PROBLEMS AND TECHNIQUES IN THE STUDY OF THE COST OF PRODUCTION IN AGRICULTURE*

By

V. G. Panse

INTRODUCTION

Investigations of farm costs are a well-established and regular feature of the commercialised agricultural economy of Western European and North American countries. Farmers in these countries support these investigations and employ the results for ensuring profitability of their agricultural enterprises and for safeguarding their economic interests in relation to price and other agricultural policies of the governments. It is, therefore, easy to understand that periods of economic depression have generally given a special stimulus to these studies in those countries. In India and other similar under-developed countries on the other hand, farming has been a traditional way of life rather than an economic occupation of voluntary choice, and conclusions of agro-economic studies characteristic of a commercialised economy are not always applicable under these conditions. Consequently economic investigations in agriculture and farm cost studies in particular have not had much support in the past either from the government or the farmers. It is only during the last decade when the government is making planned efforts to increase national wealth and is adopting a policy of boosting agricultural production by various measures, that farm cost studies have begun to receive serious attention. Estimates of farm income as a whole and cost of production of various agricultural commodities are basic to devising measures for the provision of incentives to the farmers and to the control and stabilization of agricultural prices. Apart from their relevance to price and other policies of the government, results of farm cost studies can also provide practical recommendations for improving efficiency of production and are consequently of great value to extension workers.

The methodological problems, such as the types and number of farms or other units to be selected for study, the approach to be adopted in collecting the primary data and their appropriate analysis and interpretation of the results, are broadly the same, whether the investigation covers the entire farm business or is confined to certain selected enterprises. There have been a few recent surveys in India which specifically aimed at the solution of methodological questions or which throw a good deal of light on them. One of these surveys was the pilot scheme for the estimation of the cost of production of cotton and rotation crops in Akola District of Madhya Pradesh in 1952-53, sponsored jointly by the Indian Council of Agricultural Research, Indian Central Cotton Committee and the Indian Central Oilseeds Committee. This was the first project of its kind in India based on a randomly selected sample of holdings and fields for study. A

---

* This paper was prepared by the author under the auspices of the United Nations Economic Commission for Asia and the Far East (ECAFE) as a working document for the Centre on Policies to Support and Stabilize Agricultural Prices and Incomes in Asia and the Far East, New Delhi, 21 March—3 April 1958, sponsored jointly by the Food and Agriculture Organization of the United Nations and the Economic Commission for Asia and the Far East.

survey on the cost of milk production was carried out in urban and rural areas
of Delhi State for two years 1953-54 and 1954-55 by the Indian Council of Agri-
cultural Research,\textsuperscript{2} embodying the same principle of selection of stables and
households and a similar project is now in progress in the urban and suburban
areas of Madras City and a rural area of Madras State. The Indian Central
Sugarcane Committee has taken up surveys in five important sugarcane growing
States in the country since the year 1955-56 for estimating the cost of production
of sugarcane based on the study of a large sample of randomly selected holdings.
Further, there is an important series of farm management surveys initiated in
six typical agricultural regions of the country in 1954-55 by the Directorate of
Economics and Statistics of the Ministry of Food and Agriculture and the Research
Programmes Committee of the Planning Commission.\textsuperscript{3} These surveys in addition
to being based on randomly selected samples, seek to compare alternative
approaches to the ascertainment of primary data. Lastly, a reference should be
made to an excellent review of the methodological problems of farm costs in
Indian agriculture, prepared by the Indian Society of Agricultural Economics in
1953. The object of the present paper is to discuss briefly methodological
problems in cost studies in agriculture in the light of the Indian experience.

