MEASURES OF FARM PRODUCTION

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In view of the wide range of commodities produced on a particular farm the only praticable common measure of farm production is the financial value. By using this measure the total physical production of a farm business (livestock, livestock products, crops and produce on hand, etc.) can be expressed in one figure.

For this purpose the term "output" will be used.

1. — Output

Output is recognised as a common denominator of the yearly farm production. It is a useful indicator of the scale and intensity of production. This may be converted to a measure of the intensity of land use by dividing it by the farm acreage.

This measure is not entirely satisfactory since it is influenced by price which is itself a variable element. Hence when comparing farm outputs over a period of years it is desirable to eliminate the effect of changes in the value of money by using the device of constant prices. The measure then more nearly reflects changes in physical quantities of output.

Two concepts of output are commonly used, viz. (i) the gross output; (ii) the net output.

(i) Gross Output :

Gross output is a measure of the total value of commodities produced during the year by all factors of production, including factors within the industry: land, tenants' capital, labour and management and other factors

from outside the industry such as manures, services provided by contractors and the like, or from other farms such as livestock purchases, feeds and seeds (inter-farm sales).

It is seldom an exact measure of the farms' own production in so far as it includes a substantial element of products which have been produced on other farms in the form of livestock, feeds and seeds bought during the year as stores or requisites.

Gross output is here defined as both cash receipts and certain items of non-cash income adjusted for the difference between opening and closing valuations of livestock and crops. (1)

Cash receipts include the sale of livestock and livestock products and crops together with other receipts such as subsidies, labour services, the sale of manures produced on the farm, etc.

Non cash income includes produce consumed by the occupier's household, the value of farm produce allowed as perquisites to workers, etc.

Some workers at other centres in the U.K., such as Leeds and Cambridge, calculate the gross output by taking the gross income (total sales) less purchases of livestock during the year and adjusting the result for valuation differences of livestock and crops. (2)

Other centres such as Bristol I & II and Manchester use the term "production" in the same sense as gross output calculated in Leeds and Cambridge. (3)

At the Department of Agricultural Economics in reading the term "net production" refers to the total income adjusted for differences between opening and closing valuations and in the case of livestock production minus any purchases of livestock during the year. (4)

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(1) DINSDALE, D.H., *Farm Management Survey Report*, 1947/48, Report No. F.M.S 31, Durham Univ., F.E.B., King's Coll., N/Cle upon Tyne, 1949, p. 2.

M.A. & F., *Farm Incomes in E. & W.* 1950/51, Farm Income Series No. 4, H.M.S.O., 1953, p. 2.

(2) LONG, W.H., *Types of Farming in Yorkshire*, Univ. of Leeds, Dept. of Agric., Economics Section, Farmers' Report No. 113, 1953, p. 32.

STURROCK, F.G., *Changes in the Economic Organization of Agric.*, Univ. of Cambridge, F.E.B., Report No. 39, 1953, p. 11.

(3) AGRIC. ECONOMICS DEPT., *Farm Management Survey* 1950/51, Univ. of Manchester, Agric. Econ. Dept., Bull. No. 69/F.M.S. 16, 1952, p. 21.

HEWETT, L.J., *Farm Management Survey*, Univ. of Bristol, Agric. Economics Dept., 1952, p. 18.

(4) BISSET, G.B. & BLAGBURN, C.H., *Financial Results on Farming in the Southern Province in* 1948/49 & 1949/50, Reading Univ., Dept. of Agric. Econ., F.M.S. Report No. 2, 1951, p. 8.

(ii) **Net Output :**

A more accurate measurement of the value of commodities produced on the farm can be obtained by deducting from the gross output as defined in Durham University reports the inter-farm sales, viz. purchased livestock, feeds and seeds. The over-statement of output therefore is avoided. The figure arrived at is called the net output. (1) Hence it is defined as the part of production which remains after paying for the use of factors contributed by other farms.

