Neth. J. agric. Sci. 31 (1982) 125-135

Developments in rural areas in relation with developments in land and water management research in the Netherlands. 1. Economic development and rural development plans[1]

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Received 19 July 1982; accepted 17 August 1982

Key-words: land and water management, economic development, rural areas, production in agriculture

Summary

For a correct interpretation of the planning and improvement of rural areas having taken place in the Netherlands since 1900, a systematic analysis of the economic context in the successive periods is of interest. Since 1900 seven periods with different characteristics can be distinguished and it can be proved that the reallocation and water management and soil improvement plans have been steered by the economic situation in these particular periods. The features dealt with of economic development since 1945 are changes in production volume and structure, costs of production, labour input and productivity. The influence of land and water management projects on the rise in productivity in agriculture is discussed as well as the present policy of selective growth.

Introduction

In the national development of the Netherlands as well as in the development of its rural areas and its agriculture, some successive stages can be distinguished, which simultaneously mark the developments in agricultural engineering and in land and water management research. Analysis of these stages may contribute to a better understanding of these developments and might be relevant when discussing future perspectives for the Netherlands as well as for less advanced countries. In fact any heavily industrialized and urbanized country with, additionally, highly developed agriculture may serve as a model for countries still being in earlier stages of progress.

[1] Adapted version of a contribution to the CIGR Congress, Brussels 1980, dedicated to the 50th anniversary of this organization.

Social and economic conditions are dominant factors in the planning of infrastructural improvement of rural areas. In a socio-economic context seven successive periods can be distinguished:

I	1900 - 1930	introduction of fertilizers, land reclamation
II	1930 - 1940	agricultural and general crisis
III	1940 - 1950	shortage and distribution of foods
IV	1950 - 1957	market balance, 'miracle hollandais'
V	1957 - 1963	transition to Euro Market, economic boom, stagnant prices due to surplusses
VI	1963 - 1970	permanent surplusses
VII	1970 - 1980	importance of non-agricultural values, selective growth.

Some indications about the reaction in agriculture upon these developments are given in this paper and the manner in which adaptations in the sphere of land and water management have contributed to this reaction are illustrated. Subjects of fundamental and applied research are shown to have regularly been adapted accordingly.

Process of development

Introduction of fertilizers (1900-1930)
The technological innovation of fertilizers caused a leapwise increase of the area under cultivation in specific regions, such as never occurred before in world history. It put an abrupt end to the dependence of land use on natural fertility of the soil.

World War I (1914-1918) had a considerable impact on national policy and consequently on policies regarding rural areas. The objectives of food supply and security that generally have been accepted since, underlie the planning of a number of large infrastructural projects:

— reclamation of the 'Zuiderzee':

1931	Wieringermeer	20 200 ha
1932	construction of the Barrier Dam	
1942	Noordoostpolder	48 500 ha
1957	Oostelijk Flevoland	54 600 ha
1968	Zuidelijk Flevoland	40 500 ha
?	Markerwaard	? ha

— large-scale reclamation of waste land and regulation of brooks
— land consolidation (First Reallocation Act, 1924).

Agricultural crisis (1930-1940)
During this period, rural engineering was predominantly dedicated to employ labourers in land improvement works. In governmental employment policy absolute priority was given to projects for the procuring of employment and consequently

these works were being executed in manual labour exclusively. This policy slackened the process of mechanization and rationalization in the execution of land and water management projects. In addition the management of small farms was supported, which caused their number to increase. This considerably influenced the future structural situation in the Netherlands.

Food deficits (1940-1950)

Numerous measures were taken to meet the country's own food demand. The dominant shortages of grains resulted in an increase of arable farming at the cost of cattle farming. On the other hand intensive animal farming increased. Governmental policy principally focussed on increasing food production and on supplying industry with raw materials, needed for the recovery of the national economy after World War II.

The catastrophic inundation of Walcheren (province of Zeeland) at the end of the war proved to be of particular significance for the development of rural engineering since it resulted in a specific Reconstruction Act by means of which an integrated project of land and water management improvement could be executed. The present thorough knowledge about saline soils can be mentioned as a further specific consequence of the Walcheren flooding. This knowledge also proves to be valuable for developing countries where the salt problem often is a major hindrance to production.

