

The Peasant Wedding Report

An economic-ecological analysis of the transition to sustainable agriculture in an age of globalisation



The Peasant Wedding Foundation

About the Peasant Wedding Foundation

Background

As a result from commotion in the Dutch agricultural sector, a group of professionals met several times during winter 1997 and spring 1998, to discuss the nature of the desired changes. They became known as the De Zeeuw Working Group, named after its chairman Dick de Zeeuw. The working group's activities resulted in the report "Naar een Aartse landbouw". In 1999, the De Zeeuw Working Group has been transformed into *Stichting Boerenbruiloft*, named after the famous painting of Pieter Breughel the Elder. In English it is called the Peasant Wedding Foundation.

Objective

The objective of the Peasant Wedding Foundation is to function as a platform of innovative organisations active in the field of sustainable rural development. The foundation will catalyse the process of analysing, understanding, and overcoming current problems of the rural areas in and outside The Netherlands.

The report

In this report, the Peasant Wedding Foundation presents a new vision on agriculture from the perspective of sustainability. In the Foundation's opinion, the cause for these problems lies in the fact that the present agricultural policy is not based on a coherent and sustainable model. If instead an unequivocal course is chosen, stability and security in European agriculture may well be improved.

The Peasant Wedding Report is the English version of the original report written by the De Zeeuw Working Group. The final texts were edited within IMSA Amsterdam (Wouter van Dieren, Tammo Oegema). Final responsibility for the text here presented lies with the Peasant Wedding Foundation.

Information

The preface of this report will provide you with some more background information. If you have any questions about this report or the Peasant Wedding Foundation, however, you are welcome to contact the secretariat: Dick de Zeeuw (chairman), Henk Visée (acting secretary-treasurer), Anne-Mette Jørgensen and Minette Kits Nieuwenkamp (staff).

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Dieren, W. Van et al. (2000), *The Peasant Wedding Report. An economic-ecological analysis of the transition to sustainable agriculture in an age of globalisation*, Amsterdam: **The Peasant Wedding Foundation**.

First published as *Naar een Aartse landbouw. Plattelandsontwikkeling en duurzame landbouw in een tijd van globalisering*, May 1998

Translation: December 1999, Eva Klok (IMSA Amsterdam)

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Cover: *Peasant Wedding*, Pieter Breughel the Elder, Kunsthistorisches Museum, Vienna

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Preface to the English translation

This report was originally written in Dutch on an independent, voluntary basis. It was submitted in June 1998 to the former Dutch minister of Agriculture, Nature Management and Fisheries, Mr. J.J. van Aartsen. In the course of 1998 and 1999, more than 1500 copies have been distributed. Apparently many stakeholders in the area of agriculture, nature management, environment, and rural development recognised its potential impact. Requests came in from not only Dutch stakeholders, but also from other European and American ones, making an English translation inevitable.

The initiative to the English translation was taken by the Peasant Wedding Foundation (Stichting Boerenbruiloft), which has been named after the painting on the report's cover of Pieter Breughel the Elder. The objective of the foundation is to function as a platform of innovative organisations active in the field of sustainable rural development. It will catalyse the process of analysing, understanding, and overcoming the current problems of the rural areas in The Netherlands and beyond. The foundation will not only work with the vision as laid down in this report; it also wants to correlate with visions on sustainable agriculture from other sources.

The board of the Peasant Wedding Foundation consists of the following persons:

Wolfgang Albrecht
vice-chairman of Platform Biologica

Gerard Boenink
chairman of the organisation for agriculture and horticulture of Gelderland (GLTO)

Arie van den Brand
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The activities of the Peasant Wedding Foundation aim to strengthen its platform function, to analyse current issues of rural development, to learn from and support sustainable rural development initiatives, and to come to solutions in terms of policy. The final goal is a countryside that is sustainable and viable with regard to economic, political, health, environmental and social aspects.

Among the activities of the Peasant Wedding Foundation are the following:

- demand-driven *support of regional initiatives* for sustainable rural development, including the bringing together of stakeholders, information sharing, and advisory activities,
- stimulating a Netherlands-wide process towards an *Agricultural Green Social Contract* as a framework for decision making based on a shared vision,
- issuing comprehensive *studies* on constraints and opportunities for sustainable rural development, e.g. on the effects and consistency of current financial incentives in order to develop a supportive national financial system,
- catalysing a *European process* toward a shared vision on the European countryside among European stakeholders, including governments, business and non-governmental organisations,
- publication of stimulating, provocative *essays*; organisation of *workshops* both at the regional level and directed at specific groups of stakeholders including policy makers.

This report was written from the perspective of the Dutch “Polder Model” with a view to broader European application. Many examples, figures and data provided concern the Dutch situation. The European countryside has a kaleidoscopic character due to diverting situations regarding aspects like freshwater resources, character of agricultural production, land productivity, social and physical vulnerability, the use of GMOs and hormones, the attitude towards nature conservation, etc. Nevertheless, we are convinced that the report as a whole provides, for any country, the basic ingredients for discussing sustainable agriculture in a wider perspective. It may serve as a visionary document on the future of rural areas in general, and on agriculture in particular.

For the sake of transparency some adjustments to the original report have been made in its translation, especially for those terminologies which refer to typical Dutch circumstances that are incomprehensible to the outsider. An appendix has been added to say a few words on an issue that was not mentioned in the original report: biotechnology. Some other, yet minor, editorial alterations are there for the sake of clarity in another language.

Summary

In this report the authors develop a new perspective for agricultural policy.

Our agricultural system is generally felt to be no longer satisfactory. It has brought us material prosperity, but at a high price. The countryside - or what is left of it - has irretrievably changed. The authors feel that it has not changed for the better, though. We need a new perspective on the future.

Present agriculture lacks a coherent systems model aiming at sustainability. It is neither financially nor ecologically consequent nor sustainable. Its goal is to maximise production on the basis of a “chemised technology”. The end of this process, however, is in sight, the resulting instabilities being too conclusive to ignore (reduced consumer confidence, water shortages, climate change, pesticides, herbicides and antibiotics, hormone and salmonella issues, animal monocultures, epidemics, competition for the green space, and disputable income bonuses).

Agricultural policy lacks financial coherence: what is taxed here, is subsidised elsewhere, and insight in the interdependencies and feedbacks between incentives and restraints is insufficient. Each year some 50 billion euro are spent on European subsidies, which means that an important instrument to organise *steering* is available. The question is: in which direction or how? In this report we make the necessary proposals.

The reports main proposals are the following:

- Agriculture needs to be based on an ecosystems approach, in which biological diversity and biomass production are inversely related. This means that *maximised* agricultural production by means of monocultures undermines the system’s stability, which then becomes easily disrupted (bacteria, viruses, erosion, climate). Sensible agricultural practice weighs yield and stability, and strives for *optimal* production. A lower yield means more biodiversity, a higher quality of nature and landscape, and a better-secured future production.
- Agricultural policy has to depart from the fact that (land-bound) agriculture cannot be detached from the human, economic and biological conditions of the countryside. This is a fundamental difference between this branch and other industries. Agricultural policy needs to reckon with preservation of human capital, natural capital, social capital and man-made capital. A maximised agricultural production (man-made capital) undermines

other capital stocks and so undermines the production structure of the future.

Sustainable agriculture has to be based on a balanced (capital) stock management.

- The free market cannot cure the problems of the agricultural sector. Balanced market pricing is only possible within a well-regulated system. Regulation is essential to preserve the four capitals. A stable agricultural production does not only represent economic value for society as a whole, *it also stands for political, health, natural and social values*. When unstructured market forces are given a free hand in these values, society has to face unexpected and undesirable consequences.
- Land is a central issue in the new perspective on agriculture. Land is true capital, and the basis of the above described four values. Land has to be better protected, therefore, analogous to the protection of labour.
- Land use must be subjected to limiting conditions. This requires an index, indicating the contribution of each land-bound agricultural sector to the four values mentioned. Such a representation of the agricultural production structure can serve as a basis to regulate sustainable agriculture policies.
- Land, as a precondition for sustainability, should not be an object for sale or speculation. Such an attitude requires a different land-market policy. Land is not just valuable as a production factor - which is then overruled by other economic sectors - but also as a source of tranquillity, nature and landscape. A land-market policy aiming at sustainability will help to strengthen the whole of green activities (from conservation to all forms of land-bound agriculture).
- These green sectors have to be regarded as a continuum. In the first part of this continuum conservation is agriculture without production (the land being important for its genetic reservoir, e.g. for the pharmaceutical industry); arable farming, horticulture and land-bound cattle-breeding are forms of conservation with production; and forestry is a form of conservation with limited production. All green sectors together manage the countryside, and together they have to withstand the pressure from urban development.
- The societal goal of sustainable agriculture is to preserve and improve the four capitals in relation to the four values mentioned. Then agriculture, nature and environment can merge, the land can be protected from speculation, and a single systems model can be used, uniting all parties involved. The core issue is that limiting conditions are set for land use and that the flow of money serves to steer the process.

- For the four capitals this results in a wide range of possible policy consequences. For natural capital, for instance, an Agri Sustainable Index can be implemented: a system of income bonuses, representing per square meter of farmland the relation between indicated maximisation and desired optimisation. Per sector, variants of this index can be developed.
- For human and social capital several financial incentives can be devised in the fields of agricultural training, employment, regional production and distribution, innovation, self-regulation, and further experiments with mixed farming. Government needs to create a new vision on the organisation of the countryside, and strive for a predictable policy and steady regulations. Landscape shops could bridge the gap between administrative regulations and daily farm practice, helping the farmer to get insight in and use the proposed new financial regulations.
- For man-made capital financial incentives need to discourage overmechanization, and stimulate human labour and transport efficiency. Indexation of the four values in relation to the regions and the sectors would lead to a better weighing of interventions in the agricultural infrastructure (land use and management of soil and surface water).
- The authors propose the introduction of a new *agricultural green social contract*, i.e., a contract between the government and the parties involved (nature and environment groups, recreation, and agricultural and consumer organisations) regarding the future of the countryside. This contract should, for the long term, lay down the rules for sustainable agriculture and the responsibilities of all those involved. Points of departure could be:
 - that land owners should be rewarded for providing and preserving tranquillity and nature (in different degrees) as well as for accessibility, an important green side-product;
 - that agriculture will provide clean soil, water and air, and compensate for its old environmental debt. The costs will become apparent in the prices of the products;
 - that European and national rural subsidies are turned into regional contributions, in order to decrease the dependency on government regulations;
 - that the quality of the soil is protected (just like labour in the present system), with an emphasis on “clean” and “living”;
 - that a clear distinction is being made between land-bound agricultural production and production which does not depend on the land (and which must comply with the same standards as industry does), such as greenhouse horticulture.

Moreover, the agricultural green social contract should contain the government's objectives and the new system of income redistribution and taxabilities, as proposed in this report.

The shift to a sustainable agriculture is a challenge for The Netherlands, Europe and the world. The innovative power of Dutch agriculture over the last decades resulted from leadership, enterprise and a strong social tradition. Now, these characteristics are needed once more to change course towards a new agricultural future.

RECOMMENDATIONS

Points of departure

1. Base the policy aimed at a sustainable rural development on a “green lands” principle, meaning that farmlands and natural lands are destined to stay green. Use appropriate tools to strengthen the social, economic and ecological position of the countryside, in Europe as well as worldwide.
2. Consider the different applications of the green lands as ranging from nature with high biodiversity, through forestry, to land-bound agriculture. The policies and economic viability of all these forms together will have to be strong enough to counter any attack on the countryside. Other forms of use, like recreation, must strengthen the position of the green lands.
3. Make sure that all those who use and own land are responsible for keeping it clean and living. A living land provides - according to its economic use - the greatest possible opportunities for shared use with plants and animals.
4. Re-assess agriculture in Europe and worldwide on the basis of a sensible management of the four capital stocks: human, natural, social and man-made capital. Sustainable agriculture will yield an optimal production, instead of a maximal one, but it will secure the needs of future generations.

Approach

5. Organise - in the first instance nation-wide and based on the above-mentioned points of departure - a broader than usual form of co-operation with the organisations managing the green lands. This co-operation must be aimed at establishing a social contract on sustainable management. It is important to involve in such a contract the users and owners of the green lands, agricultural organisations, product-chain organisations up to and including the consumer, public organisations interested in the countryside (nature, environment and recreation) and financial institutions, together with the authorities.
6. A nation-wide social contract for sustainable management of the green lands could be expanded towards both the European Union and regional initiatives. In the latter case, the contract needs to join in with the many existing initiatives for regional co-operation.

7. The social contract contains the objectives of a sustainable rural policy. These objectives must guarantee policy consistency, in order to create confidence with farmers and other managers of the green lands.
8. The social contract must contain contributions to achieving the objectives of all parties involved. The government's contribution consists in formulating the standards for clean and living green lands, and in creating financial instruments to reward the green lands' societal functions (tranquillity, nature) as well as instruments to strengthen the value of the green lands compared to other destinations. Moreover, incentives are needed for co-operation, learning and experiments.
9. Use the many existing rural organisations to develop and implement the social contract. Rural youth organisations, farmers' societies, volunteer groups for conservation, women's organisations, churches, and so forth, are the pivot in the necessary innovative processes.
10. Highlight the start of the social contract process with a government vision, to be discussed in Parliament.

Objectives of a new policy

11. Concentrate the policy on objectives with a ten-year term:
 - to double employment in green lands management (sustainable land-bound agriculture, conservation, etc.);
 - to halve the emissions of manure and ammonia;
 - to make groundwater and, subsequently, surface water potable;
 - to double the natural variation of plant and animal species on a regional level.
12. Concentrate the policy furthermore on:
 - sufficient technical and economic experiments aimed at a sustainable green lands management, within five years;
 - adjustment of research programmes of the agricultural research institutes, within two years;
 - assessment and adjustment of subsidy regulations in order to create broader possibilities for regional initiatives, within two years;
 - starting a tax reform, to create new forms of steering for the societal functions of agriculture, within two years.

Contours of a new policy

13. Replace the current system of ad hoc regulations and sanctions within the framework of agricultural and conservation policy with a system of bonuses linked to the societal function of green lands management: use all the money available to preserve the natural capital of nature, clean water and a clean soil. European rural subsidies should not decrease. Instead, these instruments should be applied to stimulate a sustainable use of the green lands.
14. Employ regulations and tax instruments to promote land redistribution which aim to strengthen the natural capital. Thus, land speculation is discouraged.
15. Apply tax instruments to stimulate ownership of green lands (nature, farmland, forests). These incentives will depend on the occurrence of natural values and plant and animal species.
16. Develop land-use policies on the national and the regional level, aiming at a sustainable management of the green lands. This means that green lands are not being preserved as a reserve for future urbanisation, but as a capital stock, which needs to be managed with appropriate instruments. Adjust these instruments if necessary.
17. Insure the risks in agricultural production sectors (cattle-plagues, floodings, damage caused by wildlife, etc.), as it is done in other economic sectors, and decrease the cover from public funds.
18. The demands for a clean and living soil, for the cover of risks, and for product quality will lead to higher prices compared to those of present bulk production. Farmers' income of needs to be improved, not only by rewarding societal functions like tranquillity and nature, but also through specific consumer information, by stimulating the consumption of regional products, by developing specific distribution channels, and through a clear choice from the government for products from sustainable production. An important incentive could be given by fiscally stimulating sustainable production methods and vertical integration of production chains.
19. Integrate agriculture and conservation where possible, either on community level or regional level. Since both conservation and agriculture support recreational co-use, one should experiment with different forms of payment for such co-use (for instance, a national entrance fee for agricultural areas).

