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Future Changes in Rural Areas of the EC.

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FUTURE CHANGES IN RURAL AREAS OF THE EC

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Abstract

In recent years the European Community has been increasingly aware of tensions between the Common Agricultural Policy on the one hand and regional policy pursued parallel to it on the other. The regional and structural funds are increasingly called upon to mitigate the undesirable socio-economic and environmental effects of the common market in agricultural products, in an increasing number of regions. Decisions on the deployment of these funds are taken while knowledge is lacking about the cost-effectiveness of investments for agricultural development in the various regions.

Therefore, in 1988 the Netherlands Scientific Council for Government Policy started a project on the possible developments for the rural areas in Europe. The study must provide scenarios that give information on the interactions between a number of more or less self-contained technical development processes in agriculture, aimed at productivity gain, and several other "non-agricultural-production" goals that might be pursued in the rural areas in the EC. In these scenarios the conflicts arising from increasing productivity, market saturation, uneven distribution of production within Europe and increasing concern for the environment and the landscape will be addressed. The scenarios can be used to set up a consistent policy for the rural areas in the EC.

Introduction

The ever increasing budgetary problems of the EC necessitate knowledge about the cost-effectiveness of investments for agricultural development in the various peripheral regions. For example: the investment of funds from the European Agricultural Guidance and Guarantee Fund (EAGGF) in particular for the promotion of agricultural development, in many cases, may not only be ineffective but may even be counter-productive, because of saturation of the market for nearly all agricultural products. Decisions on the deployment of these funds are taken in a knowledge vacuum. In view of the need to apply the limited resources from the funds as effectively as possible, a more informed assessment of the different alternatives for the use of resources is desirable. Consideration must be given here not only to the promotion of agriculture or other forms of land use, such as forestry, nature conservation, recreation, production of "green" raw materials and the like, but also to the supply and processing industries. In many cases there is little scope for action in these areas, and it is necessary to look outside farming and allied sectors for possible solutions.

To satisfy this need for information, it is necessary to gain an

understanding of the development possibilities for different agricultural activities in a number of regions. It is important here to take account of the production ceilings imposed by community policy, the continued increase in agricultural productivity and developments in other regions. Information must then be provided, on the way in which different agricultural activities contribute to the achievement of other regional objectives, such as the creation of jobs, the generation of income and conservation of nature and landscape.

Therefore, the Netherlands Scientific Council for Government Policy formulated a project under the title *Landelijke Gebieden in Europa* (= Rural Areas in Europe) in its programme with the following objective:

"To provide information on the interactions between a number of more or less self-contained technical development processes in agriculture, and objectives from other points of view such as socio-economic, environmental protection and nature conservation and the consequences of these interactions for rural areas in Europe".

The underlying principle of this objective is that developments in the field of agriculture must form the starting point of the analysis and that the final effects (and hence conclusions) must be relevant to the rural areas of Europe.

The developments in agriculture considered here relate in particular to the continued increase in production per unit of land area and per unit of livestock. Although the market and price policy pursued hitherto has led to production cutbacks for a number of products in recent years, the policy has had little influence on this unremitting increase in productivity. Factors which play a greater part in determining the speed of this process are technical developments in cultivation methods and, increasingly, in the environmental field. If the present area of land under cultivation is maintained without any change in land use, the structural over-production which has developed over the past 10 years in virtually all major agricultural products will take on even greater proportions.

In view of the fact that the Common Agricultural Policy aims to curb the production of surpluses, in order to minimize the distortion of the world market, we assume in this study that action will be taken to bring about the necessary adjustments to both the Common Agricultural Policy and regional policy. This pressure for a more market-oriented policy may lead to a concentration of farm production on a much smaller area of land than that currently under cultivation, which will probably be situated for the most part in regions where the best quality agricultural land is to be found.

The final effects on rural areas of these technical developments in agriculture may be perceived, for example, in trends in regional income generation and employment (generally speaking, the socio-economic aspects), in the regional intensity and scale

of agricultural production (generally speaking, the agrotechnical aspects) and in emissions of environmentally hazardous substances from farming and the disruption of nature and landscape (generally speaking, the environmental protection and nature aspects). An attempt is made in the LGE project to quantify the development possibilities outlined above in their interaction with one another. For this purpose the objective of the project set out in general terms is developed in a number of questions amenable to research. These are:

1. What developments in productivity can be expected within the next 25 years in each region and for each type of agricultural activity? What investments and changes in inputs will be needed to bring them about?
2. What options can be discerned for the Common Agricultural Policy, given the desire to bring about a more market-oriented policy?
3. What objectives and associated options can be discerned in the socio-economic area, both for the EC as a whole and for each region?
4. What objectives and associated options can be discerned in the fields of environmental protection and nature conservation, both for the EC as a whole and for each region?
5. How do the various desiderata influence one another?
6. What combinations of desiderata are possible and what consequences can be observed in relation to them in the various rural areas of Europe? What would be the likely consequences of the different possibilities for the Netherlands?

