

## AGRICULTURE AND ITS ENVIRONMENT: ARE THERE OTHER WAYS?

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### INTRODUCTION

Although the Common Agricultural Policy has served its original purpose very well, the problems with overproduction and the environment are by now so profound, that the need for a major overhaul is widely acknowledged. The aim of the present paper is to contribute to the discussion of this technical and political problem.

For this purpose some fundamental aspects of the agricultural production process are treated first, because the kind of effort that is needed to control over-production and the environmental effects of agriculture depend to a large extent on the technical options and boundary conditions.

Subsequently, the two perspectives of agricultural development are presented, that were originally developed by the Netherlands Scientific Council for Government Policy within the framework of its policy oriented survey of the future (WRR, 1983). These are the perspectives of separation and integration of functions. These differ especially in their view on agriculture in its relation to nature and environment and in the way to cope with the problem of over-production.

The discussion of the advantages and disadvantages of these opposite perspectives paves the way for the presentation of a broad outline of another common agricultural policy that is characterized by both market orientation and solidarity and may lead to a competitive and sustainable agriculture and a fair reconciliation of conflicting agricultural and environmental goals.

## SOME FUNDAMENTAL ASPECTS OF THE PRODUCTION PROCESS

In case of wheat, the yield increase in various regions of Europe has been about  $70 \text{ kg ha}^{-1} \text{ yr}^{-1}$  for a number of years. This yield increase was roughly the same for potatoes and sugar beets when expressed in terms of dry matter. Therefore this growth has neither led to much differentiation among regions nor between crops. However, the scale of the analyses may have obscured emerging problems.

A further analysis shows that a few years after the Second World War a sudden transition from a slow growth of a few  $\text{kg ha}^{-1} \text{ yr}^{-1}$  to a high growth of around  $70 \text{ kg ha}^{-1} \text{ yr}^{-1}$  occurred. A comparison of the present situation with the potential situation shows that a great part of the cultivatable land in Europe is indeed in use as such, but that the potential production still exceeds several times the actual production, so that practically all over Europe, the rates of increase in production of  $70 \text{ kg ha}^{-1} \text{ yr}^{-1}$  may be maintained for a number of years.

The increased inputs that are necessary to bring about these increased yields are sometimes brought under a common nominator on the basis of their energy content. Contrary to earlier data presented by Pimentel, it appears now from his work (1984) that the fully mechanised, high yielding American corn farm, is three times more energy efficient than the traditional farm in Mexico, where the work is done by hand or with the help of animal traction and no industrial fertilizers are used. Comparison on the basis of direct plus indirect use of only fossile energy reveals also that the so called law of diminishing returns does not hold for this energy total as an input.

These increasing returns on energy suggest that technological innovation in agriculture enables a continued yield increase with relative less inputs per unit product. This may be understood as follows. The relative costs of fixed operations, such as plowing and sowing, decrease of course with increasing yield. Too little is realized, however, that the number of fixed operations increases with increasing yields at the expense of the variable operations. For example, to achieve moderate yields it is necessary to adjust the acidity of the soil by liming, but high yields do not require more lime. Similar phenomena hold for other mineral nutrients. This makes many inputs not a variable cost element but a complementary cost element of the decision to grow a certain crop on a certain place. In this way, the popular notion of variation of inputs in dependence of relative prices, described by continuous partial production functions with

diminishing returns is undermined. This increase of the number of fixed operations at the expense of variable operations makes also that the needed amounts can be better controlled in case of higher yields. Or to emphasize about the same in another way: the growth processes near the potential level of production are much better understood and managed than close to the bottom line, where far too many factors interfere.

For example, the application of energy-rich nitrogen fertilizer is better controlled in situations where the yield is higher because then less unpredictable losses occur by volatilisation, denitrification, leaching and even immobilisation. This is indeed important as appears from the work of Van der Meer (1986), who found that the recovery of industrial fertilizers by grass under zero grazing increased during the last 15 years from 40 to 80, because the water supply level is now better controlled and probably also because the quality of the organic matter in the soil increased.

Viewed over time, the yield of wheat in the Netherlands increased from 3500 in 1950 to 5000 kg ha<sup>-1</sup> in 1970, whereas the efficiency of the indirect plus direct energy use stayed about the same at 145 kg GJ<sup>-1</sup>, in spite of the about three fold increase in labour productivity in the same period (De Wit, 1979). Protection against pests and diseases is also a very important prerequisite for high yields. This does not require much energy, but rather the skill and experience to apply appropriate chemical and biological controls. Moreover, in integrated systems of pest control, the limited need for pesticides and fungicides is offset by a decreased need for herbicides in case of good crop growth.

