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Articles should have a maximum length of 10 folio pages (including tables, graphs, etc.) typed in double spacing. Contributions, in the language preferred by the writer, should be submitted in triplicate to the Editor, c/o Department of Agricultural Economics and Marketing, Pretoria, and should reach him at least one month prior to date of publication.

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Contents

AN APPROACH FOR THE DEVELOPMENT OF PLANNING STANDARDS FOR A HOMOGENEOUS FARMING AREA: PART I[1,2]

by

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1. INTRODUCTION

These days it is an accepted fact that the management of any manufacturing enterprise requires reliable and up-to-the-minute management information in order to be able to take rational production decisions. The object of the development of computerised management information systems is to provide the management of big enterprises on a continual basis and timeously with the necessary management information.

As in other manufacturing enterprises in the non-farming sector, there is also an insatiable demand for the latest reliable management information in farming enterprises. Unfortunately, however, the management information system for the farming industry is, on the whole, inadequate[3], with the result that managers of farming enterprises often have to take production decisions without the necessary information.

A research project which was undertaken in a farming area in the Eastern Free State and on which this article is based was aimed at filling the gap in reliable management information that existed there. More specifically, the object of the research was to develop accurate and reliable planning standards with the help of which farmers in that area would be in a position to plan the field husbandry branches of their farming enterprises meaningfully.

At the beginning of the study it was known that various homogeneous soil units occur at various localities in the area. It was therefore to be expected that planning standards that would be drawn up for specific crops in respect of specific soil units could be suitable at several places and farms in the area[4].

2. THEORETICAL GROUNDING

2.1 The economic planning of a farming enterprise

For the purposes of this discussion the economic planning of a farming enterprise is regarded as the establishment of a farming plan that will indicate the composition and scope of the various branches of farming for long-term maximum profit and satisfaction of requirements[5]. The plan will also indicate the size of the expected profit and what the nature and scope of the inputs must be in time in physical and financial terms to put the plan into practice. This means that the plan will indicate what the flow of funds and activities should be in the course of a year.

The object of "maximum profit in the long term" means, first, that the plan must be such that the production potential of the farming enterprise will in time be at least maintained and, secondly, that the plan should be based on the long-term average (normal) climate pattern[6].

There are different techniques with which a farming enterprise may be economically planned. The best known and those most used in practice are farming enterprise budgeting, activity planning and linear programming. Although each technique has its own characteristic mechanics, which will not be elaborated upon here, basically the same information is required in the application of each of the techniques[7].

The information may be subdivided into constraints data and planning standards.

2.2 Constraints data[8]

Four types of constraints may be distinguished, namely, physical and financial, technical, personal and institutional.

2.2.1 Physical and financial constraints

During a given production period a farmer has a certain amount of land, machines and buildings. Labour and capital may also be limited and it may be difficult to obtain additional quantities. Information is required on the nature and scope of these production factors so that physically and financially suitable and practicable economic planning can be done.

2.2.2 Technical constraints

Constraints on, for example, the area that can be put under row crops, carrying capacity of the land, sheep to cattle ratios, etc., are determined by the quality of the land and the technical knowledge

available. Information on the technical aspects is required for technically adapted economic planning.

2.2.3 Personal constraints

A farmer may prefer a certain branch of farming regardless of whether it is less profitable than some other branch in which, for personal reasons, he does not wish to engage. For acceptable economic planning the personal preferences of the farmer must be taken into account. The level of education and managerial skill of the farmer are also personal constraints that cannot be ignored[9].

2.2.4 Institutional constraints

Farming enterprises may be restricted in scope by relevant production quotas, marketing quotas, contracts, soil conservation principles, and so on. Limitations set by such institutional constraints must be taken into account for institutionally suitable economic planning.

2.2.5 Remark

Whereas constraints information will differ greatly from farm to farm in a homogeneous agricultural area, this is not necessarily the case with planning standards. Planning standards can be made to apply with little or no alteration to various farming units in a homogeneous farming area.

2.3 Planning standards

A planning standard is defined as a summary in physical and financial terms of the inputs required and the outputs that will be obtained per unit of an activity, under a series of set assumptions[10].