A variety of methods will be used to answer the various research questions. However the main emphasis will be on probing the conflicts between different desiderata, or in other words, exploring the trade-offs between the different objectives at stake. The same problems were examined in earlier studies of the Scientific Council for Government Policy (*A Policy-Oriented Survey of the Future and Scope for Growth*). In both these studies it was finally found that the optimization of objectives with the aid of a linear programming model, that contains several object functions, yielded satisfactory results. Therefore, the same method is used in the LGE project. A brief discussion of the main features of this method is appropriate here.

The pursuit of objectives often means that, with the aid of selective policies, particular sectoral and/or regional economic developments can be stimulated. Thus, for example, an attempt can be made to combat rural unemployment by bringing about the development of labour-intensive sectors (such as consumer and business services). It is also possible to encourage the production of grain in a particular region in order to achieve self-sufficiency in important agricultural products. The extent to which an objective is achieved depends on the sectoral or regional development possibilities.

The question whether or not combinations of objectives are possible has to be seen in terms of the question whether a particular sectoral and regional economic structure is

technically possible. In a linear programming model a question such as this can be answered by describing the sectoral or regional structure in the model and by attributing to it the objective functions which are of relevance. Thus, for example, employment can be incorporated as an objective by itemizing all sectorial generated employment.

In the LGE Project a linear programming model known as 'GOAL' (General Optimal Allocation of Land use) is developed in which objective functions are formulated in terms of agrotechnical, socio-economic and environmental aspects. Sectoral developments are limited here to land-based agriculture and other forms of land use in the rural areas of Europe. By first calculating an optimum for the various objectives separately, it is possible to determine what optimal values can be achieved for these objectives. Requirements can then be set for the minimum values to be attained for certain other objectives. A consequence of this is that the optimum values of other objectives have to be brought down to a suboptimal level. This demonstrates the interchanges between different objectives. If the requirements in respect of the various objectives are then intensified step by step (indicating the different desiderata), the consequences of the policy pursued can be illustrated in a number of scenarios. It should be borne in mind here that scenarios do not show what the most probable development will be, no forecast is produced. However, a description is given of what can happen when certain outline conditions have to be met. In this way various scenarios do provide an advance indication of possible development orientations.

A requirement may, for example, be set that agricultural production should be achieved at minimum cost, so that production is allocated to the different regions in an optimum manner from the point of view of cost. If, however, the requirement is that agricultural production should provide a maximum number of jobs, an entirely different distribution among the regions may be obtained. Prompted by differences of opinion on the objectives to be achieved, a number of scenarios can be devised in this way, built up from the values obtained for the various objectives and the associated allocation of land uses to the different regions.

What must then be done is to establish whether the calculated land uses can be achieved in the regions concerned. Alternative land uses can be examined for each region to determine whether they meet the requirements imposed locally in respect of the development of the rural area. Possibilities to be considered here are the production of 'green' raw materials, fibres and energy on arable land, forestry, whether or not combined with uses for recreational purposes, and other forms of multi-functional land use. In regard to these land uses objectives other than purely agricultural ones (including environmental protection and nature conservation) also play a role.

Apart from the problems of land use, loss of employment and income of course also play a major role. When there is a likelihood of this occurring after the introduction of

alternative land uses, the possibilities must be examined of getting other sectors of the economy to fill the gap on the labour market. Here the dynamics of the agricultural supply sector to agriculture, the food processing industry and other industries processing farm and market gardening products have a role to play. These regional analyses may point to scenarios which, while they are technically feasible, are unacceptable from a regional policy point of view.

Finally, the study indicates in which way the European system of regulatory provisions should be involved in bringing the scenarios outlined to fruition. Here the existing European regulatory system is assessed for its effectiveness and recommendations may arise with regard to new directions in which the system can be developed. This means not only the re-orientation of the Common Agricultural Policy but also the implementation of a selective regional and economic policy. It may become apparent in this context that scenarios considered feasible in other respects have to be discarded for political or administrative reasons.