20. Reinforce agricultural education toward sustainable use of the green lands. Besides practical knowledge, a new theoretic concept is needed, based on sustainable development, management of the capital stocks, integration of different rural functions, and relevant instruments and techniques.
21. Reinforce technological development toward new farm crops and domestic animals that have the ability to strengthen agri-biodiversity and the sustainable economic position of the sector. Furthermore, reinforce technological development toward less dependence on chemical inputs and energy and animal-unfriendly production methods.
22. Stimulate the foundation of regional landscape shops where locals are being advised on the objectives of green lands management, where jobs are mediated in the fields of conservation and landscape maintenance, and where the new system of income redistribution linked to nature- and environment friendly management is translated into counsel and fiscal services.
The landscape shops could play an important role in elaborating regional contracts and in counselling on land use and management changes.
23. Use the existing experience with milk quotas to devise similar systems for areas with (imminent) overproduction. Quotas should in principle be assigned to the owners and users of the land.
24. Not-landbound agriculture has to comply with the same standards as industries in the fields of environment, welfare, labour conditions and spatial planning.
25. Stimulate a capital flow to the countryside by means of, for instance, tax incentives for green investments (including transitional forms toward sustainable agriculture and the development of nature reserves), forms of joint ownership and joint use of the countryside, and by means of various savings systems (eco-smiles) for products from sustainable agriculture and forestry.

Measuring

26. Re-evaluate the information influencing the decision-making processes in companies, authorities and organisations. Make sure that information on the four capital stocks is available, and that decisions are accounted for in this respect.

27. A green-lands index contains information on the natural capital represented by land, with environmental quality and biodiversity as the main aspects.

28. An Agri Sustainable Index describes the degree of sustainability of agricultural production; the green-lands indexes encompass biodiversity, energy efficiency, resource efficiency, environmental quality, and ecological footprint.

Foreword

A period of rapid developments has fundamentally changed the character of our villages, countryside and nature. Country life will never be the same again. This is not surprising, since nothing remains the same forever, but it is odd to see that the change has brought us so little to be really proud of. Of course we are proud to be delivered from former deplorable labour and social conditions, proud of a good food supply and a reasonable level of welfare in areas where this used to be more or less exceptional. But we have paid dear for it.

Don't we all have mixed feelings about the enormous loans young farmers need to contract to start a business?

Don't we all have mixed feelings about the crisis in the pig breeding sector, with all those suffering animals and people, and with a public sector making a loss of several billions because of swine fever and manure overloads?

About abandoned farms where new nature has to be created to compensate for all the natural areas that have disappeared over many decades?

About the complex administrative work farmers and country people have to do to comply with the rules and regulations?

Don't we all have mixed feelings about urban youth who no longer have the faintest idea where their food is coming from, their choice being limited to the supermarket and a fast-food restaurant?

Don't we all have mixed feelings about the large sums spent by the European Union on the countryside? What do we buy there for 45 billion euro per year?

About the conflicts between farmers and conservationists in land use projects?

About the "no admittance" notices around nature reserves and farmland?

Don't we all have mixed feelings about another road, another (planned) railway, another trading estate and another residential area in a rural zone?

About the fact that the manure problem has prevented The Netherlands for decades from complying with the European standard for groundwater, which has to be suitable for consumption?

Don't we all have mixed feelings...

City or country people, many of us know these mixed feelings. But hardly anyone seems to be able to do much about it, though everyone tries, once in a while.

Several nature conservancy organisations proposed to link large-scale nature projects with other infrastructural investments, at the cost of farmland.

The Worldwide Fund for Nature proposed similar plans for the so-called Green Heart of the Netherlands and the Rotterdam region.

In a report about the future of the dairy sector, the Dutch organisation for agriculture and horticulture LTO describes a new, clean and environment-friendly sector.

A branch of this same organisation published a report indicating a shift in paradigm (agriculture being no longer the sole rural function) and making proposals to manage agriculture, nature and landscape as a whole.

The Association of the provinces of The Netherlands (IPO) wants “Green on the map” and asks for several billions of guilders extra to resist the demand for houses and infrastructure in the countryside.

The National Council for Agricultural Research NRLO published a report about the future of fishing, green space and the agrisector, proposing far-reaching changes.

The Dutch Ministry of Agriculture, Nature Management and Fisheries describes “A green Delta” in which the countryside provides room for urban activities and for new activities which would support the national economy.

These are all excellent analyses and fine plans. Intuitively, however, one feels that they will probably come to nothing because of developments that are very difficult if not impossible to influence.

A hot item in the European Union is the Agenda 2000: what will be the impact of the introduction of new member states? One thing is certain: no matter how hard a government may try to gain support for its own agriculture, the money available for subsidies will have to be divided among an increased number of candidates, while competition from Middle- and Eastern-Europe will grow.

Worldwide, further trade liberalisation is discussed; the new round in the WTO negotiations involves agricultural products. And no matter how hard the European Union may try to keep the defensive structure around the European Union upright, the prices will be affected by further trade liberalisation.

At the same time, in their attempts to realise Agenda 21 (the UN plan for sustainable development approved in Rio de Janeiro in 1992), environmentalists face the problems of deforestation, the lack of drinking water, erosion and desertification, the loss of cultural values with indigenous peoples, and the decline of nature, especially in coastal areas. But really sustainable agriculture is virtually non-existent.

While the best European farmlands are being taken out of production, indications accumulate that world food production is not half as promising as it was until recently assumed. Even though, technically speaking, high quantities can be produced, there is no guarantee whatsoever that the food will reach the people who need it most: the hungry.

We live in a strange world. It seems that our common wishes are by definition unrealistic. There is no connection between the things that need to happen and those that happen for real.

Where do people really distinguish between causes and effects? Where do people either distinguish between or connect objectives and means? Where do people work on a more fundamental analysis of rural problems? In the Netherlands, in Europe, in the world?

Why then should we not start in The Netherlands, which has always been a leader in agricultural production and conservation?

What is needed to really understand causes and effects and to forge fundamental changes?

In this report we will give a new and ambitious answer to these questions.

1. Introduction

Since the publication in 1953 of Mansholt's Plan for the European agricultural sector, this sector has thrived. Incomes drastically increased, technological developments boomed, and the sector's contribution to the exports was substantial.

At the same time much went wrong. In his 1998 Mansholt lecture, former Dutch agricultural minister Van Aartsen reviewed the current instabilities in the agricultural sector and put forward the question why we appear unable to take appropriate measures, except when urged to do so by major crises.

In this respect, the following conclusions are of importance. It has become clear that no coherent or sustainable systems model underlies present agricultural policy and technology. Neither financially nor ecologically agriculture is consistent or sustainable. With a little good will the "chemisised technology" could be regarded as a sort of generic maximisation model - the end of which is in sight, however. The instabilities Van Aartsen mentions are a lack of consumer confidence, water shortages, climate change, pesticides, herbicides and antibiotics, hormone and salmonella issues, animal monocultures, epidemics, the competition for green space, and income bonuses, the continuity of which he doubts. He does not mention the so-called ecological footprint, which is equally important, though.¹

There is a deplorable lack of coherence in agricultural financial regulations: what is taxed in one place is subsidised in another. There is no insight in the interdependencies and feedbacks between incentives and restraints. Certain, however, are the 45 billion euro annually spent on direct European subsidies², which means that an instrument is available to organise steering. The question is: in which direction or how?

A clear conclusion derives from Van Aartsen's list.

If the agricultural sector wants to survive, this direction will be determined by a reduced use of hormones, chemicals and intensification techniques, aimed at less vulnerability and a more reliable production in the long term, at the expense of today's high production.

¹ Appendix 1 gives the ecological footprints of 52 nations.

² 45 billion ECU through the European agricultural fund (national contributions are not taken into account).

The shift toward this (form of) sustainable agriculture is a difficult one, and it will not be realised instantly, even though attempts are clearly being made.³ Even consumers are not really interested, although 60 percent⁴ say to have little or no confidence in the present food production system. The curious thing is that, while nearly 2.5 million people support environmental and conservation organisations, the connection between this kind of green and agricultural green is very loose and unstable. Nature is seen as an expensive hobby of society and as an apolitical issue. The connection between nature and agriculture becomes looser instead of tighter.

The competition from new EU member states and other countries is bound to create new instabilities, and so does the liberalisation of agricultural markets, agreed in the WTO treaty. The effects of climate change on agriculture are hardly considered. Therefore, a drastic change may be rightly advocated.

³ “The change needed in the agrisector is one of feeling shared responsibility for developing and preserving ecological, cultural, ethical and spatial values. It is a change from reactive to active policy: thinking and acting with an eye to sustainability”, report of the Dutch Council for Agricultural Research NRLO 98/20, p. 3.

⁴ Mansholt lecture 1998.

2. Problem definition

Current agricultural policy analyses lack several dimensions. The scenarios of the Dutch Institute for Agricultural Economics LEI (Zachariasse et al., 1994) are largely based on extrapolations of trends. Some fundamental suggestions are made in a report by the Dutch Scientific Commission for Governmental Policy (WRR, 1998), but a visionary answer to the points mentioned in Van Aartsen's Mansholt lecture is absent. The new report of the Dutch Council for Agricultural Research (NRLO, 1998a-c) makes concrete proposals and gives a thorough analysis, but has certain flaws.⁵ This general analytical failure has the following causes.

2.1. Ecosystems theory

First of all the insight is absent that every form of agriculture has to be primarily subjected to some ecosystems theory. The prevailing agritheory does not accept nature as the main system to which every agricultural activity is subordinate, even cultivation under glass, which is a relatively controllable form of agriculture. *Until a generally understood and accepted ecosystems theory will be the guiding principle for agricultural politics, instabilities will keep on occurring.* (See chapter 3.1)

2.2. Four capitals

Secondly, is it hardly understood that agriculture, the social structure and land use cannot be separated. In principle, any good can be produced in any social environment. An automatic loom works as well in a European region as in Taiwan. Agriculture is different, though. Much knowledge is vested in social structures, in generations of culture and handicraft, and so inextricably bound up with the specific human, economic and biological conditions of rural areas. In parts of the former East bloc a stable, dateless, semi-feudal agricultural production structure was destroyed within just a few decades - but could not be replaced with a successful modern version. Clearance of the Dutch glasshouse or bulb districts on behalf of urban expansion would mean the destruction of social and agricultural capital. The agricultural production system is of high cultural value, but society is rather negligent about it.

⁵ The UK report *Innovation with ambition* (NRLO, 1999) does contain a great deal of the necessary

Using the four-capital model of Ekins, Serageldin and IMSA as a base for further policy can strengthen this insight. We will elaborate on this model in chapter 3. The essence is that any future policy needs to be based on conservation of the four capitals. The four-capital model is shown in Figure 1.

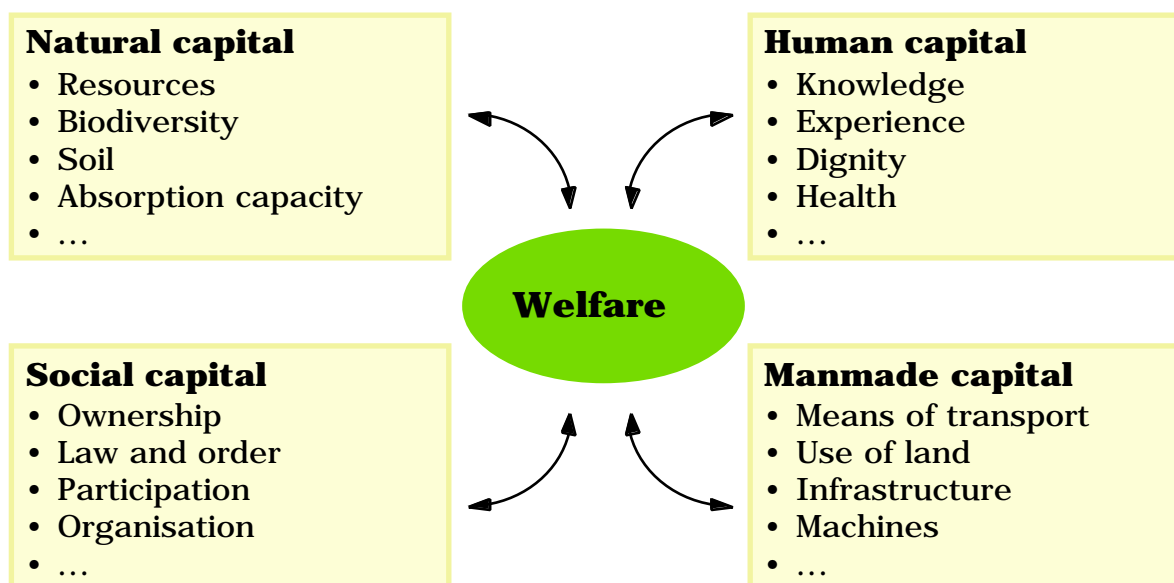


Figure 1: The four-capital model (Source: Ekins (1992) & Serageldin (1994); elaborated by IMSA)

2.3. The free market

Thirdly, it is hardly understood that rash submission to the free market is incompatible with preservation of the four capital stocks. Only at the fringe of a wood of regulations the agricultural market is permitted some freedom in price setting. The Water Manifesto (De Waterkring, 1998) and the NRLO report provide us with material for comparison.⁶ Water, for instance, has first of all a practical value, which is, in principle, priced and tradable. Water production, however, depends on factors that are hard to control through the market. The other values of water regard people's perception of their environment, and the future. Both values cannot be traded on any market.

systems approach, though, and so does the report of the Group of Bruges (Groep van Brugge, 1998).

⁶ See chapter 5 on NRLO and values.

For agricultural products, similar values can be discerned:

- *Political value:* For 5000 years, a stable, reasonably priced food supply was the main goal of any policy - but this seems to be forgotten now. Since many years it is common practice in the EU to talk about *stocks* in terms of *surpluses*. Large intervention stocks or surpluses offer security but have, at the same time, a destabilising effect. The decreased mean world stock is now largely in private hands, which has made the market more flexible. Governments no longer manage this food stock. In times of need, they buy it up, so that it can fulfil its historical political role.
- *Health value:* Without sufficient proteins, vitamins, minerals, fats and carbohydrates we cannot survive - which also means that health demands do not stop at some border behind which then lie mad-cow disease, pesticides, hormone scandals and swine fever. Health demand applies to the whole system. Health is not a marginal issue.
- *Natural value:* A consistently applied ecosystems theory implicates an indissoluble bond between healthy food, a healthy soil, clean water, and surrounding biodiversity. The latter provides biological buffers against diseases and plagues, and serves as a genetic reservoir.
- *Social value:* Millions of farmers live on and for their crops or cattle. Just imagine how the world and the countryside would look like if this connection got lost. Agriculture has now disappeared from many areas in Europe; villages are abandoned. If nature were to take back this land, everything would, in principle, be all right. Certain areas are being overtaken by immigrants, however, who have no relationship with the region. These areas lose their structure. Schools, local merchants, authorities and the like need to be linked to a professional population connecting the past with the future, and their surroundings with the daily struggle for life. Such a loss of structure also arises in impoverished areas and in areas where some or little agricultural activity remained.

As soon as a withdrawing government gives the unstructured, rash market powers a free hand in these values, many unexpected and undesirable things happen. In many parts of Europe the following events per sector are to be expected.