The integrated system of land reconstruction by Special Act has given a strong impulse to analogous developments elsewhere in the Netherlands, particularly in the river districts.

Market balance: 'Miracle hollandais' (1950-1957)

After 1950 world market prices of primary agricultural products generally exceeded the cost of production. Signs of overproduction already were evident in this period for a number of crops, which caused the prices to decrease. This tendency was delayed due to the Korean War, though after 1957 when a general economic recession became manifest, prices were outdistanced by cost developments. A change set in under influence of the rapid economic growth known as 'miracle hollandais'.

For the first time in history the Dutch agricultural population decreased in number, both relatively and absolute, as a result of attraction of labour in industry and trade. In connection with this process a further objective was introduced in national rural policy, viz parity of income for the remaining agrarian working population. From now on, income parity on socio-economically well-managed farms became a desideratum for agricultural price policy. It is generally accepted that this policy is primarily necessary from a social point of view, but it is also a prerequisite for investments required in periods of quick technological development. In case investments fail to appear, irrevocable arrears will occur later on.

In rural engineering the demand for conditions applicable to labour saving techniques (i.e. mechanization and rationalization by means of infrastructural projects) strongly increased in this period. Improvement of water management and land accessibility (rural road building and reconstruction) in cooperation with municipal-

ities and polder boards flourished. Investment in infrastructural projects rapidly increased especially in reallotment projects, a phenomenon which did not occur to that extent in any other country in the world.

The disastrous flooding of Zeeland in 1953 should be mentioned here as the specific event which led to large-scale land consolidation projects in that province. The experience gained in this way has been of great use to many reallotment projects since, especially in the river districts of the Netherlands.

Agricultural research was strongly expanding in this period and quite a number of research establishments, both foundations and governmental institutes, were established at Wageningen, next to and independent of the Agricultural University (period 'Mansholt'). Main emphasis was put on the development of knowledge in the field of crop production and related growing techniques, as well as on mechanization and rationalization in agriculture. In the next phase investigations into the economical and social scientific aspects of the rural areas were realized.

Transition to Euro Market and tendency to surplusses (1957-1963)

In agriculture economics of scale became an objective in this period as a result of the Treaty of Rome in 1957. The Common Market, involving the removal of obstructions to the mutual exchange of products, goods and services, resulted in a downward pressure on agricultural prices. On the other hand the favourable economic cycle caused a rapid increase of production costs, particularly with regard to the labour share. Measures to be taken in order to increase labour productivity in agriculture and their consequences for rural engineering, have been strongly emphasized since. Heavier mechanization has become a fixed issue. In the sphere of research, the optimal use of natural resources became a topic. This resulted in expanding research programmes on land reconstruction and land layout and in further investigations into problems of soils and water.

Food surplusses and reorganization of agriculture (1963-1970)

Costs of production in agriculture continued to rise after 1963. Prices of agricultural produce, however, increased simultaneously. The strong economic development in other sectors resulted in an intensified outflow of labour from agriculture. Consequently, labour productivity rapidly increased. Continuing mechanization led to larger production units on the one side and to specialization on the other and consequently to higher efficiency (decrease of mixed farming, simplification of farming techniques).

Food surplusses became more or less a persistent phenomenon in Western Europe. Strengthening of the competitive position through reduction of cost prices as an aim of governmental policy came increasingly into focus. In terms of rural engineering this development can be translated into an intensification of the programmes for increasing holding sizes by way of buying out farms, for construction and reconstruction of roads, for outsettlement of farms, lot concentration and lot enlargement, etc. Realization of reallotment projects within the context of integral development of rural areas came to full prosperity by then.

Selective growth; non-agricultural values (1970-1980)
After a long preamble, aspects other than agrarian ones started to play an ever growing part in the process of land development in rural areas during this period. Ecological, scenic and environmental values, the demand for outdoor recreation facilities and the preservation of relicts that are interesting from a point of view of historical and geographical landscape research can be mentioned in this context.

