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RAPPORTEUR'S REPORT

ON

INTENSIVE DEVELOPMENT APPROACH TO AGRICULTURAL DEVELOPMENT

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According to the scope of the subject circulated amongst the members, the purpose of selecting the topic 'Intensive Development Approach to Agricultural Development' was 'to promote thinking and research on the *problems* and *implications* of the new strategy for agricultural development.' This strategy forms the keystone of agricultural development in the Fourth Five-Year Plan.

The papers submitted for discussion at the forthcoming Conference provide ample evidence of a beginning having been made in this direction.

As many as 15 papers have been submitted on this topic. Their contents cover a wide range of problems and implications of the new strategy of agricultural development—economic, technical, administrative, social and even political. They also contain a critical and painstaking analysis of the geneological predecessors of the new strategy, *viz.*, the Intensive Agricultural District, and Intensive Agricultural Area Programmes, which have been in operation in many parts of India since 1960-61. The main points brought out in these papers are discussed under the following four heads: (1) identification of the problem of intensive agricultural development, (2) approach towards intensive development and its critical analysis, (3) the implications of the new strategy of intensive agricultural development on regional inequalities in development and disparities of income amongst various strata of rural society, and (4) analysis of the intensive agricultural district and intensive agricultural area programmes.

IDENTIFICATION OF THE PROBLEM

Qualitatively and quantitatively, there are many aspects and facets of agricultural development. But in all these, the crucial element is the expansion of agricultural output.

Three authors (N.C. Agrawal, R. S. Savale and S. L. Chowdhury) have made attempts to identify the crucial problems of raising output levels in Indian agriculture. Two other authors (Shivabhai J. Patel and P. D. Saikia) have also made some pertinent observations in this connection.

Agrawal cursorily surveys the increase in net cultivated area and output of foodgrains by taking the 'recorded maximum difference' between the initial and last years of the three five-year plans. He attributes the 'increase in production of foodgrains' during 1950-51 to 1960-61 most importantly to 'putting into use a large area of land under cultivation,' which is only partially true. Since 1960-61, he finds 'only a marginal increase in net cultivated area' both under foodgrains

and other crops and not much scope for its expansion after 1965-66. These facts, according to him, 'clearly point out that either the maintenance or an increase in output is possible *largely* through intensive agricultural development and marginally through any extension of cultivation.'

Agrawal arranges the various inputs for increased yields in 'order of ratings' as water, credit, manure (organic and inorganic), improved seeds, improved tillage and pesticides, etc. But the basis of arranging in this order of importance is not mentioned.

Savale identified the problem of development by defining it as "the process whereby the people of a country or region come to utilize the resources available to bring about a sustained increase in per capita production of goods and services." In this context, he decries the perpetual complaint about scarcity of certain *new* resources, the complete *lack* of efforts 'to utilize *existing* resources to the best possible manner,' or of 'developing new resources and to substitute them for the scarce ones.'

Savale then concentrates on the 'quantitative levels of agricultural development' possible to achieve at farm levels by means of expansion of irrigation and optimum cropping plans as also by making some changes in the cropping pattern. For these purposes, he bases his analysis on three empirical investigations, *viz.*, Farm Management Studies in the Nasik district during 1954-57 and the two departmental research schemes on Economics of Blasting of Wells by Air Compressor Units and the Socio-Economic Survey of Nhavari Village.

From the farm management data, by using the technique of multi-period programming, Savale prepares an optimal farm plan for an average 10-acre farm in the Nasik district with given amounts of fixed factors of family and bullock labour required in certain peak periods. This farm plan extends over three consecutive years, changing mainly in the extent of irrigation on the holding (16 per cent, 30 per cent and 50 per cent) and acres sown under different crops, under the assumption of necessary capital being available in every year. In this manner, Savale shows that extension of irrigation accompanied with optimal farm planning raises '*net revenue*' from Rs. 1,423 in the first year to Rs. 2,114 and Rs. 2,904 in the second and third years respectively. But is this level of extension in irrigation feasible for all farms in the country ?

Savale then presents a comparison of benefits from dry and irrigated farms of various sizes on the basis of optimum farm plans worked out on 1620 IBM by linear programming method. In these optimal plans, returns from irrigation are very high. A 10-acre dry farm is shown to yield 'expected net returns' of Rs. 535 only while an irrigated farm of the same size could fetch Rs. 4,853, a sum more than nine times higher. Similar relationship was found on a 20-acre farm (Rs. 1,159 dry and Rs. 10,363 irrigated). The new strategy of agricultural development adopted for the Fourth Five-Year Plan appears to be a child's play in face of these staggering figures.

There are some technical questions related to Tables I and II which have a bearing on this aspect. For instance, under linear programming shadow prices of input factors and marginal net returns *to* factors of production are governed

entirely by the number of constraints imposed on the model and the number of enterprises proposed to be optimized. Do these constraints, enterprises and shadow prices need be based on actual empirical conditions or not? And, if so, how much abstraction from farm conditions should be permissible for such exercises?

For showing the additional returns to be derived from optimum plans involving changes in cropping pattern, Savale depends on data from D. K. Desai's book 'Increasing Income and Production in Indian Farming.'

After a perusal of Savale's results, one is left in complete bewilderment. If all the computations of additional yields and income are even approximately real, how is it that during the ten years since these data were collected, no one has benefited from their vast economic potentialities? These data lie on every official's table in the Union Ministry of Food and Agriculture and its output-raising wings.

Chowdhury's paper is in sharp contrast to the papers of Agrawal and Savale. The *urgency* of solution of the 'people-food ratio, in his opinion, calls for preference of short range ventures over long range projects. He is impatient with the intellectual anarchy of policy-makers who advocate single factor solutions for all ills of agriculture or regard each agricultural situation unique on account of the complexity of local conditions. Nevertheless, he himself advocates essentially a single factor solution—the chemical fertilizers—and thinks that 'enough basic farm knowledge' has been collected about this factor for 'almost universal application.' The 'largest yields' and 'most substantial returns' in the short range, according to Chowdhury, arise from capital invested in chemical fertilizers. This proposition is ostensibly based on some agronomic experiments on which Chowdhury reports only too briefly.