OBJECTIVE OF FARM COST STUDIES AND SELECTION OF FARMS

The objective of determining farm costs may be to study the economics of
the farm business as a whole or of individual enterprises like production of parti-
cular crops or animals and their products. In studying individual enterprises
apportionment among them of certain common items of expenditure such as
those on farm implements, farm buildings, management, etc., raises a difficulty
which sometimes results in the extreme view that the individual farm product
has no final cost that is determinable independently of the cost of other products,
and individual products are not the real natural divisions upon which the classi-
ification of farm expenses rests. While such a view, which would take away most
of the practical interest from farm cost studies is not generally accepted, there is
yet a considerable insistence that the entire farm activity should be kept under
observation even when the objective is limited to the study of a single enterprise.
Actually, a substantial portion of costs of individual farm enterprises like raising
of crops or animals, consisting of expenditure on human and bullock labour and
on materials like seed, manures, feeds, etc., is directly determinable. The re-
main ing problem, \textit{viz.}, the apportionment of costs on common items among in-
dividual enterprises has to be solved by evolving suitable conventions on the
basis of economic reasoning. Greater attention to the study of individual enter-
prises will itself help in developing these conventions. In studies confined to in-
dividual enterprises there is, therefore, no justification for diversion of resources
to the collection and analysis of a large amount of extraneous data, which have
only a limited bearing on the principal objective of the investigation.

Case studies have been the most commonly used media for investiga-
tions on farm economics in the past. The apparent reason is that these investigations
are costly, laborious and time consuming and the investigator had therefore to

\textsuperscript{2} "A Pilot Survey for the Estimation of Cost of Milk Production under Indian Conditions;"
\textsuperscript{3} "A Survey of Farm Management Studies in India and Abroad" S. R. Sen, F.A.O. Development
Centre on Farm Planning and Management for Asia and the Far East, New Delhi, 1957.
confine them to a few cases chosen deliberately as being typical of a particular class or set of prevailing conditions. Insistence on comprehensiveness of the investigation, as for example, keeping the entire farm business under observation even where a particular enterprise was the object of study, made it all the more necessary to restrict the investigation to a minimum number of carefully selected units. The weakness of the method is that valid generalizations are not possible from such case studies and their scientific and practical value is consequently very much reduced. Numbers are required to average out the influences of extraneous factors and make the sample representative of a class and the larger this number the more precise the representation.

The aim of cost studies in agriculture is to obtain results applicable to a class or a set of agricultural or other conditions. All farms or holdings or other units included in this class or set of conditions are collectively termed a population and the complete list of units comprising the population constitutes the frame out of which random selection is to be made. It is important to define and delimit this population clearly according to the objective that the investigator has set himself. Again, an important aim of these studies is to compare the results characteristic of different classes or conditions, e.g., cost of production of a crop for farms in different size groups or of milk production in urban and rural areas, within a larger population like an agricultural or geographical region. The sample for this purpose can be selected first by dividing the larger population into sub-populations or strata and then making a random selection of units within each stratum. It is also possible sometimes to achieve the same result by making the initial random selection of units for study directly out of the larger population and subsequently classifying the results into various strata for comparison. Case studies do have a limited use for procedural and other preliminary enquiries, but cannot replace randomly selected samples of adequate size.

In the Indian surveys referred to in the introduction, the domain of study was either a district or a compact group of districts forming a region. This area was stratified according to the administrative sub-divisions and within the strata villages formed the primary units and operational agricultural holdings in the villages secondary units. In the pilot survey in Akola District, 30 villages were selected randomly with 5 villages from each of the six sub-divisions of the district, and in each village two operational holdings were selected randomly, in addition to a similar sample of individual fields growing the particular crop. In the sugarcane survey the sample consisted of 180 to 360 sugarcane growing holdings per region at the rate of 12 holdings per village, the villages being selected with a probability proportional to their sugarcane acreage. The region was stratified according to areas allotted to different sugar factories. Under this survey, a total number of 900 and 540 holdings have been under study in the two major sugarcane growing states, Uttar Pradesh and Bihar, respectively. In the farm management surveys, 20 villages were selected per region for study according to each of the two methods of collecting primary data, villages being selected with a probability proportional to their cultivating population or cultivated area. Ten operational holdings were selected per village for the cost accounting method of study and 20 for the survey method. In the milk costing survey in Delhi State, the area of the State was divided into the municipal area comprising of Delhi and New Delhi Cities and the rural area. In the former, stables and household
with milch cattle were stratified according to size and a total of 60 units were chosen for study. In the rural area, clusters of three neighbouring villages formed the primary units and households of farmer and non-farmer milk producers formed the two strata of secondary units. A total of 96 units were thus selected for observation.

