de-intensification of dairy farming, leading to less commodity output per ha. Water management would benefit from less drainage, allowing the water table to rise in winter. This would provide for sufficient water in summer and would make the uptake of water from elsewhere and irrigation redundant. However, it would also reduce the period of grazing and mowing and thus commodity output per ha. Since dairy farmers are not compensated for this, they cannot de-intensify drainage up till now so as to benefit water management, notably of regional wetlands. For the same reason they cannot reduce the fertilisation of the grassland and the intensive grazing and mowing. Higher water tables would benefit flora and fauna, notably the migratory birds that breed in summer (RIVM and DLO, 2000). Subsequently, through restored biodiversity, the grassland areas would also be restored as an environment for recreation. So the intensification of commodity production in dairy farming has led to increasing net social costs, both by increasing negative externalities and decreasing positive externalities. But, by de-intensification, the jointness in production (including the sum of negative and positive externalities) could be made (more) positive again.

Arable farming

9. This is the second main land using activity (0.6 of 2 million ha farmland), but by far the smallest in gross economic output. Its share in rural employment is also relatively small. For food security it is more important, notably for its ample supply of potatoes, a favourite staple food for the Dutch besides cereals. The supply of cereals is only 25% of domestic demand, as the milling and baking industry prefers foreign cereals. So the inland cereals, soft and low in protein are mainly used as feed for poultry and pigs. The main reason why arable farmers still grow cereals is their indispensable role as a break crop in the short rotations with sugar beet, potato and vegetables as cash crops. Sugar beet is still a cash crop owing to its effective protection by the EU through domestic production quotas and import quotas imposed on much cheaper sugar from cane. However, the main cash crop is seed and ware potato and, in the north-east of NL, starch potato. To maximise production and economic output, this crop is frequently sprayed against late blight (Phythophtora), an air-borne fungal disease. As a result, intensive potato production is by far the main cause in NL of environmental pollution by pesticides. Together with sugar beet, it is a major cause of desiccation of natural habitats by intensive drainage. In spite of its various negative externalities due to

intensification, scaling-up and specialisation during the last decades, arable farming still has three major non- commodity outputs, based on its almost 0.6 million ha of fields intersected by more than 50 000 km of ditches (Table 1a). However, the intensification of commodity production in arable farming has led increasing net social costs, both by increasing negative externalities and decreasing positive externalities. But by de-intensification the jointness in production can be made (more) positive again, though the loss in agro-historical landscape can only partially be restored.

Horticulture outdoors

10. This activity uses 70% less land than arable farming, but generates 50% more gross economic output with a higher share of rural employment. Fruits are losing importance, because foreign producers have cheaper land and labour. Vegetables remain competitive and flower bulbs are expanding, owing to progress in technology enabling replacement of expensive labour by machines (mechanisation). Also, flower bulbs, trees and shrubs are expanding markets. So, horticulture outdoors is increasingly dominated by non-food production. Fruits and flower bulbs need intensive protection by pesticides and therefore are the main causes of environmental pollution by pesticides. In this sector also, intensification of activities has led to increasing social costs, by both increasing negative externalities and – in marginal terms – decreasing non-commodity outputs (food security and rural employment).

Horticulture indoors

11. This covers some 10 000 ha with glasshouses. Though this is less than 0.001% of the dairy farming area, it almost equals dairy farming in gross economic output. Horticulture indoors already generates more economic output and a higher share in rural employment than horticulture outdoors. As in horticulture outdoors, non-food production is rapidly expanding and increasingly dominant. On a per hectare basis, pesticide use is very high, but since the area is limited, the share of indoors horticulture in total pollution by pesticides is limited to 5%. Excluding carbon dioxide emitted in the production of the electricity needed for lighting (no data found), the contribution to global warming of heating the glasshouses is relatively high (3% of the national and 27% of the agricultural contribution). Also, the 10 000 ha of glasshouses are locally more and more experienced as a disturbance of the landscape and the night. The latter is caused by intensive illumination of the crops at night, which also illuminates the sky over a wide area. Also in this sector the intensification of activities has led to increasing social costs, based on both increasing negative externalities and – in marginal terms - decreasing non-commodity outputs (food security and rural employment).

Pig and poultry farming

12. Pig and poultry units cover some 10 000 ha. On this relatively small area they achieve a high gross economic output, comparable to horticulture, though their share in rural employment is only half. Nevertheless, the size of these activities creates a self sufficiency of 250-270% in pig and poultry meat and eggs. This huge export-oriented production (13 million pigs and 100 million poultry) is almost completely dependent on feed imports from Asia, the United States, Latin America and other European countries through the harbour of Rotterdam. Since pig and poultry farms are practically landless, their manure is offered to the land-based activities. Poultry manure is most acceptable for arable farming and horticulture, because of its high value for fertilisation. Pig manure is of less value for them and is only partially accepted. As a result, most pig manure is used, together with their own excess manure, by dairy farmers on maize. So the 0.2 million ha of silage maize in NL is the place where most excess manure is used, or rather dumped. The maize as a crop thrives well on this excess input of manure, but most of the minerals accumulate in the soil and leach to ground- and surface- water. As well, pig and poultry manure contribute a considerable share to global warming by emission of dinitro-oxide from denitrification. Finally, the 10 000 ha of units and silos for feed and manure, distributed all over the countryside, are seriously disturb

the landscape, including the possibilities for living, recreation and tourism. Of all five main activities, pig and poultry farming would probably be singled out as the activity with the highest social costs, if a national inquiry were conducted on this subject.

13. Over all of these five main activities, the linkages between commodity and non-commodity outputs and negative externalities differ spatially in both nature and degree. In other words: regions strongly differ in nature and degree of activities and thus in nature and degree of commodity and non-commodity outputs and negative externalities. For example: dairy farming is in every region but the highest densities of dairy cows occur on the sandy soils of the South and East. Also most pig and poultry units occur there. Most glasshouses are in the West and arable farms are concentrated on the sandy clay soils of the south-west and the middle and the peaty sand soils of the north-east.

14. For a more thorough analysis you are referred to the economic data and expertise of LEI-DLO and the environmental and ecological data and expertise of RIVM.

1.2 Where there is jointness, have attempts been made to de-link the non-commodity production from commodity production and how much has it cost? In other words is there any evidence concerning the cost of changing current farming activities to preserve non-commodity production following a change in commodity production?