The deduction of livestock purchases is necessary, since particularly on farms where considerable numbers of store cattle and sheep are bought in for re-sale, the gross output would give a misleading figure of actual production.

It may be considered more accurate to exclude as well, from the gross output, the receipts not derived from farming, such as farm stores used in the farm house, government grants, and so on. Net output, therefore, is a measure of what the farm itself has produced.

It should be pointed out that the deduction of livestock purchases, feeds and seeds from the gross output to arrive at the net output has a certain artificiality as the gross output is a composite measure which is contributed by various factors of production used jointly. The contributions of these factors to gross output cannot be separately identified and they cannot, therefore, be measured. Consequently, one cannot say how much of the quantum of production is attributable to the livestock, to the feeds and to the seeds. The figures assigned to these items in the annual trading account might not be equal to their contributions to the farm output.

An alternative way of arriving at net output is to deduct total input from total output. Total input is here defined as opening valuation of livestock and crops plus purchases of livestock, feeds and seeds and total output as total sales along with closing valuation of livestock and crops.

It should be noted that total output is here not the same thing as gross output and total input includes a large content of capital items. (2)

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(1) DINSDALE, D.H., *Ibid.*, p. 2.

ASHBY, A.W., *Standards of Production and Net Output on Scottish Farms*, Scot. J. Agric., Vol. VI, No. 4, 1923, pp. 387 - 401.

CONACHER, H.M. *An Examination of the Notion of Net Output*, J. Agric. Econ. Soc. Vol. I, No. 1, 1928, pp. 22 - 25.

(2) EL TONBARY, A.A., *Comparative Standards in Farm Management Appraisal with special reference to Homogeneity of Farm Type*, Ph. D. thesis, Durcham Univ., Vol. 1, 1954, pp. 80 - 81.

Some workers use the term "social output" or "net production" in a quite different sense from that defined as net output, that is, the contribution of the farm to the national income in the form of returns to the landlord as rent, to the community as rates, to the farm labourer as wage and to the tenant farmer as profit. (1)

Hence in calculating the national farm output it might be appropriate to use the net output. But if the aim is to measure what the agricultural industry provides for the use of the non-farming population, treating farmer's house holds as consumers, gross output would be used. The members of the Community may use the concept of social output.

It may be said that the lack of an agreed terminology for the various concepts of output does not make the task of exposition any easier for the foreign investigator.

2. — Calculation of Output :

Methods of calculating output for the farm as a whole can be applied separately on the same lines to the different components of output, that is, livestock output, cash crop output, miscellaneous output. Further calculations can be made relating livestock output to fodder crop acreage and cash crop output to cash crop acreage. Accordingly, separate units of omparison will then be available and serve as useful supplementary comparative measures.

These calculations could be dealt with more exactly if the necessary information is available through the farm accounts. But there are some difficulties associated with these calculations, viz :

(i) identification of the acreages devoted to fodder and cash crops in a particular year ;

(ii) identification of the outputs in relation to the acreages assigned to livestock production and cash cropping respectively in that year.

It is evident that the annual trading account normally includes a carry-over of crops from the previous year. This carryover of crops may be sold or fed to livestock in the year of current account. The estimation of these quantities and the values placed on them seldom corresponds with the subsequent realized figures.

Farmers at the valuation date are often uncertain as to whether they will sell or feed dual-purpose crops like oats or hay and fequently change

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(1) STURROCK, F.G., *Ibid.*, p. 31.
AGRIC. ECONOMICS DEPT., Manchester Univ., *Ibid.*, p. 21.

their intention between the valuation date and the time to sell or feed. Also, favourable climatic conditions may help to release more crops for sale than was anticipated at the time of valuation.

