Micro-macro links in planning

P.B. Krishnaswamy
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Micro-macro links in planning:
the role of small group action in Indian agricultural development and its implications for extension

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Summary

Planners and administrators in developing countries with a dominating smallholder agriculture face difficult problems in the formulation and implementation of development programmes. Such programmes must at the same time form an integral part of macro-level planning for balance and consistency in the development effort and be meaningful and workable at the micro-level in the eyes of the farmers who are expected to act on and benefit from them.

Some of the normal difficulties in establishing effective micro-macro links are compounded by the requirements of the 'new' production technology in agriculture. These call for considerable initiative and flexible management — whether it be in seed multiplication, raising of nurseries, pest control, soil and water use — on the part of farmers and the local field staff. There have been many studies of farmer response to innovation; but not enough of the response of government and other public agencies involved in the process.

This research monograph focusses on one major aspect of this complex question, namely, the organization of farmers for group action and its implications for planning techniques and methods of implementation. The discussion takes place primarily in the context of Indian agricultural development.
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Preface

Research on this project was undertaken during 1974-75 with the help of an award from the International Development Research Corporation, Ottawa, and an invitation from the Australian National University to study the subject of this research as a Visiting Fellow in its Department of Economics. The assistance from these institutions is gratefully acknowledged. Neither of them, nor the Government of India (of which the author is a serving official) is in any way responsible for any of the views expressed in this report. Many persons have helped with comments and suggestions in its preparation. In particular the author is indebted to Sir John Crawford and Dr R.M. Sundrum of the Australian National University for their assistance and encouragement.
Chapter 1

The focus

Programs to improve productivity and incomes in the agricultural sector with the help of modern technology have achieved notable results in recent years in many developing countries. This is particularly true of cereals production. But there is growing concern that only a section within even the relatively privileged land owning class in the rural areas has benefited so far from such programs. This has been the case even where the declared objective of policy has not been to extend benefits selectively. In the meanwhile, population pressure keeps building up, adding urgency to an already difficult problem. It is but natural, therefore, that among academics and international agencies no less than among governments in developing countries, there is currently intense interest in the problems of rural poverty in terms of ensuring broad-based development in the rural areas.

This study focusses attention on one aspect of this challenge of rural poverty, namely, making the improved techniques of production more broad-based among cultivators.

Faced with this fact of uneven spread of improved techniques, one approach which has strong appeal on grounds of equity is to reallocate scarce inputs more widely, correcting any tendency that might exist for a minority of influential farmers to corner supplies. To the extent that a highly-skewed pattern of distribution of these inputs has led to some of them being over-applied on some farms in relation to other inputs for a given technology while other farms are applying them in sub-optimal doses, reallocation can lead to an increase in total output. But as a basis for promoting sustained growth in output, this approach has limitations. Sustained growth can occur only when the more basic scarcity aspect in the availability of inputs is tackled successfully. This involves not merely producing more inputs, but also training masses of farmers and equipping them to utilize the new inputs efficiently. This is a simple enough proposition.
What is perhaps not equally obvious, however, is the full operational implication of the term 'inputs' in the context of agricultural production. Besides such 'purchased' items as chemicals and implements, it also includes the basic resources of soil and water. These latter are described as resources rather than as inputs. If the distinction sought to be conveyed by the use of these two terms is that while the one is fixed in supply, the other can be increased at will, it is misleading for policy-making. Both society and the individual farmer can augment supply of the resources by improving their quality. The quality no less than the quantum of these twin resources of soil and water sets the tone, so to speak, for the productive efficiency of the other inputs. Better soil and water management can, for instance, serve as substitutes to a certain extent for additional fertilizer for supplying a given level of nutrition to the plant crop. This aspect assumes increasing importance as cultivable land gets progressively scarce in a country, and consequently on each unit of land the technology that is being promoted calls for a much larger investment in other inputs than under traditional technology.

Certain elements in good soil and water management are within the scope of individual farmer action. Certain others, however, require a unit of action that is beyond the typical farm in Asia. The individual farmer who tries to protect his farm from soil erosion, to improve drainage, or even to provide himself with a tubewell is not likely to go far. He will either have to look to the government to provide such facilities, or to join with his neighbours before he can accomplish any of these tasks.

There is yet another factor that can make individual effort quite ineffective. This is inherent in agriculture to some extent. It is heightened, however, by the impact of modern technology under conditions of small farms. This arises from externalities in such aspects of crop husbandry as protecting plants from attacks of pests and diseases. The need for simultaneous or co-ordinated action in such cases again places a premium on group action.

This view of modernization of peasant agriculture has important implications for policy. In the pages that follow an attempt is made to isolate factors relating to scarcity and complementarity of inputs on the one hand and economies of scale and externalities in operation on the
other under field conditions. This is followed by an attempt to analyse the major implications of these inter-relationships for planning and extension techniques. Experience seems to suggest that while macro-level action in devising strategies and providing facilities to promote development are necessary and important, it does not seem to be sufficient in the context of small-farm agriculture. It still leaves a gap in tapping available potential for improvement. This is a gap which more flexible approaches to planning and less structured and formalized group action on a modest scale by farmers might be able to fill. The possibilities of such action and the lines on which they might be generated in respect of specific activities connected with agricultural production in the broadest sense of that term are explored in this study. The discussion is developed in the immediate context of Indian agriculture. However, some of the concepts and approaches might have a more general relevance to peasant agriculture in Asia.
Chapter 2

The objectives

During a quarter century of economic planning in India, the central objective has been stated in somewhat different terms from time to time – sometimes simply as 'raising living standards', or 'removal of poverty' and sometimes more grandly as 'generating a dynamism in the economy which will lift it to continually higher levels of material well-being and of intellectual and cultural achievements'. The foremost concern, however, has been to make sure that the people have enough to eat. When planning started in 1950 soon after the country had attained Independence, per capita food consumption was not only low in some absolute sense, but it had been falling in the decades immediately preceding the departure of the British (Blyn 1966:95-106). That was at a time when population was growing at less than 1 per cent per year. Between 1951 and 1971, population increased by a little over 50 per cent, but there was a near doubling of foodgrains production.

The performance of the agricultural sector, of course, goes beyond the supply of foodgrains to the people. It provides raw material for the more traditional industries (such as cotton textiles and sugar) and has a role in determining the level of export earnings (jute and tea). But the major effort is on the foodgrains front. This is partly because the sheer size of the food requirements makes it virtually impossible for the government to rely on imports on a regular basis. At best imports can help to cover marginal deficits in years of low production. Partly also it has been one of the objectives of policy not to rely on outside sources, except when it proves completely unavoidable. The preference is to import the inputs for agricultural production (such as chemical fertilizers) rather than the foodgrains themselves. Behind this policy has been the assumption that given the existing low output per unit of land, there are ample opportunities to expand production internally. Self-reliance, in this sense of the term, has
been the second plank of policy in regard to agricultural production in general and of food production in particular.

The third objective - and one that has come into prominence in recent years - is that the increase in production and productivity that is being aimed at should be broad-based and not confined to a few farmers or regions in the country. The value attached to this particular objective was by no means uniform over successive Plan periods. To start with, the objective was all-round and broad-based development. 'I hope that these Community Centres [around which agricultural development programs were then being organized] will not merely pick out the best and most favourable spots and help them develop', declared Jawaharlal Nehru in 1952, 'but also try to work out the problems of the other spots which are backward economically, socially and in other respects ...' (Nehru 1969:7). By the middle sixties, however, the emphasis was shifting perceptibly. The aim was to concentrate available inputs on select farmers in select areas and to maximize output within the shortest possible time. The impact on output was quite encouraging but the imbalances being created could not be ignored. The government noted with evident concern that...

... the new agricultural technology tends to add a further dimension of disparity between those who have the resources to make use of it and those who have not. There is thus the danger of emergence of a sharp polarisation between the more privileged and less privileged classes in the rural sector, the privilege in this instance relating to the resources and tools of development (India, Planning Commission 1970a:149).

In spelling out the objectives of policy for the current (fifth) development Plan, the government took particular care to emphasize the need for improving the production base of the 'small and marginal farmers' everywhere. That this approach would make additional demands on the available administrative and organizational resources of the country was recognized. Its justification was related to the more basic objective of 'raising the consumption levels of the lowest 30 per cent of the population'. This called for expanded opportunities for production and employment within agriculture, more particularly for the relatively backward classes and the backward areas. Achieving the same objective
by an alternative strategy of letting production go up only where it could at the least cost, and redistributing the resulting output in favour of the bottom 30 per cent of the population, was not favoured. The reasons were only partly ideological - an aversion to an approach to development based on a permanent transfer of doles and subsidies. Partly also there was the recognition of the immense difficulties - political and administrative - of extracting surpluses from a minority to sustain a majority. In the conditions of the country, 'the process of redistribution' declared the government roundly, 'must be woven into the process of production itself ...' (India, Planning Commission 1973, Part 1, p.25).

It is the pursuit of such a combined objective - to get a larger output and to secure that increase on a broad base of farmers and regions - that makes other aspects of planning, namely, the choice of strategies, instruments and techniques, particularly complex.

In the pages that follow we turn to a study of the particular strategies, instruments and techniques of agricultural development that have been pursued in the Indian context. Points of comparison with experience from other developing countries in the region are provided where it is felt they would help to illustrate a more general trend.
Chapter 3

The effort

Strategies

For countries faced with growing population pressures on the available land and with low crop yields, the choice of a 'strategy' for achieving increased output now tends to be assumed, explicitly or implicitly, as something simple and straightforward — apply modern technology to push up yields per acre. In fact, this near axiom is believed to have a wider applicability. 'Even where there is new land to be opened up' declared an FAO Survey in 1968, 'this is often a costly and lengthy process. There are thus many attractions in emphasizing the raising of yields on the existing area by means of technological improvements' (FAO 1968:111).

'Basically, development involves securing higher productivity all round and this is a function of the degree of technological advance the community is able to make' observed the First Five Year Plan document of India in 1952. The Second Five Year Plan echoed the same sentiment: '... the main source of increase in agricultural production' noted this document, 'must be increase in yields from more intensive, more efficient and more profitable agricultural production'. But a look at the pattern of allocation of resources within the agricultural sector shows that right up to the mid-sixties infrastructural development claimed more than two-thirds of the total resources committed for agricultural development, with expansion of irrigation facilities winning the pride of place invariably. Annual investment on agricultural research and education was hardly Rs.5 crores till 1965; it jumped to Rs.17 crores for the Fourth Plan period (1969-74), and is currently of the order of Rs.50 crores per year.1 Fuller details are furnished in

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1Note: 1 crore = 10,000,000

Before 6 June 1966 1$(U.S.) = Rs.4.76
After 6 June 1966 (U.S.) = Rs.7.5
Appendix I. There are problems in estimating the exact amount invested in a given sub-sector of a Plan in India, with its federal set-up and peculiarities of budget classification between 'Plan' and 'non Plan' expenditures. Nevertheless, as indicating broad patterns of relative priorities over a period of time, the Table does give a reasonably meaningful picture. The low priority for promotion of improved technologies is quite striking in the earlier Plans. The assumption tended to be that what the situation called for was to encourage farmers to apply a few techniques developed elsewhere, and not necessarily to evolve, through innovation or adaptation, techniques tailored to the local environment. This 'neglect' of technology in the country's agricultural development strategy till the mid-sixties subsequently came in for criticism (Brown, D.D. 1971:92-7; Mellor and others 1968:79-85).

Quite apart from the problems associated with classification of expenditure, it is also easy to exaggerate differences of policy between country and country and within a country, over a period of time, in regard to the importance attached to particular aspects of development. These differences are better understood as shifts in relative emphasis rather than as abandonment of one philosophy in favour of another in some absolute sense. Also, the inter-relationships between these aspects - between research and organizational development, between extension and infrastructure improvement - and the manner in which investment in one can complement and reinforce another should not be lost sight of. However, it is interesting to enquire on which element in the 'package' a particular strategy of agricultural development leans more strongly at a given time.

The possible variations are many, but one can perhaps distinguish three major candidates for priority, where the accent is not directly on technological improvement. One is simply to encourage more land to be brought under cultivation, another is to step up supplies of specific inputs such as water and fertilizers to the farmers and the third is to operate on the economic incentives, particularly altering price ratios. The choice in actual practice is not necessarily very deliberately made, with a careful weighing of the relative costs and returns; once made, in whatever fashion, it is also liable to change under pressure of circumstances. In planning agricultural development, the undoubted need for flexibility in strategy can cover up a good deal of confused ad hocism. An official report published in 1967 on
agricultural development in India, for instance, castigated previous policies as strategies 'of production drives by fits and jerks starting on the heels of famine and closing with a good monsoon', and pleaded for a more sustained and realistic program of action (India, Admin. Reforms Commission 1967:5). In retrospect, however, one could get an idea of shifting priorities and strategies from the following data.