He, however, adds for caution that with irrigation, even *existing* crop varieties would yield much more than the present average yield if nitrogen is added to the soil, the only limiting factor on irrigated lands. He produces some ratios of per acre yields of some cereals on fertilized and unfertilized irrigated lands which are striking (wheat 5.66 times; barley 2.1 times; oat 4.52 times; maize 5 times; paddy 3.5 times; bajra 3.75 times). It is not mentioned whether these results are for *existing* or new fertilizer-responsive, non-lodging (dwarf) and diseases-resistant varieties. This omission is unfortunate.

Thereafter, Chowdhury tries to bring out the nature and extent of difference in cereal production with and without use of chemical fertilizers. Initially, he contends that, without fertilizer use, only one cereal crop is grown in a year which has to be either followed by a legume crop or preceded by fallowing in order to let the soil recoup fertility consumed in the preceding crop. This severe restriction on area that can be grown under cereals in one year in the absence of plant nutrients can be got over, not on dry but on irrigated lands, with chemical fertilizers. Thus, according to him, 'fertilizers substitute admirably for land in irrigated farming,' which also simultaneously 'enhance considerably both the output and economic returns of cereal enterprises,' placing them at par with such competing crops as sugarcane, cotton and vegetables.

For calculation of economic returns on a cereal enterprise, wheat, Chowdhury contrasts the figures obtained in a five-year study by Chandnani (1958) and another two-year study conducted at the farm of the Division of Agronomy, I.A.R.I. Chowdhury deduces therefrom that green manuring and double cropping, 'without tackling the problem of soil fertility through fertilizer use,' could raise neither output nor economic returns. 'Net profit' with optimum fertilizer use increased considerably, Rs. 1,300 per hectare.

We, however, do not know what is or is not compounded in this figure of 'net profit.' From the figures given in Table I, one suspects that this figure is only the gross value of additional yield per acre multiplied by the prevailing price of the crop. If that is so, it is neither the economists' nor the farmers' concept of 'net profit' but agronomists' own. This concept of 'net profit' is hardly relevant for practical purposes for obvious reasons.

This suspicion is confirmed when Chowdhury analyses the two-year data of yields of wheat obtained at various levels of nitrogen use (0, 30, 60 and 90 kgs. per hectare) over a basal dressing of 50 kgs./ha. of P_2O_5 and 25 kgs./ha. of K_2O preceded by *kharif* jowar with a dressing of 25 kgs./ha. each year.

This calculation based on a simple equation, is open to two very serious criticisms from a practical point of view. In this equation, the only economic variables considered for determining optimum dosage of nitrogen are the cost per unit of nitrogen, and price per unit of additional wheat yield obtained. And by computing the point at which the cost of added fertilizer is greater than the value of additional yield the optimum dosage is arrived at. This might appear alright for an agronomist. But for the purposes of applied economics, this function in no way determines either the practicable level of optimum dosage or the point of 'maximum net profit' for actual application on the farm. The equation has to include *all* the *additional* costs required to be incurred by the farmer, for application of nitrogen at the suggested levels and net profit has to be maximized after deduction of all these costs, and not merely the cost of fertilizers. In addition, the constraints of physical availability of human and bullock labour and other complementary resources for applying fertilizers at these levels are also to be taken into account before any optimum dosage of nitrogen application can be determined. Moreover, economic considerations of uncertainty and risk also come in and may diminish the dosage level in practice. Chowdhury does not appear to be aware of these economic problems, when he takes his results as a 'conclusive indication' and goes on to propagate the 'scientists' belief of an early closure of the food gap' based on Swaminathan's and John Strohm's experimental researches.

Patel and Saikia complain of the existence of idle resources of human labour, bullock power, manure, and even of land in some areas of Assam. They consequently identify the problem of agricultural development as consisting in promoting better and more intensive use of these idle resources together with certain other policies.

Issues for Discussion

Thus, amongst the papers on identification of the problems of agricultural development, we have either the vision of immense possibilities opened up by

linear programming techniques when applied on *existing* input resources, or the agronomic fantasy offered by the use of the new and modern catalytic input, the chemical fertilizers. Traditional inputs like irrigation receive their emphasis in both these solutions. It is, therefore, necessary to discuss the following issues:

(1) Is the problem of agricultural development in India at this stage primarily of the reorganization of agricultural production structure and more intensive and better utilization of fixed resources like land, human and bullock labour, etc., or that of the *urgent* and *rapid* spread and expansion of a few new resources like fertilizers, pesticides, fertilizer-responsive exotic varieties, etc.?

(2) Is the extension of new inputs to be examined primarily in the context of their impact and facility in promoting more intensive and better utilization of traditional resources like irrigation and credit, and fixed resources like human and bullock labour? Or, contrarily, even the nature and quality of these resources are to be determined only according to the requirements of the new strategy?

(3) Are the agronomic results so far achieved on fertilizer use in the experiments and the economic benefits visualized therefrom *adequate* as a basis for making country-wide application of the new inputs and making macro-projections of their economic benefits?

(4) Can linear programming as a technique of farm planning be practically useful as a tool for raising output and income of farmers on the farm through extension?