Further, fodder crops are frequently valued at the estimated cost of production or consuming value which is appreciably less than the value based on a market price. Assuming that a part of such crops would be sold after valuation, then an element of profit would be introduced into the subsequent year's calculation of cash crop output, i.e. reducing the cash crop output figure for the year of production. It is generally agreed that the more dual-purpose crops enter into the calculation of the output/acreage relation and the greater the carry-over of crops, the less reliably will the calculated figure reflect the cash cropping performance

It is, therefore, clear that these points must be taken into consideration in order to get the appropriate measures which relate the outputs from livestock and cash crops in a particular year to the acreages assigned to livestock production and cash cropping respectively in that year. (1)

3. — Factors affecting size of Output:

As output measures the physical production of the farm business, it may be greater or less according to variations in quantity, kind, quality and price (seasonal selling) of farm products. (2)

Quantity depends on several factors. Amongst these factors are size of farm, quality and type of land, location (climatic influence), shape and layout of farm (ease of working), degree of intensiveness of production and so on.

Kind of production depends on the particular enterprises undertaken such as dairying, sheep, pigs, poultry, cash crops and so on. Some of these enterprises produce high value products such as bacon, the others produce comparatively low value products such as beef,

Every kind of a particular product has different qualities which differ in their values. For example, graded milk is of higher value than non-graded milk, the well finished beast exceeds in its value the less finished beast. Therefore farmers can raise the value of their outputs by improving the quality of their products.

Prices of farm products within the prescribed price context vary according to time of selling.

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(1) El Tonbary, A.A., *Ibid.*, pp. 81 - 83.
(2) El Tonbary, A.A., *Ibid.*, pp. 76 - 80.

4. — Input as a factor influencing size of Output :

Apart from the influences determining size of output, which have been already mentioned, size of output depends also upon a combination of the quantity, kind and quality of a large group of inputs according to their prices. This combination is in large part a reflection of management decisions.

Prices of feeding stuffs, fertilizers, fuel, etc., are not controllable by the actions of an individual farmer but the quantity and quality of these resources used on a particular farm might vary according to the farmer's decisions. For example, a farmer can apply larger or smaller dressings of manures according to his own decision. He can use a specific fertilizer amongst the nitrogenous fertilizers according to his choice.

It should be mentioned that various inputs do not vary independently of each other. For example, by using large dressings of fertilizers, crop yields might be increased and so more labour and tractor fuel be required at the time of harvest.

The contribution of any one of these foregoing factors separately to the farm output cannot be clearly isolated but it is possible to measure the combined contributions of all these factors.

The factors operating on output and input may be divided into two categories :

(i) factors, which operate independently of management such as influences of natural forces: (general and seasonal climatic conditions (e.g. sun, rain, frost, flood, drought, wind, etc.), pest and diseases attack), farm size, shape and layout of farm, inherent or geological character of soil and economic forces such as general price levels (for products and requisites);

(ii) factors within the control of management which will be either (a) under partial control such as permanent equipment of farms (as provided by the landlord) and type of production (within certain limits) or (b) under complete control of management such as choice of crops and varieties, methods of cultivation, use of fertilizers and so on.

5. — Analysing Output :

Increase in output may be sought along two broad lines :

(i) Intensifying the farming system, i.e. altering the combination of crops and livestock enterprises, e.g. increasing the production perhaps by keeping more cows, pigs, hens, etc., on the farm, producing more intensive

crops such as potatoes or vegetables for cereals or grass, or keeping more highly productive livestock, e.g. dairy cows, pigs or poultry for store cattle or sheep.

(ii) Operating the existing farming pattern at a higher level of productivity i.e. increasing unit yields per acre, per cow, per sow, per hen, per labour unit, e.g. increasing the quantity of produce such as yields per acre of crops, milk yield per cow, number of eggs laid per hen, number of pigs weaned per litter, liveweight gained per head of fat stock.

The actual output of a particular farm therefore depends on the production pattern as well as on the yield level of operation, i.e. forms of organization and technique.

In view of the variety of production patterns practised by different farms the only possible measurement, by which the relative economy of these two aspects may be appraised, can be devised by means of a system of indices.

For this purpose two production indices have been adopted by Blagburn of reading University: (1)

(i) an index of the intensity of the farming system, i.e. "system index";

(ii) an index of the productivity of enterprises, i.e. "yield index".