15. Of the six main non-commodity outputs, food security and rural employment are considered first. Food security was a national priority after the food scarcity and even hunger of the Second World War. It was a major reason behind NL and five other European countries' founding the European Community. The stimulation and protection of European food production have even enabled NL-agriculture to develop into the second net exporter in the world (export value minus import value). In this situation it is understandable that no specific policy attempts in NL have been made to de-link food security from commodity production. Nevertheless, food consumption in NL is becoming more and more dependent on imports; some 50% of products in supermarkets are already from abroad (20% from outside Europe?). So, food security in NL and probably also in other EU-countries is spontaneously being de-linked by consumers replacing domestic by foreign products because they are different, better or cheaper ! Although agriculture has been an overall success in NL, in the most rural provinces in the North and East and also in rural communities elsewhere agriculture alone was not able to solve the sometimes high unemployment problem. Therefore, it has systematically been tried to improve rural viability by enhancing non-agricultural activities. As a result, rural employment is overall increasingly becoming delinked from agricultural production. Of course, the gradual reduction of the share of agriculture to 25% at the moment has only partly been achieved by these domestic policy attempts; probably other factors such as the development of international and European trade have contributed most to the "spontaneous" development of non-agricultural activities in rural NL, which further de-links rural employment from agriculture.

16. The serious negative externalities and the uncertain perspectives of land-based agriculture on the liberalising world markets would be strong reasons to deliberately de-link the four remaining non-commodity outputs. However, attempts up till now have been quite modest, involving an estimated annual cost of 1 billion Euro, which is only 0.3% of the national expenditure (Table 2).

Table 2. Government attempts to de-link land-based non-commodity production from commodity production in dairy and arable farming in NL (estimated costs per year)

Main attempts to delink non-commodity outputs	Payments of farmers for joint production in specific regions and on specific fields (costs/year)	Purchase of land for direct non-agricultural provision of non-commodity outputs in specific regions and on specific fields (costs/year)	Total costs/year (billion EURO)
main four land-based non-comm. outputs:			
c. Agro-historical landscape	c. payments for conservation of valuable landscapes and farm buildings (0.1)	c. in combination with d. or e.	0.1
d. Environment for rural recreation		d.in combination with c. or e.	0.0
e. Natural habitats	e. payments for various packages of conservation of natural habitats, notably for migratory birds to breed in summer or feed in winter (0.1)[6]	e. purchase and management of 0.5 million ha up till now and 0.25 million ha more in the future for an Ecological Main Structure (0.7)[7]	0.8
f. Ground- and surface water management	f. payments for loss of production by measures to protect or recharge groundwater or to enable periodical flooding (0.05)	f. purchase of strips of land along water courses and around water pits for better management (0.05)	0.1

17. Attempts are focussed on the creation of an Ecological Main Structure (EMS), to safeguard the great variety of natural habitats and the related biodiversity. Only a small part of this EMS concerns wild or unmanaged nature such as dunes, marshes and forests. Most of it concerns former woodlands planted for timber, grasslands for cattle husbandry and heather areas for sheep husbandry. Therefore, the EMS may also be considered as an implicit attempt to de-link the conservation of agro-historical landscape and rural recreation from agriculture. Explicit attempts to de-link these two non-commodity outputs have until now been practically negligible. However, explicit and more ambitious attempts can be expected, considering the gradual urbanisation of NL and the increasing demand for these non-commodity outputs besides nature. Firmer attempts to de-link the fourth non-commodity output of agriculture, groundwater recharge and flood control, can also be expected. There are two major reasons: to avoid negative externalities of agriculture (desiccation, pollution by minerals and pesticides) and to deal with increasing precipitation as a result of global climate change. In principle, the four land-based non-commodity outputs can be de-linked in two ways: partially by direct payments to farmers or completely by purchasing the land for economically and physically separate production of the non-commodity outputs. As appears from Table 2 both ways are followed in NL, though complete de-linking seems to be preferred in spite of higher costs. Up till now, the majority of farmers and policymakers prefer separate to joint production. However, the majority may prefer the reverse if agriculture loses the competition in liberalising markets and not enough land can be purchased or costs are too high for separate production. Then, both farmers and community could decide to deliberately join production of commodity and non-commodity outputs again, but in that case based on explicit demand and directly paid supply (separated from commodity supply).

1.3 If the production of a non-commodity output has been de-linked from commodity production have there been effects on production of other non-commodity outputs? What have been the effects on other non-commodity outputs of attempts to de-link a specific couple of commodity and non-commodity outputs?

18. The clearest example of de-linking in NL is the provision of natural habitats including preservation of biodiversity (Table 2). The Ministry of Agriculture, Nature and Fisheries co-ordinates both partial and complete de-linking. Complete de-linking involves the creation of the Ecological Main Structure (EMS) to collect the main existing natural areas, to connect them by special connection zones and to expand them by developing new natural areas. Currently the EMS covers 0.50 million ha of land: in 2020 it should cover 0.75 million ha. The additional 0.25 million ha should mainly be purchased from dairy and arable farmers. It mostly concerns farmland lying adjacent to, or between, existing natural areas and is appropriate or even necessary to strengthen the EMS because of its strategic location and its actual natural values. The Ministry has assigned the governments of the provinces concerned to delimit the areas to be purchased, which implies that farmers willing to sell land within these areas should first consider an offer of the province to purchase or exchange. Of course, it may take decades before a province has acquired the entire delimited area in this way. In the meanwhile, the transformation of the area from agriculture to nature has already started by contracting land for joint production of natural habitats. Farmers may choose a contract from a broad package of joint production couples, varying from slightly extensified grass production with breeding opportunities for meadow birds to strongly extensified grass production, including growing opportunities for various wild plants. Also for land around the EMS but outside the delimited areas for expansion of the EMS, farmers can sign contracts for joint production of nature. However, these forms of partial de-linking are not considered very cost-effective by most ecologists. They argue that NL gets a lot more biodiversity for on average 1 000 Euro/ha management costs of nature areas, compared to the 1 000 Euro/ha compensation for production loss for farmers extensifying their grassland for flora or migratory birds! Their opinion has made the Ministry up till now quite reluctant to invest more in so-called agricultural nature. So, national policy focuses on the complete de-linking of agriculture and nature. As already stated in the response to Question 1.2, expansion of the EMS to 0.75 million ha in 2020 also means a certain de-linking of agriculture and the other land-based non-commodity outputs: historical landscape, environment for rural recreation and rural water management. However, it is doubtful whether bundled direct provision on this scale could meet future demand, if most of the remaining land-based agriculture is lost to competition and the remaining 1.5 million ha of farmland urbanised or used in other ways that would limit or even exclude additional joint production of non-commodity outputs.

1.4 Have non-agricultural alternatives of providing non-commodity outputs been explored, or implemented? Have differences in costs and quality between agricultural provision and non-agricultural provision been observed?