APPROACH TOWARDS INTENSIVE DEVELOPMENT AND ITS CRITICAL ANALYSIS

Of the five papers dealing directly with the intensive development approach (Patel, M. L. Manrai, Carl C. Malone, S. M. Pathak and J. B. Singh and Harpal Singh), only one (Patel) mentions some experiments towards intensive agricultural development made by the Indian Agricultural Research Institute and the Institute of Agriculture, Anand, *prior* to the inception of the Community Development Projects and National Extension Service, and the IADP. In these experiments, stress was laid upon providing *each farm family* a block of five acres of land, with irrigation, required credit in the form of necessary inputs and technical guidance. The yield per acre was much more than twice when compared to average yields in the Anand taluka. Patel does not mention the aspect of costs at all.

These possibilities 'were considered generally true for all the crops and all the areas with the difference only in degree.' But why, by whom, and on what basis Patel does not explain. Despite these efforts, the problem of providing employment for about half the family labour had remained unsolved.

Similarly, the Paddy Pilot Schemes of Bombay Government started in 1957 for growing paddy by the Japanese method had raised yields by 9.16 B. maunds per acre. For Patel, 'these schemes seem to have served as a basis for the package schemes suggested by the Ford Foundation Team,' although he cites no evidence for his impression. The rest of Patel's paper deals only with the IADP and general bottlenecks in enhancing production to which we shall turn in the critical analysis of the IADP experience.

The three papers by authors working in official institutions (Manrai, Malone and Pathak and Singh) mainly *describe* the intensive development approach and how it has been followed in the IAD and IAA Programmes. Most of what they say is already available in several official documents, *viz.*, the Third Plan, Assessment and Evaluation Reports on the IADP, Approach to Agricultural Development in the Fourth Five-Year Plan, Draft Outline of the Fourth Five-Year Plan and several other publications of the Union Ministry of Food and Agriculture and the Planning Commission. There is also avoidable repetition and duplication in these papers.

We shall, therefore, focus attention only on *some* points relevant to the discussion of the intensive development approach proposed to be followed during the Fourth Plan.

Only one author (D. Ramesh) from the Agricultural Prices Commission has made an attempt towards economic analysis of data obtained from composite demonstrations. Another author (Harpal Singh) has made a critical analysis of the approach, on the basis of data obtained in the farm management studies. To both these papers we shall refer in some detail in this and the next section.

Criticism of the Approach

The intensive development approach has been critically examined only in one paper (Harpal Singh). Harpal Singh has questioned some of the basic premises of the approach, although his use of inter-regional data from farm management studies to prove his point is open to serious criticism. We shall, therefore, bring out the good points as well as the weaknesses of his paper below.

Harpal Singh considers it a 'moot point . . . whether the total aggregate return on the scarce resources is maximized by dispersing them over wide areas in smaller doses or by concentrating them in fewer areas in high doses.' This question arises in his mind on account of the fact 'that diminishing returns to certain selected factors of production in agriculture start much earlier than in other branches of production.' He argues that while the point of diminishing returns to fertilizers and other new inputs may not have been reached in most part of the country, this may not be the situation in areas selected for intensive agricultural development. In his own words, 'all these are academic conjectures.'

But he then proceeds to inject some empirical concreteness into these conjectures with the help of *overall* input-output data collected from various regions in the country in the farm management studies. Taking the total *value of all the inputs* (both actual and imputed) per quintal of output, he infers that since the levels of input vary between regions, 'the additions to output are obtained at *increasingly* higher cost.' One does not, however, feel sure that he can derive this conclusion from his figures. He knows that 'resource-mix in the different regions compared was not the same in *physical terms*. And hence they are not *exactly comparable*.' Yet he uses these data to derive an *even more general* conclusion and says, 'they *still* provide an idea of how the product curve is *likely* to be in case inputs are further intensified in areas of low and high input intensification.'

Harpal Singh appears to have fallen victim to an economic fallacy or a wrong economic symbolism. Apart from the inherent difficulties of using average input-output data of farm management studies in different regions, conducted over different years and only with 'near uniformity' in methods of investigation in which 'a few non-comparables' are 'still left' (all his words), he appears to implicitly expect that the additional physical product likely to be achieved with the use of fertilizers and other inputs will have some *essential* relationship with the *level of total inputs*. And the lower the level of total input the greater the marginal physical product should be with the use of fertilizers, pesticides, and improved implements. This implicit expectation has no logical or empirical basis. Nor does he show that it has. It depends very much on the physical production relationships in different areas and the quality of different physical factors. His farm management data are only in value terms, and even in those, it is not possible to assume uniformity on account of numerous economic factors operating in different regions. In fact, if this were to be true, one would expect to find areas with lowest input levels like Orissa, Bihar, and Madhya Pradesh to be the largest consumers of the new inputs. But as is well-known, they are not, in spite of the farm management data. He would, therefore, do well to re-examine this fallacious expectation.

He then tries 'a refined method' to study factor-product relationships at different levels. He compares '*marginal value productivity*' of factors like land, human and bullock labour, working expenses and capital assets. These results, according to him 'are to be interpreted with great caution . . . there are a number of anomalies in such a straight comparison.' And yet he '*got a feel of suspicion* that the high level of input use has not been associated with high marginal productivity.' The basic fallacy pointed out above nevertheless remains, and makes his 'suspicion' as much a 'conjecture' as it would be if he had employed no farm management data whatsoever.

The same happens to his refined method in comparing output at various input-range levels in single districts, although the anomalies of inter-regional comparison are very much diminished in the analysis of data from a single district. The fallacy nevertheless remains.

Finally, Harpal Singh himself recognizes 'a most pertinent objection,' that 'how far the production relationships obtained by the use of mostly traditional inputs can hold true when the form and the composition of factors in the new approach to agricultural development undergo change.' Only at this point, he seems to recognize the need for citing direct data relating to the additional physical product obtained from the use of fertilizers and other new inputs. He relies on Panse and Khanna and Minhas and Srinivasan to prove that the *rate of increase in yield* diminishes with larger doses of fertilizer application. And from this, he questions the wisdom of '*input intensification*' in limited areas beyond the point where diminishing returns set in to maximize output when resources are scarce. This is a valid and telling point.