Net areas sown in India went up by about 14.5 m. hectares (12 per cent) between 1951 and 1961. Of this, 10.5 m. hectares was added in the first five years. In the decade between 1961 and 1971, the addition was much more moderate — 8 m. hectares (6 per cent). By 1970, the Government in its Fourth Five Year Plan was viewing the situation as characterized by a 'virtual exhaustion of uncommitted land resources' in the country (India, Planning Commission 1970a:121). The present strategy is clearly to make land already under cultivation yield better.

Within a strategy of increased production through increased input use, it is useful to differentiate between two approaches, though these two are not mutually exclusive. One approach emphasizes a more intensive use of the human input, namely, labour where it is in abundant supply, and the other pins its faith on a greater application of material inputs such as water and plant nutrients. Arguing the case for the human input strategy on the ground that South Asian work practices in agriculture are not labour intensive, Myrdal, for instance, asserted in the context of countries such as India that 'a fuller utilization of the labour force and a higher level of agricultural production are not only compatible objectives but, indeed, two aspects of the same thing (Myrdal 1968:1254-5). At an early stage, however, Indian planners did not appear to subscribe to this view. The model of development implicit in their prescriptions was that of a heavily labour-saturated agriculture relative to available land, with no real increase in output possible without accumulation of capital. The country's First Five Year Plan (India, Planning Commission 1952:20-5) warned that 'mobilisation of idle manpower for the development programme will generate new money incomes, divert larger quantities of essential commodities like foodgrains into the hands of those with the additional purchasing power, and thus create problems for those whose incomes remain more or less fixed'. It went on to declare that 'a programme of full employment, with assurance of at least the current level of real wages to the newly employed and with no reduction in the real wages
of those already employed, can get into swing only as capital formation in the community goes up' (India, Planning Commission 1952:20-5). The government seems to have retreated from this polar view of late. However, judged by the less than enthusiastic response to the Dandekar proposal for an employment guarantee in the rural areas to build up productive assets for agricultural development, one would suspect that there has been no major change of policy in this regard during the last 20 years.

In taking a measure of the input intensive strategy in India's agricultural development over successive Plan periods, one might as well begin by looking at the attention that irrigation development has received from the planners. In the investment budget for agricultural development this item has remained the single most important entry consistently. It accounted for nearly two-thirds of the total Plan investment for the agriculture sector and a little over a quarter of the total investment for the economy as a whole in the First Plan (1951-56). Gradually, however, it has been losing ground, the proportions dropping to less than half and less than a tenth respectively, within two decades of planned development. There are, however, two specific features relating to irrigation development that we may note at this point. One is the fact that even though in absolute figures the progressive increase in the cultivated area provided with irrigation has been an impressive achievement, in terms of the proportion of the total cultivated area that has this facility, the improvement has been rather limited - from 17.0 per cent in 1951 to 22.8 per cent in 1971. This has important implications for policy; an approach to agricultural development that requires irrigation as an essential component can have direct relevance in India to only one in four farms. The other feature worth noting at this stage is that during these two decades private initiative in expanding irrigation has outpaced expansion of irrigation under government canals. This again has important implications for policy. To the extent that the strategy adopted places a premium not merely on availability but controlled availability of water for irrigation, it confers an advantage within the irrigated farms on those with privately controlled sources of water. This has been confirmed by some field studies (Nanjamma Chinappa 1974:18). We shall examine these implications in greater detail later in this study.

In regard to the other inputs, the increase in the level of their use has been quite remarkable. Details are
provided in Appendix II. The overall position is best summed up in the finding that there was a 39 per cent increase in purchases by agriculture from non-agriculture for intermediate consumption between 1951-2 and 1960-1. Increased use of chemical fertilizers and of diesel oil for pumping purposes marked the two largest increases (Thamarajakshi 1972:84-5). The trend continued in the sixties also. In evaluating the pace of agricultural development, one often tends to make judgements based on trends in output. But as pointed out by Dr Khusro (1969:18-20), this could be misleading in two different ways. Firstly, in a situation where monsoon conditions have such a vital bearing to the performance of this sector, output variations may reflect changes that at least in the short run do not tell us about the effectiveness or suitability of the overall strategy for development that is being pursued. Secondly, in terms of what Dr Khusro called 'human endeavour and ambition', i.e. of success in motivating farmers to use new inputs or even traditional inputs more intensively, trends in the consumption of intermediate goods are more directly relevant than trends in output that are the result of various other factors, outside the control of farmers and planners alike. While on this question of strategy, attention should be given to certain specific aspects of input use beside the overall rate at which it has been increasing over time.

Before we turn to consider this, we may very briefly refer to the third possible strategy alternative mentioned earlier - the economic incentives strategy. A lament, often voiced strongly by visiting experts during the fifties and early sixties to India, was that this element had been sadly neglected by planners. There is perhaps some force in this argument, though it is not clear whether the possible limitations of this approach (given the structure of rural markets in a country like India) or the implications for food prices to the urban consumers in the eyes of governments under strong pressure to keep these prices as low as possible, are fully appreciated by those who rather airily advocate a system of incentive prices for agriculture. More generally, it would appear that even the strongest proponent of the price incentive road to agricultural development will not regard it as the mainspring of growth in a situation where the techniques of cultivation are backward and inefficient. In a situation of land scarcity, it is at best a junior partner in a larger package that aims at facilitating a wider use of improved techniques.
We may now revert to the questions that we wished to raise in seeking to go behind data relating to trends in the use of agricultural inputs in the aggregate to understand their significance for development.

The first of these questions centres on to whom these inputs are being supplied. Here, strategy has to take its cue from overall objectives of policy. As mentioned earlier, during the fifties the approach in India was that every region and every farmer should get some benefit. Selectivity was rejected, even where it could be shown as more 'efficient' in some narrow technical sense. There was, of course, no question of supplying an input such as water for irrigation to every farmer. But others such as fertilizers and quality seeds were to reach as wide a clientele as possible. This was declared policy; to what extent the particular institutions and mechanisms adopted for carrying out this policy fulfilled this aim is a different matter. But by the early sixties, this strategy itself came to be abandoned in favour of a more selective approach. The aim this time was to get a quick increase in output of foodgrains from those areas and farmers that had a ready potential for development. From a total of 320 districts in the country, 15 were selected for concentrated attention. Scarce resources, both material and personnel, were to be supplied liberally in these favoured areas. An important criterion for selection was availability of plentiful water for irrigation. Of the 15 districts selected, eleven were devoted mainly for growing paddy, two for wheat, one for millet and one for jowar.

There have been a number of evaluation studies of how well this selective-cum-package strategy performed in relation to its professed aim of increasing yields per acre of the principal foodgrains mentioned above. The general conclusion has been that the program was but moderately successful. After a detailed comparison of changes in crop yields in the selected districts with corresponding figures for other districts, as also on a time-series study of yields in the selected districts before and after the introduction of the program respectively, D.D. Brown (1971:59) concluded that gains in output and yield were no better and no worse in the 'package' districts than in the others; as that per time-series data significant changes had occurred in only three out of the 15 districts. After a similar analysis, Mellor (1968:86) concluded that the program had little impact on production or productivity of paddy in the selected districts in comparison with the other districts; that in the case of
wheat the program merely strengthened an upward tendency in yield and production; and that the only distinctive gain was a spurt in the use of chemical fertilizers. Desai (1972: 144-53) also arrived at a similar conclusion.

To what extent the program suffered for want of a clear-cut improvement in technology or price support, or, positively, contributed to the preparation of farmers and extension personnel for a more intensive strategy of crop production that was to follow soon with the availability of high-yielding variety seeds, are matters that we shall not go into here. What is more directly relevant is to see what changes in strategy were considered necessary in the light of emerging circumstances.

Interestingly enough, both the points of view – one in favour of abandoning selectivity and the other in favour of even greater selectivity – were pressed with vigour on the government. The pressure for abandoning selectivity was mainly political. State governments were getting increasingly resolute about defending a strategy that was touching such a small proportion of the cultivated area and of farmers. Thanks to their lobbying, to the 15 'package' districts, 140 were added for intensive development. By the time the High Yielding Varieties Programme (HYVP) came to be introduced in 1966, 250 districts had qualified for special attention. Within a period of five years, roughly one out of every two cereals farmers with facilities for irrigation was to be helped to switch to a cultivation program based on the high yielding new seeds, with all their associated inputs and practices. This development can only partly be regarded as a deliberately thought-out strategy on the part of the central government. In part it represented recognition of a fait accompli presented by the State governments to the Central Planning Commission. A June 1967 report on the working of the HYVP in the first year complained that though the Govt. of India had advised the States to take up the programme in a few districts in the interest of compactness and proper supervision over implementation, the reports received from the States indicated that the kharif programme of high yielding varieties was implemented in 1747 blocks in 258 districts in the country ... The selection of such a large number of districts and blocks resulted in the dispersal of production efforts over wide-spread areas raising problems
of staffing, supply of inputs and field supervision (India, Directorate of Economics and Statistics 1967:11).

The arguments in favour of even greater selectivity found a strong advocate in Professor D.K. Desai. He wrote in 1969:

Unless a strategy is evolved to combine the scarce resources of technical, financial and administrative inputs with the managerial inputs of the efficient farmers, rapid growth in agricultural production may not be achieved. This lesson of the I.A.D.P. experiment should not be lost and the same mistake should not be repeated in the High Yielding Varieties Programme. Let the most efficient farmers adopt this programme wherever they are (Desai 1972:154).

Given the processes of economic and political decision-making in the country, this advice evoked little support among policy makers. The trend towards greater and greater dispersal has gone unchanged in subsequent years.

In the event, the availabilities of the critical inputs such as fertilizers and pure seeds lagged well behind the requirements of a quick saturation of large areas that was the cornerstone of this strategy. Two important results followed which we may note briefly here. To the extent that the strategy was very faithfully implemented in particular States or for particular crops, the inputs including the technical and extension services have had to be spread rather thinly. Such thin spreading could take the form of everyone getting small and possibly sub-threshold level doses of critical inputs; or, particular inputs being supplied in adequate doses for given farmers and areas - 'area X has been given the benefit of an irrigation project this year, let area Y get the benefit of a seed multiplication farm' type of phenomenon. In either case, given the complementarity of the inputs, yield was likely to suffer. The other possibility was, of course, notwithstanding protestations of policy, a limited number of farmers in each area selected for the program might succeed in cornering scarce inputs, from seeds to credit, in the process negating the objective of taking modernization to every farmer. Empirical evidence seems to suggest a mixed phenomenon in different areas at different points of time. We shall review this evidence,
though only in a summary form, in the next chapter.

**Instruments**

The term 'instruments' is used in a broad sense here, to include both organizations and personnel employed in the process of agricultural modernization. Such organizations and agents may have a wider role to play than merely spreading improved production techniques among farmers. In India, for instance, the system of 'Panchayat Raj' initiated during the late fifties to take over a number of local development functions was also expected to provide training opportunities for the rural population in the politics of self-government. But our interest in these organizations will be limited to their role as agents of agricultural development.

As the immediate focus of this study is on technological improvement in agricultural production, we could begin this summary description of major organizations connected with the development process of Indian agriculture by looking at the research base. The Indian Council of Agricultural Research (ICAR) was established in 1930, following the recommendation of the Royal Commission on Agriculture (1928). Over the years the Council has developed into a broad-based research organization, sponsoring or co-ordinating research work in a number of research stations and experimental farms and also liaising with its international counterparts. Given the wide variety of crops and agronomic conditions in the country, it is impossible to develop a viable research system through a few major national institutes. The emphasis in the Council of late has been to stimulate adaptive research at the State level to tackle specific local problems. This it tries to achieve through State-level research stations and agricultural universities. Some good results have been claimed from attempts at promoting localized adaptive research. For instance, the Punjab Agricultural University is said to have released two varieties of wheat and two varieties of rice to suit local conditions and requirements between 1971 and 1973 (Johl and Mudahar 1974:124). That the country has developed a research base of very considerable potential has been acknowledged by a number of observers (Crawford 1974:67; McClung 1972:30-1). There are over 70 agricultural colleges, turning out on an average 5000 graduates in agriculture every year. Compared to other developing countries of Asia or Africa, India is perhaps more strongly placed in its capacity to generate research and trained personnel.
The other efforts of the last decades relate to creation of new organizations to tackle specific tasks or the strengthening or restructuring of older ones. These relate mainly to production/distribution of essential inputs for agricultural development or supply of extension services in the rural areas. Both publicly-owned and privately-owned organizations have been pressed into service for this purpose. Let us take chemical fertilizers, for example. The level of nitrogen use in India was about 40,000 tonnes in 1951-52. Of this 11,000 tonnes (27 per cent) was produced within the country. By 1973-74, the use level had gone up to 1.7 m. tonnes. Of this 1.1 m. tonnes (65 per cent) was locally produced and much of the expansion came from privately owned fertilizer factories. It is perhaps in the supply of credit that one can notice a range of tactics employed by the government in promoting organizations for agricultural development. The initial emphasis was on strengthening and expanding co-operative societies of farmers. This policy served its purpose in some areas for some of the farmers. The Agricultural Refinance Corporation set up by the government was intended to fill the gap in areas where the co-operative structure was weak, particularly in lending for land-improvement purposes on a medium and long term basis. In some cases, privately developed institutions have been taken over by government with a view, at least partly, to orient their operations towards agricultural development. The nationalization of leading commercial banks in 1969 with the directive that they turn away from their near-exclusive attention on urban business requirements to the needs of farmers is a case in point. Under the impact of this policy and within a period of five years, the number of branches of these banks in the rural areas increased by nearly 50 per cent, and the number of farmers served and the amounts advanced for agricultural production purposes went up nearly ten times. Another public sector organization, founded in 1965, namely the Food Corporation of India, began to trade in imported fertilizers at the wholesale level as a supplement to and in some ways as a check on the activities of private dealers. In regard to water development, besides the usual activities of the Public Works department in constructing major irrigation dams, etc., the main emphasis has been to provide infrastructural services to the farmers for developing their private sources of water, by provision of credit, groundwater surveys, etc.
We can now turn to look at the machinery employed by the government for administering the development program. The importance of the administrative element in the development process has been rather elaborately underlined in India from the beginning. The approach was made explicit by the Indian Planning Commission when it stated in the First Five Year Plan (India, Planning Commission 1952:111) that 'in all directions, the pace of development will depend largely upon the quality of public administration, the efficiency with which it works, and the co-operation which it evokes'. The Commission also observed that 'in some fields of development, the existing agencies will need to be supplemented and strengthened; in others, new agencies will be required to carry through the Plan'. The most important single agency newly created for purposes of agricultural development since the attainment of Independence was, of course, the Community Development and the National Extension Service.

