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RAPPORTEUR'S REPORT

ON

BUDGETING AND PROGRAMMING IN FARM MANAGEMENT

Rapporteur: DR. J. P. BHATTACHARJEE *

Scope and Content of the Papers

The Conference has received twelve papers for presentation and discussion in the section in *Budgeting and Programming in Farm Management*. The topics dealt with in these papers cover a wide range from cost accounting and farm management at one end to linear programming at the other. Most of the authors, however, have tried to knit together in their papers an account of the techniques of budgeting or linear programming or both, with a discussion of their need for and/or applicability to farm planning in India. All but one of the papers take up some part or other of this broad field and present arguments with or without illustrative applications. There is, however, one paper that refuses to fall in this pattern, inasmuch as the difficulties and problems in the application of the cost accounting method to farm cost enquiries in India have been discussed in it in general terms and without any reference to the budgeting and programming techniques.

The papers can be conveniently classified into three groups on the basis of the product-mix offered by them (their content) and the methods followed to obtain it (nature of treatment). One group of four papers presents mainly a general account of the role of farm planning in farm management, the meaning and nature of farm budgeting followed up, in two of the papers, with a discussion of the steps involved in it. Another group of three papers covers a part or all of the same ground and also presents the results of attempts to apply the budgeting technique to the planning of farms in concrete situations. The remaining four papers fall in another group inasmuch as the authors try not only to discuss in general terms the pros and cons of the budgeting and the programming techniques but also to illustrate their arguments with a comparison of parallel farm plans prepared separately with the help of two techniques. There is thus a good bit of common ground covered by the papers, which can be dealt with first. The areas of special coverage in the papers in the last two groups can then be tackled more systematically. It is proposed accordingly to offer comments on the papers, under four broad heads: farm planning and farm management, farm budgeting and linear programming.

Farm Planning and Farm Management

All the authors emphasize directly or indirectly the importance of farm planning for securing increases in output and net returns and a better allocation of limited resources. Some stress the need for it specially under Indian conditions of farming; and some appear to relate it *even* to such conditions. The

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basic hypothesis in every case is that the drawing up of a plan for a farm helps in the improvement of its organization, operation and management. The tools that may be used for this purpose are three-fold, namely, marginal analysis, budgeting and programming. Two of the authors, Dr. D. K. Desai and Miss M. M. Malya, discuss the pros and cons of all the three tools, while Shri S. K. Ghosh, Dr. C. P. Shastri and Dr. A. S. Kahlon and Shri S. S. Johl, deal only with two of these tools, budgeting and programming. The other authors, Dr. H. S. Singh, Dr. S. P. Dhondyal, Shri Harpal Singh and, Shri D. Singh and Shri S. D. Bokil have covered only the budgeting technique. Dr. Desai and Miss Malya have each pointed out the generally accepted objective of farm planning, namely, profit maximization or cost minimization, and the way this objective is sought to be achieved through the marginal analysis. The limitations of this analysis have also been pointed out. Dr. Desai's treatment of this aspect is logical, and systematic. Miss Malya also brings out, more or less, the same points. The basic difficulties in the extension of the marginal analysis are the multivariate situation, the constraints and the limited horizon of values or alternatives that a farm planner has to face in reality.

Almost all the authors have discussed the advantages and disadvantages of the budgeting approach to farm planning. Dr. C. P. Shastri has given a comprehensive account of the meaning, nature and preparation of farm budgets (complete or partial). The main points are, however, covered also by Dr. Desai, Shri Ghosh, Miss Malya and Dr. Kahlon. Dr. H. S. Singh has emphasized one special aspect of it, which will be referred to later. The objectives (maximization of net return), the assumptions (linearity, finiteness, additivity, divisibility and independence) and the requirements (data on prices, coefficients, resources and alternatives) in budgeting are fairly well known. There is hardly anything new that can be said about the general aspects of farm budgeting. It is for this reason that there does not seem to be any area of disagreement or difference of opinion among the different authors. All seem to agree that budgeting is a practical and useful technique and is the most feasible one in certain situations.