Incidentally, Harpal Singh also raises a few other relevant issues. He alleges that 'sufficient experimental and field data on the high yielding varieties programme are not available to derive a clean and convincing response curve.' This statement is shocking if it is true.

The implications of Harpal Singh's criticism of the intensive development approach have far reaching ramifications. If he is right about the economic irrationality of 'input intensification' in limited areas beyond the point of diminishing returns when resources are scarce, it would imply that a much greater area can be benefited and a much larger increase in aggregate output obtained with the same quantity of fertilizers than appears to have been so far visualized. Moreover, if he is also right about the need to take cognizance of concrete difficulties and likely imbalances in traditional agriculture, this will also tend to cast doubts on the provision of financial outlays and the 'industrial planning' in the Fourth Plan with high targets for physical inputs like fertilizers, pesticides, agricultural implements, and provision for large imports of fertilizers and pesticides. These would appear to suffer from a fatal error, viz., ignoring the *actual* and *real* limitations in promoting the expansion and use of these new inputs to the extent and at the rate as is contemplated in the Fourth Plan. This would be true even if the supply of the targeted fertilizers were to be distributed over the entire area of assured irrigation or rainfall since it has been found that, despite strenuous efforts, it has not been possible to step up the rate of application of fertilizers significantly except in a few of the 15 IADP districts. This has been due mainly to the actual and real limitations of this process, which necessarily make the progress slow. Whatever provisions have been made for these targets would, therefore, appear to be more than would be required if 'realistic' possibilities of expansion in the use of fertilizers, etc., were taken into account. Simultaneously, if policies designed to reorganize the structure of production and promote intensive and better utilization of all the fixed factors of land, labour and capital are also implemented, in course of time, these will lead to more intensive utilization of even the new inputs, when alone the new strategy can be pushed forward at a faster rate.

To illustrate the points in the preceding paragraph let us take an example. For instance, S. L. Chowdhury estimates the optimum dosage of nitrogen per hectare for wheat at 101 kgs. at the farm level. Let us round it off to 100 kgs. per hectare. If estimates of fertilizers economically needed were to be worked out for 32.5 million acres (13.5 million hectares approximately), on this basis, we shall appear to need 1.35 million tonnes of nitrogen for these selected areas only. But from Chowdhury's data, it is also seen that fertilizers yield a diminishing rate of return right from the beginning. Returns per rupee of investment in nitrogen decline from Rs. 7.70 to Rs. 4.92 as the level of fertilizer dosage is raised from 30 to 60 kgs. per hectare. Consequently, if returns to fertilizer are to be maximized at the macro level, it will be *economically* rational to apply 100 kgs. of nitrogen on $3\frac{1}{3}$ hectares of land rather than on one hectare. This will increase the extent of selected areas for fertilizer application from 13.5 million hectares to 45 million hectares for the same quantity of scarce fertilizers. Thus, much greater economic benefit can be derived from the same scarce resource if wisely utilized.

Apart from these serious repercussions of the present intensive development approach on the priorities, targets and allocation of Fourth Plan resources, there are several other economic questions which are relevant. The most important of these pertain to the economic rationale of concentrating efforts in selected areas and the criteria of their selection. It has been the experience in the IADP areas which have been selected on account of their maximum favourable conditions that progress in 'input intensification' has been stalled on account of

numerous other factors besides availability of water. Consequently, these factors also would require to be taken into account, at least broadly, for *prior* determination of the areas of maximum agricultural production potential if *aggregate* output is to be raised in the *least* possible time. But this would make the selection of areas an altogether arbitrary operation.

Selection of areas only on the basis of water availability has no meaning whatsoever if it also makes it necessary to pursue all the supporting programmes of reforming land tenure, credit and administrative institutions, and make changes in irrigation policies in the selected areas.

The principle of selection of areas would thus run contrary to purposes and *a priori* logic of maximizing output with limited resources in the shortest possible time?

Moreover, in so far as the *entire* area of assured rainfall or irrigation water is not proposed to be covered under the strategy, additional difficulties arise in choosing areas from amongst such areas. No rational criteria for selecting such areas appear to be available. This aspect, however, is completely ignored by the exponents of the *a priori* logical necessity of the present intensive development approach.

INTER-REGIONAL DISPARITIES AND INTER-PERSONAL INEQUALITIES

Three papers (T. R. Gupta and Gurbachan Singh, Baidyanath Misra and Benudhar Mishra) contend that the intensive development approach will promote and aggravate inter-regional disparities in development and inter-personal inequalities of income and welfare.

Gupta and Singh question the logic that 'the demonstration effect of increased production and productivity (in one area) would automatically flow to others.' They argue that by making differential allocation of the new resources for limited areas by denying them to others, the intensive development approach amounts to giving benefits to some at the cost of others. Since economic development, according to them, is a function not only of investment expenditure in the most profitable channel, but also social, cultural, psychological, religious and political forces, they stress upon the need for finding out ways and means of compensating those areas which are not covered by the intensive development programme and of mopping up a part of the benefits accrued to the areas selected for intensive development. For these purposes, they recommend 'point rationing' approach, comparatively larger investments in social overheads in non-intensive development areas, and taxation by means of betterment levies in intensive development areas. But unfortunately they do not discuss these measures analytically and in sufficient detail for worthwhile discussion.

However, before Gupta and Singh emphasize these aspects, they try to provide "full economic justification" for higher investment in intensive development of agriculture in the Ludhiana district and seek to prove that Ludhiana has registered higher increases in per acre yields of several crops than in the Punjab State as a whole. Both these aspects of their analysis are open to serious criti-

cisms. In fact, 'economic justification' for making differential allocation of resources for development of agriculture in Ludhiana is based on a serious arithmetical error in their Table III. The ratio of additional returns to additional expenses, which they have taken as the criteria for selection of areas for intensive agricultural development, turns out to be only 1.9 for Ludhiana if this arithmetical error is corrected. Thus, Ludhiana, which, according to the authors, is the district with the maximum production potential in terms of their own data, turns into a district with about the lowest production potential and can hardly claim any economic justification for its selection as an IADP area.