Thus continuing yield increases until the level that climate, soil, reclamation level and know-how permit, leads to a continuing efficiency increase of all production factors, measured per unit product. The rate of increase of the yield per hectare is therefore not so much determined by economic factors, but by the rate new knowledge can be put to good use. If it pays to farm a field, it pays more to exploit the technological possibilities for yield increase at the existing level of reclamation.

Whether the yield potential should be enhanced by further reclamation is a more complicated problem, because the possibility to increase the productivity of labour and machinery may be as important a consideration. But also when this is taken into account there are locations, where present production potentials at the existing level of reclamation are too low to justify further cultivation at present prices, whereas at the same time further reclamation is too costly. These are the marginal soils that

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without a policy of support are bound to lose in a Europe where markets are saturated, prices are under pressure and where there is still considerable leeway for production increases at decreasing costs in regions that are well suited for agriculture.

#### SEPARATION OF FUNCTIONS

The perspective of separation of functions is based on the idea that agriculture as well as nature and the environment are best served by physical separation because then both interests can be served optimally in their own rights and with their own means. Overproduction is brought under control by abolishment of all forms of price supports and market protection. The farmer is not troubled by demands from conservationists and it is possible to create attractive landscapes without violating agricultural standards. Considerable yield increases are still possible, so that all demands can be met with greater efficiency on a smaller area than at present by a relatively small number of capable farmers and against international competitive prices. Marginal soils are exploited extensively and in such a way that all justifiable demands of nature conservationists are met. External effects like the pollution of water and air are better controlled because of the high efficiency of production, so that it is possible to meet high standards. It is not implied in this perspective, that high technology farming in the endowed regions is devoid of any diversity. The cropped areas may be, but this need not apply to boundaries, field divisions, uncropped areas and sides of roads and waterways. There are also excellent examples of nature reserves that were designed and created within the framework of land improvement schemes.

As has been said, the yields continue then to increase on all soils that remain in production with an estimated 70 kg grain equivalents  $\text{ha}^{-1}$  year<sup>-1</sup> and this continuing increase has to be balanced by taking marginal land out of production. At an average yield in the EC of 4000 kg grain equivalents  $\text{ha}^{-1}$  this amounts to an increase of 1.75 percent per year. Since marginal soils yield less than the average, about 2.5 percent of these soils would be forced out of production each year.

The marginal land in Europe forms an excellent starting point for creating ecological refuges and semi-natural reserves, intertwined with areas that are extensively grazed by cattle, sheep and deer and with

semi-natural permanent forest with production as one of its functions. It is also suggested that this land could be used for growing agricultural products that are not contributing to the present surplus.

By means of such extensive use of land, hardly any income is generated, so that only a fraction of the present farmers can be gainfully employed on this land. Therefore transitional income subsidies are necessary to support the farmers that are unable to find employment elsewhere because of advanced age or for other reasons. In the long run this does little to keep these marginal areas to such an extent populated that a reasonable infrastructure can be maintained. A full separation of functions is impossible because there are valuable ecological refuges that can only persist if the countryside is properly farmed. Also nature reserves should not be restricted to marginal soils.

#### INTEGRATION OF FUNCTIONS

The perspective of integration of functions is based on the idea that agriculture on one hand and conservation of nature on the other cannot do without each other and that both interests are best served by spatial intertwining and integration of their functions. In this perspective of integrated agriculture (Van der Weijden, 1984; Van der Wal, 1985), the important role of agriculture within the EC is fully recognized, whereas at the same time the societal causes of the problems in agriculture and of the deterioration of nature and the environment are emphasized. It is stated that in present day agriculture, too much emphasis is put on increasing the labour productivity at the expense of the productivity of the soil, energy and other basic resources. At the same time it is stated that conservationists have held on far too long to the ideal of the old cultural landscapes and to the myth that everything was much more beautiful around 1900.

Economically, great importance is attached to the creation of employment opportunities, mitigation of income differences and increase of self-sufficiency in Europe. Higher import levies on grain substitutes for animal fodder and lower export refunds for agricultural products are envisaged to unburden the EC budget, to increase self-sufficiency in Europe, to limit direct and indirect energy consumption, to encourage re-use of organic waste and to reduce regional overproduction of manure.

It is considered of vital importance to keep labour costs down by reduction of taxes and of social levies on labour, by income subsidies for small farmers or by some negative income tax scheme. The necessary budgetary compensation could be found by extra levies on energy and raw materials. The use of the latter would then be reduced while the use of labour would be encouraged. Things would not go as far as machines being replaced again by the people they once replaced, but expert work as accurate observation, planning, caring for crops and live-stock etc. would certainly be promoted. It could be feasible again to adapt agricultural practices to small differences in soil and topography, to exploit the advantages of more sophisticated crop rotation schemes, to exploit hedgerows for firewood, to use lighter machines and to farm in general with more care. In combination with subsidiary payments, this opens possibilities for the reintroduction of functional natural elements on the farm level.