Generally speaking, the objective of multiple purpose plans caused a delay in the process of land consolidation particularly so in regions with high ecological and scenic values.

This policy is indicated as 'selective growth'. It implies modernization of agrarian infrastructure in such a way that other than economic values are given adequate consideration. This actually means limitation of rationalization in agriculture in order to preserve prevailing ecological, environmental and scenic values. The delay in infrastructural projects caused by these new aims may have serious consequences for the regional social economy, however. Compared with regions where restrictions are more moderate, a rapidly increasing arrears is apt to occur which causes the expression 'selective growth' to become increasingly inadequate as it no longer fits the actual situation. This holds in particular for the regions with sandy soils in the eastern and southern part of The Netherlands and for the wet grassland on peat soil regions as well.

A further general consequence of this development is a changing emphasis from investments to management measures in rural areas. Within the framework of reallotment and other projects, measures to manipulate management and related compensation systems are being introduced to an increasing extent. These shifts in the aims of rural reconstruction plans caused scientific and applied research to be adjusted accordingly. The impact of restrictions in farm management on farm techniques and farm economics because of ecological and scenic considerations and vice versa, now became subject of research.

Main features of economical development in agriculture after 1945

Development of labour productivity
Fig. 1 shows the development of the cost of wages, the amount of labour and the production volume in agriculture.

Production volume. The graph shows an increase of production by 60 % in the period 1950-1957, or 6.7 % per year. This increase slackens down to a mere 11 %, or 1.8 % per year, in the period 1957-1963 to increase strongly once more in the next period (1963-1970) to 37 %, or 4.7 % per year. Compared with the rise during the first post-war decade this increase is much less impressive. The rise kept on in a slightly reduced way after 1970 (4 % per year). In a longer range (1957-1970) production rose by 49 %, or 3.0 % per year only.

Real cost of wages and labour input. The rise of cost of wages per hour became strong after the period of recession from 1951 to 1953 with an average of 2.8 % dur-

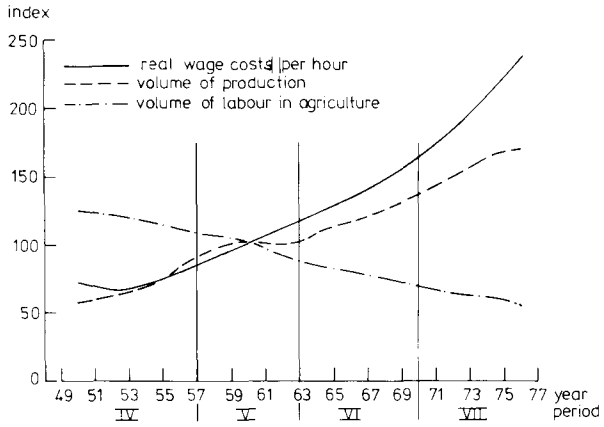

Fig. 1. Development of wage costs and labour volume.

ing the period 1950-1957 and continuing at the same rate during the next two periods until 1970. Wages increased much more after 1970, viz by 6.5 % per year. These higher wage costs could only partly be met in the course of time by means of increasing production and mechanization. In addition, a considerable outflow of labour from agriculture to other sectors of economy was inevitable. As the periods under consideration generally showed a large expansion of these other sectors, workers leaving the agrarian sector could mostly find employment elsewhere quite easily.

The decrease of labour volume of approximately 2 % per year in the 1950s and 4 % in the 1960s slightly slackened down afterwards. The explanation is that first of all paid labour had been saved on. Farms where labour is exclusively being supplied by members of the family were already in the majority to such an extent around 1970 that a further saving on paid labour in agriculture became increasingly difficult. It is to be expected that for the next future circumstances will get worse as employment conditions started to decrease rapidly in other sectors of the economy as well. Consequently, maintaining a competing position requires continuously increasing mechanization, reationalization and farm extension by way of intensification and enlargement of holdings. In the meantime the phenomenon of mammoth holdings had recently been introduced, particularly so in intensive cattle farming where vertical integration is known to be the driving power. Its share in total production volume is still small though it does have an impact on price developments.