As a measure of the precision of the results obtained, sampling errors are available for some of these surveys. In the pilot survey in Akola District average values of important components of cost were estimated with sampling errors ranging from 5 to 8 per cent. In the farm management survey in one region the first year's result showed that 30 to 60 villages would have to be selected with 2 or 3 holdings per village for obtaining average values for most characters with a sampling error of 5 per cent for wheat and sugarcane, while for gram the number of villages to be sampled may have to be raised upto 100 for a similar precision. With a larger number of holdings per village, the number of villages required to be selected to attain this precision would be reduced only at a slow rate. In the sugarcane survey in Uttar Pradesh, the total input per acre for plant-cane in different regions was estimated in 1955-56 with sampling errors of 4 to 5 per cent and important components of cost like human and bullock labour with sampling errors upto 8 per cent. Over the two years of milk costing enquiry in Delhi, the average annual cost of production per unit weight of milk was estimated with sampling errors between 3 and 4 per cent both in the urban and the rural areas; the seasonal estimates had somewhat larger sampling errors ranging between 5 and 9 per cent. The average cost of feeds, which is the principal component of the cost of production of milk was determined with a sampling error of about 4 per cent for buffaloes and 8 to 10 per cent for cows over the whole year, the sampling errors for seasonal estimates for this component ranging upto 11 per cent for buffaloes and 18 per cent for cows. These results demonstrate the feasibility of obtaining farm cost data with a satisfactory degree of precision from randomly selected samples.

METHODS OF COLLECTING PRIMARY DATA

Another condition for securing valid results in cost investigations in agriculture is that the primary data should be reliable and procedures best fitted for collecting authentic data under given conditions should be employed.

In farm costing studies two principal methods of ascertaining data have been in the field. They are the cost accounting and survey methods. In the first method careful accounts of day-to-day operations and transactions are maintained for the chosen units by the farmer himself or by the investigator by taking observations on the spot, while in the other method data are obtained at suitable intervals from the farmer over a given period either through a personal interview at the farm or by the farmer filling in and returning a questionnaire supplied by the investigator. The cost of collecting data through a questionnaire is naturally the lowest. Where, however, a randomly selected sample of any appreciable size is involved, neither of these two methods in which the farmer himself is required to prepare the accounts or provide replies to a questionnaire can be relied upon, because experience shows that even with relatively simple questionnaires, there is a large amount of non-response in surveys conducted in advanced coun-
tries where co-operation from farmers should be easier to secure. This introduces a significant element of bias in the data collected, as the farmers who respond are likely to be different in various material particulars from non-responding farmers.

With the investigator doing the entire work of collecting data through his own field agency, the cost of collecting primary data by the cost accounting method is naturally very high as compared to the survey method. For example, in the farm management surveys the primary field staff in a region consisted of 20 fieldmen at the rate of one per village in the cost accounting method against 4 investigators at the rate of one investigator for 5 villages in the survey method. Also, while a fieldman kept 10 holdings in his village under observation, the investigator surveyed 20 holdings per village. The investigators, who are graduates, have a higher scale of pay than the fieldmen, who are generally educated up to the high school standard. The annual expenditure on salary and other allowances for this staff in one particular region worked at Rs. 27,000 for fieldmen and Rs. 11,000 for the investigators. However, under the conditions of an economically backward country like India, where farmers are handicapped by illiteracy, lack of accurate quantitative appreciation of their business and suspicion about the motives of economic enquiries, the primary data derived by the survey method are likely to be highly biased, as is demonstrated by the results of the farm management surveys.

In these surveys, comparison of the two methods of collecting data was a principal objective. This comparison is based partly on common villages in which the two methods were tried in separate sets of holdings in the same village and partly on independent villages, where the two methods were employed in separate groups of villages. The allocation to the two methods of holdings in the first case and villages in the second, was made randomly.