The word activity is another name for a branch of farming[11]. However, activity also covers the method by which a certain product is produced. It includes the intensity of production as well as the particular method or technique used.

The unit of the activity may, for example, be a hectare of land. Planning standards are described on a unit basis so as to make them mutually comparable. Assumptions are needed for a planning standard to delimit the field of application.

Table 1 sets out the framework of a field husbandry planning standard. The information given in the table may be classified under the following components: assumptions, outputs, inputs and financial summary.

2.3.1 Assumptions

The purpose of the assumptions is to delimit the field of application of the planning standard and to qualify the information given in the standard. If the characteristics of the factors about which the assumptions are made change, the information in the planning standard will also change (point 2, Table 1).

2.3.2 Outputs

The physical yield from the specific activity described in the standard is shown together with its monetary value (point 3, Table 1).

2.3.3 Inputs

In the standard the types, quantities and value of the inputs required to carry out the activity are shown (points 4 to 7, Table 1).

The following information is given under cultivation practices:

The type of cultivation practices and the sequence;
the dates between which each cultivation practice usually occurs;
the type and size of tractor and implement with which each cultivation practice is carried out;
the time that a specific tractor and implement take to cultivate a hectare at average working speed;
the running and fixed costs of the stated tractor and implement combination to cultivate a hectare at average working speed;
the man-hours of regular labour required for each cultivation practice; and
the regular labour cost for the various cultivation practices.

Under the heading "material used" the sort, type, quantity and cost of inputs such as fertiliser, seed and pesticide are shown and, under "contract work hired," particulars of any hire services are shown.

"Other cost items" include the values of items such as drying, crop insurance and other fixes costs.

2.3.4 Financial summary

In the financial summary the profitability aspect of the standard is summarised (point 8, Table 1). The gross margin is obtained by subtracting the variable cost from the gross income and the net income by subtracting the total cost (fixed plus variable)[12] from the gross income. Cost of depreciation of tractors and implements, regular labour costs and overhead fixed costs, such as telephone costs and tractor and labour costs for general farm work, are taken as fixed costs. Costs of fuel and/or maintenance of tractors and implements, costs of material and costs of contract work hired are included under variable costs and, under the heading "other cost items", expenditures such as crop insurance and drying costs.

2.4 Requirements which planning standards must meet

Because the standards must be used for the economic planning of a farming unit, economic planning principles must be used as the points of departure in determining them [13] [14]. It follows from the planning requirement that the standards must be comprehensive. The concept comprehensive means, first, that "standards should be selected or developed in sufficient detail to provide that the final results will provide a clear picture of the internal physical and economic results for the enterprise"[15]. In addition, the concept comprehensive, in the case of the standards drawn up for a homogeneous area, means that planning

TABLE 1 - A framework for a field husbandry planning standard

1. Title For example: Planning standard for maize silage.

2. Assumptions For example:
(a) Climatologically normal year.
(b) Average level of management.
(c) Unlimited capital.

3. Physical and financial yield

Gross income = quantity x unit price

4. Cultivation practices

Practice	Average date		Tractor size	Type and size of implement	Tractor and implement			Regular labour	
	Start	Finish			Time per ha	Running costs per ha	Fixed costs per ha	Man-hours per ha	Cost per ha
			kW		Hours	c	c		c
Total	x	x	x	x	x			x	

5. Material used

	Sort	Type	Quantity per ha	Cost per ha
				R
Total		x	x	

6. Contract work hired

	Type of work	Cost per ha
		R
Total	x	

7. Other cost items

	Item	Running costs per ha	Fixed costs per ha
		R	R
Total			

8. Financial summary (R)

1. Total variable cost per ha
2. Total fixed cost per ha
3. Gross income per ha
4. Net income per ha

9. Remarks

standards must be determined for all farming activities that may occur in the area.

It is also important that the standards should be accurate and reliable. "All standards or normals should reflect accurately the physical, economic and institutional context applying ...."[16].

A further requirement is that the standards should be so drawn up that they are mutually comparable[17]. This means, in addition to the fact that they must be reduced to the same basis, that the same conditions must apply to the various standards. What this amounts to is that for each standard the composition of inputs required to produce the maximum profit per unit of activity must be given.