The Community Development (CD) program was inaugurated in October 1952, in the form of 15 pilot projects in different parts of the country, drawing upon the experience of isolated rural improvement projects. Each of these projects covered a 'block' of 60 to 100 villages, with a multi-purpose village level worker (VLW) for a group of five or six villages each. Within a year, the National Extension Service (NES) was integrated with the CD block organization, and a string of extension officers (EOs) in agriculture, animal husbandry, rural industries, etc., headed by a team leader, designated as the Block Development Officer (BDO) was made available by the government to each block. By March 1956, 1075 such blocks covering 25 per cent of villages had been established, and by the mid-sixties the rural population was fully covered by this agency for rural development.

The objectives envisaged for the movement were comprehensive and ambitious. The then Deputy Chairman of the Planning Commission had described them as the creation 'in the millions of rural families a burning desire to change their old-time outlook and arouse enthusiasm in them for new knowledge and new ways of life'. It was to be 'ensured' that 'every family has a programme for increased employment and production for which it is assisted; that every family is represented on at least one multi-purpose co-operative society in its own right; that every family makes its voluntary contribution to works of benefit to the community as a whole'.
There is a sizeable literature on the strengths and weaknesses of this program (Balwantray Mehta Committee 1957; Dube 1958; Hanson 1966:282-4; 420-7). For our limited purpose, we shall merely take note of the following:

(a) Organizationally, the program was based on a view of Indian rural society that stressed the commonality, if not the homogeneity, of interests of the different classes constituting that society. The watchword was community spirit, co-operation and voluntary effort, and not divergence of interests or imbalance in influence among the classes. On the face of it this may appear surprising, for the highly differentiated and hierarchical character of Indian rural society has been a by-word among sociologists. Possibly, in the minds of the planners what was initially perceived as an ideal to be achieved became confused with reality. As Hanson observed, 'rural development policies have rested on an ideologically-inspired assumption of a degree of unity and common purpose among the peasantry that is at variance with the realities of village life' (Hanson 1966:534). P.C. Joshi voiced a similar view. 'The existence of mutually antagonistic interests in rural society is hardly favourable for the success of the type of community participation which the (CD) programme visualises' (Joshi 1968:461).

(b) Stemming from the above view, the mechanisms developed and the organizations set up for stimulating popular participation and local initiative in development activities were such that by and large they bestowed greater prominence and power to the traditional elite in the rural areas. It would appear that this development was not peculiar to India (Myrdal 1968:1334-46; 1366-84).

(c) The 'delivery system' for this program was almost exclusively bureaucratic to start with. The dominance of the bureaucratic element came in for severe criticism as the years went by and it culminated in the establishment of 'Panchayat Raj' (a three-tier system of locally elected councils, at the village, block and district levels) to give directions to and control the activities of the officials involved in the program. Whether this change marked an improvement in either the nature or the speed of rural development has been hotly debated.2 We shall merely note

2 For the two conflicting views, see India, Administrative Reforms Commission 1967:20-4; and Ram Reddy 1974.
here that the controversy has never been as to whether the basic field-agent, directly in touch with the farmer, should be an official or a non-official, but only whether at particular levels of supervision the agency should be a bureaucratic or a non-official one. For all its declared commitment to socialistic ideals and policies, the parties in power did not attempt to generate a cadre of party workers or other non-bureaucratic agents to actively undertake rural development work, in conjunction with the official agencies, or on its own momentum.

In the flood of criticism that has been heaped upon the CD and Panchayat Raj programs, it is easy to overlook one of its solid achievements, and one which has endured beyond its immediate purposes. This was the wide network of extension workers in various disciplines connected with rural development that was built up all over the country as part of this program. A summary picture of the personnel recruited and trained for this purpose over a period of about ten years has been provided in Appendix III. They constitute the arteries, the general conveyance system, for the package of rural development services chosen at any given time. Jawaharlal Nehru had once described the Community Blocks where these administrative personnel were located as 'centres of human activity which are like lamps, spreading their light more and more in the surrounding darkness'. The torch has been lit, even if the battery charging it has proved weak.

A brief reference to the general administrative machinery in the rural areas, with which the specialized extension machinery has also been meshed, would be in order before we proceed to look at the techniques employed to plan and implement rural development programs. 'Under-developed societies tend, almost by definition, to have underdeveloped administrations. As it is to the administrations that a major share of the practical tasks of development is confided', wrote Hanson (1966:268), 'we have here another of the notorious vicious circles that whirl around in developers' nightmares'. But he was quick to add that

India, for all the administrative deficiencies which she displays, is exceptionally fortunate. The British left her with a well-articulated, smoothly-functioning administrative machine, headed by an elite corps which could stand
comparison with any analogous body of senior administrators anywhere in the world (Hanson 1966:268).

Of late, however, there has been some dispute as to whether the colonial legacy was more an asset or a liability for the demands of a development administration. A recent study sponsored by the United Nations described the administrative legacy in the context of India and Pakistan as an 'irrelevance' (Lefeber and Datta-Chaudhuri 1971:78). What was recognized quite early on was that a different spirit or approach would be required among the bureaucrats when the task is promotion of rural development, instead of merely collecting taxes or keeping order. While drawing up the very first Plan, the Planning Commission described in somewhat lyrical terms what it regarded as an essential need for a change in philosophy within the administration in keeping with its new responsibilities. 'By approaching the people as comrades in the same cause, disclaiming privilege and status and eager to learn and to help, those engaged in administration can make an immense contribution towards creating the conditions in which public co-operation can grow' (India, Planning Commission 1952:146). In the realm of rural development administration, this new spirit in dealing with the people was also to be matched by a change in the traditional authoritarian boss-subordinate relationships in favour of a team spirit among the officials themselves (Dube 1958:90). We shall not go further into the question as to what extent such a change in philosophy has in fact shown signs of emerging.

The more tangible aspect of the change had to do with the structures and the styles of administration. There were repeated if somewhat vague calls for reform in successive official and non-official reports; but little concrete action. More than 20 years after the first Plan had been launched, the Planning Commission began its chapter on 'Plan Implementation' in the Fifth Plan with the following words:

In every Plan, the problems of implementation have been discussed and general remedies have also been suggested. Some of the basic weaknesses in the process of implementation have been identified from time to time ... In spite of this, there has been no significant improvement in the levels of performance (India, Planning Commission 1973, Part 1, p.92).
The verdict was more direct when the document reviewed the implementation machinery for an aspect of agricultural development policy on which government had invested a lot of importance from the very beginning, namely, land reforms. 'The administrative organisation has proved to be an inadequate instrument for the speedy and efficient implementation of land reform' (India, Planning Commission 1973, Part II, p.44). There is perhaps a touch here of what Hanson called the practice of using the administration 'as a whipping boy' for the economic miscalculations or political vacillations of the leadership; but the point itself is well-taken.

There were two aspects of the administrative legacy that directly impinged upon the performance of rural development programs and which were perhaps more directly amenable to change had the planners pushed for the change strongly enough, as compared with changes in such intangible things as the 'spirit' of administration. These were (a) the one-way flow of ideas and orders, within the administrative structure; and (b) the increasing severity with which administrative activity was reduced to a set of tightly prescribed 'tasks' as one went down the hierarchy. The tasks themselves were, in turn, reduced to targets, which the functionaries had to fulfil, not to understand, much less evaluate critically or question. Successive Plan documents waxed eloquent upon the theme of the feed-back and iterative process of agricultural development planning. But there was little systematic examination of whether the administrative system prevailing in the country, which at best stressed horizontal co-ordination but not vertical consultation, was even consistent with the planning process that was sought to be ushered in. Another corollary of the old system was that there was little flexibility at the operating level, and little scope for field workers to develop initiative in response to the particular environment in which they may be working. Moreover, in the minds of field workers adherence to prescribed procedure took precedence over fulfilling the larger objective of administrative action. The position was fairly summed up in the report of the Study Team on Agricultural Administration of the Administrative Reforms Commission:

The administrative pattern, agricultural administration being no exception, is oriented more to procedure than to performance. Checks, counterchecks and inspections have assumed more importance than service. Performance is geared to inspections; inspections are based on targets;
and targets are related to financial provision (India, Admin. Reforms Commission 1967:254).

Professor Ram Reddy (1974:64) highlighted another feature of the administration which has a direct bearing on the implementation of agricultural development programs, namely, lack of consciousness of the time element. 'The system' said Professor Reddy,

is based on suspicion and distrust and encourages the administrator in charge of a programme to play for safety ... The inadequacies of the Indian bureaucracy are not due simply to the fact that it is a bureaucracy but due, to a considerable extent to the fact that it carries too much baggage from the past. Procedures place relatively too little emphasis on 'dispatch'. Agricultural administration in relation to the evolution and communication of agricultural policies and programmes at the national and State levels is the victim of these outmoded procedures (Ram Reddy 1974:64).

Enough has been said to indicate the weakness of the system in meeting the two dimensions of 'dispersed decision-making' and that too 'within comparatively rigid time-spans and sequences' which, as Professor Raup (1967:29-58) pointed out, are the dominant features of administration and management of agricultural development.

Techniques

In the federal system of India, agricultural development falls primarily, though not exclusively, within the competence of State governments. However, in two important ways the Centre has a large influence on the manner in which the States undertake the tasks connected with agricultural development. First, development programs for agriculture have to fit into a larger national plan of development for the economy as a whole. The crucial decisions of linkages with the manufacturing sector (e.g. the fertilizers industry) and with imports and exports can be made only at the Centre. Secondly, the system of financing of plans is so heavily dependent upon Central government loans and grants that the values, perceptions and judgements of the Central authorities dominate the plans of the State governments. To these factors, one can add the further fact that helps this trend,
namely, the arrangement by which top positions in development agencies in the State bureaucracies are usually filled by civil servants who are recruited by the Centre and who shuttle between the Centre and the States during their career. This arrangement reinforces the consensus deriving from power at the Centre and in that of the States having been held by the same political party during the fifties and the sixties.

The choice of the specific objectives of the plan and of the strategies for achieving the objectives is very much within the ambit of the Central government, even though the National Development Council on which the State Chief Ministers sit has to approve these objectives and strategies. Given a set of requirements of particular crops, etc., for a given time-horizon, every other decision on the mix of programs, their relative weight and timing is made with reference to one important, almost over-riding principle, namely, ensuring consistency and balance inter-sectorally. Coupled with the strongly entrenched administrative tradition of clearly defined tasks within a hierarchical command-structure, this approach to planning leads to a poor view of local initiative or improvisation, and a high premium on fulfilling targets set from above. This is the key to understanding why the application of highly sophisticated techniques of planning, which as practised in India 'could stand as a text-book classic' (Mellor and others 1968:124) can sometimes lead to very curious results, particularly where it impinges on the activities of millions of farmers in widely differing agro-climatic and socio-economic conditions.

The point being made here is rather important for the main theme of this paper; and it would be as well to put it in some perspective. A central planning authority in a country, whether under a federal or a unitary set-up, has to make the initial decisions of a broad nature - assessment of resources for investment, design of strategy, etc. It has to give concrete shape to these decisions and fit them into the government budget, taking a variety of factors into account. In the Indian situation, for instance, the Federal government has to give advance information of the likely order of imports and total supplies of chemical fertilizers for the country. Without this kind of information, the field-worker will have no means of deciding whether he should encourage farmers to use more or less fertilizers in one year compared with the previous year. In addition, the central authority has to make clear the 'ground rules' - the incentive system, infrastructural support - for action by
local officials and guidance of farmers themselves. The arguments in favour of more flexible planning and greater local initiative are not, therefore, in any way pleas for leaving undone any of these essential tasks that can be done only at the higher levels.