The first year’s data in one region have been analysed statistically. As was to be expected, sampling errors of the comparisons made over independent villages were larger than those made within common villages, but subject to the sampling errors, the trends of the results were similar in both cases and overall comparisons in respect of three crops, wheat, sugarcane and gram, showed that the estimates derived from the survey method for the major factors of input examined, viz., human labour, bullock labour and seed, as well as the total input itself were significantly and in some cases strikingly higher than the corresponding estimates by the cost accounting method, the difference being sometimes as high as 50 per cent of the latter. In regard to total output, the farmer’s estimates of yield are usually under-estimates, unless the yield is measured physically. There was in fact a trend in the direction of under-estimation by the survey method, but the differences were not significant for wheat and gram, while for sugarcane there was actually a significant over-estimation by this method. Since the entire output of holdings under the cost accounting method was not presumably measured objectively, the comparison between the two methods in respect of this item needs much care. The general conclusion from the first two years’ data from the farm management surveys in different regions is in line with the above results and establishes the tendency in the survey method to exaggerate inputs and
perhaps to a less extent to suppress yields, thereby leading to a serious over-estimation of the cost of production.

It is clear that employment of trained whole-time field workers with a good knowledge of local farming and other conditions and their location in the villages where they can record for the selected farmers operational and other data through direct observation and physical measurement, supplemented by careful enquiry to the extent necessary is essential for farm cost studies under Indian conditions.

The work for collection of field data is two-fold, viz., to make objective measurement of physical quantities of items involved in the various farm operations and transactions and to secure conversion factors for turning these quantities into money equivalents. Items of farm cost which can be measured objectively without much difficulty are briefly commented upon first.

(1) **Human Labour:**—Actual working hours can be recorded separately for family labour and for hired labour, permanent and casual. Wages are paid either in cash or kind or both and there is no difficulty in computing the money equivalents of these wages. Sometimes arrangements for payment of wages to permanent labour are quite intricate, as when the labourer is given a small piece of land for cultivation in part-payment of his wages, and it is then preferable to employ the wage rates for casual labour for conversion of permanent labour into money value as well. Evaluation of family labour can also be made by adopting the wage rate for casual labour, although there is a difference of opinion among economists as to whether family labour should form a component of the cost of production or should be included in the farm income. The difficulty is even greater in evaluating the farmer’s own physical labour in organizing the cultivation and his managerial skill and initiative. The general consensus of opinion in India is that it should form part of the farm income. In the current investigations on the cost of production of sugarcane, however, the farmer’s supervisory labour and management have been considered as legitimate items of cost of production and he is given an allowance equivalent to the full crop season’s labour for a male adult and 10% of the gross value of the product.

(2) **Bullock Labour:**—This is partly owned and partly hired. Frequently considerable bullock labour is used, as is also human labour, on an exchange basis. These are treated as family labour. Hired bullock labour is valued at actual rates of hire, but since the major part of bullock labour is from owned bullocks, it is necessary to evaluate the latter on the basis of the cost of maintenance of the animals. This cost includes feeds, care, depreciation on animals and on cattle shed, veterinary and other services, etc. Feeds form the major portion of cost and since concentrates are purchased and fodder consists largely of by-products of farm crops, it is simpler to evaluate the feeds at local market rates than on the basis of their cost of production. The evaluation of the cost of maintenance of the working animals presents some difficulty in that the farmer usually keeps other animals like buffaloes, cows, etc., as well and feeds and looks after all animals together. One suggested method is to adopt a conventional scale for equating different types of animals as is done by the Punjab Board of Economic Enquiry, but a more rational procedure which has been found feasible for allocating to different categories of animals their appropriate share of maintenance is the use of the statistical method of least squares for this purpose.
(3) **Seed:**—Here the problem is one of evaluation. Purchased seed is of course evaluated according to the purchase price. Home-grown seed should be charged at the cost of production. This should not be difficult, especially if the enquiry is continued over a number of seasons. Some investigators, however contend that since the Government policy is to persuade farmers to use improved seed in preference to the home-grown produce, seed should be evaluated according to a standard sale price.

(4) **Manures and Fertilizers:**—Farm-yard manure presents a difficulty in evaluation as it is not easy to compute its cost of production. A practicable alternative is to use prevailing local prices for this purpose. Green manure presents no difficulty as the various operations of cultivation and quantity of seed sown can be recorded and evaluated. Evaluation of residual effects of these manures presents a problem which has not been satisfactorily solved. In a crop like sugarcane, where a ratoon follows the plant crop, the two together may be taken to exhaust the manural value. In other crops where the crop may be either directly manured or grown on the residual manural value, the estimate of the average cost is not likely to be seriously affected by omitting to take the residual value into account. In certain crops, however, where direct manuring is the rule some allowance for residual effect of the manure left behind seems necessary and needs investigation.