2.5 Factors that influence planning standards

All the factors that have a direct or indirect influence on field husbandry planning standards for the area under investigation and which are reasonably measurable were identified and analysed[18]. The factors are soil, climate, pests, crops, techniques, management, capital, labour, right of ownership and prices.

It was clear from the theoretical analysis of the factors that each of the factors exercises an influence on both the input and the output components of a planning standard. The various ways in which different factors influence planning standards also became obvious.

The way in which the various factors influence planning standards will not be detailed here[19]. For this discussion it is sufficient to state that each of the factors mentioned must be taken into account in determining field husbandry planning standards and that the nature of each factor must be explained for each planning standard so that the field of application of the standard is clearly delimited.

2.6 Sources of Information for Planning Standards

2.6.1 Introduction

Requirements set for planning standards are, *inter alia*, that they must be comprehensive, accurate and reliable. According to production economics theory, accurate and comprehensive planning standards can be determined only after comprehensive production functions for the various farming activity units are known[20]. Production functions available in practice are of so restricted a scope, both as regards comprehensiveness and number, that they are not a significant source of planning information. Other sources of information are consequently used[21]. The other sources of information used supply so-called point data[22]. The planning standard described in paragraph 2.3 is an example of a point data standard. For the application of the planning techniques with which farming enterprises are economically planned in practice, such as activity planning and linear programming, planning standards in the point data form are required[23].

2.6.2 Sources of information

There are various sources of information for planning standards[24]. First there is published information on the various components of a planning standard, for example, publications on soil surveys made, on climate descriptions of the region and on technical experiments[25].

Secondly, there is the source of unpublished data. In this case differentiation may be made between recorded and unrecorded data. An example of recorded data is the information noted in farmers' record books and an example of unrecorded data is the knowledge and experience of farmers, extension officers and researchers. Lastly, there is the research source, that is to say, doing specific research to obtain information that is still lacking.

The nature and purpose of the planning study to a large extent determines what type of source of information will be used for determining the planning standards. Heady and Candler explain it as follows:[26] "If an individual farm is being programmed given the techniques used, the best estimate of input coefficients is likely to be obtained from a conference with the farmer and the extension agent. In this way, the peculiarities of the individual farm layout, and of the individual farmer, can be taken into account. When the solution is to provide programs for typical farms or firms, the best sources of data are likely to be census data, farm records and surveys, technical studies of production relations, information from extension personnel, and conferences with interested farmers. The sources cited suppose that programs are to be computed which express techniques and resource restrictions as they are found on farms. However, if programming is done to estimate whether or not individual farms, or farms typically, should adopt prospective new techniques, other data will be needed, namely, the set of coefficients representing the new techniques. There are two basic sources of this information: research workers in technical fields who have developed the new techniques, and the experience of farmers or processing firms who have served as innovators in trying the new method".

Various sources of information must be used more than once to be able to draw up full and reliable planning standards[27].

This arises, *inter alia,* from the fact that planning standards are compiled from information derived from different academic lines of study[28].

2.7 Techniques for collecting data for planning standards

2.7.1 Introduction

There are various techniques for collecting data for planning standards. The appropriate techniques are determined by the source of information.

If the information has already been published or recorded in an unpublished report, the appropriate technique is simply locating the publications or report and using the required information.

When the information is available, but not in a published or report form, there are alternative techniques of collection such as the survey method, analysis of farm records, processing of mail-in record data and group discussion.

In the cases where the information is not known at all research must be undertaken to obtain the information. The following techniques may be used, namely, case studies, technical-economics experiments and economic engineering methods. A brief explanation of the various techniques follows:

2.7.2 The survey method

Two methods of obtaining information through surveys may be used. First, information may be obtained using a prepared questionnaire for interviewing a farmer, an extension officer or a researcher. The main advantage of this method is that a wide field can be covered. Objections to this method are that it is relatively time-consuming and expensive. In cases where the respondent has to rely on his memory alone, the margin of error may be big.

A second method of collecting data is by using questionnaires that are sent out. The advantage of this method is that it is relatively cheap, but the limited scope of the information usually obtained in this way is a disadvantage.