The real question, however, is to what extent, for which activities, and in what manner the planning process gets reduced in practice from above to quantitative budgeting and targeting. To indicate, for example, to the district, block, or village level development worker that the price of fertilizers in the coming season will be such and such, or that supplies will be roughly of a certain order is one thing. But to lay down to these functionaries targets for fertilizer consumption, as if it is they, and not farmers who use fertilizers, is a different thing altogether. In the paragraphs that follow, some concrete instances of how misplaced targetry can make a travesty of planning are cited from published reports. They are meant to illustrate the more general point that when planning gets equated with achievement of targets, means become the ends and form takes precedence over substance.

The first example comes from a village-level study by Professor S.C. Dube (1958). He was particularly interested in studying how the VLW performed under the system of planning in vogue. He points out that the VLWs had been taught in their training institutes that their role was to stimulate the village community to discover potentials for development. They were expected to mobilize local resources, particularly manpower, for promoting development. Professor Dube then goes on to describe the realities of the VLWs work actually on the field - the preponderance of the old-style administrative over extension methods, the need to fulfil targets regardless of the consequences to the local community, and the resulting bewilderment and frustration among the extension staff closest to the farmer. One particular example cited by Dube relates to distribution of improved seeds. This had become part of the 'approved' schemes of CD blocks, which meant not only financial and other inputs were available, but in fact were pressed upon the village extension staff right from Delhi. Targets were laid down at the beginning of the year from the Centre to the States, from State capitals to district headquarters, from districts to blocks and finally from the blocks to the villages. For the functionary at any given level, fulfilling the target was the test of good performance and the surest way to satisfy
the 'boss' at the next higher level. To the twin bosses, one political and the other bureaucratic, sitting at the very top of the pyramid at Delhi, the fulfillment of the target tended to be equated with 'success' in the mind of the bureaucrat and with 'progress' in the mind of the politician. But where did all this leave the farmer and the VLW? Here in Dube's own words is the story of improved potato seed:

It was not only received too late for sowing, it was of an inferior quality (some of it being actually deteriorated) and was priced much higher than comparable or even better seed in the market. As a last resort, the VLWs had to appeal to the rich villagers to help save their jobs by buying this seed even though it was not needed. Notwithstanding these appeals, they could not thrust all the unwanted seed on unwilling villagers and had actually to pay the price of the unsold seed from their own salaries.

... In some cases the seed received by the Project headquarters was obviously of an inferior quality. It was evident that its use would not produce the desired and promised results. Yet VLWs were asked to distribute it in the area. The VLWs took it to the villagers who, after considerable pressure, accepted it with great reluctance and scepticism. The yield justified their misgivings. In the following year the VLWs found it difficult to sell more seed, though this time it was certainly excellent in quality (Dube 1958:186-7).

A study in the early sixties illustrated the same phenomenon in Andhra Pradesh (Ramana 1962:288-9).

The question arises: why did the CD project authorities, who must have had a clearer understanding of local problems than their counterparts at more remote levels, act in this manner, when simple commonsense would have told them that what they were doing was counter-productive? The answer is, of course, that they were under the same kind of straightjacket as the VLWs below them. There were approved budgets and schemes, targets to fulfill and expenditures to show. Planning had become synonymous with this approach all along the line. For a description of how the disease afflicted the block level 'planners', we turn once again to
Dube:

In this region\(^3\) people practice a local variant of the improved method of rice cultivation known as the 'Japanese method'. A comparatively small acreage was under rice in this area, and the method in use was almost as productive as the Japanese method. Yet because the Japanese method was being popularized throughout the state, even in this Project a great deal of time and energy had to be spent on it in compliance with directives from state headquarters. The same amount of effort could have been used much more productively in other areas of development work. Similarly, the Project officials had to spend a great deal of time exploring the possibilities of launching a sericulture project (and even making some initial preparation for it) in the clear knowledge of the fact that this region was unsuited for it (Dube 1958:93).

For an example of how 'targetry' can overrule commonsense at the next higher level of the district, we turn to an official report itself. This is a sample of what an evaluation team found of the manner in which the High Yielding Varieties Programme (HYVP) was being put through:

In February, 1966, the district authorities were informed that they would have to achieve a target of 15,000 acres in TN-1 variety during the kharif season of 1966-67. Already over 218 acres in ... talukas were covered under the variety ... On 8th March, 1966, the Chief Executive Officer of the Zila Parishad was informed that the Government had decided to allot to the district a target of 1 lakh acres under the HYV Programme during the kharif season (India, Directorate of Economics & Statistics 1967:17-8).

The report goes on to describe how the district council managed to bring the target down after pointing out that there was a total of only 65,000 acres in the whole district that would be suitable for growing this particular variety of paddy and concludes as follows:

\(^3\)i.e. the particular state where Dube did his fieldwork.
The formulation of targets in the villages, blocks and at the district level, thus, went through numerous revisions unrelated to suitability of the area for growing the variety, and resources in seed or fertilizers or either the preparation of [sic] the cultivators for growing TN-1 (India, Directorate of Economics & Statistics 1967:18).

It may be added that as the process of bargaining took time and as the district authorities were never sure whether they would succeed in their efforts with the State Government in making the program more realistic in coverage, the blocks were asked to raise their sights to match a district target of 1 lakh acres (India, Directorate of Economics & Statistics 1967:18). The experience was repeated in the following year. The report for 1968 observed rather gingerly 'that past experience and the local conditions were not fully taken into consideration while fixing targets and to this extent they suffer from lack of realism' (Programme Evaluation Organisation, June 1969:5). In part the phenomenon cited here reflects dilution of the earlier strategy of selective development to which a reference was made earlier in this chapter; but it also illustrates how the techniques of planning and implementation in use tended to convert aims of policy into strategies, programs and targets in a one-way process with ever diminishing concern to relate what is being done to what was needed locally or aimed at when the process started.

We may round off this part of the discussion by citing an example, again taken from an official report, of how the process operates at the State level. This particular example relates to a poultry rather than a crop improvement scheme, but the point it illustrates is the same:

In Andhra Pradesh, a duck extension scheme involving Rs. 200,000 was initiated because the Government of India offered a subsidy. The objective was to raise an exotic variety of duckling and upgrade the local stock by cross-breeding. Of the three centres planned, two

were started in 1959. An amount was allocated for cold storage hiring charges without first seeing if such facilities were available anywhere near the centres. A mammoth incubator with 2500 capacity was ordered for one of the centres while the maximum expected laying strength was only 100 eggs. After the buildings had been erected and equipment purchased, it was found that this particular breed of duck was not available anywhere in the country except in numbers too small to run even one centre efficiently. To solve this problem, the officials-in-charge of the centres bought the local breed which were multiplied and distributed among the people, even though the specific objective of the scheme was to discourage the spread of the local breed. A related problem arose - the eggs could not be disposed of because of lack of demand by the local market. These problems were still unsolved when a third centre was opened in 1962 (Nayar 1969:93-4).

What is interesting to note in this case is not that there were some miscalculations; but the manner in which the person(s) working the scheme felt obliged to fulfil targets (even by running counter to the basic objective of the program), rather than point out to the higher level planners that what they were promoting did not make sense. That some centrally conceived program, reinforced by the particular financial arrangement of development activities in India, takes priority over local reality and plain commonsense is also illustrated in the Report of the Agricultural Administration Committee, 1958, which states that 'in a State over 35 lakh acres were said to be water-logged but no scheme had even been included in the State plan to effectively check this menace and its adverse effects on production' (quoted by D.R. Gadgil in Khusro 1968:565, 1 lakh = 100,000).

While on this point, we may take note of how this particular style of administration can and does affect fulfilment of the objectives of planning in the first instance. Given that for the VLW, planning activities are communicated as a set of targets to be fulfilled, the aim of 'conveying' the new technology - the know-how as well as the inputs - to the general body of farmers and not a select few among them who are ready to receive them gets compromised. Clive Bell described the process by which this happens in the following
terms:

Convince a man holding 50 hectares that he should put half his land under high-yielding wheat and you have contributed as much to fulfilling your target as you would in successfully persuading fifty cultivators, each holding 1 hectare, to do likewise. And this does not allow for the likelihood that each small farmer may be more difficult to convince than the big farmer alone (Bell 1972:152).

To select more such examples that show the planning and implementation mechanism in a particularly bad light might be easy; but it is important not to lose perspective here. The point that is being made is not that the bureaucracy in India is unusually dense or perverse. If one looked close enough, similar instances of apparently unproductive and irrational behaviour could perhaps be found in other bureaucracies. The disabilities of bureaucratic institutions even in discharging routine responsibilities, not to mention in initiating and sustaining change, that affects the daily life of millions, have been well documented. Our purpose in citing these examples is more limited, namely, to illustrate how a pronounced reliance on the administrative instrument which itself works on the traditions and techniques of an earlier era, with a strong aversion to variety and improvisation can handicap the development process.

The issue, however, goes beyond familiar polemics between centralization versus decentralization, and between concentration and delegation of planning decisions and administrative action. It touches, in a more basic sense, on what is being planned, on the planners' perception of the nature and purposes of administrative action. Agricultural planning has tended to be practised as the formulation and implementation of a series of investment proposals - on irrigation works, on seed farms, etc. - by fulfilling which some desired results will be achieved - such and such order of increase in the output of particular crops, etc. What tends to be lost sight of in the process is something which is as obvious as it is important, namely, (a) the relation between input and output cannot be so mechanistically determined in a biological process that characterizes agricultural production as

\[ \text{i.e. the extension personnel.} \]
contrasted with, say, industrial activity, and (b) even if the nature of the relationship could be ascertained with reasonable accuracy in advance for a particular area, farmers and crop, the decisions themselves, in a system of private ownership of land, rest with farmers. To quote Professor Dandekar on the subject:

A plan is a plan in the true sense of the term only when it is a proposal for action on the part of the one who makes the plan ... The reasons our plans for agricultural development have not been plans in the true sense is that they have not been essentially plans for state action.... Consequently, many of their targets lack real meaning, validity, and sanction ... We witness the district and block agricultural officers and the extension workers under them running around with targets of agricultural production, crop by crop, targets of areas to be sown under different crops, targets of areas to be brought under new minor irrigation, targets of green manuring, and targets of compost pits to be dug ... In all these cases the officers and extension workers know full well that what they can do in achieving these targets is very limited, and that the final decisions lie with the farmers. But they receive orders from above in terms of targets, and they must report their progress in terms of these targets ... In consequence, a whole make-believe world is created in which targets are determined and progress is reported in terms of items over which the parties concerned have no authority or control whatever (Dandekar 1967:11).

This may sound like a fairly self-evident proposition; but a glance at current plan documents as well as processes of working at various levels of administration would show that old ideas and habits die very hard indeed. A 1970 study by the Planning Commission covering 39 selected blocks, 286 villages and over 1200 rural households noted that the uniform pattern (of plan formulation, project selection and budgeting) offered very little scope for flexibility in planning and implementation of the detailed schemes in relation to local needs. A more flexible budget and staff structure to area needs would have undoubtedly resulted in
well-tailored schemes to fulfil local aspirations better than what was observed in this study (India, Planning Commission 1970b: 173).

This marked a hard-earned insight; what it still missed was something that Professor Dandekar had spelled out in some detail in 1967, namely, apart from infrastructural investments directly within the control of government, the processes of production in agriculture could only be indirectly influenced through incentives, education and organization. 'Planning' as it touches the farmer directly can only be to teach him how to make use of an existing facility better, and to expand and improve that facility wherever feasible. There is as such something that is inherently iterative and therefore tentative about this process of trial and learning between the farmer and the development agent, of jointly looking for opportunities for development in each local situation and devising the tactics and the techniques of action that suit the participants in that situation, rather than mechanical fulfilment of targets prescribed from above. And it would seem that a planning process that is so sparing of the scope for initiative and improvisation for its own agent on the field is unlikely to be appreciative of the need and scope for such initiative and improvisation on the part of the farmers.

One of the strong arguments in favour of transferring a large number of programs administered by permanent officials to locally elected councils has been that the latter are likely to be less wooden and more aware of local conditions and requirements. This was the pillar on which the Balwantrai Mehta committee based its recommendations for what it called a system of 'democratic decentralization' in rural development planning in India. What this argument overlooks is the fact that decentralization, whether 'democratic' or not, at the district level and below, without any change in the approach to and techniques of planning at the more crucial decision-making levels of the State and Central governments, would not be very effective. The tyranny of targetry, backed by financial sanction, can be very potent, as some of the elected bodies have themselves found to their cost. There are occasional cases (Programme Evaluation Organisation, June 1969:4-5) where a local body has defied targets given from above and devised its own programs, but as a rule, the effect of democratic decentralization, within an unchanged planning straightjacket, is that the village level bureaucrat finds
company from the ranks of political leaders in fretting at enforced and irrational uniformity.
Chapter 4

The achievement

The share of agriculture and allied activities in the national income of India fell from about 50 per cent in 1960 to 40 per cent in 1972 (at constant prices). However, nearly 70 per cent of the population continues to be dependent on agriculture for a livelihood. Hence, the performance of the agricultural sector remains crucial for the entire economy.