19. For a long time the four land-based non-commodity outputs have been recognised as public goods, whose supply is too important for society to base entirely on voluntary joint production by agriculture. As a result, authorities and private clubs decided to assure sufficient supply of these public goods in addition to that produced jointly with agriculture. Almost a century ago, in support of the trinity of landscape, nature and environment for recreation, the initiative was taken by a club of friends of nature, called “Natuurmonumenten”. They started to purchase valuable and attractive nature areas and land properties in 1920 and have since then accumulated 0.10 million ha. Purchase and management are based on a mixture of gifts, legacies, membership fees and state subsidies (includinggifts from the national lottery). Later, the Ministery of Agriculture started a second non-agricultural provider, named “Staatsbosbeheer”. Originally it was the national forestry service, but it has been transformed into a

provider of nature and recreation environment, with the emphasis on forest management (total area with and without forests: 0.25 million ha). As well, the 12 provinces each started their own provision: "Provinciaal Landschap". Together they manage 0.10 million ha. Finally, various communities and private persons and parties own 0.15 million ha of nature and historical landscape, to a large extent open to the public. The role of these private and public providers has been increasingly recognised, along with a growing awareness that intensification, scale enlargement and specialisation have made agriculture a bad provider and even a destroyer of nature, landscape and environment for recreation. During the last years a minority of farmers has been trying to regain people's appreciation and confidence by voluntary or directly-paid provision of nature and landscape. As already stated, most ecologists and policymakers doubt the efficiency of agricultural nature, considering the its cost and quality. So, non-agricultural provision is still preferred.

20. The fourth land-based non-commodity output of agriculture, management of ground- and shallow waters has developed in an analogous way. Even centuries ago regional water boards were started to provide for water management, in addition to joint production by agriculture. Gradually the water boards have become the main provider, and intensification has changed agriculture from a provider to a consumer of water management. To face up to desiccation of natural habitats (caused by overdrainage) and increasing precipitation (caused by global warming), water boards can follow two ways. They can purchase land from farmers or they can pay farmers for water services including production loss. The same dilemma is being faced by water companies with draining and polluting agricultural activities above their groundwater reserves. In general, both water boards and water companies try to provide their services as independently as possible from agriculture. In other words: they have little confidence in joint production by modern agriculture.

Conclusion to the first question

21. Yes, there is still a strong degree of jointness in NL agriculture of commodity and non-commodity outputs. But intensification of commodity production has led to decreasing positive and increasing negative externalities. So overall, social costs have increased with production levels and initial positive jointness probably has even turned negative (only a national survey of public opinion can confirm this estimate). How have positive externalities (or non-commodity outputs) decreased, or de-linked and negative externalities increased? Historically, NL-agriculture has six major non-commodity outputs. Supported by national and European policy, agriculture has become so productive that food security as the first non-commodity output is oversupplied by more than twice the domestic demand. This oversupply is also caused by a decrease in domestic demand, since consumers increasingly prefer foreign food. So, food security is progressively being de-linked by consumers themselves! Favoured by the prosperous development of the European and world economy, but also by deliberate domestic policy, non-agricultural activities have become even more important than agriculture. As a result, in most rural areas agriculture has become a minor provider of rural employment. So this second non-commodity output is becoming de-linked, too. The four remaining non-commodity inputs (landscape, nature, recreational environment and water management) all require a lot of land. Therefore, historically they have been jointly produced by the most land-based activities: dairy and arable farming. But gradually their production has been reduced because of intensification of commodity production, which led to specialisation and scaling-up of activities, including the destruction of hedges and other natural habitats, canalisation of water courses and lowering of ground water tables. Moreover, intensification and specialisation have led to increasing joint production of seven major negative externalities (pollution by excessive manure and pesticides, acidification and desiccation of natural habitats, global warming by emission of greenhouse gases, disturbance of the landscape by ugly buildings and light emission, and reduced animal welfare). The evolution of agriculture from net provider to net consumer (water) and even polluter or destroyer of the four land-based non-commodity outputs of public good character has led to various private and public

initiatives of non-agricultural provision. Major initiatives are regional water boards and national organisations for conservation and restoration of nature and landscape. But the non-agricultural provision of the four non- commodity outputs is still limited by land. Dairy and arable farmers are still using 60% of the 3.3 million ha of rural areas (shallow waters included), while water boards and nature organisations can use only 20%. This situation can only slowly be altered, because the money is not available for purchase of land on a large scale and the farmers are not willing to sell land on a large scale. So to meet the demand, the four land-based non-commodity outputs will remain dependent on joint production by dairy and arable farmers, in spite of increasing non-agricultural production. However, the big problem is to encourage farmers to de-intensify commodity production, to reduce negative externalities and produce more of non-commodity outputs.

2. As far as NL agriculture is still involved in joint production, is there market failure associated with the non-commodity outputs?

22. According to the theory of social welfare, commodities jointly produced with non-commodity outputs (positive externalities) are likely to be under-provided and commodities jointly produced with negative externalities are likely to be over-provided (see intro first question). However, it takes a deeper analysis to assess whether the market really fails in achieving a socially optimum joint production (Figure 2).

2.1. Are there examples of market failure occurring (or can we predict when they are likely to occur) following commodity price decreases? In particular, have changes in marginal values of non-commodity outputs in reaction to changes in commodity prices been observed/measured?

23. Prices of none of the major agricultural commodities in the EU have kept pace with inflation and cost increases during recent decades, in spite of subventions and market protection against non-EU producers. So in practice, European farmers are already used to producing at ever decreasing prices or more precisely: at ever decreasing marginal benefits! Their reaction is well-known: “we must keep on saving costs and increasing production both per unit and in number of units”. In this way NL-farmers have shown to be very competitive up till now, considering their second position behind the United States - farmers in net value of their exports (exports minus imports). However, the permanent increase of production needed to remain competitive at ever deceasing marginal benefits has led to increasing negative externalities (Table 1b). The most clear examples of market failure are presented by horticulture outdoors and indoors and pig and poultry farming. Apart from an (ever smaller) share in rural employment these minimally land-based activities have no positive externalities to compensate for their major negative externalities. So their social costs are clearly higher than their private costs, but the market fails to adjust. The main reason of this market failure is that most foreign and domestic consumers are not willing to pay for commodity production with fewer negative externalities (see Question 2.2). Besides, most negative externalities have increasing marginal damages. This is because ecosystems have a certain tolerance for negative effects, but beyond a certain limit suffer increasing damage by escalation of damaging processes (eutrophication, acidification, desiccation, fragmentation of habitats). Under pressure from world trade negotiations and the entry of new member states, the EU will probably further liberalise its Common Agricultural Policy. Along with technological and economical improvements this will lead to further decrease of commodity prices and marginal benefits. Farmers will try to remain competitive in the usual way by reducing costs and increasing production per unit and the number of units. Inevitably, they will produce further negative externalities and further diverge private and social costs, thus aggravating market failure in NL, unless EU and national incentives effectively may curb intensification of production and its negative externalities.