Stock-breeding:

- It will become even more attractive to fiddle with safety regulations in the cattle feed industry (BSE), and all kinds of albuminous raw materials from marginal sources will be added.

- The international meat trade will become permanently uncontrollable.
- Food preservation techniques will be used which are now illegal.
- The use and production of pesticides will increase (in other sectors too).
- There will be series of food scandals.⁷
- The authorities will be constantly pressed to politically justify and financially compensate the scandals.
- Factory farming will move to Poland, the Ukraine, Portugal, Rumania, Bulgaria and Canada.

Dairy:

- Dairy farming will soon cease to exist in the Netherlands, Denmark, Austria, Ireland, Belgium and, subsequently, the rest of Europe. Imports from (new) cheap milk producing countries will support the dairy *industry*, and yield such high profits that dairy *farming* will go bankrupt.
- Participants in dairy co-operatives will become mere shareholders, who themselves do not produce.
- Pasturelands will be taken over by amateur farming, conservation and urbanisation.
- A small market niche (of five to ten percent) will emerge for local quality produce.
- After completion of current depreciation periods, the dairy industry too will leave for cheaper countries.

Arable farming:

- The cultivation of potatoes will not disappear immediately, but severe pressure will be exerted by renewed consumer attention to health issues.
- The cultivation and processing of sugar beets will move to cheaper countries. The use of GMO seed in these countries will meet with consumer resistance here.
- The role of sugar in the food pattern will drastically change (decrease).
- As a raw material, sugar will become of major importance in ecological chemistry. It will be produced in cheaper countries, though.
- Producers of consumption goods will increasingly turn to contract growers in the cheapest countries:

baby food	Chile
meat	Argentina
potatoes	Eastern Europe
barley	Turkey
onions	Rumania, Bulgaria
fruit	Israel, Bulgaria, South Africa, Chile
wheat	Australia, USA, Canada, (France?), the Ukraine. ⁸

⁷ Like BSE (cattle), swine fever, botulism (stock-breeding), aflatoxin (grain), salmonella (poultry), hormones (calf fattening), and wine and olive oil crises.

- In ten to twenty years the greater part of current European arable farming will have disappeared. It will be replaced by a small number of new crops, especially for agrification.

Forestry:

- The already marginal forestry sector in Western Europe will become increasingly dependent on amateurism and government support. The connection between forestry and conservation on the one hand, and consumer use of timber on the other hand will weaken.

The rural structure:

- The current social rural structure will be severely damaged, first as a result of changes in the dairy sector, but also in other regions which are now occupied with arable and factory farming.
- Large parts of the vacant areas will be used for greenhouses and bulb growing.
- The impact on landscape and environment will further damage ecological diversity.
- Sustainable farming will come to nothing.

2.4. Land-bound capital

The fourth insight should be that completely different capital flows could easily take control of the agricultural sector as soon as it is fully liberalised.

Capital as such is not free of values. There are many forms of capital, and they can be used in various ways. Land-bound capital is much less speculative than the flash-money streaking daily around the globe in the so-called Global Casino. The money of a co-operative or a savings bank is invested differently from capital changing owner every minute on the Exchange. The enormous speculative profits of the financial markets, though, put high pressure on all money, heightening the trend to direct capital to where most profit can be expected. In our ever “richer” world it appears increasingly difficult to reserve funds for education, domiciliary care and the like. Likewise, it will become increasingly difficult to keep flash capital out of the agricultural sector as soon as this sector is opened up for short-term profits or deprived of its functional defences.

⁸ Assessments based on interviews with key persons in these sectors.

Sustainable land management (for instance the preservation of a good soil structure) demands long-term care, just like water reserves and landscape conservation.

Speculative capital has other desires. For instance, it could buy a region, put a wall around it, make it yield a triple production during five years, and then get out.

Although this need not literally happen, the comparison is realistic enough: if the authorities fully withdraw, agricultural production too becomes deprived of regulations, zoning plans and other control schemes, and the results will be accordingly.

In fisheries, the principle of the commons has been abandoned a long time ago. Short-term interests prevail⁹

2.5. Climate change

The fifth and last insight concerns the changing climate. The agricultural production factors of water (drought), temperature and soil are increasingly uncontrollable. Seasons are no longer predictable. We observe more storms, droughts and floods, winters that are too mild or too severe, hail and snow in the growing season, and summery warmth in winter. What counts is not the earth's increasing temperature, but the climate's instability.

These five factors, as described in 2.1 to 2.5, together with the discontinuities mentioned by Van Aartsen in his Mansholt lecture, render the agricultural heritage of 1945-2000 outdated and call for new structures.

The main questions are: do we want to preserve our agriculture, and how do we ensure world food production? In this analysis, the instabilities mentioned first of all influence the European situation. If the situation in Europe were balanced by a substantial improvement elsewhere in the world, it could be concluded that the net result of all changes is either neutral or even positive if the global food production would improve compared to the present situation. This will not be the case.

⁹ See for instance John Gray, 1998, for an analysis of the Global Casino's behaviour.

2.6. World markets

The opinion underlying this report is that it is our common interest to preserve and strengthen agriculture in Europe. Moreover, we believe that Fort Europe must not shut out products from other parts of the world, even though our proposals necessitate many, mostly fiscal measures to make first and foremost European agriculture sustainable. This could very well lead to reinforcement of the fort and, as a result, to closed borders. We will elaborate this subject in chapter 5. Here we will concentrate on the food situation and agriculture outside Europe.

The biological succession model (see chapter 3) can easily lead to misinterpretations of the ecological necessity to limit agricultural pioneer production. Over the last half century, the agritechnological goal was to boost the quantity of agricultural production per unit of land or unit of energy input. Since this goal has been reached over and over again, it seems possible to feed the world population, in spite of all predictions of the opposite. From the point of view of ecosystems theory, though, this goal should now be replaced by the aim to optimise - and not maximise - production, since also food production will decrease in the decades to come due to the paradoxes of maximisation.

It is necessary to keep agricultural ecosystems intact, in order to ensure food production in the long term. Optimisation favours sustainable production; maximisation endangers it. Overfishing is maximisation; sustainable management of fish populations enforces optimisation of catches.

An agricultural technology which assumes that soil, sea, plants and animals can be fully exhausted without any side-effects and costs, is a serious mistake. In the past, a consistent use of ecosystems theories led to numerous sustainable agricultural systems; neglect of these theories led to the disappearance of whole civilisations. An example of the latter situation was salinisation as a result of wrong irrigation methods in, for instance, the deltas of the Indus (Pakistan) and the Euphrates and Tigris (Mesopotamia). An example of a sustainable agricultural system are the paddy fields in Southeast Asia, where the use of high-yield varieties did not endanger the surrounding biological system.

A poor understanding of ecosystems' stabilising role still leads to a great many disasters. Since the 1930s, the landscapes of East and Central Europe have been devastated. Hundreds of thousands of kilometres of ecological primary structure were removed, for the sake of short-term gains from monocultures. Water reserves disappeared, and canalisations, houses and other infrastructure replaced water-buffering zones. The 1997 floods in large

areas between the Oder estuary and the Danube were one of the results, just like the 80 or more landslides in the European Alps since 1950. Now and then, inundations of the Ganges estuary in India and Bangladesh still make the headlines, but the true figures behind this kind of natural disasters resulting from a lack of understanding about the role of nature in organising our (rural) culture, are rarely mentioned. To name just a few:

Between 1965 and 1990, China lost 35 million hectares of farmland, an area as large as the whole of farmlands of France, Germany, Denmark and The Netherlands. Calculating on the basis of China's mean grain yields and consumption, this area could have fed 450 million people (Van Dieren, 1995).

In 1980, the capital importing countries' debt amounted to 567 billion dollars. Over the next twelve years, they paid 891 billion dollars in instalments and 771 billion in interests. A large part of these payments, however, had to be financed with new loans. As a result, in 1992 these countries' debt amounted to more than 1600 billion dollars, more than twice their 1980 debt (Van Dieren, 1995). The decreasing prices of raw materials illustrate the practical impossibility for these countries to pay off their debts (see Figure 2).

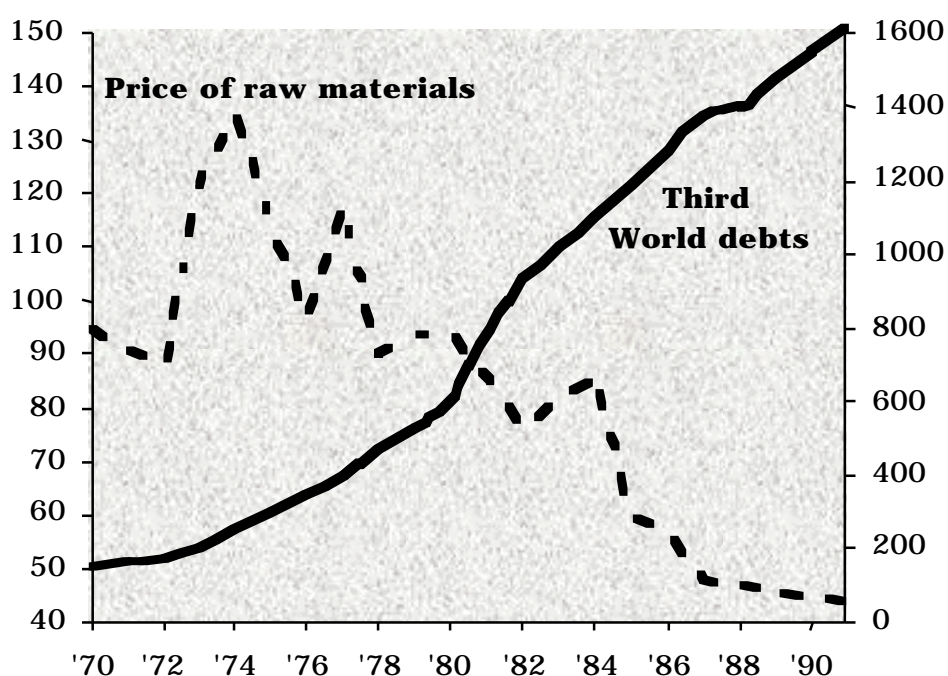


Figure 2: World trade prices and third world debts (Source: Wuppertal Institute, based on Durning, 1992 (UNDP, WB, IWF)).

In 1990, 800 million people did not have economic or physical access to sufficient food for a healthy living, and 185 million children under the age of six were really hungry. The cause of this is not food shortage, but poverty: more than 1.1 billion people live in absolute poverty on an income of less than one dollar per person a day. 1.3 billion people have no access to safe drinking water (RIVM/UNEP, 1997).

The causes for this hunger and these shortages can be found in false trade regulations and poor income distribution, but there is more. Poor knowledge and use of ecosystems play an equally important role, just like greed and overuse. With the present tree-felling concessions, the jungle of Surinam or Borneo will have disappeared in ten years from now. Then, their low-lying cultures are doomed to die too.

The huge advantage of the here advocated reversal towards sustainable agriculture in Europe is that standards will be put into practice which can serve as global examples and limit values. What we are doing here, could become the new world standard.

This implies development of a new vision on a just world food supply, in which the forces of development aid, global income distribution, food production and free markets are regrouped. We know that too much food aid ruins local production. We know that too much free market causes poor countries to completely sell off their (mineral) supplies. We know that the northern greed overburdens too many agricultural ecosystems in the South. We also know that too much agricultural production gets lost in decadence and overabundance, instead of reaching the hungry. We know that the growth of China's consumption will lead to a grain shortage and increased meat consumption, resulting in more hunger.

No matter how understandable this all is, it is neither ethical nor sustainable. We have not further examined this global issue in the context of this report. It will certainly have to be elaborated in sequence to it. We also know that Europe is not an island, least of all in the agricultural sector. We are contributing to the European surpluses, which impoverish farmers elsewhere, and ruin markets with our subsidised exports and food aid. It destroys a healthy, and especially a sustainable production-oriented development of agriculture elsewhere, first of all in many developing countries. Priority for a balanced development of our rural areas, in which natural values are considered as important as agriculture and stock farming, contributes to a more balanced development elsewhere, with better opportunities for their agriculture and their farmers. Whether this will eventually lead to less hunger and malnutrition is first of all dependent on the policies of the developing countries themselves.

The present growth of the world population makes it doubtful whether the world will be able to produce enough food to reasonably nourish all its inhabitants, even when mean figures are used and the distorted relationships which still lead to permanent malnutrition of a majority of the world population are overlooked. Such a long-term perspective should also lead to caution: is it sensible to abandon farmlands in Western Europe which are among the most productive in the world, when the limits of production have been reached elsewhere and the world market prices for food will keep on rising? The issue might not even be the destination of our farmlands, but the preservation of essential agricultural knowledge and skills in these regions. (See also chapter 4 on preservation of human and social capital.)

3. Analysis: two model theories

No production system can do without a solid theoretical basis.

Liebig’s principle is still dominating present agricultural technology: plants are mechanistic objects driven by light, water, N, P, and K. Chemistry serves to ban diseases and plagues, while oil, gas and machinery eliminate labour and maximise production. The same goes for animals. Meat production is a technique. The animal does not count, neither as an individual nor as a biological organism; it is merely a machine.

Ecologising agriculture does not mean abandoning Liebig’s principle, but adding understanding for the fact that plants and animals are part of a greater ecological whole, as well as understanding of sustainability. And also: adding more respect for plants and animals, for the creation, and for the farmer, whose existence has become too insecure.

First of all, fundamental understanding of ecosystems theory is required. This can be obtained with the help of Odum’s succession model (see Figure 3).

3.1. Ecosystems model

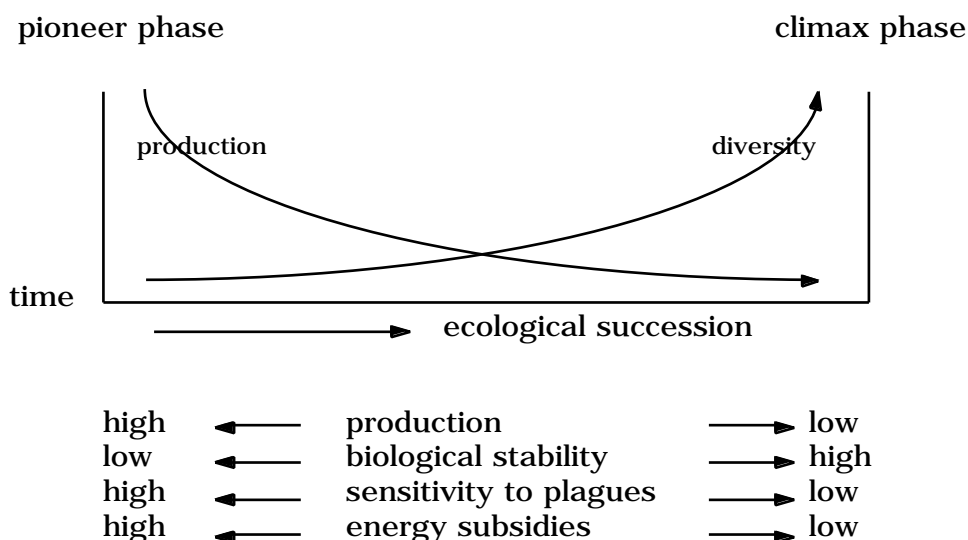


Figure 3: The succession model (Source: Odum, 1971)

Odum's ecosystems theory (1971) implies the following.