The treatment of linear programming is also non-controversial. The four authors who have dealt with it at some length agree that budgeting is in reality programming with pencil and paper and without recourse even to calculating machines, not to speak of electronic computers. The objectives, assumptions and requirements are about the same. The relative advantages of the programming technique have also been pointed out very clearly—ability to handle a large number of activities and constraints, the optimality of the solutions obtained and the usefulness of the computational by-products (marginal value products of the resources, opportunity costs of the activities, etc.). All the authors have referred, more or less, to the same sources while discussing these aspects.

Technique of Farm Budgeting

Most of the authors have described or discussed or hinted at the steps involved in the preparation of farm budgets. Dr. Shastri's paper is, in fact, a discussion only of this aspect, and goes into greater details than the other papers. Two of the steps mentioned by him in the development of farm budgets need special emphasis. These are (a) diagnosis of the flaws and weaknesses of the present plan of operation of the farm, and (b) analysis of the causes of such flaws and weaknesses. Without these two steps, preparation of a farm plan can hardly be distinguished from an exercise in arithmetic. It is indeed this very point that has been discussed in one of its most important aspects by Dr. H. S.

Singh. Dr. Singh has put in a plea for introducing more of realism into farm planning and budgeting by incorporating management ability as a variable or restricted resource. He has fairly successfully shown that the quality of the human element, which is at the back of the managerial ability, is the main factor responsible for variations in investment, output and net returns among farms more or less with comparable resources in other aspects. Dr. Singh has used for illustrating his point, data relating to some farms in the U.S.A. He could have made a more meaningful contribution to this field if he had tried to prove his point with the help of data for farms in India. In fact, it may be worthwhile to discuss at the Conference the variables that can be appropriately used under Indian conditions to estimate the managerial ability of the farmers. For his survey, Dr. Singh had used as the index of the level of management, output per unit of input in certain key enterprises in each farm. Supposing a similar approach is adopted in India, what will be the enterprises under different conditions of farming and/or in different type-of-farming areas that can be regarded as key activities, and what items of input will be regarded as significant for such analysis.

The last but one step in budgeting is the preparation of alternative plans. Alternative plans can be worked out, as Dr. Desai has pointed out, on the basis of one or more of the following assumptions :

- (a) Addition to the existing resources ;
- (b) Addition of new enterprises to the present activities on the farm ;
- (c) Changes and modification in the existing cropping pattern and/or activity combination ; and
- (d) Alteration in the methods and techniques of farming.

Dr. Desai seems cautiously to imply that the last two of the alternatives are relevant to farming situations in India. This is a point worth considering in some detail, particularly since there seems to be some area of disagreement among the authors. For example, Dr. Shastri mentions that "only in the case of very clear and definite necessity, the area under main crops should be adjusted." This point of view is somewhat different and may, in some situations, conflict with the one emerging indirectly from the paper by Shri D. Singh and Shri S. D. Bokil who hold that "to the extent that farm planning aims at augmenting the supply of farm products available to the farmer for human consumption, it is on surer ground." They link their arguments to the price and marketing uncertainties faced by the farmers in India, besides other risks. They also mention that "possibilities of multiple and more diversified cropping might, therefore, be taken to be particularly promising." The last statement seems to indicate a better prospect for alternative farm plans prepared on the basis of point (b) mentioned earlier, namely addition of new crop enterprises. Miss Malya and Shri Ghosh have also pointed out the difficulties presented by price and other uncertainties in the way of acceptance of farm plans. But their solution is in the direction not of diversification but of simplification and specialization.

It appears to the Rapporteur that farm planning, if it is to be oriented within a static framework, can work out alternatives only within the range of possible adjustments and changes in the cropping pattern. The alternatives thus available are likely to be rather limited, though there is undoubtedly scope

for improvement. In dynamic situations envisaged under planning as in India, development of agriculture is expected to take place through the use of additional resources like fertilizers, irrigation water, improved seed, etc. (point (a) above). Use of such resources is also necessary for or implied in improvement of farming methods and techniques (point (d)). It is not, therefore, possible to generalize about the assumptions to be adopted in the preparation of alternative plans. Different categories of farmers will offer different ranges of choice. Dr. H. S. Singh's approach seems to be more pragmatic, even though operationally more difficult. In other words, the basis to be adopted for alternative plans should be largely determined by the uncertainty preference, managerial ability, etc., of the farmer rather than by a blanket rule.