24. Market failure is less evident in the case of non-commodity outputs (positive externalities). The analysis can be restricted to the four land-based non-commodity outputs, since domestic agriculture has become a minor provider of food security and rural employment (Table 1a). Dairy and arable farming are the joint producers of the four land-based non-commodity outputs. These activities also have reacted to the decrease of marginal benefits by reduction of costs and increase of production. As a result, they have jointly produced ever more negative externalities and ever fewer non-commodity outputs. The latter is due to the fact that the non-commodity outputs have opportunity costs, notably land and labour and production limitations, which farmers must reduce to increase productivity. This intensification of commodity production has led to ever less and ultimately negative marginal values of the non-commodity outputs. Nevertheless, various inquiries have shown that the majority of Dutch consumers still appreciate the management of the countryside by farmers, but prefer recreation in the areas of the non-agricultural providers, namely the nature organisations. So, agriculture also seems to have reduced the demand for its joint production of the non-commodity outputs by increasing commodity production to the detriment of the non-commodity outputs. With the prospect of further falls in commodity prices, to be compensated by further intensification, it is understandable that the public and policymakers choose more and more to de-link the provision of the non-commodity outputs. So, if liberalisation of trade reduces the demand for joint production, and non-agricultural provision is increasing, can we still speak of market failure? Yes, because consumers are giving clear signs that these outputs are underprovided, which means that non-agricultural provision isnot sufficiently compensating for the reduction of joint provision by the farmers (see Question 2.2).

2.2 How has the existence (or otherwise) of market failure been established? What conclusions can be drawn about the reliability of the valuation methodologies used?

25. The existence of market failure in the case of negative externalities is clearly demonstrated by the behaviour of consumers. Though they are well informed about the negative externalities of agricultural products, they seldom switch to products under integrated or organic labels, which are available in most supermarkets but cost more for having internalised the negative externalities. Apparently, the reduction of negative externalities cannot be led by the market, because the vast majority of consumers behave as free riders! The alternative is to drive this reduction by policy, but policy is also failing, as shown by the increase or insufficient decrease of the negative externalities (RIVM, 2000). The implementation scheduled for 2003 of the EU-maximum norm for manure input/ha (170 kg manure-N/ha) would lead to a 50% reduction of manure input and therefore a significant reduction of the negative externalities. Since processing and export of manure are not economically feasible, the manure input can be reduced by 50% only if livestock numbers are reduced by 50%. This would imply a strong de-intensification of land use, which would also benefit the provision of non-commodity outputs. So, the EU could support NL-policy to overcome market failure. However, until now the Ministry of Agriculture has not been willing or daring enough to sanction joint production so drastically, as can be seen from the fact that it has asked the EU Commission to raise the norm to 250 kg N/ha.

26. The existence of market failure in the case of non-commodity outputs (positive externalities) is less evident, though consumers send strong signals of under-provision while farmers decrease rather than increase their joint production. A major sign of under-provision is the recent initiative of the main organisations for nature and landscape conservation, recreation and water management in calling for a national offensive for better protection and more provision of the non-commodity outputs (www.Nederlandnatuurlijk.nl). They plead for a mixture of public and private efforts, including extra public investments of 0.5 billion Euro per year until 2010 (besides the current investments of 1 billion Euro per year as specified in Table 2). Explicitly they call for more joint production by dairy and arable farmers (the partners of this alliance have detailed information on demand). Theoretically, the failure of the market to provide the four non-commodity outputs could be overcome by progressive marginalisation of agriculture, ultimately leading to land abandonment on a large scale. In such a case the negative

externalities would decrease again and sufficient land would become available for delinked provision of the land-based non-commodity outputs! As a matter of fact, this autonomous scenario seems to be ongoing, since almost half of dairy and arable farmers in NL are 55 years or older and have no successor (Vereijken and de Boer, 2000). Their one million ha can only partly be purchased by other farmers, because of increasing land prices and decreasing marginal benefits. However, the most likely purchasers of all this land will not be authorities or nature organisations, but economically powerful private parties, notably citizens with higher than average incomes. For 300 m^2 of land to build a house with a garden they pay now 50 000 Euro. For the same amount they can buy a hectare of farmland! Up till now only speculators have done so, because in NL it is very difficult to get permission to build a house on open land. However, political pressure is growing on the Ministry of Housing, Physical planning and Environment to be more permissive (more on this in the fifth note of physical planning, www.minvrom.nl). So, in the case of progressive marginalisation of agriculture land will indeed be abandoned but most of it will be taken over by private parties. This will lead to diffuse urbanisation of the rural areas to the detriment of the four land-based non-commodity outputs. So market failure will probably continue even if joint production fully disappears, unless authorities prevent or at least restrict diffuse urbanisation to protect both agricultural and non-agricultural provision.

27. A systematic and more detailed analysis according to externality agricultural activity and overall would certainly provide more details on the market failure of joint production. The author assumes the single NGO's in the alliance for more non-commodity production have reliable data concerning under-provision, otherwise they would not join the alliance and risk discontent and even loss of their members! So the mere fact of the impressive initiative of this broad alliance of NGO's is considered sufficient evidence for overall market failure concerning the provision of the four land-based non-commodity outputs.

3. If the market fails to incorporate non-commodity outputs, are non-governmental options explored as the most efficient strategy?

28. This final question is answered by responding to its five sub-questions.

3.1. Focusing specifically on the spatial dimension, what are the degrees of excludability and rivalry in the consumption of certain specified non-commodity outputs?

29. Non-commodity outputs can theoretically be provided and consumed in various degrees of excludability and rivalry. Based on the theoretical framework of OECD (2001), the most relevant options of the four land-based non-commodity outputs in NL are presented (Table 3). The options are briefly highlighted.