Due to a complex of drawbacks in the socio-economic sphere, a change can be traced in the government's agricultural policy in the sense that now stronger emphasis is put on medium sized farms once more. Consequently one may expect that raising the labour productivity by way of farm enlargement becomes less relevant.

All in all these developments led to an enormous rise of labour productivity in the course of time. This labour productivity can be defined as the quotient of the gross added value in constant prices and the number of labour units. If, for statistical reasons, labour productivity in 1963 is set at 100, it was only 61 in 1950 against 230 in

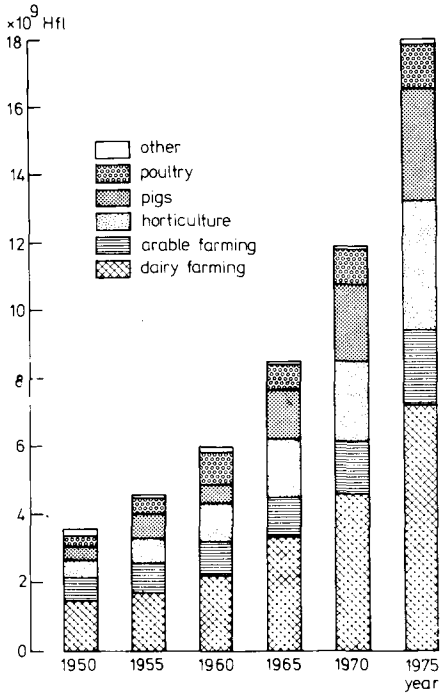

Fig. 2. Development of production components.

1974 implying an annual rise of about 4 % in het period 1950-1963 against 7 % in the period 1963-1977.

The increase of labour productivity reflects the pressure upon Dutch agriculture in the past decennium (share of costs and returns). Integration of mechanization and automation in farming, farm enlargement, outflow of labour, improvement of production techniques and production conditions in the sens of better land and water management demonstrate the continuous search for ways of escape. Conditions now are such that the increase of labour productivity is expected to continue whereas its speed gradually will slow down.

Production structure

Dutch agricultural production did show some conspicuous structural changes during the post-war period (Fig. 2). The total production volume increased considerably, though less then shown in Fig. 2 as sums are given there in current prices. Corrections for price changes are required to obtain a more correct comparison level. This proves to be a rather intricate matter, however, since the production structure considerably changed during the past decennia. Products of cattle farming (dairy farming) take 40 % of total agricultural production during the entire period under consideration. This implies that actually the relative position of dairy farming in Dutch agriculture did not change at all.

Contrary to this, arable farming fell back from 17.5 % to a little over 12 %,

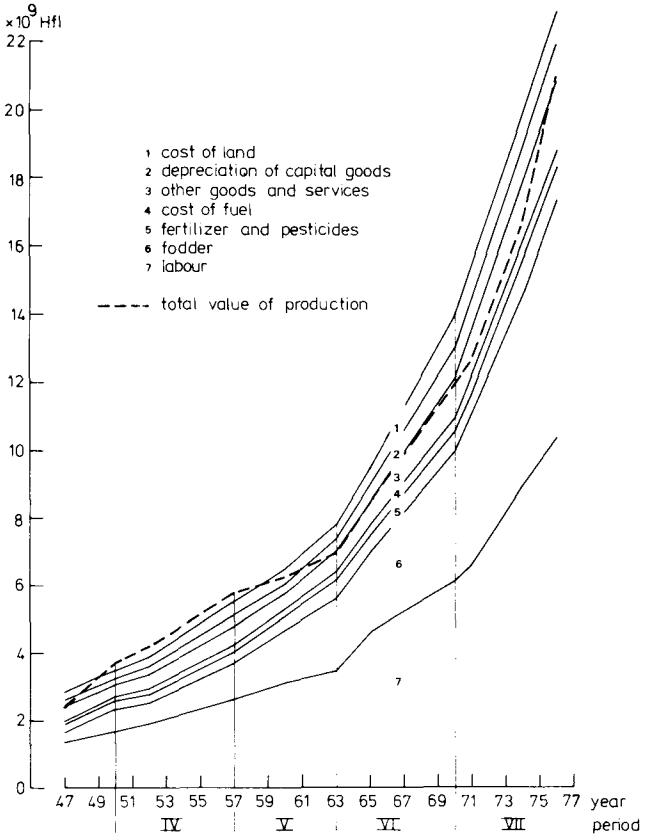

Fig. 3. Course of the various cost components in agriculture and of the total value of production.