Incidentally, this regrettable error also brings out the dangers inherent in making selections of areas upon any single criteria like assured irrigation or rainfall in which simple human errors may lead to such serious consequences of faulty and wrong selection of areas, as seem to have happened in some of the IADP areas.

Gupta and Singh's data in Tables III and IV do not contain any details about their statistical adequacy and representativeness for the purposes for which they have been used nor about the methods of their collection. These may well bear some discussion.

Baidyanath Misra regards the intensive development approach only as an extension of the principle of 'unbalanced growth' as against 'balanced growth' to agriculture. To him it seems to be a desirable strategy at the present stage of the Indian economy. But he then refers to the disadvantage of investment in 'growing points', viz., that it increases regional differences and creates political resistance to development programmes of the government. He believes that 'all the areas (in India) require the jolt' of 'unbalanced' growth. He would, therefore, like 'investment to be made on a broad front so that the various parts of the country can move forward in balance and political harmony. He also casts doubt on the hope that intensive development areas 'will constitute growing points from which the impulse towards growth will spread to the rest of the economy,' on account of scarcities and bottlenecks inherent in a developing economy.' Consequently, according to him, this approach may decelerate the growth process instead of accelerating it by generating inflationary tendencies.

Misra, however, seeks a compromise between economic efficiency and social urgency by taking shelter under the Marshallian time analysis. He accepts the intensive approach only as a short term economic policy. To make a reference to Marshallian time analysis for this purpose seems quite unnecessary. But he regards social urgency too as complementary to economic efficiency. Thus, he ends on a note which hangs in the air, and is not conclusive.

Benudhar Mishra emphasizes that despite economic soundness of the principle on which the intensive development approach is based, it leads to disparities in inter-regional development. This problem, according to him, assumes even wider dimensions in the context of subsistence agriculture. It can be mitigated only if a part of the additional benefit from the intensive areas is syphoned off to other areas, but that may hamper incentives in the selected areas. He, therefore, suggests that the intensive approach should be 'farmer-based' rather than

'region-based.' At best, the latter may be suited for 'commercialized farming' areas, but only the 'farmer-based' approach will be suitable for subsistence farming areas. He, however, does not explain these propositions. His suggestions will in no way avoid the dangers of increasing disparities in inter-regional development and inequalities in inter-personal incomes and employment.

Similar criticisms of the intensive development approach have been made by other eminent economists like Dr. V. K. R. V. Rao and Prof. V. M. Dandekar. Manrai makes a reference to these in his paper and seeks to answer them. But the answers given by him either make a complete nonsense of the new strategy of intensive development or fail to meet these criticisms effectively.

Manrai tries to emphasize that the Ford Foundation Team had recommended concentration of efforts in limited areas *without at the same time affecting the normal efforts in other areas*. If this approach were now to be followed, as is explicitly mentioned in the Draft Outline of the Fourth Plan, it would destroy even the *a priori* logical foundations of the new strategy of intensive development approach. In so far as 'normal' efforts in other areas would involve the use of fertilizers and other improved inputs, the new inputs cannot all be concentrated in selected areas and thus maximize aggregate output in the least possible time.

As a second answer to this criticism, Manrai refers to the 'secondary and tertiary effects of increased agricultural production in a certain area,' which, according to him, 'spread out to beyond the confines of that area,' and thus lead to 'increased availability of food in the country, decrease in our dependence on imports releasing large volume of foreign exchange for other sectors of the economy.'

We have already seen that every single author of the papers in this section has questioned the validity of this answer. In fact, one fails to see how it is at all relevant as an answer against these critics. There is no logical or empirical basis to presume that the 'secondary and tertiary effects' Manrai refers to would in any way be equitably distributed, and help in reducing inter-regional disparities in development and inter-personal inequalities of income and employment. In fact, these effects may even aggravate these disparities and inequalities further. Increased availability of food and decrease in dependence on imports are not even relevant in this context.

Patel and Saikia also criticise the intensive development approach on some general grounds.

Patel argues that in the context of self-reliance, 'our specialists and scientists should themselves have evolved a plan after studying thoroughly the situation in which our farmers are placed.' This is only a plea for taking the existing fixed resources situation into account.

Patel then goes on to bring out the vital need of co-operation for small farmers, and to bring them into the movement for intensive agricultural development. He commends a plan for intensive agricultural development on co-operative basis on the pattern of Israel. He also stresses upon price incentives as a factor in intensive development of agriculture.

Saikia's suggestions for an Intensive Area Plan for Assam are more in the nature of a plea for under-developed regions with specific characteristics. Saikia finds a great contrast in respect of the practices of using fertilizers, pesticides, improved seeds and improved implements between a 'package' district in Assam and eight non-package districts. He concludes that 'modern agricultural technology has failed to impress the farmers in non-package districts.' He then goes on to bring out the causes for this situation, and finds them in the '*defects of the general approach*' in agricultural development.

Saikia then recommends the establishment of a *Model Village Agricultural Production Unit* in each block which would cover 15-20 villages and be equipped with all facilities of modern technology and a government model farm attached to it. This unit would make 'even more intensified efforts' than under the package programme. Thus, Saikia's plan would amount only to modifications in the *unit* of area chosen for intensive development together with some changes in the internal organization of the unit such as the provision of a government model farm. Saikia, however, does not *analyse* the economic and practical implications of his plan.