Table 3. Main spatial options for provision and consumption of the four land-based non-commodity outputs in NL

	Non-rival[8]	Congestible[9]	Rival
Generally non-excludable[10]	Pure public goods - landscape, nature and recreation through the media	Open access resources (type II) - landscape, nature and recreation from main public roads and places	Open access resources (type II) - landscape, nature and recreation from small public roads, paths and places
Spatially non-excludable	Regional or local pure public goods (Type I)	- landscape, nature and recreation within own region or community	
Socially non-excludable		Common property resources (type III) - landscape, nature and recreation in national parks under strict rules	Common property resources (type III) - landscape, nature and recreation in small public areas (forests, parks, nature areas) under strict rules
Generally excludable	(Type IV)	Club goods (type V) - water management by regional water boards	Private goods - landscape, nature, recreation and water management on farms and other private properties

Agro-historical landscape, nature and environment for recreation

30. The 3.3 million ha rural areas of NL have a rich diversity of geomorphological, archaeological, geographical and architectural values. Altogether they may be called the agro-historical landscape of NL, 60% of which is voluntarily provided for by dairy and arable farmers and 20% by nature organisations. A major option for non-excludable and even non-rival consumption is through the media (radio, television, internet, magazines and newspapers). A second major option for non-excludable consumption is from public roads and places: however this is congestible and even rival at higher densities of consumers ('tragedy of the commons"). A highly-valued option is consumption within the own community or even in the own neighbourhood. The alliance for the nature offensive signals a strong underprovision, especially in the densely populated and highly urbanised west of NL ("the Delta-metropole"). On top of the policy-driven expansion of the Ecological Main Structure, they claim an extra 0.30 million ha (10% of the rural areas) around the main cities for nature and recreation (Nederlandnatuurlijk.nl). For the consumption of the 20% of rural area owned by nature organisations, the main option is visiting on foot or by bike following strict rules as appropriate for common properties. Consumers behaving outside the rules are excluded. In spite of the many strict rules, congestion and even rivalry are quite seriously disturbing consumption and undermining provision, so even here the "tragedy of the commons" cannot be prevented. It has led to strong signals of underprovision and substantial claims to increase the percentage of rural areas for direct provision of natural landscape and environment for recreation. Excludable and rival consumption on farms (and other private properties) has become a minor option: 95% of farmers focus on intensive commodity production to remain competitive and maintain their income. So, the strong underprovision of landscape, nature and environment for recreation cannot easily be alleviated by direct non-agricultural provision, nor by joint production by farmers (ANWB, the organisation highlighted in Question 3.3 has been charged by the alliance to estimate the demand for landscape more accurately) .

Water management

31. The western half of NL is less than 1m above sea level, so only dykes and intensive drainage ensure dry feet for the people and dry land for the farmers. Though the eastern part of NL is at least 1m above sea level, here also intensive drainage is needed to prevent the precipitation surplus in winter from

flooding low-sited buildings and land. So water management is a historical necessity for the existence of NL. Most of the dykes and ditches have been created for agriculture by the farmers themselves. Since the Middle Ages their management has been gradually taken over by so-called water boards, on behalf of the community. Through the centuries the water boards have expanded and professionalised their two basic tasks, protection against flooding and field-wise management of the water table for optimum agricultural production. Another important task of the water boards has become the discharge and, during last decades, the purification of waste water. In 1850 there were still 3000 water boards: since then they have merged to number fifty nowadays. They cover the entire country and are allowed to impose water charges and purification levies on any local inhabitant. So citizens pay the regional board for providing their safety against water and for purification and discharge of their waste water. Also, owners of buildings and land pay for the water management of their property. In practice, farmers pay more than all other citizens. Because they are the major payers, they have most votes in the boards. Only recently has the dominance of the farmers started to diminish through a more democratic weighting of the votes. This is justified because the citizens pay ever more for "integrated water management", even including management of water dependent nature and recreation. Though "membership" is obligatory to all local inhabitant, water management by water boards is best characterised as a "club good". These goods' major characteristic is that they are congestible but also excludable, which enables an optimum balance between provision and demand. A major challenge is to manage the increasing precipitation caused by global warming. NL must not only manage its own precipitation surplus, but also that of large parts of Germany, Belgium and France, which are discharged by the rivers Rhine and Meuse. As well, NL must manage both the continuous subsidence and salinisation of the peat soils in the West (caused by low water tables for farming) and a possible rise of the sea level (caused by global warming). Recently a commission for water management in the 21st century has estimated that at least 60 000 ha farmland is needed to manage the expected extra water quantities (www.waterland.net.nl). So, NL is also facing an under-provision of water management to be made up by more non-agricultural provision by the water boards or by more joint production by farmers. However, intensified commodity production has made farmers a minor provider with limited scope for water management for non-agricultural purposes, as yet.

3.2. What market creation measures or policy instruments have been put in place to ensure the required level of supply of non-commodity outputs and to address negative externalities?

32. In the foregoing it has been shown that EU and national policy have encouraged the NL-farmers to specialise, intensify and scale up activities for a few commodity outputs. This has made NL-agriculture a major provider of negative externalities and a minor provider of positive externalities or non-commodity outputs. Politically, this has always been justified because of the provision of the two basic non-commodity outputs of agriculture: food security and rural employment (rural viability). Though food security has become strongly overprovided and non-agricultural activities have become the major providers of rural employment, this agricultural policy still dominates and is still justified in this way. The reduced provision of the other non-commodity outputs by agriculture is accepted as an inevitable sacrifice to be compensated by non-agricultural direct provision. Major examples of this compensation policy are the Ecological Main Structure provided by governmental and private nature organisations and integrated water management by the water boards. To reduce the negative externalities of intensive agriculture NL policy has adopted the world-wide objective of sustainable agriculture. This concept is used as a major policy instrument to reduce the negative externalities without reducing competitiveness and income of the farmers. However, there is hardly any scope for success of sustainable agriculture in markets that are liberalising since reduction of negative externalities always leads to higher costs or lower commodity output. Therefore it is not surprising that policies of NL and other EU countries fail to achieve agriculture that is both competitive and sustainable, with a significant reduction of the negative externalities. Besides, the compensation policy for non-agricultural provision of the four land-based non-commodity outputs fails to fill the gap between demand for these outputs and their supply. An alternative policy would be to reduce negative externalities and underprovision of non-commodity outputs in one sweep by encouraging farmers to convert from

intensive monofunctional production to extensive multifunctional (joint) production. This can be achieved by replacing subsidies and protection of commodity production by direct payments for providing the four land-based non-commodity outputs. Initially these payments could be made by the EU and the NL-Ministry of Agriculture ("cross compliance"and "modulation"). Later, nature organisations and water boards could take over the payment of the farmers by imposing region-wise levies to the consumers of "regional public goods" or "regional club goods" ("regional population as a club for rural services with obligatory membership").

3.3 To what extent have trusts, clubs, voluntary provision by local community groups, consumer groups, local government been involved?

33. In the foregoing it has been shown that the reduction in joint provision of the four land-based non-commodity outputs by the farmers is partly offset by direct provision by nature organisations and water boards. The major land-owning nature organisations have already been described under Question 1.4 and the water boards under Question 3.1. It has also been shown, under Question 2.2, that nature organisations and water boards are major partners in a broad alliance of organisations of consumers and providers of the land-based non-commodity outputs. A major partner with almost 4 million members (a quarter of the population; half of all households) is the organisation for tourism and recreation (www.ANWB.nl). The organisation started a long time ago as a union of bikers and gradually changed into a union of car drivers, though it has remained a provider of touristic and recreational services both for urban and rural areas. The organisation has a strong influence on government policy and a key role in possible market creation for nature, landscape and water dependent recreation. A major characteristic of ANWB and remaining consumer organisations in the alliance is that they do not own land for direct provision of the land-based non-commodity outputs. They can contribute only by pressing the government to purchase more land from farmers or to pay farmers for joint production. They can also urge their own members to pay directly for more provision of the non-commodity outputs as "regional public goods" or "regional club goods", for example as an explicit part of the levy of the regional water boards.