It will be interesting in this connection to compare the farm plans prepared and presented by four of the authors with the help of the budgeting technique. Dr. Kahlon and Shri Johl have tried only to make changes and adjustments in land use and cropping pattern while Shri Harpal Singh has taken into account not only land use but also the utilization of human and bullock labour. Shri Ghosh and Dr. Dhondyal have, however, provided not only for variations in land use and human and bullock labour, but also for additional inputs like fertilizer and additional resources of working capital. The four authors have, therefore, approached budgeting with the different sets of assumptions. One may easily wonder which of the three sets of assumptions is more realistic and will lead to a more acceptable and workable plan. And in discussing this, one should remember that none of the farmers for which alternative plans have been prepared fall in the category of small and so-called "subsistence" farms, which means that these do not necessarily suffer from the limitations of financial and other resources usually associated with the small farmers in India. In the context of the extension of the use of fertilizers, improved seed and irrigation water that has been provided for in the Third Plan, would it not be more meaningful for extension purposes to go for farm budgets and plans prepared on assumptions regarding changes in cropping pattern, use of additional resources and improvements in technique? And what are the conditions in which new enterprises may be considered?

Linear Programming

Illustrations of the linear programming technique have been given by Dr. Desai, Shri Ghosh, Miss Malya and Dr. Kahlon and Shri Johl. The restrictions or constraints used by Shri Ghosh are land, cash available and human labour in three critical months. Miss Malya has used land, irrigation facility, total availability of human and bullock labour and of working capital. Dr. Desai has, in addition to these, provided for hired human and bullock labour, the resource variables being specified in much greater details in respect of availability in different time periods. Dr. Kahlon and Shri Johl have, broadly speaking, used land classified for different crops, labour in different seasons and for different crops, irrigation capacity, cash and farmyard manure as restricted resources. The model tried by Dr. Desai and Dr. Kahlon are more detailed than the other two.

There are three aspects of linear programming that will probably interest agricultural economists in India at this stage. The first is the setting up of the model, the second relates to the computations involved in obtaining a solution, while the third concerns the nature of the solution arrived at and the interpretation to be put on it. Dr. Desai, Dr. Kahlon and Shri Ghosh have each demonstrated convincingly that the solution obtained by the programming method

shows a higher level of return for the farms in question than the ones derived through the budgeting technique. This, of course, is as is to be expected since the programming technique ensures optimality of the solution in every case. This attempt amounts merely to an arithmetic illustration of an algebraic proposition. It has its purpose, namely to convince the uninitiated of the mechanical and unimportant nature of the computational side of programming.

Of greater interest to Indian economists at present may be the approach to be adopted to the setting up of a linear programming model or tableau. There are obviously a few pitfalls to be avoided. Some of these may probably be illustrated fairly well with reference to the attempt made by Shri Ghosh. The usual and the simpler approach to the specification of the crop enterprises (X_j , $j=1, 2 \dots n$) is to express them in terms of units of land area like acre. The technical coefficients (a_{ij}) are worked out in terms of requirements of different inputs or resources per acre of each enterprise, while the net return coefficients—namely, (C_j)—are expressed in terms of net returns (in rupees) over fixed resources for each crop enterprise per acre. Shri Ghosh has, however, taken a slightly different, though perfectly valid and legitimate approach namely, to take as the unit of each enterprise intensity, a maund of the crop produced. All the variables noted above have, therefore, been expressed in terms of their magnitude per maund. It appears, however, that the price factor that he has used is not the 'net price' but the average market price (gross price) per maund of each commodity. These details are not mentioned in the paper but can be easily derived. The result has been that what he has maximized through the linear programming method is not the net return but the gross return. Yet he has used the term marginal return in the simplex tableau. These are being mentioned here in order to emphasize the need for understanding very clearly the economic interpretation of the different variables and processes involved in linear programming.