2.7.3 Analysis of farm records

The farmer's farm record data are analysed by the researcher. An important advantage of this method is that it makes available reliable information that has been obtained under normal farming conditions[29]. This method is fairly time-consuming and expensive.

2.7.4 Processing of mail-in record data

The processing of information contained in mail-in record analysis statements can produce useful information on certain components of a planning standard. However, it is not possible to compile a full set of practical, useful planning standards from the present mail-in record statements because the information in them is not presented in a sufficiently detailed classified form. The mail-in record system could be altered to produce fuller planning data.

2.7.5 Group discussion

Several variations of the group discussion method are used in practice. Basically, however, what the method amounts to is that a group of people (farmers) come together in a meeting and questions are then put to the group and discussed and a common answer is later reached. The advantage of this method is that reasonably reliable information is obtained in a relatively short period[30]. Disadvantages are, first, slanted answers resulting from domination of the group discussion by certain members or in cases where members were showing off to each other[31].

A second disadvantage is that the effectiveness of the method drops when many variables are involved in the problem situations.

2.7.6 Case study

In this method a single farm, or a group of farms, which are accepted as modal in respect of various characteristics in a homogeneous region, are studied. Reliable data obtained under normal farming circumstances may be collected. Disadvantages of this method are that it is relatively time-consuming and costly.

2.7.7 Technical-economics experiments

These are technical experiments so planned and executed that they allow production function determination. Theoretically this is the best method of determining exact planning standards. In practice, however, few production functions are available. Few experiments were planned in the past with the purpose of producing information with which production functions could be determined. The reasons for this possibly lie in the fact that the usefulness of production functions was not understood or they were considered to be too expensive. Heady and Dillon point out that it is desirable to plan technical experiments so that the information obtained will also allow production function determination. Their view is as follows:[32] "Instead of attempting to estimate production functions ... researchers have most often simply tried to ascertain such qualitative facts as whether (a) output responded to some hypothesized input, (b) one level of output induced a greater response than another, (c) any interaction occurred between input. Such questions were answered by way of analysis of variance, care being taken to replicate the experiments sufficiently to assure correct answers to the questions posed. In terms of the questions asked, such procedures are correct. However, from an applied research viewpoint, the questions are inadequate. The farmer needs more than qualitative information or information about one or two factors at two or three levels. He requires quantitative information of the overall production surface. For maximum benefit to the farmer applied research on input-output phenomena should lead to the estimation of the relevant production function".

2.7.8 Economic engineering methods

Time, motion and method studies of labour and mechanisation practices are included under this heading. With these techniques precise data can be gathered that may be used to advantage in the preparation of time inputs for planning standards. The application of the methods takes considerable time and is therefore fairly expensive.

2.8 Considerations in choosing a suitable technique

In choosing a collection technique or techniques the researcher must first determine what source or sources hold the information. Next he must weigh the suitable techniques against each other as regards advantages and disadvantages. In this connection aspects such as the degree of reliability the information must have and the availability of labour, funds and time for obtaining the information must be considered. The researcher must therefore choose the technique or techniques that best meet his requirements for reliability of the information and which fit the labour, time and funds available for the task.

REFERENCES

1. Based on an M.Sc.(Agric.) thesis by M.F. Viljoen, University of the Orange Free State.
2. For the purposes of this discussion a homogeneous farming area is considered to be an area where the factors that influence planning standards are comparable for all practical purposes.
3. Confirmation of this is to be found in a priority task which the Department of Agricultural Technical Services is working on countrywide, namely, the collection of data for planning suitable farming systems.
4. A soil unit refers to a soil that has a defined set of physical and physico-chemical soil properties; this includes properties such as slope and depth and those contained in the description of a soil series.