(5) **Rent, Rates and Taxes:**—Where actual payments are concerned, there is no difficulty in ascertaining these, except perhaps where the rent may be of a share-cropping kind when evaluation of the produce delivered to the owner is involved.

(6) **Repairs to Farm Structures and Implements:**—These do not present any special problem, but where family labour is employed for this purpose, it involves additional work for the field investigator.

For ascertaining certain other items of cost arbitrary or empirical procedures have to be adopted. Depreciation on implements, farm structures, irrigation wells and animals is perhaps the most important among these. Even if linear depreciation is used, the ascertainment of either the purchase value or the current value and the expectation of life cannot be done objectively, and the investigator’s judgment has to be largely relied upon. Another item is the rate of interest on capital. Here again, a reasonable rate of interest has to be adopted as it is difficult to ascertain with any degree of reliability rates of interest actually paid by farmers for borrowed capital. There is also no uniformity among investigators as to whether interest on owned capital should form part of cost or should be treated as return on capital. Then again, interest on working capital is not usually taken into account, presumably because of the difficulty of estimating it. In the cost of sugarcane enquiry referred to above, however, interest on working capital was calculated for a period representing slightly more than half of the full crop season. The estimation of rental value of owned land also involves an element of personal judgment, as the current values of specific categories of land are involved. In the absence of any large number of actual transactions, it is difficult to ascertain these values. The usual method of evaluating the rental is to charge a reasonable rate of interest on the value of the land.
There is a further problem of apportionment of common overheads and other expenses among individual enterprises like different crops. Depreciation on farm structures and implements is one of them. Since most of the implements used are bullock-drawn, a reasonable rule is to allocate depreciation on them and on implement sheds in proportion to the bullock labour on different crops. Where, of course, an implement is used entirely for a single enterprise, this problem does not arise. Interest on farm assets is distributed on the same principle. Apportionment of farmer's supervisory and managerial services presents a difficult problem but a method like the one adopted in the sugarcane survey, which is mentioned above, is one practicable solution.

**INTERPRETATION OF COST DATA**

Computation of cost from the various ingredients discussed above is the final problem which does not present many points of statistical interest, but on which the greatest diversity of opinion prevails among economists. Rather than discussing the composition of cost in terms of fixed and variable costs, it seems more profitable to consider the standards adopted by Indian Economists in connection with the farm management surveys as being more in line with a predominantly subsistence agriculture. According to their definition, there is first of all cost A, which includes all expense in cash and kind as those on items like seed, manures, fertilizers and insecticides, wages of hired labour, cost of bullock labour, rates, taxes and interest actually paid, other miscellaneous expenditure and depreciation on and repairs to implements and farm structures. By adding the rent paid to the landlord we get this cost appropriate to the tenant farmer. Cost B is obtained on the analogy of commercial firms by addition of the imputed rent on owned land and interest on owned capital to cost A. Finally, cost C further includes the imputed value of the farmer's own and his family labour. While the structure of cost will depend on the purpose in view, it would seem that it is the direct expenditure as represented by cost A that weighs with the Indian peasant and affects his response to price changes, his decisions and his farming efficiency. Rent paid by farmers for land taken on lease for cultivation does contribute significantly and sometimes appreciably to the direct cost. But with the growing volume of legislation for passing on to the tiller the ownership rights in land, the contribution of this factor to cost is declining rapidly. In regard to the value of farmer's own and his family's labour, it has been mentioned earlier that the agricultural economists in India do not favour making the farmer's labour in organizing cultivation and his managerial skill a charge on the cost of production. But there can be no doubt that in formulating agricultural price and development policies, the value of farmer's and his family's physical labour utilised in actual cultivation should be taken into account, as a reasonable wage for productive work must be made secure.