Objectives and restrictions

The scenario technique applied, in which use is made of linear programming models with multiple objectives, makes it necessary for the relevant objectives at European level to be formulated explicitly in the initial phase of the study. The objectives are formulated on the following premises:

1. The EC as a whole is concerned with ensuring the security of supply for all major agricultural products. One of the scenarios can be based on achieving security of supply by means of self-sufficiency. This self-sufficiency and any surplus should be of such proportions that the world market is not distorted. The way is, thus, left open for the development of agriculture in the Third World. Another scenario can be based on liberalization of the world market according to the proposals by the United States in the recent GATT negotiations. The production within the EC must then be defined based on market equilibrium.
2. The EC pursues the objective laid down in the Treaty of Rome of promoting convergence between the Twelve and discouraging divergence.

The formulation of the objectives can be tied in closely with pronouncements of the EC itself, notably in the context of the Common Agricultural Policy. On the basis of the Single European Act, the Green Paper, the *Monde Rural* report and the coordination of the structural funds, objectives can be discerned and grouped under the angles of approach referred to above. These objectives, often formulated in an abstract fashion, must be developed into a limited number of quantified objectives. Here 'quantified' means that there must be a numerical relation between regional agricultural production and the objective selected. This will require the use of different units. Thus, one objective may be expressed in kilograms per hectare, another in men years and yet another in Ecu. The objectives and their operating within the GOAL model are presented in Table I.

Table I: Objectives relating to the use of rural areas in Europe, taken from EC publications, and their operating within the GOAL model

- A Agrotechnical:
- maximization of soil productivity
 - minimization of costs per unit of product
- B Socio-economic:
- minimization of costs per output
 - maximization of employment in agriculture
- C Landscape and rural infrastructure:
- minimization of land use change
- D Environmental protection:
- minimization of pesticide use per ha
 - minimization of nitrogen use per ha
-

Source: Scientific Council for Government Policy.

Table I, refers only to EC objectives that will be accommodated in the model. That does not mean of course that other important objectives will not be addressed in the further course of the study. Attempts are made for example to maximize market stability by way of stock formation and price control. Some of the general objectives are, therefore, formulated in such a way that they can be quantified and made operational in the model calculations. The same applies to the preservation of social structures, for example, by maintaining a minimum level of provision, and the minimization of regional differences, for example, by maintaining the gross regional product at a constant level. The operating of the objectives concerning nature conservation cannot be dealt with within the model as the location of nature plays an important role. In a post-analysis the outcome of the model is confronted with spatial defined goals with regard to nature conservation. An agrotechnical objective that fulfils also an environmental objective is the minimization of pesticides or nutrients per unit of product. The implementation of the model study is expected to show whether the objectives applied provide a sufficiently accurate picture of the scenarios to be developed. Further refinements may still prove necessary.

In addition to objectives, the GOAL linear programming model also comprises a number of restrictions. These restrictions impose constraints on initially unlimited regional and sectoral development processes. Three main types can be distinguished.

1. Logical restrictions: it may be stipulated, for example, that no more must be produced than the production capacity allows. This type of restriction will be included directly on the first specification of the model.
2. Restrictions arising from economic or physical planning con-

straints: maximum and minimum growth in consumption or exports may be specified. Growth or reduction in and use for a given activity may also be restricted, for example, not all holdings can switch immediately from arable farming to livestock farming. This type of restriction can to some extent be directly built into the specification of the model, but probably a number of them will have to be added when the results are analyzed.

3. Politically strategic restrictions: certain forms of consumption or the growth of production or consumption may be subjected to restraint. Specific wishes in respect of a particular agricultural activity in a particular region may also be stated. It will be clear that this type of restriction can only be applied in the second instance. In fact these restrictions reflect the supplementary requirements of the EC or of the member states. Full documentation and justification must also be included for each of these restrictions.

Once the model study has yielded a number of technically achievable scenarios, they are subjected to more detailed analysis. A frame of reference will in turn be required for this analysis at the level of the individual regions. Here too consideration focuses on objectives to be achieved, for which reference can be made to the indications given by the EC itself in its documents on the structural funds, i.e.:

- the elimination of development deficits;
- the revitalization of regions hit by industrial decline;
- the relief of long-term unemployment;
- the involvement of young people in the work process;
- the speeding up of structural adjustment in agriculture;
- the promotion of the development of the countryside.