Table 1 presents, in a capsule form, main trends in the use of inputs, output and productivity in agriculture during two decades of planning. The picture presented by Table 1 is quite impressive. Within two decades, output has doubled (cereals output going up by a little more than 100 per cent, and of total output rising by a little less than 100 per cent), and yields have improved by 50 per cent to 60 per cent (depending on the choice of the terminal year). This is an order of improvement that is unmatched in the country during a corresponding interval of time in the previous hundred years.

For all this showing, however, a persistent impression is one of dissatisfaction. Some of it is derived from stagnation or worse during particular years. The Government's Economic Survey 1974-75 (1975:6), for instance, observed that 'The unsatisfactory performance of agricultural sector is the root cause of the stagnation of national income and the acute inflationary pressures which have emerged since 1972-73'. Looking at the general trend, however, the causes for dissatisfaction are to be traced to one or other of the following major considerations (some of these are perhaps relevant to countries other than India):

(a) Output is not growing fast enough, in relation to population growth, desired increases in per capita consumption, etc.
### Table 1

**Main trends in inputs and outputs in agriculture**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total cropped area (m. hect.)</th>
<th>Gross irrigated area (m. hect.)</th>
<th>Chemical fertilizers used (NPK-m. tonnes)</th>
<th>HYVP cereals area (m. hect.)</th>
<th>All agrl comds (1959-60 to 1961-62=100)</th>
<th>Cereals (m. tonnes)</th>
<th>Productivity</th>
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<tr>
<td>1950-51</td>
<td>131.9</td>
<td>22.6</td>
<td>(Negligible)</td>
<td></td>
<td>68.9</td>
<td>42.4</td>
<td>83.2</td>
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<td>147.3</td>
<td>25.6</td>
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<td></td>
<td>84.4</td>
<td>55.9</td>
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</tr>
<tr>
<td>1960-61</td>
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<td>28.0</td>
<td>0.3</td>
<td></td>
<td>102.7</td>
<td>69.3</td>
<td>103.3</td>
</tr>
<tr>
<td>65-66</td>
<td>155.4</td>
<td>30.9</td>
<td>0.8</td>
<td></td>
<td>95.8</td>
<td>62.4</td>
<td>92.2</td>
</tr>
<tr>
<td>66-67</td>
<td>163.7</td>
<td>33.2</td>
<td>1.1</td>
<td>1.9</td>
<td>116.6</td>
<td>83.0</td>
<td>111.5</td>
</tr>
<tr>
<td>67-68</td>
<td>163.8</td>
<td>37.3</td>
<td>2.0</td>
<td>11.4</td>
<td>122.5</td>
<td>87.8</td>
<td>112.7</td>
</tr>
<tr>
<td>68-69</td>
<td>159.7</td>
<td>35.4</td>
<td>1.8</td>
<td>9.2</td>
<td>114.8</td>
<td>83.6</td>
<td>107.6</td>
</tr>
<tr>
<td>69-70</td>
<td>163.8</td>
<td>38.6</td>
<td>2.3</td>
<td>15.3</td>
<td>131.4</td>
<td>96.6</td>
<td>118.0</td>
</tr>
<tr>
<td>1970-71</td>
<td>167.4</td>
<td>38.6</td>
<td>2.7</td>
<td>18.0</td>
<td>130.9</td>
<td>94.1</td>
<td>117.2</td>
</tr>
<tr>
<td>71-72</td>
<td></td>
<td></td>
<td>2.8</td>
<td>22.1</td>
<td>120.6</td>
<td>85.7</td>
<td>110.4</td>
</tr>
<tr>
<td>72-73</td>
<td></td>
<td></td>
<td>2.8</td>
<td>25.5</td>
<td>131.6</td>
<td>93.9</td>
<td>114.5</td>
</tr>
<tr>
<td>73-74</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

(a) Comparable data not available; as per indirect evidence there was little change in 1971-72 and perhaps a marginal decline in 1972-73. Area figures for 1973-74 have not yet been published. *(IAB 13th Ed. 1974:70-2).*

(b) Comparable figures not available but there is some evidence to indicate that the expansion continued after 1970-71 also, roughly at the rate of 2 m. hectares per year during 1971-72 and 1973-74. *(Economic Survey 1974-75, p.67)*

**Sources:**

1-2: *Indian Agriculture in Brief (IAB)*; 13th Ed, 1974, pp.10-11;
(b) The rate of increase, such as it was, has tended to slow down of late - *(Economic Survey 1974-75* (1975:3) noted that 'There is considerable evidence to suggest that India's agriculture seems to have lost the momentum for growth it exhibited in the late sixties').

(c) Instability is tending to increase with the rate of growth (Sen 1967).

(d) The cropping pattern and the composition of output are changing in ways that should cause concern from a long-term point of view, particularly from the point of view of maintaining balance - between food and clothing, between internal consumption and exports, and more particularly from the point of view of improving living standards of the poorer sections of the community (Lipton 1970:127-48; Narain 1972; Raj 1974).

(e) Imbalance, as between regions and classes of farmers within the country, are getting accentuated under the influence of the new technology (India, Planning Commission 1970a:149; Frankel 1971:191-3; Bansil 1972:104-17).

These five major strands of criticism raise a whole host of issues of theory and policy. We shall take up for consideration only such of these that are directly relevant to our study here. The first point relating to inadequate growth is obvious enough. Point (d) relating to shifting composition of output raises important questions. There are many imponderables in this situation and we shall not indulge in speculation as to what role miscalculation or prejudice on the part of authorities should be held accountable for the observed results to the extent that these results were within their control at all. Nor shall we pursue (c) relating to increasing instability as it is perhaps premature to take a view on this question in relation to the technology now being pushed through. Points (b) and (e) reflect a swing of the pendulum from the euphoria of the Green Revolution of the late 1960s. As comments on the efficacy of the 'new' technology in generating a sustained increase in output, and the costs to society of that strategy, they call for a somewhat closer examination.

It has of late become commonplace to use as an index of 'progress' or 'modernization' the area planted with high yielding variety seeds from year to year. Reviews of 'the state of agriculture' are replete with such data, particularly in relation to developing countries that are dependent on
these cereals. This is, however, a very partial index. Table 1 shows that the direct correlation between the area covered by HYV seeds on the one hand and yield per acre under actual field conditions is not very striking, even though for particular crops such as wheat, yield improvements associated with the new seeds was quite spectacular, specially in the early years. It was as recently as 1970 that Mr Lester Brown had written that 'the paramount threat to the Green Revolution is increasingly the availability of markets rather than production technology' (Brown, L.R. 1970:97). A review only four years later in respect of Sri Lanka brought forth this comment:

What has struck us most forcibly is that adoption by itself does not necessarily lead to agricultural development or even to substantial increases in productivity ... We have a situation of adoption with the results obtained from it considerably lower than what was expected. Much of the research up to now has had adoption itself as its focus, whereas the evidence from this survey as well as others indicate that Sri Lanka has moved beyond that stage. The focus should be on identification of the factors limiting the benefits from adoption ...

A level of adoption beyond the capacity of the farmers and the ecological and the socio-economic environment to support it could be considered as over-adoption ... over-adoption has probably increased the vulnerability of agriculture to adverse changes in the ecological and socio-economic factors affecting farming. Over-dependence on a technology which can produce efficiently only in a fairly exacting ecological and socio-economic environment is particularly dangerous for a developing country which cannot ensure favourable conditions for its farmers (Dias and Gunawardena 1974:7-13).

Having presented the above view as an example of the reaction against the earlier 'over-sell' of the green revolution, we now proceed to look more closely at the characteristics of 'the technology' and the characteristics of the 'ecological and socio-economic environment' which are relevant to its adoption.
Chapter 5

The questions

Questions relating to the 'socio-economic environment' - the pattern of landholdings, systems of irrigation, structures of market, etc. - in which farmers act are reserved for consideration in the next chapter. In this chapter we discuss issues relating to the technology as such, the aspects that are relevant to its adoption by farmers, and by the same token, relevant to its active promotion by the Government as a strategy of development. First it is necessary to dispose of the statistical as distinct from the more substantial aspects. Official data on the subject are prone to some error. In India, for instance, the coverage figures by land area reported to be sown with HYV seeds are often notional, computed from seeds distributed to farmers and assumed norms of seed usage per acre. This indirect index is used because of practical difficulties of collecting in reasonable time areas actually sown with HYV seeds. It is much easier to get a measure of the seeds distributed, much of which takes place through public agencies (official and co-operative), than their subsequent use by individual farmers. To the extent that farmers adopt seed rates different from the norms assumed by the Department, there is liable to be error. Field studies\(^1\) show that, as a rule, farmers use a higher dosage than that recommended to them. Hence the coverage figures are likely to contain an upward bias. For purposes of gauging trends in use over a period of time, this bias may not pose a serious difficulty. Even here, there exists the possibility of the seed not reaching farmers in time for the sowing season. When such delays occur farmers may take delivery of the seed because they are committed to their use, but may later use it for consumption purposes. To the extent that the duration of such delays - or, more generally, the occurrence of factors that result in

the use of the seed for purposes other than that intended by the authorities - from year to year may not be of a random nature, there are difficulties of counteracting this bias even for purposes of assessing trends, particularly where the number of observations is limited.

Also, where varieties considered as merely 'locally improved' one year are upgraded and classified as HYVs in subsequent years, part of the reported expansion in the HYV acreage is a statistical illusion, as far as effects on yield are concerned. In international comparisons this definitional problem exists even in a given year.

In relation to agricultural production it seems useful to distinguish between the terms 'techniques' and 'technology'. One can simply say that a technology is no more than a bundle of alternative techniques of doing a given function or activity. An advance in technology so-called can take more than one form. It may simply open up a more convenient or cheaper way of performing an old job - just one aspect of agricultural production such as ploughing. This kind of an improvement is more likely to be the result of an advance in engineering than in, say, genetics, though for that reason it may be of no less consequence to the farmers. At any given time, therefore, farmers have a range of choices or techniques of doing various things connected with crop production. Thus a farmer may avoid machines in ploughing (using a bullock-drawn implement rather than a tractor), but may resort to machine-pumping of water for irrigation. Similar examples of alternative techniques of attempting other tasks in raising a crop can be given.

What the seed-chemical advance for rice, wheat, corn, etc. represents is that, for a given combination of inputs (such as water and fertilizer), a much larger output becomes possible. One must ask whether this innovation implies an advance, a new technology - a different isoquant standing for a decidedly more efficient input/output combination in conventional diagrams on the subject - which everyone must utilize if he is not to be castigated as a 'laggard'; or whether there is now, as a result of this innovation, a unique package where there was a bundle of alternatives earlier. To answer this question, one must first define 'inputs' and 'techniques' more rigorously. For our purpose, it is enough to note that to the extent that the new seeds embody certain characteristics (in regard to absorption of nitrogen and yields) which make them superior to the
traditional ones, with less than perfect substitutability between them, we have a new 'input' rather than a new 'technique'. At this stage, therefore, one can say that while alternative ways remain of performing specific tasks in agriculture (i.e. in applying the inputs), the new seeds embody a unique technology by giving rise to a new input.

But this is only the starting, not the stopping point, for analysing the implications for policy. It is known that the market situation faced by different farmers in developing countries is not uniform even within a small locality. The prices charged for inputs (including credit), and the prices obtainable for the output can vary considerably from one class of farmers to another. Some can mobilize cheap labour, others have access to cheap credit. Some are obliged to sell their produce soon after harvest when prices tend to be low, others can hold on to their stocks and reap the benefit of higher prices. Under the circumstances, farmers can be expected to make different choices not only as to what inputs and how much of the inputs they should use, but also in what way they should use them. This problem can arise because of lack of freedom or knowledge on the part of particular farmers in making the choices. But more importantly, it arises because farmers are not driven by some overwhelming desire to maximize physical output, without reference to the particular set of prices they face as producers. The greater the reliance on purchased inputs, the more sensitive are the farmers likely to be to calculations of costs and returns. The point has been analysed by Keith Griffin (1974:Ch.2) in relation to the new seeds, and more specifically by P.A. Yotopoulos (1974:263-74) in the context of Indian agriculture. It follows, therefore, that a recommendation to farmers in favour of one unique package of inputs ignores this reality.

In trying to understand how an advance in technology presents itself to the farmers on these lines, we seem to have fallen back on the view mentioned earlier of agriculture as a range of tasks which itself varies with time (e.g. irrigation, when it is first introduced), or some of which assume a special significance (e.g. plant protection while using seeds which are particularly prone to pests and diseases) and alternative ways of doing each of these tasks, rather than some specific combination of inputs. We shall keep coming back to this view.

The merit of the new seeds, as commonly explained, is that it yields better when used in combination with water
and fertilizer. Let us now look at some data on fertilizer application by farmers using the new seeds on their (irrigated) rice farms. Table 2 compares doses of nitrogen recommended by the research scientists with the actual doses applied by the farmers, by size group of farms, between 1967 and 1969 in four prominent rice growing States of India.