Some comment on the contribution of the farm family's labour to the total labour employed in agricultural production is necessary. In the theory of the family farm, it is assumed that the bulk of the labour is unpaid and the hypothesis is often put forth that family farms are consequently less responsive to price changes than large-scale or commercial farms. Practically all Indian farming would apparently be classed as family farming, but it is important to note that while the Indian farmer owns most of the bullock labour, a substantial and often grea-
ter part of the human labour employed is hired. For instance, in the pilot survey in Akola District, it was observed that 60% of male labour and over 85% of female labour employed for the production of cotton, millets and groundnut was hired. Similarly, data from the current sugarcane survey in Uttar Pradesh and Bihar show that hired male labour constitutes 50 to 60 per cent of the total male labour involved in the cultivation of sugarcane in different parts of Uttar Pradesh and in North Bihar. In South Bihar this figure is 44%. Little female labour is employed in these areas, but again a substantial portion of it is hired. In the milk costing survey in Delhi State, 38% of the labour in rural area and 47% in urban area was found to be paid labour, although milk production is largely a household enterprise. The important place of hired labour in agricultural production should be borne in mind in applying the theory of the family farm and its conclusions to Indian agriculture.

The study of the yearly trend in the cost of production of agricultural commodities is important for various purposes, but the method of obtaining complete cost data as discussed above is too costly to be recommended as an annual routine. Instead, an index for the cost of production can be computed annually by taking as the basis stable estimates of the various physical components of cost, collected through a comprehensive investigation over, say, 3 years. Only the annual data on certain wage rates and prices and estimates of yield rates based on crop sampling or other similar surveys would then be necessary for the construction of the index. Results from some Indian surveys show that cost of labour, human and bullock, hired as well as own, forms 60% or more of the direct cost of production of various crops. In some crops like sugarcane, groundnut and wheat, seed forms an important component, but not in the crops like cotton and millets. For irrigated crops, irrigation charges have to be taken into account and manure is an important component for certain unirrigated crops like cotton. An index based on some of all of these items, depending upon the crop, would account for 90% of the direct costs and should reflect the seasonal trend accurately. In milk production, according to the results of the Delhi State survey, feeds account for 65 and 71 per cent of the cost in urban and rural areas respectively and labour adds further 12 and 18 per cent. In the urban area, depreciation on animals is an important factor responsible for 19 per cent of the cost and has to be provided for in the index.

The cost of production of agricultural commodities has to be looked upon also from another angle. In using cost figures in connection with the formulation of price and other agricultural policies, the question of the level at which cost should be considered assumes importance. For instance, prices of agricultural products related to the cost of production near the average level would be in the interest of the consumer, while the level represented by the bulk line cost is likely to provide a greater incentive for increasing production. It is not proposed to go into the economic aspects of the problem here. Statistically the questions concerning cost level are related to the frequency distribution of cost. We do not have enough data on the general nature of these distributions, but the sugarcane surveys in Uttar Pradesh and Bihar indicate that the distributions of the cost per acre in the different regions are nearly symmetrical, although having a slightly longer tail on the higher side, and approximate to the normal distribu-
tion. As an example, the frequency distribution for cost per acre in rupees on a sample of 360 holdings in the western region of Uttar Pradesh was as follows:-

<table>
<thead>
<tr>
<th>Class interval (central value)</th>
<th>100 180 260 340 420 500 580 660 740 820</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>18 37 86 101 64 32 11 5 5 1</td>
</tr>
</tbody>
</table>

If the frequency distribution for cost is cut off at a point at a distance equal to the standard deviation of the distribution from the mean on the higher side, the major portion of the distribution would account for 83% of the frequency which is close to the limit of 85% usually adopted to define bulk line cost. The important point to note is that since in considering cost levels the frequency distribution of cost forms the basis, it is essential that this distribution should be strictly representative of the population in view. It may be repeated that the only method of ensuring this representativeness is to study a truly random and adequately large sample of the population. Another use of the frequency distribution of cost is in the analysis of cost and output of efficient farms. Farming efficiency may be defined in terms of the ratio of cost and output and with the help of the frequency distribution, farms can be classified for analysis according to this ratio and other relevant factors, such as output levels. It is important to observe that the analysis of farming efficiency can commence only when the results of the study of a representative sample of farms from the population are available, because any attempt to define and select efficient farms in the absence of this information would be difficult and would lead to biased conclusions, if based on the subjective judgment of the investigator.