The farm plans drawn up with the help of linear programming also prove the simple fact that the more detailed and the better specified the model is, the more realistic will be the solution. Thus, the solutions obtained by Dr. Desai and Dr. Kahlon seem, on the whole, much more realistic and feasible than that obtained by Shri Ghosh. In fact, the solution obtained by Shri Ghosh is rather perplexing. Whereas the farmer's present plan includes 4.88 acres of gross cropped area in *kharif* and 3.43 acres in *rabi* and the alternative plan developed through the budgeting technique shows 4.8 and 4.2 acres respectively in the two seasons, the linear programming solution gives 1.68 acres in *kharif* and 6.63 acres in *rabi*.¹ The model set up by Shri Ghosh obviously does not show how this change-over is to be effected. It appears to me that the solution would have been very different if at least March labour had been used as another restricted resource. This is being mentioned because the labour requirements in the months of March and April would increase considerably under the new plan so much so that there will be need for hired labour. The calculation of costs and returns, shown in Table VIII, will, therefore, undergo considerable revision. The application of the linear programming technique does indeed require a very realistic approach to the setting up of the model.

It would have been interesting and useful if the authors who have illustrated the use of the linear programming technique had given more attention to the Z_j-C_j values obtained for the resources and the activities. These could have

1. The total cropped area is 8.31 acres and operated area, 6.19 acres.

been, for example, compared with the rates of rents and rates of wages in the area. Dr. Desai has dealt with this aspect and referred to the competitive nature of the different activities. I wish he had dealt with these points at greater length.

The scope for the use of the linear programming technique for farm planning in India seems obviously to be rather limited at this stage, as most of the authors agree. Dr. Desai's arguments are very cogent and reasonable. There is need, however, for the development of this tool in our country and, if I may say so, 'Indianizing' it. This process can probably be helped by further work designed to ascertain the key resources that should be taken into account in linear programming models. If linear programming is to be used in India, it will obviously have to be in the form of simple models involving as few resources and activities as possible. This process of simplification can be helped if work is undertaken to show the relative importance of various specifications of resources and activities, and their relative effect on the nature of the solution.

The Rapporteur is particularly happy at the efforts made by the authors to apply the budgeting and the programming methods to farm planning. While budgeting is older of the two methods, it did not meet with general acceptance in America until about a decade back. The application and use of linear programming, however, may be said to have started only about five years back.

SUMMARY OF GROUP DISCUSSION

Chairman: DR. J. P. BHATTACHARJEE

The group discussion in the section on 'Budgeting and Programming in Farm Management' followed the lines suggested in the Rapporteur's Report. The general aspects of farm planning *vis-a-vis* farm management were considered at the outset. This was followed by an elaborate examination of various aspects of the method of farm budgeting. This led also to a comparison of the techniques used in the two alternative methods of budgeting and linear programming, and finally to a consideration of some of the relevant issues in the application of linear programming to farm planning in India. A few additional issues were also raised at the plenary session where the report on the group discussion was presented. The main points that emerged in the course of these discussions are briefly recorded here.

Farm Planning and Farm Management

The attention of the group was drawn to the fact that the discipline of farm management, as understood and interpreted at least in the agricultural colleges in India, was identified more with the field of agronomy than of agricultural economics. It was pointed out that in many agricultural colleges teaching and research in farm management were included in the activities of the Department of Agronomy with the result that farm management tended usually to be interpreted in terms of agronomic measures for increasing physical output. This

approach to farm management was recognized by the group to be unbalanced inasmuch as it tended to de-emphasize its basis in production economics. For the development of the discipline on right lines, it was considered necessary to have farm management placed within the field of agricultural economics for the purpose of both teaching and research, if not also of extension. Agricultural economists in India would, therefore, do well to make attempts individually as well as through associations and organizations to secure a proper recognition of this concept and orientation of farm management.

There was some discussion about the role that farm management could or should play in the context of the Indian economy. It was generally agreed that the basic orientation of the discipline of farm management might be to secure adjustments in farming to a developing economy through avenues like changes in the extent and manner of use of resources including human resources. The primary objective of research in farm management should, therefore, be to find out more efficient ways of resource use on farms, while the role of extension should be to help the farm operator in securing the necessary adjustments in the matter of getting command over resources and their efficient utilization. In other words, the approach to the discipline of farm management should be basically dynamic, particularly in a country like India where all attempts are directed at breaking away from a stagnant agricultural economy. The starting point in farm management research and extension, thus interpreted, would be an assessment of change over a period in the goals set for agriculture and of the possible ways of achieving it. It is within this framework that the approach to the management of individual farms needed to be worked out.