Table 2

<table>
<thead>
<tr>
<th>State</th>
<th>District</th>
<th>Fertilizer dose recommended kg.N/hect.</th>
<th>Actual dose applied (kg.N/hect.)</th>
<th>Decile size group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I</td>
</tr>
<tr>
<td>Tamilnadu</td>
<td>Coimbatore</td>
<td>45</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>N. Arcot</td>
<td>45</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Thanjavur</td>
<td>48</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Orissa</td>
<td>Sambalpur</td>
<td>24</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Cuttack</td>
<td>24</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>Varanasi</td>
<td>22</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Basti</td>
<td>22</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>Thana</td>
<td>24</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Bhandara</td>
<td>18</td>
<td>1</td>
<td>6</td>
</tr>
</tbody>
</table>

Note: The decile groups were formed as follows: farmers were ranked from lowest to highest by operational farm area and the ranked list was then divided into ten groups with equal numbers (deciles) of farms. The ten groups were then combined to form four broader groups, the smallest three deciles into Group I, the next three into Group II, the next higher three into Group III, and the last and highest decile into Group IV.


The first point that strikes anyone is that in none of the districts under study did any of the farmer groups...
apply the full dose of fertilizer recommended to them. It is no doubt important to what extent this was the result of sheer shortage of fertilizers in the relevant years, defective supply arrangements, unfavourable price ratios, or scepticism on the part of the farmers in acting on the recommendations given to them on a somewhat general basis for whole areas without reference to soil and other characteristics of particular farms. But we shall not go into causes here. Let us look merely at the effect on yields of such 'sub-optimal' use of one input, in this case chemical fertilizers.

Here one immediately runs into data problems. In an experimental farm, under controlled conditions it is possible to study yield changes in response to varying intensities in the use of one input. This procedure becomes impossible when we are trying to study yield behaviour on actual farms spread over a wide area. To compare actual farm yields with yields obtained in research farms for the varieties under consideration will not help in identifying the effect of sub-optimal use of one particular input in which we may happen to be interested for the moment. It is interesting, however, to see what levels of fertilization the research scientists themselves use in the demonstrations arranged by them on farmers' fields to show the superiority of the new seed varieties, the levels they recommend to the general body of farmers through the extension personnel, and compare these with the dosages actually being applied by farmers. Once again we have some data problems in analysing the situations for thousands of farmers, using a variety of improved seeds in a variety of agronomic conditions. But let us look at the broad magnitudes. In the four rice growing States referred to, nitrogen application by the scientists in the demonstration farms was above 100 kgs/hect. (India, Ministry of Agriculture 1974:103). With fertilizers getting more scarce the Indian Council of Agricultural Research has also set its sights lower. A recent publication describing the results from certain experiments conducted by them noted that 'even with a moderate level of 50-60 kg./hecet' (and with some careful management), 80 per cent of the potential yield could be obtained. The same report went on to caution, however, that 'the minimum threshold level of N should not be less than 40 kg.N/ha as the response at lower levels of N was not found to be pronounced (India, Department of Agricultural Research and Education 1975:7). The paddy varieties used by the farmers in the four states during 1967-69 were not necessarily the variety in respect of which this particular research result has been reported. But the
question does remain: given the concept of a threshold level of application of an individual input that is in short supply, to what extent a development strategy that pushes a large number of farmers to use not merely inadequate but possibly ineffective doses of the crucial inputs is justified in terms of either increasing national production or of farmers' net incomes. The question goes back to the choice between a broad-based versus a selective strategy of development referred to earlier in Chapter 3. A re-examination of strategy in the light of the known characteristics of the technology now being promoted everywhere and given the scarcity of critical inputs would seem to be called for.

Let us now turn to look at the other characteristic of the new technology, which has been stressed so strongly, namely, complementarity in the use of the different inputs. As an FAO document put it, 'the returns from several inputs used together exceed the sum of the returns from them when used singly, provided the inputs are used in the right proportions and are properly adapted to the ecological conditions' (FAO 1968:80). The policy implication of this view is also clear. The same document of the FAO put it rather categorically: '... it is essential that technological improvements should no longer be introduced piecemeal in developing countries but as a "package"' (FAO 1968:80).

What this prescription amounts to is this: if you are going to give the new seeds to a farmer, make sure he gets everything else that has to go with it. Let us overlook for the moment the injunction about the 'inputs being used in the right proportions', and concentrate on the mere fact or otherwise of certain components of the package being applied. (Owing to difficulties of gathering data, we shall also ignore the question of the timing and manner of the use – which for items such as water and pest control chemicals may be as important as the quantum of use). Table 3 summarizes findings from field surveys on the use of the package recommendation under the HYVP in India.

The figures cited have been taken from sample studies and cannot be taken as indicating anything more than the broad magnitudes of the extent of penetration of the new technology in its full package form. We have little direct information as to why farmers adopt some but not others of the inputs and practices, or why they vary, in the particular agro-economic conditions facing them, intensity of particular measures and inputs in comparison with the 'norms' recommended
<table>
<thead>
<tr>
<th>Year</th>
<th>Season</th>
<th>Crop</th>
<th>% of farmers using HYV seeds who also adopt a minimum set of the package</th>
<th>Elements in the package considered</th>
</tr>
</thead>
<tbody>
<tr>
<td>1968 (a)</td>
<td>Kharif</td>
<td>Paddy</td>
<td>15.4</td>
<td>(Seed treatment)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maize</td>
<td>14.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bajra</td>
<td>3.8</td>
<td>(Fertilizers)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jowar</td>
<td>47.9</td>
<td></td>
</tr>
<tr>
<td>1969 (b)</td>
<td>Rabi</td>
<td>Wheat</td>
<td>9.4</td>
<td>(Plant protection)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Paddy</td>
<td>16.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jowar</td>
<td>55.8</td>
<td>(Inter-culture)</td>
</tr>
<tr>
<td>1973-74 (c)</td>
<td>Sornavari</td>
<td>Paddy</td>
<td>Nil</td>
<td>(Seed treatment)</td>
</tr>
<tr>
<td></td>
<td>(June/Aug)</td>
<td>Samba</td>
<td>(Transplanting)</td>
<td>(Manure (organic))</td>
</tr>
<tr>
<td></td>
<td>(Aug/Dec)</td>
<td>Navarai</td>
<td>(Fertilizers)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Jan/Mar)</td>
<td></td>
<td></td>
<td>(Pesticides)</td>
</tr>
</tbody>
</table>

Sources: (a) Programme Evaluation Organisation, June 1969.
(b) Programme Evaluation Organisation, November 1969.
(c) Nanjamma Chinappa, 1974:20, Table 17. (Data relate to eleven villages in North Arcot district of Tamil Nadu, India. Number of cultivators covered were 309 in Sornavari, 493 in Samba and 277 in Navarai.)
to them. A somewhat common explanation of this phenomenon is that farmers find the recommended package uneconomic, and that they obtain acceptable yields without opting for the full package (Mukherjee and Lockwood 1973). Defective arrangements for the timely supply of inputs and lack of a sufficiently broad-based research-extension feed-back to ensure that the recommended package is specific to each area and class of farmers, are also equally plausible explanations.

Whatever may be the proximate causes, let us get back to the question we started with, namely, the impact on yield. We seem to run across not only inadequate empirical data, but inadequate knowledge on the basis of which predictions of yield under such suboptimal conditions in farmers' fields could be made. But the questions that arise are important for making policy. What levels of yield is the planner to expect when it appears probable that most of the farmers will be using less than the full package? Besides the seed, are there other critical elements in the package, such as pest control, without which the rest of the package is rendered unprofitable? For particular elements, such as fertilizers, are there minima, below which their application is unrewarding? On a given combination of inputs, what are the further influences of 'environment' and 'management' respectively on productivity? Are there indispensable elements of 'environment' or 'management' in the technology, and if so are they within the reach of the farmers? The interactions among inputs and their effect on yield are patently complex; we seem to have inadequate knowledge of yield patterns at lower intensities of resource use and less than perfect management under actual field conditions. This is not so much a comment on the technology itself, as on the manner in which it is 'sold' to the policy-makers in the first instance, and in turn diffused by them in the countryside.

Let us try and look at this problem as it might present itself to the individual farmer. For the reasons just noted, the yield behaviour on his farm is liable to be much less predictable than simple-minded recommendations may appear to suggest. But the farmer faces the further problem of having to commit himself to the adoption of the full package at the time the new seed is offered to him on the eve of crop season. But there are so many uncertainties in the situation, environmentally and managerially. There is no assurance in advance about the supply of other inputs in the local market as the crop season advances. There is perhaps even less assurance as to how much of the stocks getting to the local supply
point would come his way. Part of the uncertainty is inherent in agricultural operations. There is no way of predicting reliably whether there would be sufficient water for irrigation all through the season, or whether a pest attack on his plant might not materialize. The initial uncertainties regarding input-output relationships under varying packages and management are thus compounded for the farmer by uncertainties regarding what inputs are likely to be available to him at the time they are needed. This is not to mention uncertainty about price changes. Given these factors, it seems to be singularly inappropriate to classify farmers, as some studies tend to do, as 'progressive' and 'laggards' respectively on the basis of whether or not they are using new seeds.

It is, of course, expected that a government which sets out to promote increased productivity in the agricultural sector will also take steps to mitigate such uncertainties to the extent feasible, and possibly set up some insurance mechanisms to protect the farmer from losses arising from unforeseen changes. The extension agency can try to supply a self-contained kit of essential inputs right at the beginning of the crop season. There will be immense organizational and administrative problems to overcome, before this could be done for millions of farmers in villages served with poor transport and other facilities. There may also be the problem of inducing the farmer to purchase particular inputs (e.g. pest control chemical) to be used on a contingent basis (in the event of an outbreak of disease). But there is the further problem of implementation. Even assuming that government has supplied the inputs and has set up a price guarantee mechanism, etc., there is the further problem of identifying the timing and the exact nature of the operation to be carried out according to the conditions of the farm and inducing or guiding the farmer to take it up. Thus, it is not merely a question of supplying the chemical, but also of ensuring that it is used at the right time and in the right manner. This could be a major challenge in a country that is trying with a small band of experts and extension workers to modify age-old habits of management among farmers who are largely illiterate and in villages served by poor communication and other facilities. But these are the kinds of considerations that have to be weighed carefully before bland prescriptions of policy - 'promote a package and your food problems are solved' - are handed down by national governments.
Let us for the moment leave the complementarity aspect in the inputs, and turn to consider the other feature of the technology, namely, its divisibility, or returns to scale. This subject has received wide attention in recent years. Dr Griffin after a survey of the possible variations in the adoption of improved techniques by farmers with different endowments and access concluded that

The new technology ... is not characterized by important economies of scale and the growth in inequality which has in practice accompanied technical change is not a necessary consequence of attempts to raise yields. The problem arises not from the nature of the most appropriate technology, but from the bias of government policy and the fact that public institutions clearly are not scale-neutral (Griffin 1974:69).

Rao (1974:2) came to a similar conclusion in a recent study of Asian agriculture. The Government of India explicitly subscribes to this view (India, Planning Commission 1973, Part I, p.23) and the Indian Council of Agricultural Research (India, Dept Agricultural Research and Education 1975:189-90) claimed reconfirmation of this thesis by citing data to show that in 1178 national demonstrations conducted in farmers' fields in different parts of the country, no significant relationship emerged between size of landholdings and yields. Occasionally, a dissident voice could be heard. A paper by Rajvir Singh and R.K. Patel (1973:43-8) argued on the basis of field data that increasing returns to scale were found to be operating in the selected area and that the old hypothesis of inverse relationship between per hectare productivity and farm size does not hold true under the new agricultural technology. Even on a given sample, interpretations and conclusions can vary depending on the standardization procedures adopted for varying inputs, and the techniques used for eliminating the influence of differing managerial and other factors. We shall not here attempt a comparative evaluation of which finding is theoretically more defensible, but turn our attention to an understanding of the more important elements in this question as they might present themselves in practice to the average farmer.

Let us start with a consideration of how size might influence the first step in cultivation, namely, preparation of the soil. For loosening the soil, as a rule it does not make any significant difference whether the land is tilled
with bullock-drawn implements or by machines. But in the subcontinent, there seem to be areas where soil characteristics may make deep ploughing advantageous, and in some cases perhaps even essential. The required depth of ploughing in such tracts or clusters of farms may be unobtainable with animal-drawn equipment. In areas where HYVs are being grown and where moisture stress is a recurring phenomenon (and this may become an increasingly frequent occurrence in India as the government plans to push the HYV seeds program to areas not regularly served by irrigation facilities) deep ploughing may assume a special significance in view of its efficacy in improving moisture retention qualities of the soil (Lawrence 1970:15-7, quoted in Owens and Shaw 1972:170). Under these circumstances, a larger farm size which can take mechanized equipment could prove an advantage, particularly where facilities for hiring tractors by the small farmer are not well developed.

A similar argument can be developed, and in fact was developed at some length by Frankel, in the relationship between farm size and ability to provide controlled, privately-owned irrigation.