which is a strong decrease relatively. A similar trend shows poultry farming, viz a decrease from approximately 10 % to 7 %. On the other hand the position of pig farming improved slightly, viz from over 16 % to over 18 %. Intensive animal farming as a whole remained constant, however, comprising about a quarter of total agricultural production. Finally, horticulture strengthened its position remarkably from over 13 % to over 21 % mainly as a result of the strong expansion of flower culture.

Development of production costs

A survey of the course of the various cost components in agriculture is given in Fig. 3 and 4, the total value of production being included in Fig. 3.

Evidently, total production exceeded total cost up to 1957, afterwards a deficit remained. Both labour and fodder are the predominant cost components by far. The sharp rise in labour costs is caused by a rapid increase of wages in other sectors, working themselves out in agricultural labour. Consequently, total cost of labour

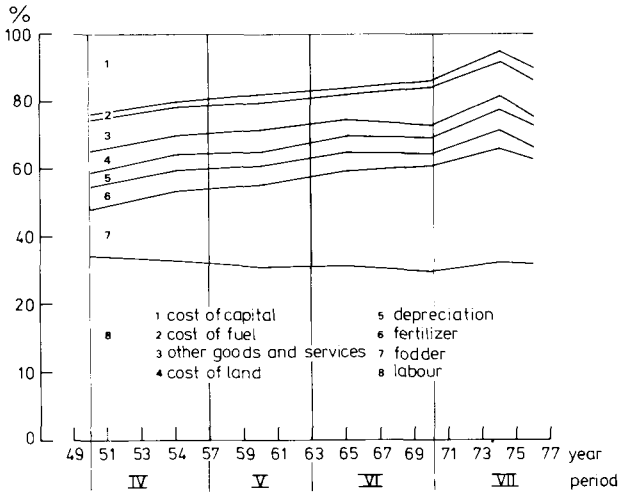

Fig. 4. Development of cost components in agriculture.

strongly increased in spite of the considerable decrease of actual labour input. Fodder consumption on the other hand increased. This is shown in Fig. 4 where the cost components of Fig. 3 are expressed as a percentage of total value in the course of time. The labour component is rather constant whereas the share of fodder rises considerably. For the other components the differences are less significant. Fuel consumption though relatively small, viz only a few percents of total production value, rose strongly. As a result of stringent legal regulations of rental prices in the Netherlands, the relative cost of land fell back with 50 % in this period. Clearly cost of capital gradually decreased in spite of a constantly strong increase of capital investment. Returns therefore considerably decreased as is shown in Fig. 3.

All in all one may conclude that, quantitatively, agricultural production about tripled from 1950 to 1976. Simultaneously a strong decrease in labour input occurred, which in 1976 amounted to less than half the input of 1950. Production per worker multiplied by six in this period. Moreover, the quality of products improved. With respect to shifts between production components, arable farming decreased with 7 % of total production in favour of horticulture.

Intensive animal farming as a whole increased, poultry being constant and pigs increasing from 11 % to 18 %. The input of capital and fodder did rise considerably, the decreasing profitability of production, however, resulted in a cost of capital that was much less, compared to that of a few decennia before. A summarizing picture of the economical developments in the periods indicated after World War II is given in Table 1.

Impact of land and water management projects on the increase of productivity in agriculture

Investments in land and water management projects in the Netherlands occur prin-

Table 1. Summary of economical development in successive periods after World War II.