3.4 What is the relationship between the different institutional arrangements in place and the characteristics of the non-commodity outputs as pure or impure public goods? In particular, why have non-governmental approaches not been employed in cases where the nature of the non-commodity output would have allowed it?

34. The four land-based non-commodity outputs can only virtually (in the media) be considered as pure public goods. In an urbanising country such as NL this option of provision and consumption is of growing importance. Nevertheless, a strong demand remains for real provision of the land-based non-commodity outputs - meeting the demand for more water management is even a matter of life or death. The majority of politicians and consumers have accepted that agriculture provides an ever smaller share of these pure and impure public goods, in the expectation that direct non-agricultural provision can compensate. To arrange the latter is considered a task of the government (national, regional, local), since it costs a lot of money to purchase and manage the land needed. Non-governmental approaches such as provision by private enterprises are thought to have little role, since profitable exploitation of the land by providing a coherent bundle of non-commodity outputs is an illusion if consumers are can free ride on the payments of others. Where pure governmental and pure market approaches seem to fail, an intermediate approach may succeed. It implies club-wise provision by regional non-profit and democratically controlled organisations such as water boards, including joint provision by farmers directly paid from the levies imposed on all regional consumers of the non-commodity outputs. The advantages of this approach are: the non-commodity outputs are provided as on demand and as a coherent bundle to anybody in the region ("multiproduct clubs"), safe from the risks of free riders. The fifty water boards are already the main providers of water management, which is most significant for the other three land-based non-commodity outputs and for agriculture. Therefore the boards are most capable of creating coherent bundles of the non-

commodity outputs, joint with agricultural production as far as needed or possible. Besides, they are most capable of excluding free riders since they cover the entire country.

3.5. Is there any evidence concerning the stability, equity and international spillover effects of these arrangements, whether they apply to non-commodity outputs or negative externalities?

35. In the foregoing it has been shown that three of the four non-commodity outputs (landscape, nature and environment for recreation) are mainly provided by nature organisations, entirely or partly financed by the national or regional government. The fourth non-commodity output (water management) is mainly provided by water boards. Altogether, these arrangements cannot compensate sufficiently for the loss in joint production by dairy and arable farmers. Therefore, it is proposed to restore joint production by dairy and arable farmers under the supervision of the water boards. In one sweep this would solve the negative externalities of dairy and arable farming, which are persisting or even increasing notwithstanding the current restrictive policy based on the concept of sustainable agriculture. The impact of the various arrangements in terms of stability, equity and international spillover is briefly discussed.

Stability

36. In spite of its large resources and great potential for a creative and effective policy, the central government of NL is far from a stable provider of public goods. Clear examples are its failure to sufficiently reduce the negative externalities of agriculture and to compensate for the loss of joint production of landscape, nature and environment for recreation. A major reason for this central policy failure is the lack of a clear majority in the Parliament for a creative and effective policy. This is inherent in the NL political situation, in which neither progressive nor conservative parties can achieve majorities making coalition governments inevitable. As a result, governments always try to find a balance between conflicting socio-economic interests and pressure groups, and always try to avoid conflicts with major groups in society or that support parties in Parliament. In such a situation break-throughs can be achieved only by powerful alliances of NGO's such as *Nederlandnatuurlijk* (see Question 2.2). Aware of its weak performance, the national government tries to delegate the provision of non-commodity outputs as much as possible to regional and municipal governments. But these are also based on delicate coalitions and so also cannot act as effective and stable providers. Because they are largely dependent on the governments' performances, especially in the purchase of land from the farmers, the nature organisations can only join the national alliance to mobilise the public for a more aggressive policy, including higher budgets for landscape and nature. Water boards are quite effective and stable providers of water management. But they tend to be too stable and need a lot of time to add to their basic tasks of flood prevention, agricultural water management and waste water management the new task of water management for landscape, nature and recreation. On the other hand, consumers are willing to pay more for local public goods or club goods than for national or pure public goods (2001). Therefore, arrangements for provision by water boards may appear more effective and stable, if the boards succeed in improving their image of rigid water authorities by a more democratic policy and a broader bundle of public services. Unlike the governments, the water boards have rather good relationships with farmers, which is indispensable in involving them again (or more) in provision of the land-based non-commodity outputs.

Equity within NL

37. Equity has domestic and international implications. Domestically an equal distribution of social costs and benefits of negative and positive externalities can be important for regions and individuals and even generations (2001). In Question 1.1 it has already been mentioned that in NL the various farming activities and their externalities are quite unequally distributed over the regions. Apart from the huge

concentration of glasshouses near Rotterdam, the western part of NL has less intensive agriculture so it suffers fewer negative externalities compared to the eastern part with its huge concentrations of cattle, pigs and poultry. But the western part is more urbanised and has far less provision for landscape, nature and facilities of rural recreation. To alleviate this inequality would probably take decades, so it will also concern the next generation in the western and eastern parts of NL. A most vital and persistent inequality between the two parts of NL is related to water management. The western part bears the highest social costs for safety against flooding, the eastern part for desiccation caused by one-sided agriculture-oriented management. A delicate issue is the inequality of costs and benefits between individuals with high and low incomes. Low incomes tend to bear a bigger part of the social costs of the negative externalities than high incomes. The latter can afford houses and recreation facilities remote from polluted and degraded agricultural areas. On the other hand, high incomes pay more taxes so contribute more to the direct provision of landscape, nature and environment for recreation than low incomes. But high incomes also tend to attach more value to these public goods and consume more of them than low incomes. So, the overall balance of equity is difficult to calculate when there is a mixture of negative and positive externalities!

Equity between NL and trade partners

38. According to the OECD background document, countries may gain from more trade (OECD, 2001). However, if there is a bundle of both positive and negative externalities involved, which are not or only partly internalised, the effects of trade on the welfare of each partner are difficult to estimate. Even a careful analysis cannot change the subjectivity of estimating social costs and benefits of negative and positive externalities. The best approach would be a national information campaign followed by a national inquiry on the basic options:

- "considering current national agricultural activities with their positive and negative externalities, do they benefit or harm your personal welfare?"
- "If these activities would internalise all externalities as follows (brief scenario for each main activity), would it benefit or harm your personal welfare?"