Issues for Discussion

In the background of the various problems raised in the papers, the economic issues to be discussed regarding the approach to intensive development are the following :

(1) In view of the complete disregard of the need for the reorganization of agricultural production structure and thus to promote better and more intensive utilization and reallocation of fixed factors, is the basic approach as conceived so far 'essentially sound' as is claimed?

(2) Is there *adequate* and convincing empirical basis in data, experimental or otherwise, to show the soundness of the approach?

(3) Is the principle of concentration in selected *areas* sound on any rational economic grounds?

(4) Are the levels of optimal dosage recommended for application in selected areas realistic and practically realizable? Are they also economically rational for maximum aggregate output at macro levels?

(5) Are the criteria for selection of areas laid down so far adequate and valid?

(6) Are the assumptions of agricultural development in selected areas leading to dissemination of development all round by means of demonstration effects and secondary and tertiary effects and thus preventing aggravation of inter-regional disparities and inter-personal inequalities sound in logic and fact?

(7) Does this approach on the basis of *a priori* logic and on the empirical evidence hitherto available, offer any promise of self-sufficiency in foodgrains by the end of the Fourth Plan, as claimed, especially in view of the candid statement

that 'the full impact of the intensive approach is likely to take *a much longer time than a five-year period?*

(8) What is the alternative approach?

ANALYSIS OF THE IAD AND IAA PROGRAMMES

Out of the 15 papers, the authors of as many as nine have referred to the experience of the IAD and IAA Programmes in one way or another. These two programmes are the prototypes, in fact, the fore-runners of the intensive development approach adopted for the Fourth Five-Year Plan, even though the scale and dimensions of the latter are much bigger. It was natural, therefore, for various authors to invoke the experience of these programmes in support of their views on the intensive development approach, be they favourable to or critical of it.

The reference to the IADP experience has been particularly facilitated on account of the availability of an official report 'Intensive Agricultural District Programme, Second Report (1960-65),' by the Expert Committee on Assessment and Evaluation, Ministry of Food and Agriculture. Some authors have been content merely by citing extracts from this report in support of their views while others have gone beyond and examined it critically with the help of additional data collected from some IADP areas. Thus, the same source has been used for opposite purposes, *viz.*, to support the 'soundness' of the basic concept of intensive development approach hitherto followed, or to oppose its large scale expansion in the Fourth Plan.

Before we focus attention on these conflicting opinions on the 'success' and the 'failure' of the IADP, there is one paper (D. Ramesh) in which some interesting economic issues of the IADP have been examined. We shall first scrutinize the methods and conclusions of this study.

Ramesh sets out to examine the 'extent of benefit' of the package of practices in the IADP in terms of returns to investment. He also estimates the 'optimal level of investment' and the directions in which the 'additional expenditure, below the estimated optimum,' should be incurred. Finally, he seeks answer to the question whether the improved technology is cost-increasing or cost-reducing.

The data used are those of *average per acre costs and income* of a given crop on 'control plots,' and the *additional average per acre costs* incurred on 'demonstration plots' in applying the package of practices against the *average per acre additional income* obtained. Data for all the demonstrations held for any particular crop in a *whole* district are aggregated together, and returns to investment are obtained with the help of these average figures.

Ramesh comes to the conclusion that in paddy, return per rupee of investment in the 'package of practices' is Rs. 2.50, for other crops 'generally more than Rs. 3,' and for potato and groundnut in Punjab, as high as Rs. 8.65 and Rs. 7.63 respectively. Ramesh cautions that these figures hold good only *as an average* since 'even in successful demonstrations, there were considerable variations in the level of yield obtained from the same package in a given area.' These variations

arise out of differences in the quality of soil, cropping patterns, extent of availability and utilization of irrigation, and managerial ability to skilfully use the package of practices.

One may legitimately raise the query : If return to investment in the 'package' depends on so many factors and are so highly variable as he suggests, of what practical and operational use are such average figures of return to investment, and for whom?

Apart from that reason, however, the estimates are open to criticism for methodological reasons as well. Ramesh reveals that his estimates of cost all relate to *operational expenses* only. No estimates regarding the fixed costs are available under these data. He does not mention what is included in these operational costs, whether merely the cost of freely supplied inputs of fertilizers and pesticides given to demonstrator-cultivators, or also the additional operational costs of labour (family and/or hired), water, bullock power, etc., incurred by the farmer. If these costs are regarded as part of fixed costs, returns to investment would naturally be exaggerated. If these are included, as is suggested for Thanjavur district a little later in the paper, what are the fixed costs the exclusion of which will tend to magnify the returns to investment?

Moreover, Ramesh concedes that in a particular region, though the 'package of improved practices' remains the same, the cultivators' practices may vary even within the same region and even more so between regions. One would, therefore, also like to know to which particular 'package of practices' his average figures of investment refer to? What is the commonsense meaning of this figure of additional investment in the 'package of practices'? It will not be a homogeneous entity in different demonstration areas.

Using the same data of average additional operational costs and average additional yields, Ramesh works out the optimal level of investment for a single district, Thanjavur, by a simple equation. This implies that, with the given level of technology and the given package of practices, additional investment in operational costs will remain profitable till the marginal cost of production plus a margin for risk and uncertainty equals the expected price of the produce. Ramesh finds that, on the basis of these results, there is scope for further intensification of the operational expenses' even with the given level of technology and package of practices.' In this exercise, the points to discuss are the detailed contents of the present package in Thanjavur and the *practical* possibilities of raising investment by as much as Rs. 90 over Rs. 205 within the given level of technology.

Ramesh has then examined the returns to each of the constituent items in the 'package of practices' and its operational costs with a view to indicate the direction in which scope for additional investment in Thanjavur district exists. This he does by fitting a production function of the Cobb-Douglas type. The inputs per acre he takes into account are the value of seeds per acre, value of fertilizers and manure, insecticides, irrigation charges and preparatory tillage, sowing and harvesting costs. The marginal productivities of these inputs turn out to be Re. 0.921, Rs. 2.423, Re. 1.863, Re. 0.231 and Re —0.413 respectively for the above inputs. Since marginal returns to fertilizers and manures, and insecticides are the highest, he

recommends that additional investment should be made in these while investment in irrigation and preparatory tillage, sowing and harvesting should be reduced.