Every biological system shows a certain succession in time. At the beginning of this succession, the system is in a pioneer phase. In a natural process, successive plants take the place of these pioneers, until the system reaches a climax. A tropical rain forest needs one to two million years to evolve from a pioneer to a climax phase, while a saltwater tidal area needs a few years only. On high moors the succession takes several centuries. Swamps reach their climax phase within 15 to 25 years. Dune areas have a geomorphologic and ecological succession of plants that needs a thousand years (Van Dieren, 1934).

In the pioneer phase, plant diversity is minimal and production per hectare high. This situation is reversed in the climax phase. In a tropical rain forest net production is zero; growth and decay are in balance.

In this definition, agriculture is ecological pioneering, yielding a high production of single crops or animal species.

The stability of ecosystems is inversely proportional to their production: pioneer systems are subject to severe disturbances (bacteria, viruses, erosion), which do not occur in the climax phase, at least not in a destabilising sense. The present large Dutch inland lake, for instance, is a monoculture: few species in large quantities and, as a consequence, severe disturbances, like eutrophication with water bloom, botulism, and massive fish mortality. Even the cormorant plagues on fish monocultures are signs of this instability.

In the pioneer phase, sustainable agriculture is impossible. Equally impossible is high food production in a climax system. The question, therefore, is: how much production do we want at the price of how much instability, or: how far can we go on the axis from pioneer to climax system, to find a system which is relatively self-protecting and which, at the same time, yields enough output. In other words: an ecologically sustainable system. Measuring three main flows of the current agricultural practice on Odum's scale, we get the following picture as shown in Figure 4.

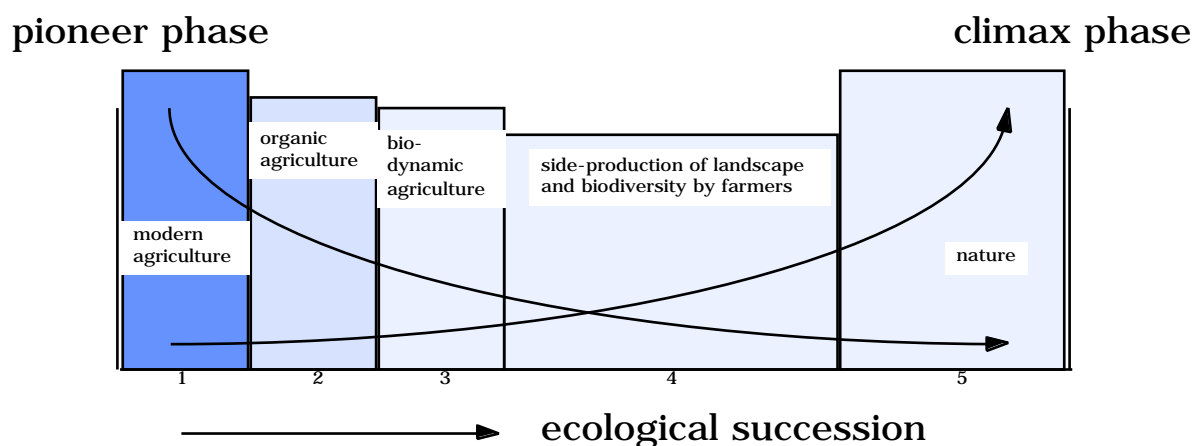


Figure 4: Agriculture's position in the succession model. Area 4 is economically important, but it is not calculated, neither as a desired "product" nor as production representing income in current economics.

Modern agriculture produces the highest output, at the cost of the greatest amount of biodiversity and with the highest degree of environmental pollution. These cost factors are hardly charged or not charged at all.

Organic agriculture produces less output per hectare, because it uses no polluting chemicals and applies more mechanical and labour intensive methods. It also uses nature and biodiversity in the near climax phase areas (4 and 5) as production factors. Since common agricultural practice neither counts the societal cost of pollution nor the loss of biodiversity, nature and landscape, the prices per unit product in organic agriculture are higher. The production of biodiversity and the calculation of societal costs represent an insurance premium against instabilities as well as the desired quality leap to landscape and nature. Organic products are not more expensive, they are more realistic.

Another basic concept needed to formulate a solid model for sustainable agriculture is the four-capital model, which demonstrates that throughput should not be the only point of reference. Sustainable agricultural production is never about maximisation, but about optimisation, so about a feasible yield instead of a maximised one. This conclusion has vast consequences.

3.2. Land as capital

The most important consequence of this line of reasoning is that it defines land as the ultimate capital good. Land is not just a means of production for this year and a few years to come, it is the basis for the values described in chapter 2: political, health, natural and social values. This conclusion also discards the habit to measure the economic value of land in the price per square meter of urban building land. Land as a precondition for sustainability cannot be an object for speculation.

Since 1870 approximately, human labour is increasingly being protected. It is subject to numerous limitations in the form of social security, labour safety regulations and labour inspections. Considering land as a sustainable natural capital, and giving equal importance to the other three capitals, means limiting the conditions for their use too. In the same way as workers are being protected from abuse - since we want to honour human value -, we have to start protecting the political, health, natural and social values of the land. In order to do so, limiting conditions need to be set, in the form of both legal boundaries and fiscal instruments.

It is current government practice in Europe to reserve money to keep the farming community alive, stimulate rural social structures, and protect nature. This is not being done systematically, though, but at random and at high costs. We do not know how much we will be going to pay tomorrow, and for what.

An option is to consider the present productive structure as a sort of agricultural millennium capital¹⁰: numbers of farmers, produced quantities, the nature of the products, social structures. The question then is whether this can be called a sustainable, stable capital stock. In a theoretical concept, it should be possible to capture the present condition of the four values in a matrix analysis. This zero measurement would then be the basis for next policy measures.

Thus we create *qualitative* indicators to guide the new policy. If, for instance, the optimal index per sector is 10, then we know how strong the sustainability push for each sector needs to be. Figure 5 shows a sustainable four-value index for the agricultural sector, as designed by IMSA, and measured for the Dutch situation.

¹⁰ This measurement serves as starting point for the agricultural four-value capital. Taking this measurement as zero in the year 2000, we have the principle of the millennium capital.

	Maximum score	Political value	Health value	Nature value	Social value	Total score
Arable farming	(40)	7	4	2	3	16
Cattle breeding	(40)	3	3	3	4	13
Pig breeding	(40)	3	1	-	4	8
Dairy farming	(40)	7	4	6	6	23
Poultry farming	(40)	2	1	-	2	5
Bulb growing	(40)	2	4	4	4	14
Forestry	(40)	2	6	6	2	16
Cultivation under glass (vegetables)	(40)	3	3	-	5	11
Cultivation under glass (flowers)	(40)	2	1	-	5	8
Total (maximum score)	(360)	31 (90)	27 (90)	21 (90)	35 (90)	114 (360)

Figure 5: Sustainable four-value index for the agricultural sector¹¹ (Source: IMSA)

This matrix could be *quantitatively* elaborated through adjustments for the Sustainable Human Development Index (SHDFI) or the Index for Sustainable Economic Welfare (ISEW). Both indexes give a reasonably accurate estimate of the desired sustainability calibration.¹² To the four-value index a regulating political policy is linked, preserving or strengthening the four capitals and optimising the throughput (production). Land is the core. The instruments are legislation and income incentives. There is a long way to go from theoretical totals of 360 and a real score of just 114. Linking the first index to the year 2000, this is the millennium agro-capital.

3.3. The capital denial

Once, hunting and gathering were most natural things to do and the only ways to find food. Tranquillity - not a scarce item in those days - and nature were an obvious part of the deal. Nowadays, the countryside's nature has become a subject of protective measures and strict management control.

The forestry sector, once of the utmost importance for the Dutch national economy, has partly become a form of conservation, and is in all other respects kept alive with subsidies and traditions. Arable farming, once a pillar of the food supply, has become a bulk producer for industry. Cattle breeding and dairy farming, once a clear sign of Dutch wealth, depends

¹¹ This is only a model for thought. All figures are debatable by definition. Refinement is necessary and possible.

on subsidies and quotas. Horticulture depends on greenhouses and natural gas subsidies, and is more and more concentrating on the cultivation of flowers (or: how to bring nature to townspeople). Factory farming (pigs, poultry, veal) has become an industry which depends on huge imports. (See appendix 1 on ecological footprints.)

Rural policy is based on contradictory ideas. First of all, the productive sectors are regarded as normal economic sectors, preferably producing for the world market. Secondly, the other rural functions (especially nature, sometimes with a recreational function) are preserved by means of government subsidies, for societal reasons. To this end, farmland is even taken out of production, making it difficult for land-bound agriculture to evolve into a more extensive farming technique. As a result, people are busy with conflicts regarding the land. In the meantime, dominant economic sectors can easily expand.

It is not hard to explain why land-bound use of rural areas is being marginalised. Land is a special capital good, which characteristics cannot be compared to those of buildings or machines. The biological characteristics of the land enable agricultural production. These characteristics are readily denied in order to count land-bound production as a “normal” economic activity, which indeed it is not, and can never be.

When the value of the land is being determined by economic sectors yielding more added value than agriculture does, the land will not remain green. So, government interventions are necessary. By means of land use planning, the government tries to keep green lands open. Another way to preserve green lands is by subsidising conservation and agriculture.

To determine the value of farmlands more is needed than just land use planning and subsidies. Firm fiscal, financial and economic instruments have to be used to make the green sectors strong enough to resist the sale of land for other activities.

The joint green activities (from conservation to all forms of land-bound agriculture) need strengthening by means of a land policy aimed at sustainability. Such a policy would have to regard the green sectors as a continuum: conservation as a form of agriculture without production (necessary to preserve the gene supply and for the pharmaceutical industry); arable farming, horticulture and land-bound cattle breeding as forms of conservation with production; forestry as a form of conservation with a small amount of production. The green sector as a whole manages the countryside.

¹² See appendix 3.

In the seventies, land policy aimed at supporting the dominant economic powers, and first of all construction, through government-decreed “degreening” of the land. The goal now is to preserve the green lands, so the opposite of those new anachronistic policies.

4. Land management and sustainability

The societal goal of sustainable agriculture is to preserve and strengthen the four capitals in relation to the four values. In such a system, agriculture, nature and environment are combined, the land is protected from speculation, and only one model is used to unite all those involved. The existing flow of money is a means to realise the objectives, but only the quantity. The incentives all need drastic changes (see also paragraph 4.2). The central issue is to set limiting conditions upon land use and to employ the flow of money as a new steering mechanism.

The following policy consequences result when the land is considered the link between the four capital stocks.

4.1. Natural capital

The land has to become a public good or commodity that can only be owned and used under strict conditions.

The soil needs to be clean. The national budget and/or the land owners' budgets should take into account overdue soil remediation¹³. Thus, we would do justice to the concept of environmental debt and the idea that we have consumed much of our capital.

Secondly, the different values of land should be equalised: land in development schemes, building land, farmland and nature are now so differently priced that the last two functions are permanently being squandered. By analogy with the rates of excise duty imposed when residences are turned into offices, a tax should be levied when land is used for other purposes than nature and agriculture. All transactions should include a tax on transfer of property to protect the long-term interest to keep the land green.

The land's natural capital regards, for instance, plant and animal species, humus, clean water reserves and the absence of toxic substances. Polluters are now being rewarded with income; sanctions are exceptional. This principle needs to be reinforced and reversed, by means of direct income bonuses and tax advantages if the existence of plants and animals on private land is being promoted, the soil is kept free of toxic substances, and the water is kept clean. At present, people are charged for water purification and the like. Positive

¹³ Dellink, 1997. The figures regard fully sustainable remediation: not just agricultural damage, but all soil damage. They are for the Netherlands Dfl. 230 to 450 billion (about 108 to 212 billion euro).

sanctions, on the contrary, would reward the preservation of natural capital. Such bonuses do already exist, for instance for farmers who delay harvesting to protect birdlife.

However, this is not *rule*, but *exception*, only applied to farmers whose land is adjacent to or surrounded by nature reserves - and who perceive it as a punishment. As a *system*, though, valid for every square meter of farmland and including an income bonus reflecting the relation between maximisation and optimisation, this rule could mean the difference between sustainable and non-sustainable agriculture. It would invite farmers to stimulate the diversity of their land. Numbers of birds, clean water and the like would then shape the criteria for an *Agri Sustainable Index*, and consequently for tax advantages and other income bonuses.¹⁴

Such indexes can be developed for nearly all land-bound sectors. Since factory farming and cultivation under glass do not really fit this definition, we will now discuss some variations.

A dominant non-sustainable characteristic of cultivation under glass is its energy use. The input-output ratio of greenhouse vegetables is strongly negative, varying from a factor 5 to a factor 40 (energy input to calorie output). The prices charged for natural gas in The Netherlands are too low, because of fear of competition and short-term interests. Again, this is a subsidy on capital exhaustion, while the reverse should be the case: premiums, in any form, on a reversal of this ratio to a net added energy value. Farmers who produce more energy than they consume, should receive tax advantages or other income bonuses. Energy-producing greenhouses do exist, but are not used because they are not profitable. This can thus be reversed.

These last years, the use of biological crop protection in greenhouses is increasing, especially since negative publicity resulted in damaged Dutch exports to Germany between 1991 and 1995. The sector appears to be doing well enough, but even so tax measures are necessary. Many pesticides are still being used, and the (export) risks remain high. The *Agri Sustainable Index* should, therefore, include cultivation under glass.

The situation in the (intensive) flowers sector is even more serious. The so-called ecological footprint of flower production is unacceptably high because of exotic cultivation in countries like Venezuela, Senegal, Kenya, Chile, South Africa, Israel etc. (Liedtke, 1998) and the spaghetti-like logistics of international flower trade. The social footprint is serious too. Eco-

¹⁴ In our proposal, the current system of tax and other income bonuses has to be put aside. A combination with our system would add more paradoxes and only increase the number of contra-productive facilities.

efficiency analyses will unavoidably result in taxes on eco-inefficiency. Should the other sectors be rewarded for good behaviour, this sector could not avoid a drastic restructuring.

Factory farming is a monoculture in which the dense populations evoke biological feedbacks like the many diseases and plagues from which the animals in this sector are suffering. Technical rationalisations have increased production, decreased animal welfare, and raised the sector's vulnerability. Quantitative reductions may be a rough remedy, but they are the only answer to the diseases and plagues ensuing from too dense populations, besides a reintroduction of normal relations in these populations (no separation of different functions: insemination, gestation, lactation, fattening, but instead so-called integrated verticalisation). The best answer to the consequences of a decreased livestock (poultry and pigs) seems to be a higher consumer price. This, however, will be counterproductive, since it will boost production and thus intensification. The alternative is, again, a premium system depending on the nature of the production or the form of (capital) stock management. Income bonuses need to regard the production circumstances. Premiums need to be introduced for integrated verticalisation, for minimising numbers per hectare, for stimulating so-called manure processing in pipeline networks (energy production), for accounting for a veterinary index (a reward for decreasing antibiotics), and for salmonella-free production, besides stronger regulations regarding the use of hormones and comparable preparations. Premiums or bonuses are not the only means, though; the farmers themselves will have to become convinced of the need to change for the better. If they want to take full part in modern society, contact with society's morals is a must. Sustainability is the only valid morality for the future.

4.2. Human capital

Agricultural human capital is *price-less*, but is at the same time under great pressure. In many parts of Europe young farmers do not succeed in finding a spouse. Of Dutch farmers, 65 percent do not have a son or daughter who want to take over the business (Agro Daily, 1998). Anxiety, uncertainty, low income, hard work, policy interventions, labour conflicts, as well as the consequences of diseases and plagues play a role. BSE (estimated costs £ 3.5 billion¹⁵) caused great problems for English farmers, and so did the crisis in the Dutch pig sector (estimated costs Dfl. 6 billion).