The need for farm planning arises from the general experience in most countries that a large section of the farmers, left to themselves, do not use their resources optimally and fail for some time, at least, to improve their farming system in the directions set by the goals of the economy. Even if, however, there is some attempt made by a section of them in this direction, the period of adjustment tends to be unduly long and can be considerably shortened through the process of planning of individual farms. It is not implied in this line of reasoning that a perfect adjustment would be brought about within a short time between the performance of the private individual sector in farming and the public policies and goals set forth for the agricultural sector in a developing economy. The objective essentially is to narrow down the gap between the two by helping individual farm operators to make decisions and take actions on right lines through making available to them the requisite information, know-how and advice, and educating them in better management in this process. There are, of course, in this line of argument, consistent and specifiable assumptions about goals of action and behaviour in the minds of individual farmers and rationality in their conduct to achieve these goals. This is also the accepted basis of the theory of the farm. Under the conditions of near-competition that seem to apply to agriculture, departures in the short run, from such assumptions do not seem to vitiate the theoretical approach generally adopted in marginal analysis. In any case, the tools and techniques available for farm planning lend themselves to application in such a way that the operational part of the rationality assumption can be modified substantially from the extreme and sometimes unrealistic form in which it is formulated in the classical approach.

The basis of farm planning in India has to be the farm operating in a household; and the approach to farm planning based on the resource avail-

abilities, skills, preferences, etc., of the farm operator. It is he who is the decision-making authority in his unit of production which again is inextricably mixed up in some cases with the unit of consumption represented by his family. The traditional marginal analysis suffers from a number of limitations which seriously impair the applicability of this approach to the task of farm planning in the above set-up. The more meaningful tools are, therefore, farm budgeting and linear programming.

Budgeting and Farm Planning

The objective, approach and techniques used in farm budgeting were discussed in some detail from the point of view of both research and extension in farm planning and management. The objective usually adopted for the purpose of budgeting is stated as *increase*, if not maximization of net returns to the farmer. The approach to the attainment of this objective is through improvement in the efficiency in the allocation and use of resources. Both the objective and the approach have to be formulated and pursued with a considerable amount of flexibility needed in each individual situation in India. Maximization of net returns should be looked upon as a goal to be achieved over a number of years through short stages of gradual improvement which the farmer is desirous and capable of securing.

The different steps involved in the budgeting technique came up for discussion. Following the Rapporteur's suggestion, the group discussed at length three of the critical steps, namely, (a) identification of the flaws and the weaknesses in the current plan of operation of the farm, (b) analysis of the causes thereof, and (c) the basis of preparation of alternative plans. One of the participants raised the question about the relevance of a diagnosis of the flaws and weaknesses in the present plan of farming, to the actual technique of budgeting. He pointed out that budgeting might not be carried to such great lengths particularly since the budgeting technique did not necessarily require such information. The general view was, however, strongly in favour of these two steps. It was agreed that only a complete understanding of the organization and operation of the farm could provide a realistic basis for the preparation of alternative plans. The advantage or the special feature of farm budgeting lay in the fact that the problems and difficulties of the farmer could be fully taken into account. The best farm plan was one that the farmer himself felt capable of accepting and implementing. This could be ensured if the farm planner knew the problems, difficulties, bottle-necks, etc., faced by the farmer and the causes of these.

Flaws and weaknesses in the organization and operation of a farm might arise from conditions like low level of intensity in the use of resources, inefficient combination of resources and enterprises, inefficient technology and low level of managerial ability. One or more or all of these conditions might be present, depending on the individual farm situation. The factors responsible for such situations could be lack of ownership or command over resources, non-availability of capital and know-how, lack of information and knowledge, aversion to the taking of risks and to the making of departures and changes from traditional practices and in general, an inadequate understanding of the role of management in farm operation. Some or all of these factors were also associated with institutional inadequacies and rigidities. It is such defects and weaknesses and the factors operating behind them, that tended to restrict the

scope of choice open to the farmer particularly in respect of new enterprises and their combination, and of methods and technology. These affected adversely the values of the technical input-output coefficients and through these the net returns.