However important the price mechanism is, it alone cannot satisfactorily solve the problems of over-production, decreasing employment and threat to the environment by separation of functions. Therefore, the change of course in the EC policy in the direction of the quota system should be continued. It should then be taken into account that large farmers on good soils, have more alternate possibilities to make an income than farmers in marginal areas.

#### MARKET ORIENTATION AND SOLIDARITY

The most pressing problem for the EC is the rising costs of the common agricultural policy which threatens to crowd out any other activity of this organisation. In order to keep the problems within bounds, a budget ceiling has been set, the intervention prices are being constrained or even decreased and a super-levy on milk has been introduced. The latter is a system of allotment of production. Up to 1984, these were only operative in one form or another for sugar beets, wines and olives. For wheat, mechanisms of "co-responsibility" are being considered. These would require wheat growers to contribute financially to the costs of export. This relieves the EC budget, but does little to constrain the increase of production.

The decrease of intervention prices is in accordance with the perspective of separation of functions and the extension of quota systems much more in accordance with the perspective of integration of functions. Such a mix of instruments is at present necessary to execute an incremental policy that needs by now the support of twelve Western European governments who have different interests to serve and operate out of different ideologies. However, also incremental changes may eventually lead to a consistent common agricultural policy. Such a policy has to serve three central aims to a workable and acceptable by all member states:

- the maintenance of a balance between production and demand;
- the mitigation of geographical differences in incomes and possibilities for development;
- the continuity of agriculture in the marginal regions to maintain the integrity of the landscape and the natural environment.

Both, the policy of production allotments and the policy of price decrease may bring about a balance of production and demand, but none of the two serves permanently the aims of mitigating geographical differences and maintaining the continuity of agriculture in marginal regions. To serve these aims, structural measures are needed that require a transfer of public money from the better endowed regions to the outlying and marginal regions of the Community. The main burden for adjustment of production is then shifted to these better endowed regions. And that is how it ought to be because these regions are situated at the centres of economic activity in Europe, profit by far the most from the common market and support much better technical adaptation and change.

These arguments support a common agricultural policy that is even in comparison with recent proposals of the EC-Commission (1985), characterized by more market orientation in the central regions on one hand and more solidarity for the marginal regions on the other. Such a policy (WRR, 1986) is presented here with an emphasis on technical and environmental aspects. This is done by discussing first the policy measures that are envisaged for the less endowed regions, then those for the better endowed regions and then the problems of change that are invoked by these measures.

## The less endowed regions

The problems in the less endowed regions of the EC are not new and in the 1985 Green Paper of the Commission of the EC several basic types of aid-systems are discussed.

Pre-pension schemes and other schemes with a social orientation are only a last resort for individual farmers and their households. Although necessary to avoid intolerable social pressures, in view of the problems that are coming up, they work too little in the structural sense.

There are also in marginal regions farms which made important efforts in the past and could be fully viable in the future. These farms could be aided by a temporary support in the form of a flat-rate allowance per unit of production.

The opposite of such structural schemes are the buying-out schemes. The land will then often be made available to public organisations for the creation of ecological refuges, semi-natural reserves, leisure parks, afforestation and for extensive animal husbandry. The need for refuges, reserves and leisure parks is limited and afforestation schemes require large initial investments which may bear some fruit only in the long run, although this does not seem likely on marginal land. These types of land use do not create much work, but at places the tourist trade may be stimulated.

To ease the surplus burden, it should be further investigated how the farmer can be enticed to grow agricultural crops that are not contributing to this surplus. Possible candidates are oil and protein crops, hemp, Jerusalem artichoke (Topinambour), field grown vegetables and pharmaceutical crops. But it is often little realized that soils that are marginal for surplus crops are in general also marginal for other crops.

There is a market for special products that distinguish themselves for all practical purposes only from similar products by either their origin or the way they are grown. These products are especially attractive because it is per definition impossible to grow them in a high technology environment. Unfortunately, they are relatively expensive to produce and cater therefore only to the demand of some of the affluent.

It is generally agreed upon that continued farming of traditional farming country, is a necessary condition to maintain its environmental value. Hence, there are good reasons for directing public support to marginal regions in such a way that environmental goals are served as well. In most schemes, this is done by paying the farmer for the execution

of traditional farming methods that are supposed to maintain the landscape and the ecological refuge functions of the farm. This may have been the case in the past, but so many irreversible changes have occurred that this is not necessarily so at present.