... the command area of the smallest tubewell is about 20 to 25 acres. Extension workers and the economists at P.A.U.² agree that the optimum size of the holding for the efficient cultivation of the high yielding varieties, assuming a tubewell and bullock power, is about 20 to 25 acres; this floor can be reduced with efficient management to 15 acres, but not below. Necessarily, therefore, the small farmer is denied the economies to scale enjoyed by large landowners. The returns to his investment in a tubewell will be lower than on 20 to 25 acre farms (Frankel 1971:29).

Instead of looking further for such examples, let us rather analyse their significance in more general terms. Firstly, one might distinguish between returns to scale of the specific elements of the Green Revolution technology explicitly, such as seeds or fertilizer and returns to scale from the appurtenances of any technology of agricultural production. In other words, it is possible to take the view, in the examples given earlier, that the higher returns to

²Punjab Agricultural University.
larger size, or the threshold size owing to indivisibility of the tractor or the tubewell reflect economy of scale from these machines, and not economies of the production technology in agriculture *per se*. If the technology of producing tractors or tubewells could improve so that their divisibility problem is got over, then this apparent advantage of larger farms in the Green Revolution technology will vanish. In fact, there are some who deny that modern units of agricultural technology are necessarily or even generally so large as to make their use on small farms unworkable or uneconomic. This is done either by pointing out that smaller machines are in fact available, or that less sophisticated but equally efficient agricultural operations such as the bamboo tubewell have been, or can be, devised, which will bring them within the reach of the small farmer (Dommen 1975:483-9).

Let us not succumb to the temptation to pursue this line of enquiry - whether it is the crop-breeder or the machine-maker who has been less mindful of the interests of the small farmer. From the point of view of this study, what emerges is the simple enough proposition that for each agricultural operation there seems to be a certain convenient and economic unit or size. This size is partly dependent on the nature of the operation and partly on the type of facilities generally available (equipment, physical access, etc.). Thus, for planting seeds, the minimum size for convenient operation is so small that size of the farm makes virtually no difference. The same thing can perhaps be said of application of fertilizers. But the physical environment in which these activities are attempted is important. Thus, for instance, the use of chemicals rather than bulky farmyard or organic manure makes the access problem easier for a farmer who wants to take the needed material across other farmers' fields. Chemical fertilizers can be carried in small bags and applied by hand; farmyard manure usually has to be transported in carts, and availability of carts and access across fields could both be difficult, particularly for a farmer whose 'farm' lies in scattered bits all over the village. In this sense, one could make the claim that the chemical revolution removed or at least greatly mitigated one disability from which these farmers were suffering earlier.

But when we extend this analysis to certain other agricultural operations, the usual small versus large farms arguments appear rather simplistic. Let us take, for instance, drainage or plant protection. Quite obviously,
there is a certain minimum size of operation here, below which it will be either ineffective or prohibitively expensive. Under Indian conditions, even the farmer in the highest farm-size decile in the village may find that his farm is not big enough to undertake really effective soil conservation or drainage improvement. This may be true even for a current (as distinct from a capital investment) operation such as fighting an attack of pest on his farm. There is a degree of interdependence among the farmers that is inherent in the nature of the operations, and the physical continuity of the fields becomes an important feature in itself. It seems useful, therefore, to examine questions about minimum size proportionality, externality, etc., in relation to each given agricultural operation specifically in the context of available alternative techniques, rather than for some vaguely-defined 'technology' of cultivation as such. The introduction of 'the' new technology perhaps merely adds to the range of operations in respect of which the right or the minimum size question has to be explicitly examined; the stakes or the economies involved are perhaps higher. The only generalization that one could hazard under the circumstances is that in the conditions of Asian agriculture there may be no effective alternative to some form of co-ordinated action, if particular operations in agricultural production are to be carried out efficiently. And other things being equal, the smaller the operative farm unit, the greater will be the need for group action. Organizationally, this view of agricultural technology and production practices has important implications for policy. And it is to a study of some of these implications that the rest of this study is devoted.
Chapter 6

The setting

Many developing countries have proceeded on the basis that the range and type of changes needed for agricultural development call for planned action. Further, they have assumed that governments will need to play a major role in initiating and sustaining the process of change. Within this broad view, one could distinguish two further categories: one where a government's role is conceived somewhat restrictively, and the other which regards it as responsible for promoting basic changes. In the former case, the aim is to provide incentives to farmers and to build up infrastructure in a general way, leaving it to the ability and initiative of individual farmers to make the best use of these incentives and facilities. In the latter case, more fundamental action is contemplated, such as in property relations (e.g. ceiling on individual land ownership, reform of tenancy, etc.), and the aim may be not merely to reach a particular level, but a predetermined pattern of production. These two approaches are not of course mutually exclusive, but India would seem to fall into the second category.

Against this background of policy, let us take a brief look at what may simply be called the physical facts of Indian agriculture. There is no getting away from these physical features - of soil structures and slopes, of water flow and seepage, of ridges and paths, of typical holdings and their parcels - if we wish to study how well particular agricultural operations are being carried out, and what potential exists for their improvement within the limits of known technology. This is the starting point in designing a strategy of development in agriculture.

The estimated 130 m. hect. of net cultivated area in India in 1960-61 was divided into about 51 m. operational holdings. The number of ownership holdings was even larger at 64 m., the difference being accounted for by the practice of leasing. The average size of an operational holding in
that year was 2.63 hect. This is a low enough figure; but not perhaps too low in comparison with the size of farms in countries such as Japan (1.18), Egypt (1.89), Taiwan (1.27) or South Korea (0.85), where productivity levels per hect. are decidedly higher.

But what tends to be often lost sight of in considering the Indian situation is that the operational holdings are, on an average, split into five or six scattered parcels. The effective size of the farm as an operating unit is therefore only 0.47 hect. Two other physical attributes of this pattern of land ownership and cultivation may be noted. Firstly, access to different parcels, or sub-units of the holding, for the farmer is often difficult and necessarily time-consuming. Secondly, a considerable area has to be set apart for ridges, to mark the boundaries between these tiny parcels of land. There is no reliable estimate of what area is left uncultivated as a result of such numerous and criss-cross ridges. A UNDP Team found recently in Rajasthan that a realignment of water courses and paths, combined with reorganization of land boundaries with some partial consolidation of holdings through exchange of parcels, resulted in a gain of 10 to 20 per cent of cultivated land. There is no reason to think that this was a very untypical situation (Task Force on Integrated Rural Development 1972:37). A government sponsored program of consolidation of holdings through mutual exchange of parcels of land on a voluntary or compulsory basis has been in operation in many States. According to one recent report (India, Dept of Agriculture 1975:64), a quarter of the agricultural land in the country has already been consolidated. Even where consolidation proceedings have been put through, the pooling has been only partial, i.e., a land-holder with say six parcels initially might end up with three, and not necessarily one compact holding. In some of the States, the program has not attained much momentum, and the process of further fragmentation through sales, inheritance, etc. must be making the situation worse. Hence, the current position is not likely to be materially better than that revealed in the survey in 1960-61.

A word here about the irrigation systems, particularly in the rice-growing tracts. Roughly 50 per cent of the irrigation is from public (government) systems and the other 50 per cent from private canals and wells. As a rule, only those cultivators who have their holdings in some reasonable-sized units can think of providing themselves with privately-
owned irrigation sources. The practice in India has been that even where the government builds an irrigation system, it provides water courses for blocks of not less than 40 hect. of land to be irrigated. The further distribution of water takes place in a somewhat haphazard fashion, through cross-bunds and cuts across farmers' fields. As a result, ensuring controlled water supply (which is regarded as an important element in the efficient utilization of the new seeds technology for rice) can pose serious difficulties for farmers dependent on major irrigation networks. There are also the related problems of controlling erosion of the soil, of conserving soil nutrients and protecting the crop from the spread of diseases, all within this framework of public irrigation and scattered land holdings. The application of improved technology in the Indian situation, in effect, means enabling millions of cultivators to plough the land deeply enough, to arrange irrigation, to control drainage, to preserve soil quality, to check growth of weeds, to protect the crops from attacks from pests and to collect the harvest from something like five different and scattered plots of land, each less than 0.5 hect.

The other feature of the economy is the scarcity of many of the important inputs for agricultural production. Here one must make a distinction between macro- and micro-level scarcity. At the macro-level, the first input that is constantly growing scarce is, of course, cultivable land per rural family. As regards water for irrigation, though net irrigated area increased by over 10 m. hect. (50 per cent) between 1950 and 1970, the proportion of net irrigated area to net area sown even now is only 22 per cent. Rice and wheat are the two major cereals in respect of which the HYVP program is being vigorously pursued; yet only 54 per cent of the area under wheat and 40 per cent of the area under rice have irrigation facilities of some sort. The supply position in regard to chemical fertilizers has become particularly difficult in the wake of the oil crisis. On a rough estimate, current domestic production of fertilizers is barely adequate to meet the requirements, and that too on the basis of considerably scaled down dosages now worked out by the research scientists, for just two of the cereals for the area reported to be under improved seeds. The requirements of these cereals under the traditional varieties, as well as of those of other food and non-food crops have to be met by costly imports. The position in respect of quality seeds is no better. The official Economic Survey 1974-75 (India 1975:7) estimated that supply of certified seeds was only
30 per cent of the requirements. In terms of personnel for extension activities, India with about 700 operational holdings per extension worker is somewhat worse off than some of its neighbours in Asia (Asian Productivity Organization 1975:5, Table 1). Such global comparisons without reference to the local environment (levels of literacy, facilities for communication, etc.) are perhaps of limited value. The Study Team on Agricultural Administration in India made a specific study of the requirements in relation to the ongoing programs of development and came to the view that one graduate extension worker was needed for 30 to 40 villages, as compared with the existing one graduate per 90 or 95 villages presently. Deficiencies in the availability of specialists to act as back-up staff for field workers have also been commented upon (India, Planning Commission 1973, Part I, p.102).

For purposes of realistically evaluating the impact of given policies, one has to look beyond these broad, macro-level data, and into the processes of allocation at the lower levels. A given order of scarcity is not necessarily evenly distributed over all areas and classes of farmers. Economic, political and sociological factors influence this process. There is considerable disparity in power and influence within the rural community. To a large extent, this disparity is a function of the pattern of land ownership. About 90 per cent of land-owning cultivators own less than 55 per cent of the total area in India. This great majority has an average holding of 1.6 hect. A minority of less than 10 per cent of the owners account for over 40 per cent of the area. This was the position in the early sixties; the position is not likely to have altered radically since, despite measures for land reform and redistribution.

More than one author has described the imperfections of market organizations for supply of credit material inputs, of techniques of production, storage, processing, etc., in the rural areas of developing countries. Governments in these countries have also been advised frequently on the need to counter these imperfections. The structure of the market to the extent to which it has developed its relationship to the rural social structure is obviously relevant in the design of strategy and instruments of action. In a study based on empirical data of the processes of market operations in the countryside in India, K. Bharadwaj noted recently:

... while markets have penetrated into the rural economy in a deep and significant manner, the
extent and type of involvement in markets of the different sections of the peasantry are not at all uniform. The character of markets reflects and to a significant extent is determined by the local patterns of power. At the same time, the functioning of the markets is itself such as to reinforce the pattern of power ... the initial resource position defines the 'bargaining position' of the participants ... The relative 'bargaining strength' (reinforced by forces of tradition, custom, social mores) determines the access to resources, the terms on which they can be obtained and the fields of feasible choices open to the individual producer in the various markets or, in short, his current production activities and his income and asset position resulting therefrom. This, in turn, influences his relative "bargaining" position in the succeeding period (Bharadwaj 1974:3).

More specifically, the author points out, there is an interlocking of markets - the landlord acting as a lessor of surplus land, as a local merchant and as moneylender. This multiple role helps to reinforce an initial advantage in terms of, say, surplus land for leasing. As part of the lease, what is laid down is not only the money rent, but often the type of crop to be grown, the mode and timing of the payment of the lease amount, as even the manner in which the share of output of the tenant is to be disposed of.

Rural markets thus exhibit highly differentiated characteristics in terms of not only prices for inputs and outputs, but even the freedom of choice in the use of inputs and the sharing of costs and returns. This however is a long-standing phenomenon, and it is more interesting to ask how this pattern has responded to the new opportunities of development.

Firstly, to the extent that traditional institutions such as co-operative societies and panchayats have been relied upon to 'deliver' and even 'plan' development, those already entrenched in these institutions have been able, by and large, to siphon off the new inputs to their immediate advantage. This has been fairly extensively documented (Myrdal 1968:1334-46). An official committee (the All India Rural Credit Review Committee) observed in 1969 that the small cultivator continues to be handicapped over large parts of the country in obtaining credit from the co-operatives
because of one or more factors, often by exclusion from membership (quoted in India, National Commission on Agriculture 1971a:10). An unfortunate feature from the point of view of production was that the tenants and small cultivators were not in many parts of the country able to obtain credit required by them for modern inputs. More importantly, however, these elements have also, in many cases, developed what the Indian sociologist A. Betelille (1974:112) has described as an 'ambidexterity' that is to say, to combine ownership of land and capital with skills in manipulating both traditional and modern institutions, particularly those set up under government auspices. A recent document from the FAO (1974:6-8) regarded this as a fairly widespread phenomenon in Asia. It is not surprising, therefore, that a series of studies in India on the working of the HYV seeds program found a persistent positive relationship between adoption of new techniques and the size of the farm.