(i) **System Index :**

This index indicates the relative intensity of the farming system as measured by the potential income, in terms of value, expressed as a percentage of the average potential income.

To arrive at a system index for a particular farm the method adopted is as follows:

(1) Determine a standard income, by value, for each cash crop and each head of stock, given normal yield.

(2) Apply these standard income values to the acreages of sale crops and numbers of stock on the farm on the basis of 100 acres. The result is the potential income per 100 acres at normal yields.

(3) Calculate the average potential income per 100 acres for farms in the area.

(4) Express the farm potential income as a percentage of the average potential income. The result is the system index for the farm in question.

(1) BLAGBURN, C.H., *Some Economic Aspects of increasing Farm Output*, Univ. of Reading, Dept. of Agric. Economics, Miscell. Studies No. 6, 1951, pp. 13 - 15.

(ii) **Yield Index :**

This index measures the overall level of yields being obtained on a particular farm by comparing the actual output from the whole combination of productive enterprises with the assessed income from that combination at standard yields.

To calculate a yield index the method used is as follows:

(1) Relate the farm actual output to its potential income. Actual output is here defined as gross sales from livestock and crops plus or minus valuation differences minus livestock purchases.

(2) Calculate the average actual output per 100 acres for farms in the area.

(3) Relate the average actual output to the average potential income.

(4) The actual output for every L. 100 potential income for the farm in question is then related to the resulting figure as just calculated in 3 above in order to put all farms on the same basis in respect of general seasonal influences on yields.

It should be mentioned that the bases adopted by Blagburn to arrive at indices for appraising farm production are similar to the methods used by others such as the Hampshire production recording scheme. (1).

The production indices are generally diagnostic in a preliminary way. Their value is that they provide an indication to the general direction where to attack the problem of improving output on a particular farm. The two indices together indicate whether the weakness of the production pattern lies in the organization of the farm enterprises, in the technical efficiency of production as reflected by the level of yields, or in both.

6. — Limitation of Output Measures

It is evident that output can be raised in many ways some of which may be economical, others may be uneconomical, e.g. extravagant use of labour or machinery, excessive use of fertilizers or excessive feeding of stock disregarding the principle of diminishing returns. These methods will obviously add to the farm output but may be so expensive as to reduce the net profit, i.e. going beyond the marginal point of profitability. Hence it is unwise to conclude that farms with high gross or net outputs are ipso facto more efficient enterprises. In other words, high output is not synonymous with high efficiency or low output with low efficiency.

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(1) M.A. & F., *Agriculture*, J.M.A. & F., March, 1943.

Since meither the gross nor the net output give any indication of the cost involved in producing output they cannot be used as conclusive measures of economic efficiency. However, they serve as measures of the effectiveness with which the resources available to a farmer have been combined and brought to bear on the current situation of prices and markets.

It might be useful then to have a measure expressing the relation between output and input. For example, net output as a percentage of total expenses provides a measure of comparison as between farm and farm.

An alternative measure can be used. This measure is calculated by relating total output to L.E. 100 worth of total input (see page 109)

In order to measure output performance as between farm and farm the output figure needs to be related to the main production factors on which the size of the farm output depends, that is, to units of land, capital, labour and total expenditure.

SUMMARY AND CONCLUSIONS

The main points which can be summarised from this study are as follows:

1) Both gross and net output are useful measures (in money terms) of the quantum of production.
2) Gross and net output provide useful indications of the scale and intensity of production as between farms of similar type.
3) Net output is a better measure of the farm's own production than gross output.
4) Neither any measure of output indicates the cost of producing it.
5) Some difficulties arise in the calculation of output. They are of two kinds, viz: (i) identifying the areas devoted to cash and fodder crops in a given year and, (ii) identifying the outputs in relation to the areas assigned to cash cropping and livestock respectively in that year.
6) It is possible to measure the relative economy of the methods of increasing output by means of production indices, i.e. System index and yield index.

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