Another approach which is much more in line with the ideas of integrated agriculture is to define and quantify the ultimate aims that are envisaged and to remunerate the farmer according to his success in reaching them. Why should the farmer not be paid for the number of species or habitats he is able to create?

There are so many suggestions and so many different social, economic and environmental conditions, that all possibilities cannot be identified and reviewed by some central authority. Therefore, ways and means should be found to support initiatives on the regional level out of the EC budget. Apart from direct financial support in the form of deficiency payments for specific acreage use, one may consider more indirect supports in the form of research and extension and the development of producers associations, market organisations and transport facilities.

These various measures in the sphere of agriculture may mitigate the problems of the marginal regions that are created by a more market oriented policy, but do not eliminate them. However, the economic function of agriculture in these regions is in any case rapidly eroding and any policy that is directed to maintain the present production structure and employment in agriculture leads towards the creation and maintenance of non-viable agricultural production reserves. It is therefore necessary to aim at a social and economic structure that can replace the agricultural structure by programs for improvement of the infrastructure, for the regional creation of non-farm jobs, for education and for the promotion of mobility. These are the first responsibility of the national governments, but within the framework of its industrial policy, the EC has to accept its share of the burden.

#### Better endowed regions

Where the production decreases in the marginal regions is mitigated, equilibrium on the markets can only be obtained by a considerable reduction of the production in the agriculturally more endowed regions. This may be achieved by a gradual reduction of the intervention prices with amounts up to 20 percent. This leads in due course to a drastic reduction of the price and the rent of the soil and clears the way for the other

soil uses. Some of the soils may become sufficiently cheap to be planted by forests, that grow here anyhow much better than in marginal regions. These could well be combined with leisure parks that are also better situated in these central regions than in the more outlying marginal areas. In view of the positive experiences with creating new natural reserves on good agricultural land, part of the soils will be also used for this purpose. The number and kind of ecological refuges will also increase by a more liberal use of roads and other ligulate elements in the landscape for this purpose and field divisions, odd corners and ditch borders on the farm.

The further necessary decrease of the production potential does not lead to abandonment of soils and to permanent barren fields but to various types of following. Otherwise situations would be created where it is impossible to maintain the acreage of profitable crops like potatoes, sugar beets and onions and to meet at the same time important crop rotational demands. It is then a small step to experiment with other crops, be it only to cut costs as far as possible. Energy out of biomass for use on the farm may then be worth considering because then the taxes on the regular supply are avoided. Animal fodders, protein crops like peas and beans and oil seeds as far as they fit in the crop rotation and perhaps industrial crops are other candidates. This development will make it still more difficult to grow these crops competitively in marginal regions.

#### Problems of change

It can never be the purpose to expose the european farmer to the caprices of the prices on the world-market, so that also in a more market oriented approach a system of import levies and export subsidies has to be maintained at the border of the European Community. If this is done at a price level that both balance each other on the average, a viable agriculture is maintained in the European Community while the budget is maintained under control. Nevertheless, this means a considerable reduction of the price of the supported commodities. To ensure that the farmers in the central regions can adapt to this new situation and that the policy measures that are needed for the marginal regions can be implemented, price decreases have to be extended over a period of at least 10 years. Such a gradual decreases means, however, that the present schemes of production allotments such as the quota for sugar and the super-levy on milk have to be continued for some time and a solution has to be found to control the increasing over-production of wheat.

It should also be realized that any policy of adapting the supply better to the demand can be frustrated by further reclamation and land improvement schemes that are prompted by national interests. In case these projects are wholly or partly financed by the national governments, they should be reported to the EC Commission, which could then control the plans in accordance with its own policy. This would be a radical shift from the present situation, where national governments act on their own discretion.

The separate discussion of less and better endowed regions may suggest the existence of transition zones which require again their own policies. This is not the case, because there is a gradual difference in the policy measures that are suggested for both regions. Apart from objective differences, the prices are the same throughout the EC and the control of the EC Commission on structural improvements holds also for all regions. The only difference is that if a region is better endowed, less EC funds will be used for development supports, environmental enumerations, industrialisation and social measures.

A new policy of more market orientation and more solidarity would generate its own slack in the EC budget for the following reason. The acreage of marginal agricultural land in the EC may be set at 30 percent, but its production is so low that this does not contribute more than 10 percent of the value of the agricultural production. Estimating the price reduction on the average at 15 percent, the hidden transfer of income does amount to 1.5 percent of the total production value. This is very small compared with the 15 percent of the agricultural production value that is at present needed to keep the common agricultural policy afloat and that would be set free for the greater part by a more market-oriented policy. The ten-fold difference between these two amounts illustrates also how much of the present budget is drained away by measures that are needed to eliminate the over-production and how little contributes to the improvement of the living standards in the marginal regions of Europe.

(For references see original paper).