Ramesh does not give the standard errors of his coefficients. It is, therefore, difficult to judge the statistical significance of the values he obtains. Moreover, it appears that investment in preparatory tillage and sowing and harvesting gives only negative returns. It will be interesting to find an economic explanation for this relationship which Ramesh does not provide.

The other points of discussion on this analysis pertain to the actual data used for this computation. Has Ramesh included all the composite demonstrations for paddy held in the district or has he made any selection out of them? If so, how?

Ramesh then tries to find out the cost-reducing or cost-increasing nature of the package of practices by taking the total costs, operational and fixed, for the 'control' and 'demonstration' plots. Fixed cost was not recorded in his data. So Ramesh improvises the same from the farm management data. What are the components of these fixed costs he does not explain. He is also aware that 'these data do not always relate to the same district.' But he heroically assumes that if a district is in the same region, it 'is broadly representative of the institutional factors, the level of technology and input use level of the region.'

Anyway, with the data of fixed costs somehow thus worked out, Ramesh inflates them to the period 1964-65 by using the Index Numbers of Wholesale Prices for All Commodities to allow for variations in prices received and prices paid by the farmers. In the absence of any information about the components of fixed costs, it is difficult to evaluate the scientific validity of this procedure. But if this procedure were to be made the basis for arriving at any *practical* conclusions about the cost-reducing or cost-increasing nature of the 'package,' it would be worse than useless.

By this exercise, Ramesh is able to show that, for most districts and most crops, while the operational costs on the demonstration plots is substantially more than on control plots, the total cost per quintal for all crops is less in demonstration plots, due to higher yields on these plots. This proves that the 'package' is cost-reducing.

Ramesh, however, does not explain how does he breakdown his estimated fixed costs between 'control' and 'demonstration' plots since the farm management studies observed no such distinction in the selection of holdings. If he has added an equivalent sum of fixed costs to the operational costs on control and demonstration plots, it will eventually tend to show the total costs on demonstration plots in a favourable light. If not, it is not possible to visualize any basis for making differences in fixed costs on the two types of plots.

In fact, the validity and value of Ramesh's paper can be adequately judged only when he furnishes more details about his data, the number of composite demonstrations, the size of 'control' and 'demonstration' plots, the type of data about operational costs collected and maintained, by whom, at what frequency of time, the variability of costs and yields, the selection procedures employed for including the composite demonstrations in various exercises, if any, etc. Until

these details are available, it is not possible to rely this study for practical considerations. Ramesh would do well to consider the limitations of the IADP composite demonstrations data pointed out by Ashok Parikh¹ and the difficulties of mixing it up with the data collected in farm management studies.

Coming now to the 'success' and 'failure' of the IAD and IAA Programmes, Manrai, Pathak and Singh, and Malone have emphasized upon the achievements and accomplishments of the IADP. Robertson and Sharma, and S. K. Agarwal, on the other hand, have stressed upon its weaknesses and deficiencies.

The first group of authors, on the basis of data presented by the Expert Committee on Assessment and Evaluation of the IADP, contends that 'total foodgrains production in every district averaged markedly higher than in the pre-programme period, and also higher than in adjoining districts.' (The comparison with adjoining districts is pointless and proves nothing since the districts have been selected for IADP purposively in view of their most favourable economic potentialities.) As against that, Robertson and Sharma, on the basis of data derived by them from the available official data, arrive at this conclusion : Of the first seven districts of IADP, 'three districts appear to be performing at a much lower level than should have been expected, viz., Pali, Shahabad and Thanjavur. The other four districts are clearly ahead of their respective adjoining districts. In terms of cash crops, performance of the package areas is comparatively worse than for foodgrains. The overall performance of the programme would therefore appear to be below its potential.'

This difference in the assessment of performance of the IADP evidently arises from the differences in methods the two groups of authors employ for the purpose. Manrai, and Pathak and Singh rely on an 'unpublished Report on Assessment and Evaluation.' Robertson and Sharma not having access to the unpublished source, try to improvise with other official data. Evidently, if these data lead to differences in conclusion, there must be something wrong somewhere. Does it not turn on the distinction between actual performance being higher than before or elsewhere and 'below its potential'? The discussion may usefully turn on finding it out.

For this purpose Malone's method of showing increases of major cereals in comparison to added plant nutrients is very useful. While Manrai, and Pathak and Singh refer only to the general expansion of the use of fertilizers, co-operative credit, etc., in the IADP districts, Malone relates cereal yield increases to the added levels of fertilizers and the yield increases (10 times) expected from these.

Malone finds that only in three districts yield increases were more than expected, while in the other four districts, these were very much lower than expectations. Nor was the rate of plant nutrients applied per acre stepped up significantly. It would also have been interesting to find out if the increase in per acre output had any relationship with the increase in the level of fertilizer application per acre. But Malone does not relate them in that way. Poor results in per acre yields according to him, 'seem to reflect that the rice varieties used during this period had low response.' But he does not furnish any data for this conclusion.

1. "Rate of Return on Chemical Fertilizers in the Package Programme Districts," *Indian Journal of Agricultural Economics*, Vol. XXI, No. 2, April-June, 1966, pp. 31-46.

Comparing further the yield trends in the IADP districts and all-India, Malone shows that when compared to average yields in 1958-61, the yield trends in the former is moving out ahead of the all-India trend. This is an ingenious way of making comparisons. But it is necessary to discuss its statistical methods and weights in somewhat greater detail before the conclusions can be accepted. Malone does not explain them.