For this project the detailed analysis will be restricted to the Netherlands. Recently the Dutch government has published a series of policy documents that contain the strategic approach to the development of Dutch agriculture, nature conservation and environmental protection. These strategic decisions can be tested for consistency with the scenarios obtained.

Approach of the study

Before a start can be made on answering the various research questions, two prior choices must be made, namely the scale level on which the study is conducted and the classification of the agriculture sector into subsectors. These choices determine the scope and transferability of the results to a large extent.

With regard to the scale level, the availability of data is of particular importance. It is, therefore, reasonable where possible to adjust the classification to that applied by Eurostat, the Statistical Office of the EC. Eurostat applies three levels: NUTS-I (64 regions), NUTS-II (167 regions) and NUTS-III (824 regions). The abbreviation NUTS here stands for *Nomenclature des Unités Territoriales Statistique* (Statistical Nomenclature of Territorial Units). We opted for a classification at NUTS-I level, because at that level politico-administrative decisions are often taken pursuant to European regional policy.

With regard to the classification of the agriculture sector into subsectors, several angles of approach can be adopted. Ultimately the classification should be such that the various objectives can be linked unambiguously to the subsectors. Clearly in this context an objective concerned with agriculture as such will initially prompt a different classification to one concerned with farm incomes.

For the moment, for practical reasons, the classification used follows one based on activities which is applied in the EC (Community typology of agricultural holdings - 85/377/EEC). The classification comprises:

1. Specialist cereals
2. General field cropping
3. Specialist vineyards
4. Specialist fruit and citrusfruit
5. Specialist olives
6. Specialist dairying
7. Specialist cattle
8. Fieldcrops-grazing livestock combined.
9. Forestry

The approach of the study can perhaps be best illustrated by way of the various research questions.

1. *What developments in productivity can be expected in the next 25 years per region and per type of agricultural activity? What investments and input changes will be necessary to achieve them?*

The current situation must be described for the various regions of Europe and the development possibilities examined. The limits to these development possibilities are assessed using a combined qualitative and quantitative analysis of the long term agricultural potential of the rural areas in the EC. The qualitative analysis is based on soil characteristics stored in a Geographical Information System and shows where certain forms of land use are possible. The quantitative analysis consists of a combination of the GIS-information and simulation studies. Using a crop growth simulation model the agricultural production potential of the various European regions is assessed based on the properties of the soil and the climatological conditions.

Two different levels of levels of exploitation are discerned:

a. *potential yield:*

optical, physiological, phenological and geometric characteristics of the crop, incidental radiation and temperature alone determine the yield or production attainable per unit of land area for different product groups;

b. *water limited yield:*

those production situations in which one of the growth factors - water - is lacking during part of/or the entire growing season.

It must be clear that these levels of exploitation can differ considerably from the *actual yield* for which, in addition, growth-limiting factors such as the shortage of water and nutrients, and growth-reducing factors, such as diseases, pests and weeds and crop management techniques, play an important role.

Production levels are estimated for different product groups, such as feed crops, grain and root crops, pulses and wood crops. These product groups have to be included in different systems of land use, such as arable farming, permanent cultivation, pasture farming and mixed crop farming. Detailed calculations are not possible for all product groups and systems of land use. In some cases, therefore, an indication of whether the soils are suitable for a particular land use has to suffice. Obviously, the degree of detail in the calculations cannot be too great. The European soil map, which distinguishes 312 regions, is taken as a basis, and a Geographical Information System is used to group these regions in larger units. Care must be taken here not to average too quickly. If averaging is too rapid important differences are lost and less accurate results are produced. Finally, the data must be supplied at NUTS-I level.

The reasons for the differences between actual and potential yields need to be described. For this it is necessary to indicate by what activities or interventions it is possible to move from one production level to another. In many cases this will require a fair amount of investment, for example, for the improvement of water management, land reclamation, infrastructure and the like. The scope of these investments is estimated in a broad sense.

2. *What options can be discerned for the Common Agricultural Policy, given the desire to achieve a more market-oriented policy?*

This question can only be answered by way of a policy analysis. An analysis of the pronouncements made by the EC Commission itself on this point (such as the 'Monde Rural' report and the statements by the Commission related to the GATT negotiations) can be supplemented by reports issued within the context of FAST (Forecasting and Assessment in Science and Technology - research programme conducted by DG XII) and the OECD. A common theme in all publications is a shift from agricultural policy to *rural management*, in which several objectives play a role. Agriculture is then seen rather as just one of the instruments by which the different objectives can be achieved. In this study relevant objectives of rural management at EC level are defined. Adjustments to the Common Agricultural Policy can be evaluated using these objectives.