Considerable discussion in the group centred round the management factor and its measurability. It was agreed that for a complete diagnosis of the defects and shortcomings, an assessment, if not a measure, of the level of management ability of the farmer would be necessary. It was, however, recognized that this was one of the most difficult variables to quantify and that considerable research work needed to be done in this area. In any such attempt, account would have to be taken of the skills of the farm operator, his aptitudes, personality traits, level of understanding and, in general, his rationality in the matter of conscious management of the farm. The difficulty in quantifying all these variables would make it almost an impossible task to derive an absolute measure of management ability at this stage. At best, an attempt might be made to relate (on a ranking scale) the management ability of an individual farmer with the average for the homogeneous group in which he would fall. Such an analysis might be based on a comparison in terms of some measure of return to management derived as a residual net income, and of the level of the input-output coefficients.

For the purpose of farm planning extension work, however, so the group felt, it was too much to expect a concrete assessment of the managerial ability of the farmer. Even in a country like the United States where farm planning work had developed considerably, it was not yet possible to make much progress in this direction. In extension work, all that might be possible at this stage was for the farm planner to obtain some general notion of the nature and level of skill of the farmer in so far as it acted as a limiting factor in the choice of enterprises, techniques and input-combinations.

In spite of the difficulties in the quantification of the management variable, the crucial role that it played in determining the nature and level of operation of a farm as well as the possibility of its improvement through planning was recognized by the group. It was felt that one might justifiably take the line of reasoning that flaws and deficiencies in many directions could arise from an inadequacy in the management ability more than from other rigidities and limitations. This point of view came up again in the course of discussion of the approach to be adopted in the preparation of alternative farm plans. Most of the participants agreed that alternative plans should first be related to the operational ability and managerial capacity of the farmer, in whatever way this capacity might be assessed or understood. Extension workers might be able to make some assessment from the level of skill of the farmer, from his knowledge of and familiarity with different crops, enterprises and methods of their husbandry, and from his preferences in the matter of bearing of risks and uncertainty. Since farm planning is also an educational process, the extension worker would do well in this matter to seek the help of the farmer himself who should be encouraged to attempt some self-assessment.

Apart from the management factor, there are a few other points which, according to the group, should be generally kept in view. Under Indian conditions of farming, the imperativeness of satisfying at least a part of the requirements for home consumption directly from farm production should not be minimized. A realistic farm plan should, therefore, be one which would not disturb very seriously the existing relationship between farm production and home consumption. This

did not mean any assumption of rigidly static conditions. All that the group wanted to emphasize was the inadvisability of going for drastic changes in the choice of enterprises. The group generally felt that more caution should be exercised by the farm planner in the choice and combination of enterprises—both crop and livestock enterprises—than in recommending changes in methods and techniques of farming. Similar caution was emphasized in respect of the choice of crops or enterprise products that were subject to considerable fluctuations in prices. Price variation was recognized on all hands as a disturbing factor to the farm planner.

A point that emerged from all these discussions on the budgeting method was the extent to which farm budgeting depended for its success on the capabilities and aptitudes of the person undertaking the job. It is this importance of the personality factor of the farm planner that should be kept in view in any attempt to extend this method on a large scale and within a short time.

An interesting point that came up in this connection was an estimate of the time needed for the preparation of a plan for an average farm in India. None of the members of the group could provide any precise information on this question. Most of the participants who had some experience in this line agreed that the preparation of a farm plan would require one longish interview-cum-meeting with the farmer, followed by some analysis by the farm planner and concluded with a second visit to the farmer. The *minimum* time needed to go through these stages was considered to be a period equivalent to two working days. Some went to the length of suggesting a much longer period, namely, about a week.

Linear Programming

The discussion on linear programming was in the nature of a continuation of that on budgeting. While emphasizing the basic similarity of the two methods in respect of objectives, approach, assumptions and requirements, the special advantages of linear programme were also noted. In the first place, the linear programming method provides the optimum solution to the problem of maximization of net returns from a combination of enterprises under given conditions of resource restrictions. In other words, in linear programming, once the problem is stated in all its bearings, the solution derived does not depend on the personal factor of the farm planner or research worker. It is almost automatically derived through the computational procedure laid down by the mathematics of it. Secondly, the input-output coefficients used for the purpose of linear programming tend to be more realistic inasmuch as these are not based on the data for research farms, but are derived from the practices and methods of operation followed by the farmer himself. Thirdly, linear programming enables the consideration of a far more detailed specification of constraints than can possibly be handled by a farm planner through the budgeting method. Finally, the by-products obtained from the linear programming exercise are as useful as the solution itself.