Even if these conclusions were valid, Robertson and Sharma's point still remains that the increase in yields is much below expectations, as the Draft Outline of the Fourth Plan also concedes. This fact is recognized by Manrai and Malone both. (It does not seem to worry Pathak and Singh). Manrai, following the Assessment and Evaluation Report of the IADP, holds the administrative system and Government's basic policies regarding credit, marketing, pricing, industrial development, import, investment and land use responsible for non-realization of the full potential of the intensive development programme. He thinks 'much remains to be done.' But what? He does not spell out beyond general prescriptions for 'weaning the entire population from the traditional methods of agriculture.'

Malone has, however, brought out some more weaknesses besides those of administration. According to him, 'the package of practices lacked close local adaptation and the block staff was not well-trained.' Except for hybrid maize, no really responsive variety was found in any district. For the first three years of the IADP, prices (of agricultural crops) to farmers in intensive districts were low compared to the cost of purchased inputs. Margins were narrow, and risks, due to the new ideas being tried, were high. Credit co-operatives were weak in execution in extending loans promptly and in loan collection. (According to Manrai, 'co-operatives in the IADP have become only a *loan disbursing agency*.') Further, irrigation policy and practice in controlling timing and distribution of irrigation water proved to be highly traditional and inflexible.

Effective analysis of the various factors responsible for the slow or lack of progress in the IADP areas is, however, made by Robertson and Sharma, who also draw some lessons for the new strategy from their analysis. They show that 'some of the chosen districts were poorly off for irrigation at the outset.' According to them, substantial advance in extending irrigable area in mainly rain-fed districts could have helped, but little progress was made in this direction except in Ludhiana. This has been a 'major obstacle to intensification.' However, if this were to be done the logic of IADP would be completely negated. After selecting areas with assured rainfall or irrigation, it will be illogical to engage in extending the irrigable area even in the IADP areas.

As regards co-operative credit, the authors bring out that it has neither been possible to make it production-oriented nor efficient on account of heavy over-dues and defaults in repayment. Credit was not given to tenants because farm plans were not prepared for them for want of proper tenancy records. Obligation to take a fixed proportion of credit in fertilizers was also a disincentive. (This fact needs careful examination in view of the general belief about the demand for fertilizers exceeding supply in the IADP areas). Linkage of credit with market-

ing was not effective. On the other hand, there was over-financing of cultivators in respect of short term credit on account of faulty methods of preparing farm plans and sanctioning credit.

Regarding farm plans, Robertson and Sharma bring out that 'farm planning has been merely a grandiose exercise on paper. The farm plan to a village level worker is just another piece of paper and the number of plans, together with the mechanical and non-dynamic way (of preparing farm plans) suggests that the farm plan in its present form is largely a waste of time and resources.'

Patel also makes some observations about the mechanical manner of preparing farm plans in Gujarat.

On crop demonstrations, Robertson and Sharma cite a field investigation of their own to conclude : "The investigation indicates that a substantial proportion of cultivators knew little or nothing about the demonstrations which had taken place *in their villages*."

From these factors, the authors conclude that the experience of the package programme casts serious doubts on the realizability of the High Yielding Varieties Programme, which is the entire sum and substance of the intensive development approach during the Fourth Five-Year Plan.

They support this conclusion by arguing that in many of the package programme areas, 'irrigation is quite inadequate even for current improved varieties, and relatively low rates of fertilizer application.' Consequently, they recommend 'a careful analysis of water availability and demand for water together with closer control over water utilization.' They raise several economic issues for determining upon criteria for choice of current investments in irrigation, and its selective expansion. These are well worth discussion.

Regarding credit and input supplies, the authors raise a whole host of doubts about the availability of fertilizer supplies and improved seeds in targeted quantities as well as about the ability of the co-operative credit and supply channels as of now to reach them to the farmer in time and in adequate quantities. They suggest supplies of inputs to be made the direct responsibility of the programme organizers which has many advantages for matching their supply and demand. Regarding extension, since the package is not being applied either in the levels of application or in terms of all its input components, the authors recommend the discontinuance of the farm plans, or at least their reduction in number. In crop demonstrations, emphasis should shift to water management, and other improved and sophisticated problems rather than mere use of fertilizers.

At the end, the authors would like 'realistic' targets to be fixed for the new strategy on account of these lessons of the package programme; otherwise, according to them, the 'new strategy areas will *also* be shadows lacking in substance.'

Agarwal attributes the unsatisfactory performance of the IADP and IAAP to institutional factors, *viz.*, the problems arising from tenancy. He also complains against slow progress in consolidation of holdings, which acts against the programme.

Issues for Discussion

In the context of the various problems and implications of the IAD and IAA Programmes raised by the authors the issues for discussions are the following :

- (1) Has there been adequate increase in output and yields in the IADP and IAAP areas to provide a basis for the large scale adoption of the new strategy as contemplated in the Fourth Five-Year Plan?
- (2) Has the increase in output been commensurate with the increase in expenditure after due allowance is made for effects of bad weather?
- (3) Has the increase in output per acre been proportionate to the increase in the levels of inputs per acre ? If not, has the law of diminishing returns been operating in the application of new inputs in the IADP areas during the short period of five years?
- (4) What are the various factors for lack of progress or slow progress in these areas, in order of priority?
- (5) In view of the IADP experience, what measures are necessary for improving land tenure, irrigation and credit supplies, extension services, and institutional and administrative deficiencies in order to achieve the objectives of the new approach?
- (6) Are the targets of High Yielding Varieties Programme and the related inputs for the Fourth Plan period over-optimistic and unrealistic?
- (7) On what economic criteria and principles should these targets be rationally and realistically fixed?
- (8) Is there any basic difference between the New Strategy advocated in the Fourth Plan and the earlier IADP? If so, how will it affect production performance?