3. *What wishes and associated options can be discerned in the socioeconomic context, both for the EC as a whole and for individual regions?*

A first indication of an answer to this question is already contained in the derivation of the objectives. A number of points of reference for socio-economic desiderata are to be found in Community policy on rural areas in Europe. In addition a characterization of rural areas in this respect can provide information on their present distribution in terms of socio-economic magnitudes. A characterization of the various regions can be produced fairly quickly with the aid of the Eurostat data. The characteristics considered relate, for example, to the contribution of agriculture to the gross regional product, population density, the land area of the region and employment in agriculture. An analysis of documents produced by the EC in fields such as socio-economic integration can provide an indication of the characteristics to be considered.

4. *What wishes and associated options can be discerned in the field of environmental policy and nature conservation, both for the EC as a whole and for individual regions?*

Nature conservation objectives are very difficult to mould into the rigid framework of a linear programming model. This is due to the fact that objectives in this field have a strong locational or spatial aspect. Also, by far the smallest amount of research has been carried out in this field and in many cases, where studies have been undertaken, the scale of the research does not measure up to the scale level applied in this study. In order to compensate for this in some way, extra attention has been devoted to this part of the project. For a number of aspects separate maps have been constructed, for instance, the spatial allocation of nature conservation units and recreational areas are considered. These maps can be used to confront the outcome of the optimization model (the result of question 6 below) with wishes that cannot be translated in unique quantitative goals.

5. *In what way do the various desiderata influence one another?*

As has already been pointed out, the Project makes use of a linear programming model in which several objectives (or desiderata) are accommodated which also describe the GOAL model. In this model the objectives are specified in such a way that they show a quantitative relationship with the land uses distinguished. The exact specification of the GOAL model, thus, provides the answer to this research question. It is possible to deduce directly from the specification of the model how the various objectives are linked to one another through land uses.

6. *What combinations of desiderata are possible, and what consequences are to be perceived in relation to them in the various rural areas of Europe? What consequences arise for the Netherlands in respect of the various possibilities?*

The answer to this question forms the main emphasis of the study. The combinations of desiderata are investigated by setting up different scenarios with the aid of the GOAL model. These scenarios describe the extreme possibilities in respect of the objectives included, thus, supplying the distribution of agricultural activities among the regions. The method by which the various options are examined results in a survey of future possibilities and must in no way be seen as a manual by which the effects of European measures on developments in agriculture can be extrapolated and blueprints for such developments drawn up. The allocation of agricultural production, thus, obtained for each region need further processing in a regional analysis. In this way the consequences of the production situations determined will be described for the other sectors of the economy, as also their implications for the natural environment and the landscape. Such an analysis will be carried out for the Netherlands (divided into NUTS-I regions).

7. *Which of the technically possible combinations determined are also politically and socially achievable in the opinion of the Council?*

It has already been indicated that, apart from an examination of the scenarios obtained with the GOAL model as to their regional effects, consideration must also be given to the regulatory measures by which it might be possible to achieve these scenarios. For that it is necessary to have at least an understanding of the nature, scope and effectiveness of the present provisions. An inventory and evaluation of the present provisions is, therefore, part of the Project. Confrontation of the scenarios with the results of this supplementary study will reveal whether, on the basis of the material available, a satisfactory answer to this question has been obtained. Next to an analysis on European provisions in relation to this question, it seems appropriate for the specific purposes of the Netherlands also to examine the role which national support and reorganization funds can play. Additional case-studies may prove to be necessary.

Conclusions

The LGE Project does not aim at a blueprint for rural policy to be pursued at European level. Nor is it the intention to present forecasts of rural developments for one or more regions based on the developments outlined above. The ultimate purpose of the study will be to provide a picture of possible consistent developments in rural areas in the agrotechnical, socio-economic, environmental protection and nature conservation contexts for the EC as a whole. This is achieved by constructing a number of scenarios in which conflicts arising from increasing produc-

tivity, market saturation, uneven distribution of production within the EC and an increasing concern for the environment and landscape are minimized. These scenarios can act as a reference for regulatory provisions at EC level geared to the development of rural areas. Moreover, the project gives a basis for a set of provisions at regional level through which the consequences of the various scenarios developed at European level can be included in the formulation of regional-economic policy.