¹⁵ Personal communication with VIVA, England; officially, £ 1.3 billion in financial compensations was paid between 1996 and May 1998 (The Parliamentary Review, 20th Febr. 1998).

Employment could be well doubled in a more broadly defined green sector. For some strange reason, though, it is beyond our imagination to reverse certain ongoing developments: labour will always be made redundant; traffic and consumption will keep on growing; and in agriculture, technologies will become increasingly important at the expense of labour. We seem to accept all this as laws of nature, even when we observe gross drawbacks from these very laws.

In reality, such developments are much less linear and more cyclical. When a technical or socio-political development enters a so-called state of overshoot and collapse, it will by definition be adjusted. Thus, brooks that were canalised 30 years ago, are now meandering again - an ecological metaphor that could apply to many political developments too. Of course, the excessive loss of jobs in agriculture should not be adjusted with qualitatively inferior new jobs. Our notion of a sustainable agriculture will definitely meet this demand.

The measures proposed for the natural capital will revalue farmers as innovators and managers, will increase their income, will raise the four values, and so enlarge the human capital of the farming community. But this is not enough. The desired discontinuity is not just a technological one (between 1950 and 1990, European farmers turned into technical experts), it has to be a socio-cultural break too.

Modern farms lack character. In regions where farmers once used to live in communities, since 1930 or so isolated farms became the standard. Even the closest communities saw their farmers disperse. In regions where farms used to lay scattered across the land, their inhabitants still had strong economic and social relations with the local community. At present, however, even these relations are in danger because of the reasons described above.

Revaluation of agricultural human capital seems impossible to impose, also with fiscal measures. There should be possibilities, though:

- Agricultural education needs to be drastically reformed within the framework of the here-described sustainability criteria.
- Typical regional production and traditional marketing of local products needs to be stimulated. The European trend to allow slaughtering in a few places only, for reasons of hygiene and efficiency, needs to be reconsidered: the reverse, i.e. local (clean) production and traditional processing of these products, restores the local population's sense of dignity and responsibility as well as the confidence of consumers.
- In certain regions, a revival of traditional building can be detected, but a real stimulus has to come through tax measures.
- Tax measures can serve to better protect traditional buildings and landscapes.

- The reintroduction of mixed farms needs to be stimulated (Rabbinge et al., 1997). The government must take the lead, by establishing at least two test farms¹⁶ per region.
- Reintroduction of “new” crops needs to be stimulated. Nothing is as undeserving as the absence of innovation. Experiments with, for instance, flax, hemp and biodiesel have failed, but nobody knows why. The biodiesel experiment (on the basis of rapeseed) did not come off the ground in The Netherlands, but was realised just across the border. A lack of leadership, money and vision?

4.3. Social capital

The aforementioned measures in the field of human capital will greatly increase the farming community's social capital. But there is more.

Once and for all a boundary will have to be drawn between city and countryside. The permanent threat of the city absorbing the rural sector has to be stopped. In England, half a million people demonstrated against this development. The demonstration was unjustly disposed of as a sign of antimodernity. In fact, both in England and The Netherlands the greater part of the population is not urban, and the same can be said for large parts of Europe. In the trends of urban and country planners and architects, though, the countryside does not really play a role as a social planning factor. Cities and metropolises produce mega-plans for the future. The countryside does not do likewise. After the Mansholt Plan, there has never again been another agri-futures plan in Europe.

The new locations for housing projects as well as the numbers of houses in The Netherlands do not mirror the future need for housing and space. The population is ageing, and will decrease after 2015. Even with an average of 1.7 person per apartment, after 2025 many houses will be empty (e.g. Bierman, 1995). More densely populated urban areas as well as incentives to redistribute the current housing stock will have vast consequences for the present plans to raid the countryside. The rural social structure will be enforced and agricultural self-conscience improved and future-oriented, as soon as the countryside is given more space. This will also be in the interest of urban society, to stop it from exploding from within, as has happened in many American cities.

¹⁶ Test farms or demonstration farms are typical of Dutch agri-policy. In order to experiment and to educate, specialised research farms have been constructed, often called “station”: the dairy test station, the poultry test station, etc.

Rural social capital is much greater assumed in daily political planning practice. It concerns property, legal security, participation, organisation and culture, with an invaluable meaning for food supply and administrative cohesion. Mostly, though, far too little attention is paid to these aspects.

Of the Dutch professional population, 250,000 people are working in agriculture and fisheries, and some 300,000 in the related supply sector, trade and the food industry; the agrisector's part in total employment is 10 percent. A total of 40 percent or 6.25 million people live in the countryside or in small villages and cities (with less than 20,000 inhabitants). The Netherlands are still not an urban society. Holland Metropolis is the economic centre of activities, a circular suburb with some minimal metropolitan functions, from which it is always possible to reach an agricultural landscape within fifteen minutes, and where old social, cultural and industrial structures can be found which are semi-metropolitan. Yet, the countryside and the agricultural working population are disregarded in policy-making. Here, the only point of departure is a future consisting of cities, roads, so-called mainports and industrial estates.

Obviously, the vast agrarian lobby, although it has built the present agricultural structure, cannot bring itself to forms of modern, future-oriented emancipation. Had it been able to do so, it would not have had its present underdog position.

Social capital: property

Since stable ownership is essential, it is important to optimise the conveyance of agricultural property. At present, succession is a problem, though.

Farmland is very expensive, but urban land costs even more. Therefore, the transfer of ownership should be reorganised, linked to quota and fiscal rights resulting from the before mentioned indexes. This would put up a tariff wall against alienation of agricultural property.

Quota rights have pros and cons. When assigned on a purely historical basis, they may lead to economic rigidity. However, quotas for car kilometres, for instance, are conducive to the distribution of income. When land, environment, nature, mobility, space, etc., become so scarce that even the classic market mechanism either does no longer work or leads to extreme inequality, then quotas are possibly the only creative possibilities left.

Social capital: legal security

In the four-capital model, legal security is seen as an important capital good. Its essences are *predictability and self-regulation*.

In a strong rural culture, legal security is in a certain sense a function of autonomous power structures, since usually social control mechanisms ensure strong and predictable social relationships. It is important to analyse and quantify this autonomy. If the amount of so-called external legal regulation in an urban area is, for instance, x times higher than in a rural area, these costs must theoretically be added to the rural income.

Predictability and self-regulation are endangered when the entire agricultural sector is driven towards over-liberalisation. Such a trend would lead to the before mentioned negative effects on production as well as to high costs resulting from a loss of social cohesion and, therefore, of economic and social predictability and self-regulation.

Because of their land-bound capital structure, agricultural systems have long time axes. Investments, planning, and the accumulation of knowledge need time ranges of ten, twenty or thirty years. Such a period can only be bridged when predictability is high. It is impossible to bridge when the movements of the free market become too strong and policies change course and direction every few years. And even more so when this is all being catalysed by the effects of climate change.

Stabilisation is a must. And the direction is to be found in sustainability and dynamic but predictable policies. (See also chapter 5, Trade liberalisation.)

Social capital: participation and organisation

Agricultural sectors are characterised by a high degree of participation and organisation. The number of unions, associations, co-operatives, working groups and commissions amounts to many thousands. There is much commotion, though. Current vision on nature, technology and the future is not in line with societal developments and policy principles of sustainable development. Reactions to WTO forces are not inspired by a vision on sustainability.

For many years, the course was unquestionable. Education and information were embedded in a chemised technology agri-model. The power and unambiguity of this model gained so much support that the sector's overall knowledge, production, technology and targets were fully in line.

This old success model is so strong that new ideas are hard to develop. Acquired rights and success concepts are not easily abandoned. Such a right is the demand that society bears the costs of the swine fever crisis or the BSE catastrophe. Other market sectors would never get even a fraction of the sum involved, or dare demand it.

The sector's high degree of organisation should be linked to new ideas and concepts, like the ones we propose here. The reason why this has not yet succeeded is not to be found in a lack of inquisitiveness, but in a lack of unambiguity, of an attractive perspective and a coherent logic. The English farmer, for instance, will never be permitted, as it were, to understand the BSE crisis. First, the government liberalised the (meat) inspection, thus causing to lose a much-needed system of checks and balances. On financial grounds it was then decided to cancel essential safety steps, enabling BSE to infect the whole chain. The final loss is now many times larger than the expected savings. The beef market as well as the lamb market have collapsed. Even though these dynamics can well be explained, it illustrates the initial confusion. In British farmers' magazines horror stories have been published about conspiracies in Brussels, about the non-existence of BSE, and about secret plans of French and German politicians and farmers' organisations to harm the English. This is one of many examples, which all designate the need for a new unambiguity. The European jungle of rules, anti-rules, directives and diverging directions needs to be cut back, and an ambitious new perspective must be designed and, at all levels, learned, understood and supported. In the summer of 1997 and in March 1998 European commissioner Fischler proposed to allow *conditional* income bonuses for 20 percent of the European budget. This is a step in the here advocated direction. Twenty percent is too little, though, and it goes much too slowly.

Social capital: culture

Social capital also regards rural culture. Culture cannot artificially be made or enforced, and least of all stimulated with taxes, one is inclined to think. But that is not as absolutely as it seems.

Few things will have such influence on a revival of the regional culture as the dogma of globalisation. Everywhere signs can be found that people do not want to be or cannot be full-size European or World Citizens, and that they prefer the local, regional reality. Especially in the most modernised parts of Europe, there is a strong trend toward Mondophobia and Europhobia. Looking around in a Scandinavian supermarket, one sees an abundance of Scanda-own products. And the same phenomenon can be observed in

Austria, Switzerland, Italy, Spain and France. The Dutch, so it seems, are indifferent in this respect.

Regionalisation of production and products is a strong tendency, which will only increase with every next food crisis. It is not really an expression of a positive cultural experience, but more likely one of anxiety and insecurity, in line with the fact that people need socially recognisable relationships. Country markets are successful throughout Europe, and so are local products. If the here proposed new sustainable agricultural policy wants to be a success, it will have to reckon with this socio-cultural dimension. The measures we propose will surely help to restore local and regional rural culture. Besides, many other initiatives are possible. We have already discussed traditional building and production methods as well as fiscal incentives. Others are:

- educational and cultural sustainability incentives to agricultural youth organisations, with the help of financial instruments,
- idem to agricultural education,
- idem to agricultural social life.

We also propose to create a new professional group: *the landscape shop*, primarily selling concepts of nature and landscape. It does not represent a civil servant or an inspector, but complements inspection and control with a productive role. The shop is based on the large societal demand for nature and landscape or biodiversity and cultural diversity. It researches this “market” as for demand and sale. The financial flow consists of the mentioned income redistribution, money from the Greenfund and new (similar) regulations, as well as from existing regulations like the (former) subsidy for people who green their yard.

The procedures for all these regulations have always been difficult. Analogous to the privatisation of many former national post and telephone services, replacing them with shops and consumer service, completed with marketing and (some) competition, we here propose to use the landscape shop to redesign a large number of landscape, ecological and cultural facilities and the ensuing economics of the farmer.

The landscape shop is the link between the consumer (of the landscape), the farmer and a flow of income. The shop is acquainted with the available green schemes and goes on tour to “sell” them. For instance, it sells a sustainable roadside management, an ecological ditchside management, a new grass with a wide variety of plants, an ecological belt with trees and undergrowth, but it also disposes of calculating models to show the effects of certain measures on sustainability. It also helps the buyer to make use of the financial advantages of his buy. In a certain sense, the landscape shop replaces current formal agricultural

information, though there are more differences than resemblances. The landscape shop is a fiscal green consultant.

Social capital: initiatives

A soft green shade on a field in spring means that later in the season this field will yield a harvest. The analogy is clear. At this moment, many initiatives are being taken that will yield a new rural development.

It seems that all over Europe people do no longer see agriculture as a sector trapped in subsidies. Initiatives need to come from all sides, not just from the capital or Brussels. It is time to newly develop the European countryside, even though this is not without risk. If agriculture is being regarded as just another hard economic sector, without emphasising the individuality of its land use, agriculture will soon lose its green character. Industrial agriculture does exist, but the drawbacks are too severe to consider this as a viable option.

An example of a new approach can be found in Waterland, the district north of Amsterdam. Some years ago, the farmers here joined in a nature and environmental Cupertino, producing both agricultural products and nature. With local products and a relation with the Amsterdam tourist branch (a room on a farm as a friendly alternative to a city hotel) they try to strengthen the local economy. Farmers who want to join do not just need their own knowledge of cattle breeding, but knowledge of nature and environment as well. The government is not unsympathetic toward the initiative (the sector takes part in an administrative experiment concerning flexibility in environmental policy), but does not meet its real demands. Everywhere in Europe farmers have joined in agricultural nature organisations or environmental co-operatives, thus slowly forming a new rural social structure. Current green subsidies are still directed at generic institutions; they are not suited for these kind of co-operative local initiatives.

Over the years, organic agriculture has advanced with small steps. Since supermarket chains, however, have realised that the consumer is concerned about the way in which food is being produced, this form of agriculture is on the rise. The Dutch sector now counts 868 farms on 17,500 hectares. Organic horticulture and fruit growing are successful. At least 30,000 consumers have subscribed to a weekly bag full of biological fruit and vegetables, in a system of secured subscription.

In the polder district of Flevoland, private individuals have taken the initiative to start a new country estate: nature, forestry and agriculture in a new combination. In Germany

several hundreds of such new estates are being developed. People clearly want a countryside with a meaning. Sense. Nature. Structure. Future.

4.4. Man-made capital

The four-capital model does not regard man-made capital as something that depreciates and has to be replaced every few years. Farmyards are nowadays often packed with scrap metal, while farmhouses seem to be built of corrugated iron and waste wood. Every 30 years the landscape is reorganised, and the “old” infrastructure replaced. As a rule, it means that landscape and nature deteriorate.

These last years a change can be observed, though. Until 1989, for instance, brooks and rivers were canalised; now it is sometimes tried to restore their natural watercourse. A much needed and systematic increase of the groundwater level, however, meets strong resistance, even though the pros (less desiccation) might well outbalance the cons. It has often been found that the costs of land consolidations are higher than the profits. But the practice is stronger than new insights are, and too many parties commercially benefit from turning landscapes and infrastructure upside down.

All these instabilities and anomalies we are now observing in present agriculture were mentioned as early as 1975. Obviously, little progress has been made in those 25 years.

The question, therefore, is how to force a breakthrough. All measures here proposed are based on:

- the ecosystems model,
- the four-capital model,
- the four-value index,
- the Agri Sustainable Index,
- tax measures (and other forms of reward and income redistribution).

Combined, they need to bring about a sustainable agriculture, in order to:

- decrease the throughput,
- restore nature,
- introduce self-regulation stimulating biological stability,
- increase farmers' income,
- give the consumer more security,
- advance public health,

- secure long-term food supply
- (etc., see also chapter 6.)

In this context, the following remarks can be made about man-made capital.

Man-made capital: infrastructure

Our point of departure is the present social and land development infrastructure. For each region, indexes can be made in which the available man-made capital is tested against two sustainability criteria: natural value or biodiversity and cultural value or social value (see Figure 6).

The list given in Figure 6 is not complete and merely qualitative¹⁷. Each column can amount to a total of 430. The present totals are 151 and 185. For each region, the total can amount to $2 \times 10 = 20$.