While the theoretical validity of these advantages could hardly be assailed, the extent to which they were meaningful and real under Indian conditions became the central theme of discussion in the group. It was emphasized by a number of advocates of the budgeting method that what mattered most to the farm planner was not the optimality of the solution in terms of the mathematical maximum but the practical feasibility and attainability of the solution. In other words, the achievable maximum was far more important than the theoretical extremum.

Further discussion on this point led to the crystallization of two issues. In the first place, it was agreed that the elimination of the personal factor of the planner from the process of deriving the optimal plan through linear programming was not necessarily an un-mixed advantage. In fact, one could go further and use it as an argument against this method and in favour of the budgeting approach. The latter allowed greater flexibility in adjustment to the special conditions and features of individual farm situations than a programming approach of manageable proportion would. Secondly, linear programming could yield a solution that might not turn out to be the best feasible one because some key constraint or other was not taken into account or could not be quantified. No idea could, however, be obtained about the nature and direction of the solution in the course of computation. The need for going back to the farmer with the solution obtained through the linear programming method and judging its feasibility on the field could, therefore, be hardly over-emphasized.

The superiority of the linear programming method in respect of its ability to handle a large number of restrictions or constraints, rested on the assumption of availability of electronic computational facilities. Since such facilities were rare and a far cry in India, this theoretical advantage need to be assessed in the light of the time, cost and effort needed for solving linear programming exercises with the help of calculating machines only. Under such circumstances, there was no other alternative but to go for a manageable number of constraints. Very little work seemed to have been done so far, on the relative importance of different types of constraints and details of their specification from the point of view of their effect on the nature of the final solution. The need for further work in this field was strongly felt by the group. There were also the difficulties in obtaining relevant data for suitable specifications of different variables like price, some inputs, land classification, etc. It was, for example, recognized that not enough data were available for a detailed classification of land in term of productivity or suitability for different crops and enterprises. Nor was enough known about the coefficients of depreciation and a host of input-output ratios.

Provided all these difficulties were overcome, the linear programming technique did offer a number of important by-products, apart from the solution of the problem. These by-products would throw light on a number of aspects of farm management by providing an assessment on points like the quantum of surplus farm labour, the marginal productivity of different enterprises, the competitive nature of enterprises, the rate of interest that the farmer could justifiably afford to pay on his borrowed funds, the amount of reliance the farmer should place on his own or borrowed resources, the rate of wage that he could afford to pay for hired labour, etc. It was noted that these by-products related to the intra-farm position and should not be generalized for deriving norms like wage rate for the area or the rate of interest for loans, etc.

Summing up of the discussion seemed to show the need for both the methods of farm planning. It was recognized that linear programming had a place at present in the field of research and development of methodology in India. Its practical application would, however, be limited and confined to attempts like the drawing up of perspective plans for different regions or annual plans for large areas or for very large farms. However, even before such ventures were undertaken, there was considerable need to develop the methodological side of the programming method. Information was needed, more particularly, on the nature of the constraints that were critical under Indian conditions, their relative impact on the

solution and a classification of the constraints and enterprises in terms of their meaningfulness and effectiveness. For extension purposes, however, farm budgeting seemed to offer an immediate scope for adoption in India, as has been demonstrated by the Intensive Agricultural District Programme.

That there could be a divergence between the State and the individual points of view in regard to production planning was recognized. Thus, a village plan prepared independently might diverge from the total of the farm plans prepared for the cultivators in the village. There was no clear-cut and recognized way of reconciling such discrepancies and divergences. It was also recognized that there was considerable scope for improvement in the net earnings of the cultivators in India through farm planning whether through the farm budgeting or the linear programming method. This improvement would take place even without the application of any external resources. For significantly improving the level of yield, however, there was no escape from reliance on the so-called external resources like chemical fertilizers. Finally, the group emphasized that the success of farm planning was linked to a large extent with the pursuit of a positive price policy by the State. Since unforeseen price variations constituted the most important danger to the success of farm plans, whether prepared by the budgeting or by the programming method, price stability or even predictability of reasonable price variations was a *sine qua non* of successful farm planning.