Aspects	Increase (+) or decrease (–) in % per year in the period			
	1950-1957	1957-1963	1963-1970	1970-1977
Gross products	+ 6.7	+ 1.8	+ 4.7	+3.6
Labour volume	– 2.2	– 3.3	– 3.8	– 3.4
Number of tractors	+15.0	+12.0	+ 7.0	+3.0
Labour productivity	+ 4.0	+ 5.4	+10.2	+8.3

cipally (up to 70 %) within the framework of reallocation projects on the basis of the Reallocation Act. These land consolidation projects still dominantly have agricultural objectives in most cases. They imply (1) increase of lot size and improvement of lot shape by legally regulated exchange procedures and the pertaining technical measures, (2) enlargement of small holdings, (3) improvement of water management, (4) soil improvement by deep-ploughing, (5) increase of land accessibility by road building and road improvement and (6) outsettlement of farms. From 1924 onwards, 765 000 ha out of a total of 2 000 000 ha under cultivation, have now been reallocated (38 %). Next to these reallocation projects, additional civil engineering works related to agriculture are realized under the auspices of public bodies like municipalities and polder boards.

With respect to the technical and economic effects of land consolidation projects, research is done by the Institute for Land and Water Management Research (ICW) at Wageningen as well as partially by other institutes. The effects of reallocation are profound and of a long-term character. Consequently, the evaluation of these effects is rather complicated. Application of the 'with' and 'without' principle when comparing similar regions, often fails due to sudden changes which always occur in the long run. Cross-sectional analysis has serious drawbacks in a statistical respect.

To obtain an estimate of the economic results, an economic growth model has been developed and changes in production exponents in reallocated areas have been traced. Returns from land consolidation projects may roughly by subdivided into three groups, viz:

a) economization of labour;
b) reduction of machinery costs;
c) increase of crop yields.

Investigations have shown that in the case of reallotment, the immediate rise of labour productivity amounts to approximately 6 % in grassland regions. Here reallotment, however, is supposed to have no impact on labour outflow nor on farm size. When all surplus labour caused by improvements from reallotment is supposed to be discharged, the rise of labour productivity amounts to approximately 14 %, farm size effects being included in the calculations. This large difference primarily is caused by the considerable potential savings on labour input.

As mentioned, approximately 38 % of the acreage under cultivation has been realloted so far. In terms of a rough estimation, the national effect of reallocation on the rise of labour productivity can be put at 2 to 5 %. The agricultural labour in-

come nowadays amounts to approximately 10×10^9 Dutch guilders (*f*) per year. If the effect is supposed to be more or less constant during the entire period of reallocation in the Netherlands, an increase of $f\,500 \times 10^6$ per year can be calculated as a result of this policy. It is not unreasonable to accept that the effect has been even higher, as an increase of the agricultural income resulting from reallotment offers an opportunity for additional investments which causes a further increase of income (economic growth). Reallotment no doubt offers much larger opportunities of modernizing and mechanizing than initially might be considered. As a result of improved water management and land accessibility it also offers an opportunity for profitable changes in cropping pattern, viz extension of horticultural areas, and for the construction of public facilities.

All in all one can say that reallotment projects in the Netherlands caused considerable changes in agricultural production conditions, creating opportunities for the rural population to introduce new agricultural systems. In this way making an important contribution to national prosperity and increasing economic resistance in times of recession.

The recent, relatively rapid, introduction of new technical developments in agriculture causes a growing pressure to execute reallocation projects. The remarkable increase of the number of so-called 'cubicle stables' in dairy farming and of tank milking for instance, are examples of this. Relatively favourable parcellation conditions are required for both developments and unfortunately this fact remains a handicap in many not yet consolidated regions.

Selective growth

In national policy, the principle of selective growth nowadays is a general issue for rural development plans. This is reflected in a series of National Reports on Physical Planning such as the Report on Rural Areas, the Report on the National Landscape Parks (Nationale Landschapsparken), the Report on National Parks (Nationale Parken) and the Report on the 'Beheersgebieden' (areas where agricultural functions are restricted for nature and landscape preservation purposes). In the areas concerned, this implies a considerable shift to private economic systems in which subsidies for adapted farming are being given. Adapted farming includes no mowing before 15 June, restricted number of stock per hectare, low level of fertilizer application, no deep-ploughing, no lowering of the water-table, maintenance of hegdes, trees and brushwood.

This application of these new aims in a regional context on an often large economical scale is expected to lead to a slackening of the rate of economic growth. The question whether or not alternative farming systems may offer an escape from this perspective needs profound study.