Natural value is determined by the contribution of the production itself and the end product to nature. Social value is determined by an estimate of the sector's meaning for the region: on the one hand socio-economic contributions - a company being embedded in local culture -, on the other hand adjustments for environmental and landscape losses, and for elements of cultural alienation.

With the help of such a scale it can be determined whether the existing man-made capital complies with the optimal or maximal value (= 10) for sustainability. This means that the existing capital is not invariable, and that interventions are possible and desired. Every scale can raise relevant questions: an index rate of 3×3 , for instance, asks for a decision on the necessity to raise these figures and, if so, with what measures. Possible measures are:

- a change of groundwater levels,
- the development of ecological buffer zones,
- depaving of roads,
- implementation of mixed farming,
- experiments with new crops and cattle, and relevant taxes, as described in paragraph 4.1.

¹⁷ This list is qualitative, and entirely the editor's view. The Dutch Institute for National Health and Environment RIVM has made an in-depth analysis of the notion of environmental indicators. We propose to qualitatively elaborate the list in line with the RIVM model (RIVM, 1998).

	natural value (max. 10)	cultural value (max. 10)
1. West-Friesland, arable farming	3	3
2. Waterland, stock breeding	7	8
3. Vecht area, Green Heart, dairy farming	7	8
4. Veluwe, western border area, pig breeding	4	3
5. Betuwe, fruit	4	5
6. Betuwe, arable farming	3	3
7. Eastern Veluwe, cattle/pig breeding	4	3
8. Salland, pig breeding	2	2
9. Salland, dairy farming	6	6
10. Twente, dairy farming	6	6
11. Achterhoek, dairy farming	5	5
12. Gelderland, forestry	9	9
13. Gelderland, poultry keeping	0	3
14. Overijssel, forestry	9	9
15. Utrecht, forestry	9	9
16. Drente, forestry	9	9
17. Drente, arable farming	3	4
18. Drente, stock breeding	6	6
19. Groningen, arable farming	2	3
20. Groningen, dairy	3	3
21. Friesland, dairy	6	7
22. Friesland, arable farming	3	4
23. Northern Netherlands, bulb growing	2	1
24. Northern Netherlands, horticulture (under glass)	0	1
25. Flevopolder, arable farming	2	4
26. Noordoostpolder, arable farming	3	4
27. Noordoostpolder, dairy	2	4
28. Flevopolder, dairy	2	2
29. South-Holland, arable farming	2	3
30. Zeeland, arable farming	2	5
31. Zeeland, dairy	4	6
32. Zeeland, pig breeding	0	0
33. Western Brabant, arable farming	1	3
34. Middle Brabant, arable farming	2	3
35. Middle Brabant, forestry	6	5
36. Eastern Brabant, pig breeding	0	3
37. Eastern Brabant, forestry	2	3
38. Limburg, arable farming	3	5
39. Limburg, stock breeding	0	3
40. Limburg, poultry keeping	3	4
41. Limburg, forestry	0	3
42. other	5	5
	151 (430)	185 (430)

Figure 6: Indexation per Dutch region for natural value and social value

See also Figure 7 in the next paragraph.

Man-made capital: land use

Agricultural land use needs to be stimulated and protected with the before mentioned (fiscal) measures. The character of the use can be changed: see the premium index for the reduction of environmental damage.

- **Machines:**

Machines put too heavy a burden on the land. Positive sanctions, stimulating farmers to use less heavy machines on their land, can lead to increased (plant) diversity.

Costs are a reason to use machines instead of people. As proposed in the ecotax, taxation on labour needs to be reduced at the expense of energy (environmental) intensive activities. The VAT tariff on lease, buy, maintenance, and energy use of farming machinery can be put on a significantly higher level than the cost of employing human labour in the same production process. Furthermore, exemption from taxation and subsidies can be deployed.

- **Transport efficiency:**

A characteristic of the (agricultural) production process is an unlimited use of transport. In the so-called strawberry yoghurt model, Wuppertal Institute's Stefanie Böge (see appendix 2) has demonstrated that the eco-efficiency (the transport) of the product can be improved with a factor 4 without changing its final price. This means that we have to look for ways to stimulate factor 10 behaviour. Obviously, current prices of transport are too low to function as a steering mechanism. The necessary price increase will indeed happen sooner or later, despite all resistance. It would be wise to anticipate such an event.

- **Eco-smiles:**

Analogous to the airmiles bonus system, eco-smiles¹⁸ could be introduced. In this system, every product is linked to a transport efficiency factor, translated in eco-smiles. The farmer can obtain eco-smiles through his mineral accounting, and is rewarded by means of wholesale or tax reductions. The consumer gets his eco-smiles at the cash desk, in the form of either price reductions or fund sharing (for instance, shares in a green agricultural investment fund).

¹⁸ An initiative of Foundation Agenda 21 ~ Tariff 21. (www.milieutrouw.nl. Chairman H.J. Redczus.)

In agricultural industry (processing), we find the same principles:

- eco-smiles for transport efficiency,
- reduced VAT tariffs for de-mechanisation,
- tax regulations to regionalise production.

All products - including those which cannot be made or can hardly be made in the European region - have to be subjected to the *comparative* eco-smile principle: if oranges from region A have a factor 6 better transport efficiency than those from region B, they will be rewarded. Containers with green beans from China, to be unloaded in Rotterdam, will - probably - be impossible then. And rightly so.

5. Trade liberalisation

We have stated that an unrestrained free market cannot be expected to support or carry a sustainable agricultural sector. At the moment, free prices in the production and sales of foods are not as usual as many people might think. Even though the auction works according to the principle of free price forming, and supermarkets offer their products at very competitive prices, *the whole system is founded on market organisation, subsidies, income redistribution and regulations.* And for very simple reasons: to protect consumers and producers from arbitrary rule and risks, to secure food supply, and to protect the agricultural production structure.

In fact, this started 3000 years ago in Egypt, when Joseph laid the foundations for agricultural policies. The entire system is, at the same time, stable and fragile, desired and hated, criticised and admired.¹⁹

We want to add the following to all we have said about the trend of liberalisation in the previous chapters.

Of course, Europe should not be a kind of fortress, defending itself from foreign competition. There is no reason why agricultural products from outside the European Union should be banned. For purely economic reasons, access to the European market should be free, and current price and other impediments should be removed. In 1995, the WTO put a stop to the proliferation of other than price impediments, transforming them into transparent and yearly decreasing price obstacles.

This does not mean, though, that in the long term all agricultural products will be traded freely, with the prices and the market as the only guiding principles. National policies will always be needed and possible, as long as they are not product-oriented, i.e. as long as they do not imply product subsidies or taxes, and as long as they do not discriminate on behalf of national agriculture, at the expense of importers. Quality demands are quite possible, as long as they do not regard the product's origin. The same goes for environmental demands, including a product's production method. These conditions can be internationally harmonised (labour conditions, exploitation of children and prisoners, etc.) Without such conditions, a sustainable agriculture cannot be obtained. Thus, it is normal, logical and even desirable to use such agreements, regulations and control mechanisms.

¹⁹ There are plenty of misconceptions when it comes to the question how far market regulation stretches. It seems to be restricted to cartel-like structures in which production and prices are agreed upon. However, the principle is also valid for all European and national regulations and directives regarding product and material safety, health and environment.

In principle, every non-EU producer can comply with the here-formulated demands. Importing countries are free to introduce adjusted indexes and define eco-smiles, in order to meet consumer demands and these policy objectives in Europe.

The question is: where is the market functioning well and where can it be strengthened? Until now we have described the free market as either not existing or heavily subsidised, or as a threat to safe consumption and sustainable agriculture.

Sometimes, when a national economy is deadlocked, liberalisation cannot be avoided. All too easily, though, liberalisation turns into a withdrawing government leaving the economy to the market forces and forgetting that the market can only function well if it is accompanied by a broad spectrum of policies which do not directly interfere with the market but which surround it. Part of such policies is legal security: protection of contract reliability, with impartial judges; protection against monopolies and cartels, and against distortion of competition as a result of badly defined subsidies; protection against discrimination intended to limit market access. In short, this means that no security can be offered regarding the price; only regarding the way in which the price is being determined. The here advocated income redistribution can be substantial, but concerns the outskirts of the market, where sustainable conditions are set.

Some parts of the agricultural market are fairly successful. In general, these markets can be better organised when they are less land-bound. For a worldwide free agricultural market, an agritechnology is required which does no longer use land and open air. Unstable production factors as soil, surface water and climate cannot be combined with the necessity of fully controllable production factors, which is a must in the risky free market.

Thus, the current practice of cultivation under glass seems to be a very useful model in which agritechnology and free market can be well combined. We have stated (chapter 4.1) that this is not fully true. Energy subsidies are influencing this market too. Once these subsidies are removed, this sector too will have serious difficulties in surviving.

Markets cannot forge sustainability, because they cannot look ahead. Mansholt's European agricultural policy could not avoid market regulation, because land development investments and vast social changes cover periods of 30 years at least. Such a term is too long for any market as well as for any financing plan. Consequently, the government needs to intervene. But where and when? Undirected short-term investments are not desirable. Interventions directed at sustainability and stability are ever so needed. Over the past period, interventions have not just been too numerous; they lacked system in every respect. It should be possible to design a system in which both paradoxes and anti-sustainability are

banned from market regulation. Policy predictability is not a panacea, however; it can well turn into rigidity. Therefore, we advocate a middle course. Dynamics is a must.

The general idea is to create a framework in which the government sets dominant preconditions for market and production. This was confirmed in a publication of the Dutch National Council for Agricultural Research NRLO, which is based on the same notions (Figure 7).

Such a point of departure cannot do without accompanying forms of market regulation. Today's trend, however, is a sanctified market. And even though the market can have a salutary effect, sustainability demands much more than such a political and economic simplification.

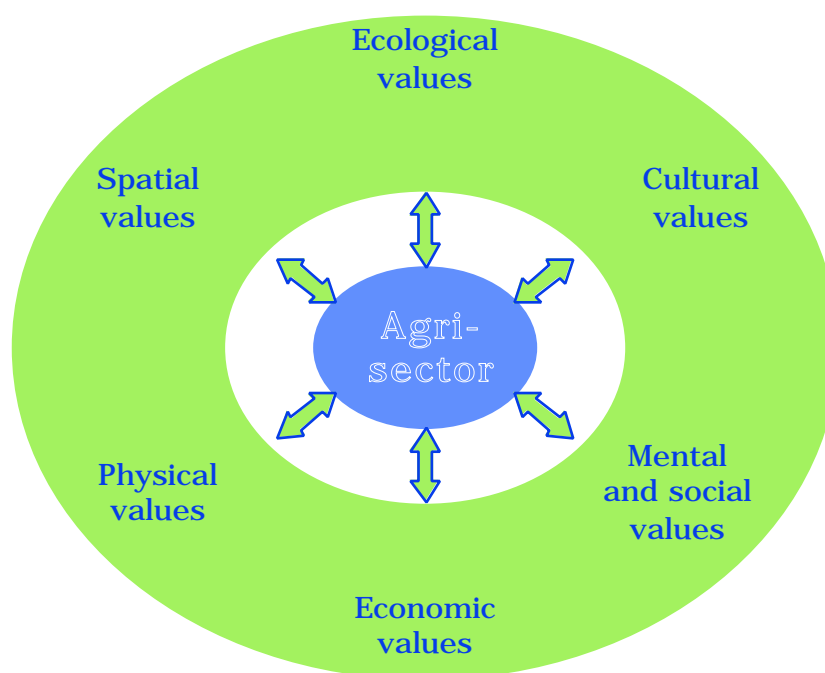


Figure 7: The NRLO places the agrisector within a value system (Source: NRLO, 1998a).

6. The agricultural green social contract

For a long time, vigilant governments watched over agriculture. In times of food scarcity, this was a good method to rebuild society. Later governments made sure that agriculture kept in line with the rest of the economy, which was the essence of the Mansholt Plan.

At present, we know that agriculture has to survive without it being able to compete with that part of the economy that is keen to occupy its territory, not only because it wants to buy up the land, but also because of footprint and biological degradation.

The example of the agricultural environmental co-operatives shows how the collective receives a financial contribution for nature and environment from the government. The collective then decides how this money is used. The government sets the conditions; the actual situation is a result of market forces, as there is a societal demand for these income transfers and related goods and services.

This model could apply to the different levels: European, national and regional.

A next question concerns the social contract between the different parties. Dutch environmental covenants between government and industry are deals in which the government provides time and security regarding its environmental policy measures, while industry accepts environmental objectives. In the fifties, the deal between agriculture and government concerned stable prices against sufficient production. Later on, export incentives and land-use investments were added. Such deals are always a sign of their time and need to be regularly reformulated. European agriculture has been working with an old deal for too long.

What could the new contract between the parties and the government about the future of the countryside imply? In other words: what are the real interests of the different parties?

The conservationist party's ultimate interest is a clean and living soil, with a rich variety of plants and animals. In other words: biodiversity.

Agriculture's ultimate interest are stable prices, yielding a sufficient income, ecological gene reservoirs, buffer systems, a fertile soil, and good water.

The citizens' ultimate interest is an outstanding and accessible countryside, a good place to stay, and a healthy food supply.

The government's ultimate interest is the highest degree of rural self-regulation and the least possible interventions.

All parties, therefore, need *security* most and for all. And a clean and living green land is the mutual ultimate interest of everybody.

- The contract's first part is that those who own the land are compensated for tranquillity and nature (in different degrees) as well as for accessibility.
- The contract's second part is that agriculture provides clean soil, air and water, i.e., rapidly decreases its old environmental debt. It bears the costs by itself, as any modern sustainable sector should do. The costs are translated into the product prices.
- The contract's third element is that the conservation and agricultural organisations together manage nature and landscape.
- The contract's fourth element is that all rural subsidies are turned into regional contributions, perhaps even without the roundabout route via Brussels or national capitals²⁰, making it possible for regions to buy certain services (like land planning) without having to depend on government regulations.
- Regarding the quality of the land, all parties must commit themselves to general land management rules: the factor land should be protected, just like labour is being protected. "Clean" and "living" are key notions in this respect.
- Finally, we have to distinguish between land-bound agri-production (of collective or non-collective goods), and production which does not depend on land and, therefore, has to comply with the demands applying to industry.

6.1. Two thousand seconds

We are beginning a new century. It would be a good thing if the green sectors, together with the Dutch (and European) society, would enter this era with new objectives for the green lands. These objectives need to be clear and concise; to be told to an outsider within half an hour (about two thousand seconds, so 2000, like the magic year itself).

²⁰ The region itself could raise a certain percentage for local initiatives, with the help of preconditions set by local authorities.

The first objective concerns the quality of the land:

5. Within ten years, the emissions of manure and ammonia must be halved.
6. Within ten years, the groundwater must be potable; within twenty years the ditchwater needs to be potable too.
7. Within ten years, the natural variety of plant and animal species in the whole of Europe must be increased with a factor two.

A second objective concerns the use of the land:

6. Within ten years, employment in the land-bound production (including conservation) must be doubled.
7. Within five years, a sufficient number of experiments must be done and measures must be taken to offer land-bound production (including nature) a wide variety of technological and economic possibilities to gain an income, especially by means of the here mentioned tax measures (see chapter 4).
8. Within three years, the research programmes of agricultural institutes must be adapted to the desire to link production to a clean and living soil.