DEVELOPMENTAL USES OF COST DATA

Apart from the close bearing of the cost of production data on price support and stabilization and other agricultural policies, cost studies can provide a direct means of improving farming efficiency. This aspect has been touched upon in dealing with the frequency distribution of cost in the previous section. By a comparison of the various inputs among groups of farms with varying efficiency, it should be possible to pick out those operational features which distinguish the more efficient from the less efficient farms. Before recommending these features for a wider adoption, it is, however, important to verify by critical analysis and possibly controlled experimentation that the special operational features associated with efficient farms are not fortuitous, but are really the basis for higher efficiency. This warning appears necessary in view of the fact that the limited regression analysis of Indian data that has been made for studying the relationship between the output on the one hand and various major input factors like human and bullock labour, seed, manures, irrigation, etc., on the other indicate that this relationship is rather weak. The multiple correlation co-efficient obtained by fitting a Cobb-Douglas type of function to the first year's data on wheat, gram and sugarcane in one region of the farm management survey was 0.25, 0.36 and 0.18 respectively and only the co-efficient for gram was significant. In another survey on sugarcane this co-efficient was 0.54 for the Cobb-Douglas function and 0.59 for a second degree polynomial. This means that in the best case only 36% of the observed variation in output could be accounted for in terms of the input factors, the remaining 64% being due to extraneous causes, of which in-
Problems and techniques in farm cost studies

Herent differences in fertility of land would be one. Much more data carefully collected over large samples need to be examined before making generalisations but the limitations of input-output relationships as indicated here have to be kept in view in drawing practical conclusions. Besides picking out input factors to which the output is most responsive, an important aim of this study should be to discover whether different input factors interact non-additively or act more or less independently in influencing output, as the findings will have an important bearing on the practical application of the results.

Information on components of cost of a given enterprise can help the farmer to make adjustments for reducing cost without adversely affecting the output or for concentrating on certain components which have a major influence on output to increase production. Adjustment of feed composition in dairying, seed rates in crops like wheat and sugarcane, use of labour-saving implements as in groundnut harvesting may be given as examples. Such information would also enable him to make profitable choice among alternative enterprises open to him, or in deciding the manner and proportion in which he should spread his resources on the various enterprises in which he is engaged.

Again, it is well-known that the farming population in India is seriously under-employed, but an accurate knowledge of the amount of labour actually utilised in farm work and its seasonal distribution is essential in exploring avenues of utilising surplus labour effectively for productive purposes. It is obvious that neither alternative farm plans, which would further depend upon seasonal and other limitations of farming, nor ancillary occupations can succeed unless based on this information. Cost of production investigations are a valuable source of this information.

It is clear that cost of production surveys can provide a variety of results which can lead to improved efficiency of agriculture and increased production. Before this goal can be reached, a good deal of reliable data must be collected in the field for appropriately designed samples, these data must be critically analysed and conclusions verified where necessary, before passing them on to extension workers for propagation among the farmers.

Summary

Problems of techniques for cost surveys in agriculture have been discussed in the present paper in the light of recent Indian data. These problems concern the selection of farms or other units for study, methods of collecting primary data, their analysis and interpretation and practical developmental use of the results.

Since the objective of farm cost studies is the analysis of one or more classes of farms rather than of individual units, it is essential that the farms selected for study should be truly representative of the respective classes. Representativeness can be secured only through random selection of a sample of adequate size. Examples of such selection and of the precision of results obtained have been quoted from Indian surveys.
Two methods of ascertaining primary data, cost accounting and survey, have been discussed on the background of Indian conditions. In either case, the task has to be assigned to a specially employed field agency and the cost of the first method is consequently appreciably higher than that of the second. It has, however, been established that by the use of the survey method even in the hands of the qualified staff the input factors tend to get exaggerated and outputs underestimated.

Some of the important questions that arise in the recording and analysis of data on various components of cost are imputation of values to unpaid labour, rental on own land and interest on own capital, rates of depreciation on farm assets and apportionment of common overheads to specific enterprises. In regard to the composition of cost, several alternatives are available, but it would seem that direct expenditure incurred on cultivation weighs most with the Indian peasant and this together with the value of his own and his family’s labour on cultivation should form the basic cost. Agreement on approach to these questions will be a distinct step in the promotion of farm cost studies.

Apart from their relation to price policies, farm cost studies can provide a variety of results of practical value for improving farming efficiency and increasing production. Some of these are indicated in the paper.