39. Assuming that such an information campaign and national inquiry were to be organised (for example by the national alliance of NGO's for a nature offensive) and the result dominated by a majority preference for a consistent internalisation of all externalities, the welfare effects are estimated of the agricultural export production of NL for Germany (D), the main importer of NL- agricultural products within the EU (table 4).

Table 4. Effects of current NL-export production for main trade partner Germany (D) on welfare in both countries and the world.

Main NL export commodities	NL -sum of externalities [11]	D- sum of externalities[12]	NL-welfare[13]	D-welfare[14]	Global Welfare
Cheese, potato, vegetables, flowers, pig, poultry	negative	positive	Decrease	decrease	Decrease

40. The result is quite evident: current export-oriented agriculture in NL is both negative for its own welfare as well as for the welfare of its importing neighbour-country D. However, if both countries would decide to jointly internalise the externalities of their agricultural activities, D would increase production, notably in the East, and NL would sharply decrease its production, and ultimately D would develop to

become a net exporter of agricultural products to NL. As a result, joint production of agriculture in NL would be restored to an overall positive result and joint production of D would be strengthened, which would increase welfare in both countries and overall (Table 5). Most significant D- commodities for export would be arable products, vegetables, pig and poultry which economically and ecologically would go well together in the eastern states with a lot of relatively cheap land and labour. Reallocation of most of the production of these commodities from NL to the East of D would suppress their negative externalities in NL and strengthen their positive externalities in D and thus increase the welfare of both.

Table 5. Effects of possible D- net export production for main trade partner NL on welfare in both countries and the world.

Main D export commodities	NL-sum of externalities[11]	D-sum of Externalities[12]	NL-welfare[15]	D-Welfare[16]	Global welfare
Potato, vegetables, pig, poultry	negative	positive	Increase	increase	increase

International spillover

41. This term is scarcely used and is not defined in the background document. Probably, it means the impact of internalising externalities by major agricultural exporters as NL for its trade partners all over the world. Before expanding on this example, it should be stated that NL would only internalise the major negative and positive externalities of its agriculture if the EU were to drastically reduce subventions and protection of its commodity outputs, so liberalising agricultural trade. Then both the agri-food complex and Parliament of NL would have to face the unprofitability of most farming activities in NL, because of the excessive costs of labour and land, and co-operate to reallocate or de-intensify the activities. If EU and NL were to do so, welfare in other EU-countries would increase in the same way as indicated for D. The impact for trade partners of NL outside the EU will also depend on their degree of internalisation of externalities. For example the United States, Brazil and Thailand would find no direct compensation for the loss of export of their feed-stuffs to NL, because D and other EU-countries can feed their pigs and poultry with their own feed-stuffs. But an associated decrease of welfare would be doubtful, if these partners also consider the loss of negative externalities associated with intensive monocultures of soybean, maize and tapioca. They may even increase their welfare, by using the opportunities of the liberalising world trade and continue production of feed for export production of pig and poultry on own account.

Summary

42. This case study is intended to contribute to an in-depth analysis by OECD of the compatibility of multifunctional agriculture and free trade. The actual and potential roles of market and policy in NL-agriculture are analysed based on three questions, as proposed by OECD.

43. The first question is, to what extent is NL-agriculture jointly producing commodity and non-commodity outputs? The answer is that in recent decades NL-agriculture has reduced non-commodity outputs and has strongly increased negative externalities by intensification of its commodity production. This has been encouraged by ample subventions and effective protection by the EU and NL-government. Nevertheless, dairy and arable farming are still major joint producers of four land- based non-commodity outputs, namely agro-historical landscape, nature, environment for living and recreation, and water management.

44. The second question is, to what extent does the market fail to incorporate the externalities of NL-agriculture? The answer is that first of all both market and policy fail to internalise the serious negative externalities of the various farming activities. The most clear examples are presented by horticulture (outdoors and indoors) and pig and poultry farming. Apart from an ever smaller share in rural employment these minimally land-based activities have no positive externalities to compensate for their major negative externalities. So, their social costs are clearly higher than their private costs, but both the market and policy fail to adjust accordingly. The main reason for market failure here is that most foreign and domestic consumers are not willing to pay for commodity production with fewernegative externalities. This is evident from the disappointingly low consumption of products marketed under integrated or organic labels. The existence of market failure in the case of non-commodity outputs (positive externalities) appears from strong signals of under-provision given by consumers as dairy and arable farmers decrease rather than increase their joint production. A major signal is the recent initiative of the main organisations for nature and landscape conservation, recreation and water management to call for a national offensive for better protection and more provision of non-commodity outputs. They claim 0.30 million ha (15% of the agricultural area) around the main cities for nature and recreation, on top of government plans for direct provision. Another signal is the estimate of a commission for the water management in the 21st century that at least 60.000 ha farmland is needed to manage the extra water quantities expected from global warming. So, for water management also, NL is facing an under-provision.

45. The third question is, have non-governmental options been explored as the most efficient strategy to solve this market failure? The answer is yes, but with the strong support of government, because government is expected to determine the provision of more (or less) public goods. To compensate for the ever falling joint production of landscape, nature and recreative environment, private and public nature organisations have started providing them directly as an Ecological Main Structure. However, that is not enough considering, for example the additional demands of the alliance of NGO's. Without water management NL would not exist, because most of the land is below or just above sea level. It was started by settling farmers, but even from the Middle Ages, water boards had taken over responsibility and management on behalf of the growing communities. These water boards have expanded their basic services (safety for flood and agricultural water management) to include water purification and even nature and recreation, and they provide them as regional public goods or rather regional club goods. But they are still failing in control of desiccation and precipitation peaks probably caused by global warming. So, in general, the compensation policy of non-agricultural provision of the four land-based non- commodity outputs fails to fill the gap between demand and provision. An alternative policy would be to reduce negative externalities and underprovision of non-commodity outputs in one sweep by encouraging farmers to convert from intensive monofunctional production to extensive multifunctional (joint) production. This could be achieved by replacing subsidies and protection of commodity production by direct payments for services concerning the four land-based non-commodity outputs. Initially these services could be paid for by the EU and the NL-Ministry of Agriculture ("cross compliance"and "modulation"). Later on, nature organisations and water boards could take over the payment of the farmers by imposing region-wise levies to the consumers of the "regional club goods" ("regional population as a club for rural services with obligatory membership").