A third objective concerns the administrative framework

- Within two to five years all subsidy rules under European authority must be transformed into a system for execution of regional initiatives without forced government intervention.
- Within two to five years the agriculture subsidy rules for income distribution must be transformed into a system which includes payments for tranquillity and nature (in different degrees), clean soil, water and air as important agricultural side-products.
- Within two to five years the tax system in the agricultural sector must be adapted to new forms of income redistribution.
- Within two years the entire system of income distribution must be transformed into a system no longer negatively penalising, but fiscally rewarding quality and sustainability.

6.2. Income transfers and taxabilities

The new fiscal, financial and economic system for the agricultural sector must contain the following elements.

- Possession of green land (nature, farmland, forest) must be tax-deductible for private persons and companies. The deductible amount depends on a certificate indicating the degree in which natural values are present and the soil is clean and living.
- Conveyance of land must be taxed, depending on the degree in which natural values are lost. Alienation for building purposes will be heavily taxed; alienation with the objective to stimulate natural values will be lowly or negatively taxed.
- Environment friendly production systems receive a bonus for relative absence of pollution. The best system is a biological company system.
- Regional allowances, to be used according to regional views, will stimulate investments. Regional decisions need to be underpinned with advice from a Commission for rural innovation.
- Bonuses for the introduction of vertical organic integration in factory farming must stimulate change. After five years, this incentive will stop, and all non-vertical production will be prohibited.
- The agricultural sector must insure itself against epizootic diseases, crop damage and the like. Here, the government will withdraw.
- Milk quotas will remain, and other quotas will be introduced, in order to preserve agricultural capital stocks.
- Each region will have its own landscape shop where the objectives of natural land management are formulated together with the local community, where jobs are being mediated in the fields of conservation and environmental protection, and where the new system of income redistribution linked to nature investments is being translated into advice and counselling. Here the farmer can find the ways to get his company high on the ASI list (ASI: Agri Sustainable Index).

- **Eco-smiles are introduced: consumer and producer receive high bonuses for products with few kilometre investments. The same goes for the energetic balance of production and products as well as for reduction regarding chemistry, hormones and pharmaceuticals per product unit.**
- **An Agri Sustainable Index will be introduced to measure the fiscal rewards for the agricultural sector. This index will encompass all mentioned measures in one clear system.**

Epilogue

The standard reaction to proposals for drastic change is: impossible, unless... Followed by the same old conditions:

“Only in a European context.”

“This country cannot do it alone.”

“International competition, you know.”

“The WTO treaty prevents ...”

Etcetera. We have heard all the arguments. And they are not very convincing.

The agricultural market and price policy has been and is being determined in a European context. This does not hold true, though, for income policy, policy in the fields of nature and landscape, or rural policy. Here the individual member states have more freedom than is generally assumed. A national or regional approach appears to be the most obvious course of action in many policy aspects. Besides, we know from personal experience, as participants in discussions throughout Europe, that everywhere the same dilemmas are perceived and the same solutions are being looked for.

Finally this: we are convinced that the time has come for a next Mansholt plan. It is now a question of leadership and courage. Our proposals will yield many winners. As soon as this is generally understood, much will change for the better.

Literature

In English

Dahme, K., F. Hintenberger, H. Schütz, E.K. Seifert, 1998, *Sustainable Human Development Index: A suggestion for "greening" the UN's indicator of social and economic welfare*, Ecological Economies

Ekins, P. and M. Max-Neef, 1992, "Real-life Economics; understanding wealth creation", published in: *Wealth Beyond Measure; an Atlas of New Economics*, edited by Paul Ekins, Gaia Books, London

Dieren, W. Van (ed.), 1995, *Taking nature into account; Toward a Sustainable National Income: A report to the Club of Rome*, Springer, New York ISBN 0-387-94533-4

Gray, J., 1998, *False Dawn; the Delusions of Global Capitalism*, Granta Books, London 1998

IPCC (1998) Report of Workshop on Rapid Nonlinear Climate Change, report of meeting in Noordwijkerhout 31/3-2/4 1998

Jackson, T. and S. Stymne, 1996, *Sustainable Economic Welfare in Sweden - A Pilot Index 1950-1992*, Stockholm Environment Institute - Centre for Environmental Technology, University of Surrey, Stockholm ISBN 91-88714-23-3

NRLO, 1999, *Innovating with ambition, Opportunities for agribusiness, rural areas and the fishing industry*, The Hague, National Council for Agricultural Research, NRLO report 99/17E

Odum E.P., 1971, *Fundamentals of Ecology*, Saunders Press, Philadelphia

RIVM/UNEP, 1977, *The Future of the Global Environment: A Model-based Analysis Supporting UNEP's First Global Environmental Outlook*, ISBN 92-807-1633-6

Serageldin, I. (ed.), 1997, *Expanding the Measure of Wealth; indicators of Environmentally Sustainable Development*, World Bank; CSD Edition, Draft for Discussion, Washington DC

Serageldin, I. and A. Steer (eds.), 1994, *Making Development Sustainable; From Concept to Action*, Environmental Sustainable Development Occasional Paper Series No. 2, The World Bank, Washington D.C.

Wackernagel, M. & W. Rees, 1997, *Our Ecological Footprint*, New Society Publishers, Gabriola Island, BC, Canada

Wackernagel, M. et al., 1997, *Ecological Footprints of Nations*, Centro de Estudios para la Sustentabilidad, Universidad Anáhuac de Xalapa, Mexico

Weizsäcker, E. Von, A.B. Lovins and L. Hunter Lovins, 1997, *Factor Four, Doubling wealth, halving resource use, The new report to the Club of Rome*, Earthscan Publications Ltd.

World Resources Institute / Wuppertal Institut / Neth. Ministry of Housing, Spatial Planning, and Environment / National Institute for Environmental Studies (Japan), 1997, *Resource flows; The material basis of industrial economies*, World Resources Institute, Washington DC, ISBN 1-56973-209-4

In Dutch

Agrarisch Dagblad, 1998, *Akkerbouwers zuidwesten hebben vaker opvolger dan collega's elders*, 11 februari

Bierman, M. et al., 1995, *Ruimte gespaard: mogelijkheden tot herverstedelijking nader verkend*, Werkgroep toekomstige ontwikkelingen in de bouwnijverheid, SISWO, Amsterdam, ISBN 90-6706-135-2

Dellink, R. en F. van de Woerd, 1997, *Kosteneffectiviteit van Milieuthema's*, Instituut voor Milieuvraagstukken, IVM-VU-rapport nr. R97-10, ISBN 90-5383-570-9

Dieren, W. van (ed.), 1995, *De natuur telt ook mee; Naar een duurzaam nationaal inkomen; Een rapport aan de Club van Rome*, Het Spectrum, Utrecht, ISBN 90-274-4598-2

Diederer, P.J.M., H.J. Silvis (LEI-DLO), 1998, *Milieudoelstellingen en landbouwmilieubeleid in Europa; achtergrondstudie voor de verkenning hulpstoffen en energie in landbouwsystemen in 2015, in opdracht van Nationale Raad voor Landbouwkundig Onderzoek*, Den Haag, ISBN 90-5059-048-9

Groep van Brugge, De, 1998, *Landbouw in Europa. Over de noodzaak van een ommekeer*, De Balie, Amsterdam, ISBN 90-6617-193-6

H+N+S Landschapsarchitecten, 1998: *Uitgewerkt en afgedaan? De relatie tussen landbouw, ruimtelijke planning en ontwerp; essay voor de verkenning "Veranderende relaties tussen landbouw en maatschappij op weg naar 2015"*, Nationale Raad voor Landbouwkundig Onderzoek; NRLO-rapport nr. 97/40 (januari), Den Haag, ISBN 90-5059-051-0

Huigen, prof.dr. P.P.P. en drs. D. Strijker, 1998, *De relatie tussen landbouw en samenleving: een proces van afstoten en aantrekken; essay voor de verkenning "Veranderende relaties tussen landbouw en maatschappij op weg naar 2015"*, in opdracht van Nationale Raad voor Landbouwkundig Onderzoek; NRLO-rapport nr. 97/39 (februari), Den Haag, ISBN 90-5059-050-0

Mak, G., 1996, *Hoe God verdween uit Jorwerd*, Atlas

NRLO, 1998a: *Globalisering en Agribusiness; kennis- en innovatieopgaven voor de toekomst*, Nationale Raad voor Landbouwkundig Onderzoek; NRLO-rapport 98/2 (januari), Den Haag, ISBN 90-5059-057-8

NRLO, 1998b, *Ontwikkelingen Nederlandse landbouw en strategieën voor de komende jaren*, Nationale Raad voor Landbouwkundig Onderzoek; NRLO-rapport 98/9 (januari), Den Haag

NRLO, 1998c, *Toekomstverkenningen vissector, groene ruimte en agrosector*, Nationale Raad voor Landbouwkundig Onderzoek; NRLO-rapporten 98/18 -19 -20 en 21 (april), Den Haag

Rabbinge, R., E.A. Lantinga, E.A. Goewie en G.J.M. Oomen, 1997, *De renaissance van het gemengde bedrijf: een weg naar duurzaamheid*, Landbouwuniversiteit Wageningen, Vakgroep Theoretische Productie-ecologie en Vakgroep Ecologische Landbouw

RIVM, 1998, *Leefomgevingsbalans; voorzet voor vorm en inhoud*, Rijksinstituut voor Volksgezondheid en Milieu, Bilthoven

Teldersstichting, 1975, *Milieu, Groei en Schaarste*, Nota nr. 26

Waterkring, De, 1998, *De waarden van water, Manifest van de Waterkring, opgesteld door Annemiek Nijhof (Tauw Water) en Michel Leenders (Institute for Housing and Urban Development Studies)*

WRR, 1998, *Ruimtelijke ontwikkelingspolitiek, Den Haag, ISBN 90-399-1488-5*

Zachariasse e.a., 1994, *Voorbij het verleden; Drie toekomstbeelden voor de Nederlandse agribusiness, 1990-2015, LEI-DLO-rapport: onderzoeksverslag 127, ISBN: 90-5242-269-9*

In German

Böge, S., 1992, "Die Auswirkung des Strassengüterverkehrs auf den Raum - Die Erfassung und Bewertung von Transportvorgängen in einem Productlebenszyklus", Diplomarbeit am Fachbereich Raumplanung der Universität Dortmund, Juni 1992. Verschenen in: F. Schmidt-Bleek, 1993, *Wieviel Umwelt braucht der Mensch?*, Birkhäuser Verlag 1993, ISBN 3-7643-2959-9

Dieren, J.W. van, 1934, *Organogene Dünenbildung. Eine Geomorphologische Analyse der Dünenlandschaft auf der Westfriesischen Insel Terschelling mit Pflanzensoziologischen Methoden*(Dissertation)

Dieren, W. van (hrsg.), 1995, *Mit der Natur Rechnen: der neue Club-of-Rome-Bericht; vom Bruttosozialprodukt zum Ökosozialprodukt*, Birkhäuser Verlag, Basel ISBN 3-7643-5173-X

Liedtke C., (to be published), *Ökologische Rucksäcke von Producten - Neue Wege in der Productgestaltung*, UWF

Weizsäcker, E.U von, A.B. Lovins and L. Hunter Lovins, 1995, 1996, *Faktor Four, Doppelter Wohlstand - halbiertes Naturverbrauch, Der neue Bericht an den Club of Rome*, Droemersch Verlagsanstalt, München

List of ISEW case studies

Diefenbacher, H., 1994: *The Index of Sustainable Economic Welfare - A Case Study of the Federal Republic of Germany* in: Cobb and Cobb, 1994

Jackson, T. en N. Marks, 1994: *Measuring Sustainable Economic Welfare - A Pilot Index: 1950 - 1990*, Stockholm Environmental Institute, Stockholm

Hochreiter, H., B. Obermayr, K. Steiner and E. Stockhammer, 1995: *Der Index of Sustainable Economic Welfare (ISEW) - Eine empirische Studie zur Wohlstandsentwicklung in Österreich von 1955 bis 1992'*, Interdisziplinäres Institut für Umwelt und Wirtschaft, Wien

Guenno, G. and S. Tiezzi, 1996: *An index of sustainable economic welfare for Italy*, Fondazione ENI Enrico Mattei, Milano

Rosenberg, D., T. Oegema and M. Bovy, 1998 (to be published): *A Pilot ISEW for The Netherlands - Preliminary results and some proposals for further research*, te verschijnen in een ISEW overzichtspublicatie van The New Economics Foundation en Forschungsstätte der evangelischen Studiengemeinschaft, London/Heidelberg

Jackson, T. and S. Stymne, 1996: *Sustainable Economic Welfare in Sweden - A Pilot Index 1950-1992*, Stockholm Environment Institute - Centre for Environmental Technology, University of Surrey, ISBN 91 88714 23 3, Stockholm

Jespersen, J., 1994: *A Welfare Index for the Danish Economy*, Ongepubliceerd discussiestuk, Roskilde Universitetscenter

Recent general literature about sustainability indicators

IISD, Institute for Sustainable Development (1997) *Principles in Practice, Assessing Sustainable Development (Bellagio Principles)*

Moldan, Bedrich, and Suzanne Billharz (eds) *Sustainability Indicators, Report of the Project on Indicators of Sustainable Development. Series: SCOPE, No.58 (1997)*

Appendix 1: Ecological footprints of nations

For each country, this table lists its 1997 population, ecological footprint, available ecological capacity and ecological deficit. The last three are provided on a **per capita** basis. The ecological deficit is calculated by subtracting the footprint from the available ecological capacity. Negative numbers indicate a deficit, positive numbers show the still existing remaining ecological capacity. If you want to know a nation's total ecological footprint, multiply the per capita data by the country's population.

	Population in 1997	ecological footprint (in ha/cap) <i>(all expressed in world average productivity, 1993 data)</i>	available ecological capacity (in ha/cap)	ecological deficit <i>(if negative)</i> (in ha/cap)
WORLD	5,892,480,000	2.3	1.8	-0.5
Argentina	35,405,000	4.6	3.8	-0.8
Australia	18,550,000	8.1	9.7	1.6
Austria	8,053,000	5.4	4.3	-1.1
Bangladesh	125,898,000	0.7	0.6	-0.1
Belgium	10,174,000	5.0	1.6	-3.4
Brazil	167,046,000	2.6	2.4	-0.1
Canada	30,101,000	7.0	8.5	1.5
Chile	14,691,000	3.5	4.9	1.4
China	1,247,315,000	1.2	1.3	0.1
Colombia	36,200,000	1.7	1.3	-0.4
Costa Rica	3,575,000	2.5	2.0	-0.5
Czech Rep	10,311,000	4.2	2.5	-1.7
Denmark	5,194,000	5.8	2.1	-3.7
Egypt	65,445,000	1.2	0.6	-0.5
Ethiopia	58,414,000	1.0	0.9	-0.1
Finland	5,149,000	6.3	9.6	3.3
France	58,433,000	5.7	3.8	-1.9
Germany	81,845,000	4.6	2.1	-2.5
Greece	10,512,000	3.9	1.3	-2.6
Hong Kong	5,913,000	2.7	0.5	-2.2
Hungary	10,037,000	2.5	2.0	-0.5
Iceland	274,000	9.9	2.5	-7.4
India	970,230,000	0.8	0.8	0.0
Indonesia	203,631,000	1.6	0.9	-0.7
Ireland	3,577,000	6.6	8.3	1.7
Israel	5,854,000	3.1	1.1	-2.0
Italy	57,247,000	4.5	1.4	-3.1
Japan	125,672,000	6.3	1.7	-4.6
Jordan	5,849,000	1.5	0.6	-1.0
Korea, Rep	45,864,000	2.0	0.7	-1.3
Malaysia	21,018,000	2.7	1.7	-1.0
Mexico	97,245,000	2.3	1.4	-0.9
Netherlands	15,697,000	4.7	2.8	-1.9
New Zealand	3,654,000	9.8	14.3	4.5
Nigeria	118,369,000	1.7	0.8	-0.9
Norway	4,375,000	5.7	4.6	-1.1
Pakistan	148,686,000	0.8	0.9	0.1
Peru	24,691,000	1.7	1.5	-0.2
Philippines	70,375,000	2.2	0.7	-1.5
Poland, Rep	38,521,000	3.4	2.3	-1.1
Portugal	9,814,000	5.1	2.2	-2.9
Russian Federation	146,381,000	6.0	3.9	-2.0
Singapore	2,899,000	5.3	0.5	-4.8
South Africa	43,325,000	2.6	1.6	-1.0
Spain	39,729,000	4.2	2.6	-1.6
Sweden	8,862,000	5.8	7.8	2.0
Switzerland	7,332,000	5.0	2.6	-2.4
Thailand	60,046,000	2.8	1.3	-1.5
Turkey	64,293,000	1.9	1.6	-0.3
United Kingdom	58,587,000	4.6	1.8	-2.8
United States	268,189,000	8.4	6.2	-2.1
Venezuela	22,777,000	2.6	1.4	-1.2

* Population figures are taken from the World Resources Institute, 1996. *World Resources 1996-1997 Database*, Washington D.C.: WRI. file "hd16101.wk1".