5. This definition agrees with the definition given by S.P. van Wyk of farm enterprise planning as the effective organisation and utilisation of the production factors, land, labour, capital and management in order to obtain in the long term the highest possible productivity (in terms of profit and/or satisfaction). Compare Hancke, H.P., *'n Kritiese ontleding en verdere beplanning van produksie aktiwiteite op 'n tabakproefboerdery naby Brits.* M.Sc. (Agric.) thesis, University of Pretoria, 1970, p. 7.
6. Ibid., p. 121.
7. Hedges, T.R. *Farm management decisions.* Englewood Cliffs, N.J., Prentice-Hall, Inc., 1963, p. 208.
8. Hattingh, H.S. *Farm management course part II presented in Durban in March 1968.* Division of Agricultural Production Economics, p. 45.
9. De Swardt, J.B. *Die besluitvormingsproses by tafeldruifboere in die Hexriviervallei,* D.Sc. (Agric.) dissertation, University of Pretoria, 1965, pp. 187 and 190.
10. Theoretically a planning standard is a point on a defined production function (input-output curve). Compare Hedges, T.R., *op. cit.,* p. 179.
11. Hattingh, H.S., *op. cit.,* p. 44
12. Variable costs are those costs that vary in their totality with pressure of operation and fixed costs are all items that in their totality are unaffected within limits by variation in pressure of operating.
    Hancke, H.P., *op. cit.,* p. 24 and p. 36.
13. Hedges, T.R., *op. cit.,* p. 167.
14. For the principles see, for example, Heady, E.O., & Jensen, H.R. *Farm management economics.* Englewood Cliffs, N.J., Prentice-Hall Inc., 1961, pp. 154-219.
15. Hedges, T.R., *op. cit.,* p. 167.
16. *Loc. cit.,* p. 167.
17. *Loc. cit.,* p. 167.
18. The influencing of a planning standard may theoretically occur in three ways, namely: When moving from one position to another on an input-output curve, when an input-output curve shifts and when an input-output curve changes shape. Any factor that by an internal change can cause one or more of the above-mentioned changes is a factor that influences planning standards.
19. For a discussion of the factor see Viljoen, M.F., *op. cit.,* pp. 11-20.
20. A production function shows for a series of levels of application of an input what the corresponding product yield will be, when other factors that influence yield remain unchanged. A comprehensive production function describes the relationship between all the different inputs concerned in a production process and the product yield.
21. Heady, E.O., and Candler, W. *Linear programming methods.* Ames, Iowa,, USA, The Iowa State University Press, 1961, p. 226.
22. Reisegg indicates that the lack of production function data in practical farm planning is not too great. He puts it that "when it comes to practical farm planning, production function data are after all not so much better than point data. Production function data are not always as exact as we may think. First of all we have to relax several assumptions important for the theory. We may find that most input factors do not change continuously. The observations as plotted in a chart may be scattered and deviate from any possible single line. Thus we have to choose one or many possible lines when dividing the final linear or curvilinear function. Strictly speaking, production function data are only valid if conditions are exactly the same as in the original study. We should not use the same function if conditions are different."
    Reisegg, F. Data requirements for farm management.
    OECD: *Inter-disciplinary cooperation in technical and economic agricultural research.* Paris, André-Pascal, OECD, 1961, p. 100.
23. Heady, E.O. Econometric models, the design of technical experiments and inter-disciplinary cooperation among economists and physical scientists.
    OECD: *Inter-disciplinary cooperation in technical and economic agricultural research.* Paris, André-Pascal, OECD, 1961, p. 71.
24. For example, see Hedges,T.R., *op. cit.,* pp. 55-64 and pp. 120-122.
25. Reisegg, E., *op. cit.,* pp. 97-101.
26. Heady, E.O., & Candler, W., *op. cit.,* pp. 225-226.
27. Spies, P.H. *Lineêre programmering en normatiewe boerderybeplanning vir die Witriviergebied in Oos-Transvaal.* M.Sc. thesis, University of Stellenbosch, 1967, p. 7.
28. In the case of field husbandry planning standards, for example, the following subjects may be sources: soil science, meteorology, agronomy, agricultural economics, agricultural engineering, sociology and entomology.
29. "This, of course, is never true for experimental data, which almost always need some adjustments to fit the situations on regular farms." Reisegg, F., *op. cit.,* p. 98.
30. Robbins, P.R. Developing and using input-output information. J.F.E., Vol. 45, 1963, p. 832.
31. This is not an essential problem of the method. By arranging the order of the meeting and way of answering questions correctly the problem can be overcome.
32. Heady, E.O., & Dillon, J.L. *Agricultural production functions,* Ames, Iowa, Iowa State University Press, 1961, p.153.