46. In addition there was the third question: what are the stability, equity and international spillover effects of these arrangements? The answer for stability is that government and its dependent nature organisations can become better providers of landscape, nature and a recreative environment, if a powerful alliance of NGO's can push them toward a more aggressive policy. Water boards have tended to be too stable and need a lot of time to broaden their tasks to include water management for landscape, nature and recreation. On the other hand, consumers are willing to pay more for local public goods or club goods than for national or pure public goods. Therefore, provision by water boards may be more effective and stable, certainly if the boards succeed in improving their image of rigid water authorities with a more democratic policy and a broader bundle of public services. Contrary to the governments, the water boards have rather

good relations with farmers which is indispensable involving them again (or more) in the provision of land-based non-commodity outputs.

47. Concerning equity between NL and its trade partners, current export-oriented agriculture in NL is estimated to be negative both for its own welfare and for the welfare of its main import partner Germany (D). However, if both countries were to decide jointly to internalise the externalities of their agricultural activities, D would increase production, notably in its eastern states (former DDR) and NL would sharply decrease its production, and ultimately D would develop to become a net exporter of agricultural products to NL. As a result, joint production of agriculture in NL would be restored to an overall positive result while joint production of D would be strengthened, which would increase welfare in both countries. Concerning the international spillover, it is thought that NL would internalise the major negative and positive externalities of its agriculture only if the EU were drastically to reduce subventions and protection of commodity outputs, so liberalising agricultural trade. Then both the agri-food complex and the NL Parliament would have to face the unprofitability of most farming activities in NL, because of excessive labour and land costs. They would have to co-operate to reallocate or de-intensify the activities. If the EU and NL were to do this, welfare in other EU-countries is expected to increase, as in D. The impact for trade partners of NL outside the EU will depend on the extent with which they internalise their externalities, too.

48. The overall conclusion from this case study is that free trade is not a threat but an indispensable basis of multifunctional agriculture or rather multifunctional rural areas, and for cost-effective provision of commodity and non-commodity outputs by farmers and other providers. However, if the EU did not combine trade liberalisation with a coherent policy to internalise externalities, in countries such as NL agricultural production would only intensify further with increasing social costs. Such an internalisation policy should first of all mean effective laws and rules to prevent, or at least drastically reduce, negative externalities. Subsequently, it would imply creation of markets for non-commodity outputs for an adequate supply of demand maximally delinked from agricultural commodities, by farmers or non-agricultural providers. So, based on this case study, the OECD is advised not to adopt the vision that multifunctional agriculture can be maximally led by the market and minimally driven by policy. In contrast, it is proposed to achieve multifunctional agriculture or rather multifunctional rural areas by a combination of a free market and a strong policy. The concrete advice to OECD is, “to enhance global welfare by a free world market of rural products for any producer and trader and to support it by a powerful international policy to protect the environment, the consumers, the workers and both wild and domesticated plants and animals against negative externalities”.

NOTES

1. National employment = 7 million of which 0.25 million in agriculture (3.6%), rural employment = 1.0 million (25% in agriculture). In 1999 3.3% unemployed in NL, 9.2% in EUR 15. (100 000 NL farms in 2000, 2% with nature services, 4% with touristic services).

2. Since agriculture in NL generates more environmental pollution by excessive animal manure than by excessive mineral fertilisers, the latter are not considered here. Since manure from various animal production activities is spread all over the national farmland, mean mineral input/ha from manure has been calculated over all 2 million ha as 43 kg P/ha and 300 kg N/ha. EU norm for N-excess input: at maximum 170 kg/ha from manure to keep nitrate in upper groundwater below 50 mg/l (currently NL is overall at the norm, however in the south the level averages 80 mg/l). So overall excess N input from manure in NL is 300-170=130 kg N/ha (= 45% of total manure input). The shares of the separate animal production activities in this N-excess input have been calculated in proportion to the total N-input of each activity.

3. P is far less a mobile element than N, but a little leaching or run-off of P already causes serious eutrophication of surface waters. Since a EU norm for P-excess input is still lacking, an agro-ecologically sensible norm is proposed: P-input/P-output= 1 at maximum (considering current P- soil reserves are agronomically more than sufficient and ecologically even excessive). Overall, mean P-output by plant and animal products = 28 kg P/ha (Boons and van der Meer, 1996). So, overall excess P input from manure in NL is 43-28=15 kg P/ha (= 30% of total manure input). The shares of the separate activities in this P-excess input have been calculated similarly to the N-excess input.

4. Acidification is known as a complex of damaging processes of weakly buffering natural habitats. Main cause is deposition of acidifying gases such as SO_2, NO_2 and NH_3 . Total acidifiying deposition in NL = 37 billion acidifying equivalents including 22 billion from inland sources. Ammonia (NH_3) from animal manure is the main inland source with 10 billion acid. equiv. (45% of inland deposition). This ammonia deposition implies 2650 acid equiv/ha and this alone exceeds the NL norm for total acid. deposition (2400 acid equiv/ha) already by 10%.

5. Main greenhouse gases are CO_2(=1 global warming equivalent), CH_4 (21 equiv.) and N_2O (310 equiv.). Total NL emission = 235 billion CO_2 equiv., share of agriculture =11%.

6. Farmers can sign contracts for joint or delinked production of nature (“agricultural nature” or “pure nature”) according to almost 100 management packages varying in payment from 100 to 2 000 Euro/ha (more info on: www.minlnv.nl, search “programma beheer").

7. Management costs of delinked production by nature organisations are estimated 1 000 Euro/ha on average.

8. A good is non-rival when it can be consumed by one individual without diminishing the consumption opportunities of this good to others. So, nobody should be excluded from using this good because there is no additional cost to accepting more users.

9. A good is congestible if its consumption negatively affects other users, but does not reduce the consumable amount of the good.

10. A good is non-exclusive if it is physically or legally impossible or very costly, to exclude individuals from consuming it.

11. See Table 1*a-b*

12. D has the same or more positive externalities but far less negative externalities as NL (per ha of agricultural area: NL=2 and D=0.9 heads of cattle; NL=12 and D=3 heads of pigs, NL=160 and D=90 kg N-fertilizer, NL=5 and D=2 kg of pesticides). Especially in D-east (former DDR) the rural areas are so extensively used and unemployment is so high (15-20%), that overall D even the sum of externalities of flowers, vegetables and pig and poultry production is estimated positive.

13. Welfare of NL is estimated to decrease since welfare gain by export cannot compensate for welfare loss associated with the negative sum of externalities of intensive export-oriented production.

14. Welfare of D is estimated to decrease, since welfare gain by import cannot compensate for welfare loss associated with loss of extensive domestic production (with a positive sum of externalities) caused by import.

15. Welfare of NL is estimated to increase since welfare gain by import added to the welfare gain by internalising the negative and positive externalities can compensate for the welfare loss by less export of commodities.

16. Welfare of D is estimated to increase, since the welfare gain by export is added to the welfare gain associated with the intensification of domestic production.

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