Appendix 2: The strawberry yoghurt model

Eco-efficiency can be defined as the maximum decrease in the environmental impact of goods and services as a result of the attention paid to the raw materials flow. The strawberry yoghurt model demonstrates what eco-efficiency is aimed at:

- increasing both economic and ecological efficiency,
- producing more values with less environmental impact,
- detaching welfare growth from use of the environment.

The transport intensity of our agricultural products will certainly measure up to that of strawberry yoghurt in Stuttgart. Stefanie Böge (1992) calculated that together the ingredients (yoghurt, strawberries, cup, sugar, label, lid) travelled 3500 kilometres. If one adds up the distances travelled by the suppliers' products, the journey of one cup of yoghurt to the shop comes to nearly 8000 km.

Figure 8 shows the journeys made by the ingredients of strawberry yoghurt. The scheme on the left symbolises the current transport efficiency; the one on the right an improved transport efficiency with a factor 4, due to an increased use of local means.

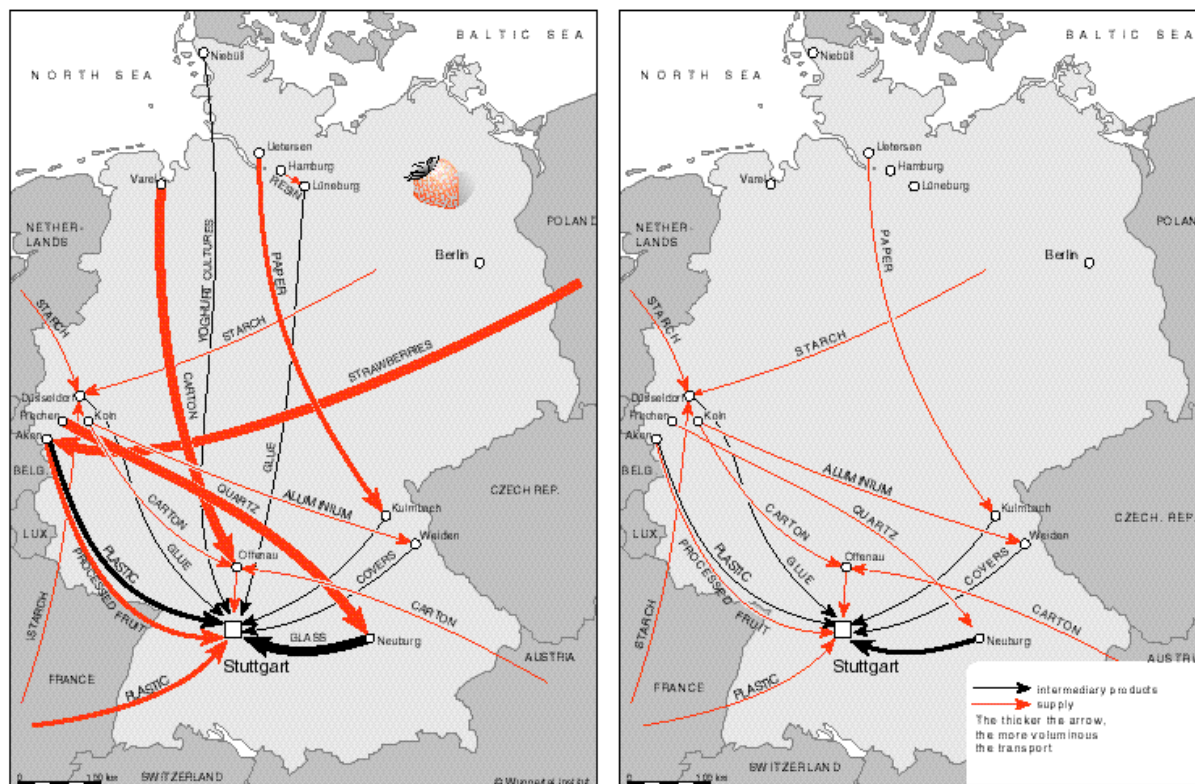


Figure 8: Journeys made by ingredients of strawberry yoghurt

Appendix 3: Examples of quantitative sustainability indicators

Both the Sustainable Human Development Index (SHDI) and the Index for Sustainable Economic Welfare (ISEW) resulted from dissatisfaction with the prevailing “index for progress”, the GNP.

GNP adds up all transactions in the economy, no matter the real value of the goods and services, no matter the condition of the supplies, and no matter the meaning of growth of GNP in the long term. From the perspective of sustainable capital management, therefore, it is misleading.

The ISEW’s concept is not so much different from that of GNP, but it tries to express extractions and additions to the four capital stocks.

Add:	Personal consumption (some 60 percent of GNP) Adjust for distribution of income
Add:	Household labour Government spending Services from <i>stocks</i> of goods (public and private)
Subtract:	Social costs car accidents, commuting, cost of unemployment Environmental costs pollution of water, air, soil, noise, ... Long-term environmental costs land conversion, global warming, resource depletion, ozone depletion, ...
Add:	± net capital investment ± net foreign lending (borrow)

Initiatives to further convert the ISEW into a complete index for sustainable welfare have been given to different European bodies. The ISEWs of ten countries have been calculated (the USA, the United Kingdom, Sweden, The Netherlands, Denmark, Italy, Germany, Austria, Australia and South Korea) or are being prepared (see literature). All calculations show that the GNP and the ISEW developed more or less parallel until the beginning of the seventies. At that point, the ISEW starts to lag behind or even declines. Figure 9 shows the preliminary results for The Netherlands, Figure 10 for the UK, and Figure 11 for the USA.

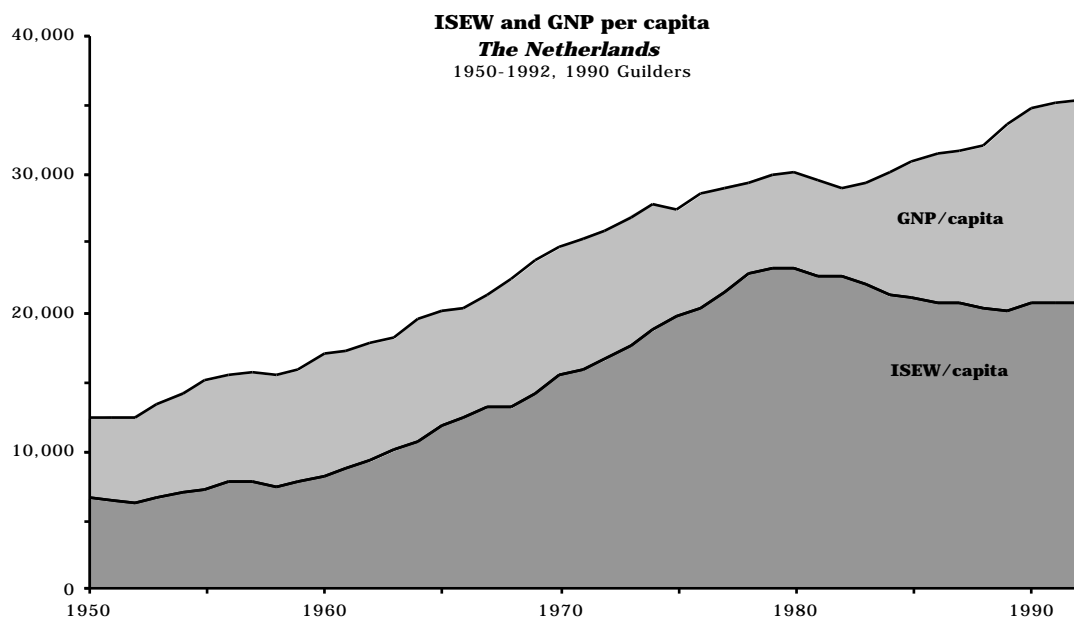


Figure 9: GNP and ISEW for The Netherlands (Source: IMSA (1995) Rosenberg, Oegema and Bovy: preliminary results ISEW The Netherlands).

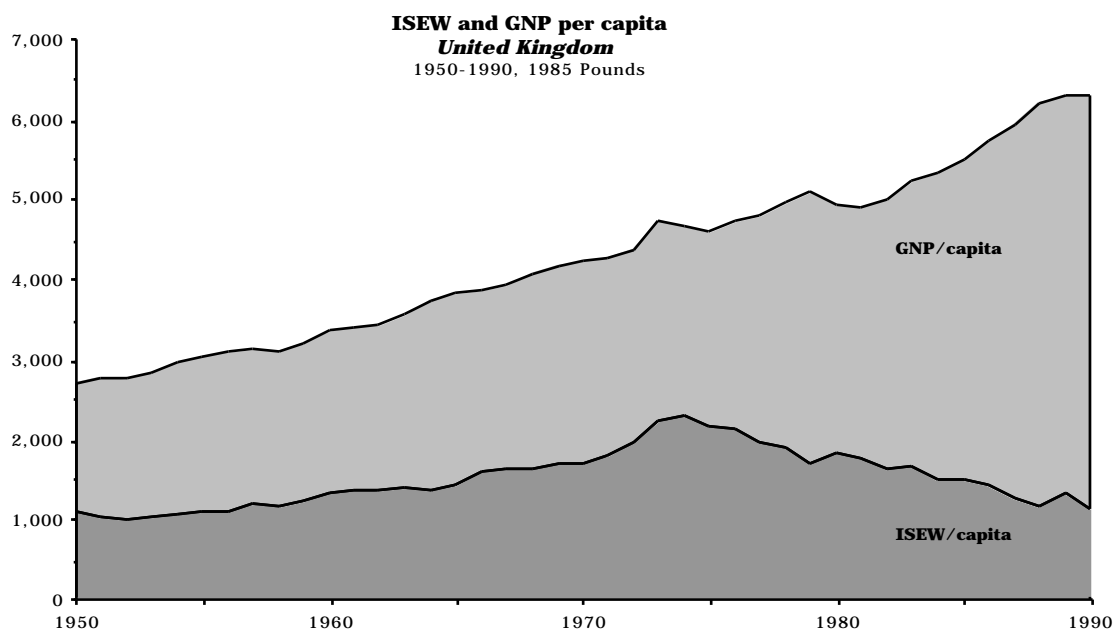


Figure 10: GNP and ISEW for the United Kingdom (Source: IMSA (1995) Rosenberg, Oegema and Bovy: preliminary results ISEW United Kingdom).

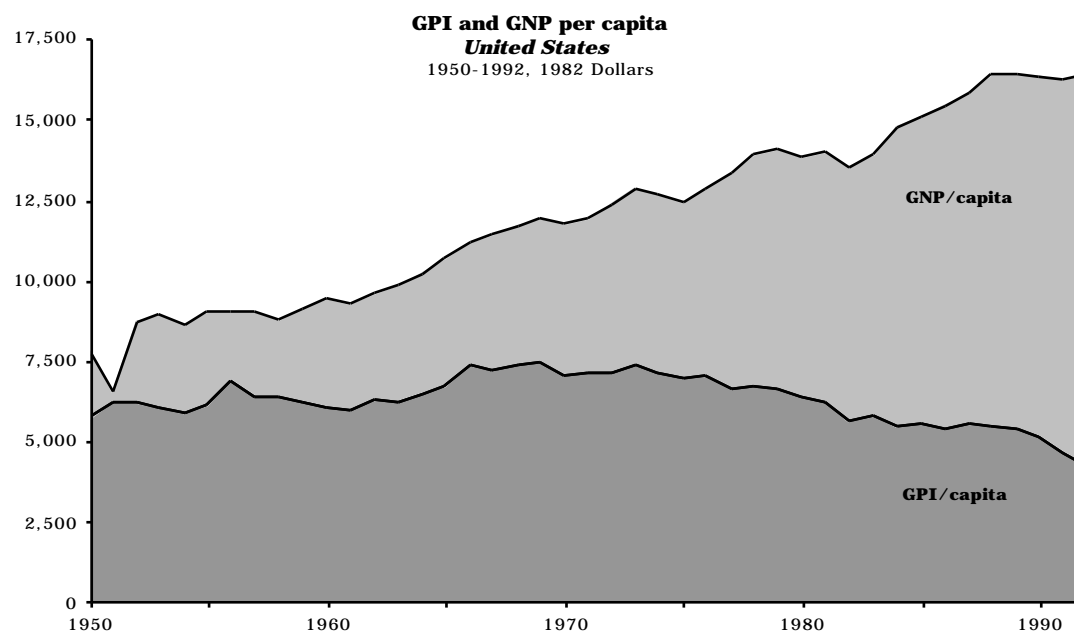


Figure 11: GNP and ISEW for the USA (Source: IMSA (1995) Rosenberg, Oegema and Bovy: preliminary results ISEW USA).

The SHDI is an addition to the HDI, the Human Development Index,²¹ published since 1990. The core concept is that one key variable is taken for each of the four capital stocks:

- life expectancy;
- education: adult illiteracy and average years of schooling;
- life standard, measured by real purchasing power, adjusted for differences in income.

The sustainability aspect is introduced by taking into account the total material input (TMI) (the less the better) (Dahme, 1988; World Resources Institute, 1997).

The ensuing ranking of nations according to the height of the SHDI is very different from the one resulting from the GNP per capita.

²¹ World Development Report, UNDP.

Appendix 4: Biotechnology

Finally, we take the opportunity here to say a few words on an issue that was not mentioned in the original report: biotechnology.

Whether biotechnology can and will play a substantial role in the herewith-proposed plan for sustainable agriculture is at present unclear. On the one hand, biotechnology does contain breathtaking potentials for improving productivity, eco-efficiency, pest resistance and salinity abatement. On the other hand, biotechnology is an unprecedented intervention in known relationships in biodiversity, soil management and the evolution itself.

To introduce agri-biotechnology at a large, global scale will take a multitude of measures, testing, and legislative and value-oriented action. Whether this can and will be done properly is an open question to date.