The discussion in this and the previous chapters was intended mainly to bring out the complexities involved - between objectives, strategies, and instruments - in formulating and implementing a broad-based program of technological improvement. It is one thing to devise plans for tackling the more obvious gaps in the national economy. Transfers of technology, international aid, deputation of experts, etc., can at best all help in designing major irrigation systems, fertilizer factories, and experimental stations for crop research or soil analysis. But beyond these symbols of development are the kind of factors that have been mentioned above - the more localized facts of the pattern of landholdings and use, the differentiated markets, the biases in organizations - which clearly influence behaviour of different farmers. To appreciate the micro-level dimensions of a more generally conceived strategy is difficult. But without this appreciation there can be no meaningful planning in the sense of achieving specified goals through a set of policies.
The possibilities

The picture that emerges from the foregoing account of the factors and processes relevant to agricultural development with numerous small producers is in many ways complex. The sheer variety in the physical, institutional and economic circumstances facing the farmers is something that cannot be wished away because of a misplaced concern for tidiness in planning. The point is not that the 'big' things - research stations, fertilizer factories, etc. - or overall economic policies are unimportant. They obviously are; without them the very possibility of advance may be denied. The point, however, is while necessary, they are not sufficient. A gulf seems to exist between what the overall policies and macro-level institutions can attempt and the actions of the individual farmer in the local environment. One way out of this difficulty is to decentralize both plan formulation and plan implementation. This can make for realism in planning, but there are limits to what planning in the conventional sense and within a bureaucratic framework can accomplish. It can provide support and technical guidance, but this it can at best do as types of activity to promote, rather than as a series of projects. A type of activity that is considered desirable can be given a project shape only at the level closest to and in consultation with the farmer. That is the only level where the physical possibilities, together with the psychology of the farmers in undertaking the work can be gauged directly. The response of the farmers can be influenced by a variety of means but the final outcome cannot be normally planned and targeted in advance in concrete detail. Our earlier discussion indicated that one aspect of development, which seems important from the point of view of modernization of specific activities in agriculture, relates to the possibilities of promoting group action among farmers. The size of the group, the purposes for which it is being promoted, its nature (formal or informal, structured or *ad hoc*) and methods of operation are important factors that call for some systematic
investigation. This chapter attempts to examine these factors in relation to specific activities in the first instance; it then goes on to look at more general principles that appear relevant to this approach to development. We start with the possibilities as well as the associated problems of producing quality seeds locally.

**Seed supply**

Seed is the least expensive input used by the farmer, but it is a vital input that greatly influences the returns to more costly inputs such as fertilizer and water. Both the physical and the genetic qualities of the seed are important. Defect in one of these aspects may suffice to neutralize potential advantages from other inputs. Use of poor quality seeds may, through introduction of harmful pathogens, seriously undermine yields not just in the field of the particular farmer using it, but in a whole neighbourhood.

In the production of hybrid seeds requiring as it does multiplication and maintenance of specific inbred lines and single crosses, expert attention and special facilities are necessary. There is little that can be done by farmers themselves in producing genetically pure seeds on their farms. But the position is different in regard to self-pollinated crops such as wheat and paddy—the two major cereals the production of which largely determines food consumption standards in many developing countries. The production of these seeds typically takes place in successive stages. The starting point is the nucleus or what is sometimes referred to as the breeder stage. This refers to the seed that the breeder responsible for evolving the variety produces for further multiplication and distribution. This is usually done in research institutes and in small quantities.

At the next stage of multiplication for the diffusion of this variety (after it has been tested and approved for release), expert handling and controlled conditions are still necessary. This is generally attempted in large-sized farms under expert guidance. This is referred to as the foundation stage of seed production.

The third and final stage is the production of what are described as certified seeds. The purpose here is to produce from the foundation stock larger quantities of seed for use by farmers. The operation at this stage is thus generally dispersed. Consequently, technical control of production
and control of quality becomes more difficult.

An idea of the magnitude of the task involved in India can be had from the fact that for covering in any year the quarter of the area currently said to be under HYV paddy (11 m. hect.) and of HYV wheat at (12 m. hect.), the seed requirement at 30kg/h.a. (farmers are known to use a higher dosage) will be roughly 200,000 tonnes per year. Actual supply as we noted in Chapter 6 was barely 30 per cent of requirements in 1973-74.

There are two further aspects to this seed supply question that are important. One is the question of variety and the other is the timing and manner of supply.

The number of HY seed varieties being evolved, tested and released for each crop is constantly on the increase. This is a trend that will perhaps continue, given the varying needs of different agro-climatic conditions in which the crops, particularly rice, are being grown. Moreover, varieties may have to be different even for a given set of agro-climatic conditions, depending on whether the aim is to maximize yield to nitrogen, water or a given unit of land, or to improve cooking quality, etc. Given this variety in environments and objectives, it becomes necessary to tailor seed production to the local environment and preferences. Correspondingly, it becomes difficult to have the seeds produced in giant farms at a handful of locations. There are strong grounds, therefore, for decentralizing this activity.

The other aspect to the seed supply problem is that of the timing and manner of supply. Successive evaluation reports on the working of the HYV programs have drawn attention to delays in good quality seeds reaching the farmers from public agencies. This is partly perhaps inherent in any bureaucratically controlled organization attempting to reach millions of farmers with small quantities of this input per farmer and trying to dovetail supply with the agricultural calendar in each area. Partly these delays are also the result of sheer inadequacies of the needed facilities in communication, marketing and finance that inevitably handicap a nation-wide operation of this sort, irrespective of whether the agency involved with the work is controlled by government or by private entrepreneurs.
Related to the timing question is the form of supply, whether as seed or as seedlings. Farmers sometimes prefer to get their supply as seedlings, for this facilitates transplanting of the crop as soon as water starts flowing in the canals. This could save a few weeks at the start of the irrigation season, which might make all the difference between taking one somewhat long duration crop and taking two shorter duration crops for a farmer who lacks a supplemental source of water. It is also easier for the experts to ensure proper care and treatment of the seedlings, give them prophylactic treatment against diseases, etc., where they are raised in bulk than on the individual farms in minute bits of land.

But there is a cost also here. Where the distribution is in the form of seedlings, there is very little margin of time between the removal of the seedling from the common nursery and its replanting by the farmers. The operation has to be completed within a matter of a day or two, if not within a few hours' interval. This involves making sure that the farmer's field is ready for the transplanting operation before the seedling is taken out from the nursery. Given the limitations of communication, transport and paucity of marketing agencies that typically characterize a developing country, the entire operation at this stage of the multiplication process has to be necessarily locally planned and executed.

The seed supply position in the context of the policy of promoting HYV technology among the masses of farmers was recently (October 1971) reviewed by the National Commission on Agriculture in India. Drawing upon the findings of an earlier (1968) Review Team (India, Seed Review Team Report 1968) and on the basis of its own enquiry, the Commission noted that the quality of seeds being distributed and used was 'deteriorating rapidly'. This is notwithstanding the fact that a number of specialists have been assigned to this work in a string of national and State level corporations and in nearly 2,000 seed farms under Government control. The problem of assessing requirements of variety and timing of seeds for distribution in each local area and of making arrangements for their supply of reliable quality are proving increasingly difficult even as the HYV program coverage is sought to be continuously expanded. The Commission cautioned against Government taking on the work of production at the third stage of certified seeds and proposed instead that every possible agency, co-operatives, seed firms, etc. - be
encouraged to enter this field in each locality (India, National Commission on Agriculture 1971b).

It may be asked why, if good quality seed is in short supply, private enterprise does not develop. Government policy explicitly encourages private enterprise in this work. Partly the answer is what was indicated earlier, namely, infrastructural inadequacies for the development of an organized seed industry in large-sized units, except in a few limited areas that are well served by the needed facilities of transport, storage, marketing and credit. There are difficulties in the development of even smaller-scale units specializing in commercial production. One significant fact noted by the National Commission in 1971 as well as by the Review Team in 1968 is worth recalling here. There seem to be a good number of farmers with the facility and the ability to produce seed of required quality beyond their own needs. But very few wish to undertake supply in sub-commercial quantities to numerous small producers. At the same time they lack the storage facilities, the financial resources, and above all the business confidence to undertake commercial production and marketing (India, Seed Review Team Report 1968:63; India, National Commission on Agriculture 1971b:9).

One way out of this difficulty is for a public agency to guarantee an outlet. This may appear a simpler operation than a direct involvement in production by the government. This is a device already in use in India and it has had some successes. But it is not always a sufficiently reliable guarantee in the minds of the farmers. There are always possibilities of slips and delays in the actual working of such a program. Officials may be transferred without notice, substitutes may not arrive in time, budget allocations may be cut unexpectedly. There are such reservations in the minds of potential producers to acting on a government guaranteed purchase program. The same consideration would apply to users of seed. This is quite apart from the operational difficulties to the government itself of planning and executing such a guarantee scheme, on a widely dispersed basis, in a sector where the physical facilities for transmission of information, collection, storage and movement of stocks are very limited. Another way of tackling this problem is to encourage a common nursery for each village for a given crop. Governments have experimented with this policy also in the past. In some of the areas this is said to be producing encouraging results. But the very nature
of the organization through which this program is executed could create complications. The local body would be expected to be the unit of operation, whether the responsibility is assigned to it directly or through the VLW. There is no guarantee that with reference to even such tangible physical features (as availability of suitable land with independent irrigation facilities), not to mention the psychology of farmers interested in growing a particular crop and who have to act together as a group, for this purpose the village panchayat (delimited as a political unit) is the right or the convenient unit for attempting such an operation. There is the further problem as to whether the local bodies to the extent that they are dominated by an elite will be really interested in producing a vital input for the benefit of the masses of small farmers and tenants. The same dangers exist in having this sort of activity undertaken by the traditional type of co-operative society. Moreover, a predetermined formal structure, fixed membership and jurisdiction of these societies may prove unsuitable for the task as it develops from season to season and from crop to crop. There would seem to be advantages in acting in a less formalized or structured group basis.

Here is a role that is important to someone to play as part of a process of triggering development. In essence this is a market role in a sector where market facilities are ill-developed and the few that exist (like the co-operatives) are not sufficiently broad-based or flexible. This is a role that the local development agent can attempt to fulfil, at least till such time as alternative marketing institutions and mechanism develop. Reliance on the bigger institutions through a structured program for this kind of promotional activity is rarely effective.

Let us now see briefly how or in what manner this kind of role can possibly be assumed by the development administration at the local level, and what that would imply for planning processes and techniques at higher levels.

The function that we have in mind is basically one of bringing a potential producer and a set of potential consumers together and of helping on a contract being struck between the two. This may sound like a simple enough function, one that is being performed undirected and almost unnoticed in a developed market economy. Nevertheless this is an important intermediary function for lack of which an economic need is left unfulfilled. We have already referred to the finding
of both the Seed Review Team and the National Commission on Agriculture that what is lacking is not so much a potential demand or a potential supply, but an agency to activate and marry the two, removing uncertainties and lack of facilities to carry over stocks or market them in distant places.

We are here thinking primarily of small producers with but limited facilities for commercial production of seeds, and who cannot spread their risks in a big turn-over. In a situation where none of the major institutions - government or private - is equal to fulfilling this need directly, improvisation has to take the place of meticulous planning. We have already seen how a planning process that does not recognize the limitations of macro institutions to reach millions of farmers in the countryside, but blindly implements targets prescribed from above, can lead to quite grotesque results. The pursuit of targets for distribution of improved seeds districtwise, blockwise and villagewise, without reference to local realities, often leads to either spurious reporting of what has been accomplished, or a compulsive desire on the part of the staff to reach the target by distributing some seed or other, without reference to quality or suitability. This, as seen in Chapter 3, was what was documented by Dube in the scheme for distribution of potato seeds in the 1950s and by Ramana for a later period in Andhra Pradesh. Planning is liable to be self-defeating under these circumstances, spreading cynicism among field staff and frustrated expectations among farmers.

Rigorous planning, with nicely targeted and planned operations executed by major institutions and based on figures churned through computers at the national level in input-output table to achieve highly prized even if ever elusive consistencies and balances, does not quite seem to work. Is there not a simple way of going about the job? We are searching in effect for a possible, not a guaranteed, answer, through improvisation aimed at developing local potential. This would be simply for the extension worker to look locally for likely producers to meet an identified demand by bringing the two parties together. He can help explicitly with supplying reliable foundation seed; he can obtain and convey advice as to which variety to go for, how and when to produce it and how to process the seed. These are in any case part of the extension tasks assigned to him. But he also needs to be taught to look for opportunities, to catalyse a small group of farmers with a shared need to place an order with a potential producer, backing his intermediary
role by his access to superior technical knowledge and quality raw material, wherever this is possible. There can however be no targets fixed in advance that the extension worker must fulfil. The moment this is done, fulfilling the targets willy nilly is likely to become the end in itself. Perhaps the person (AEO) next in hierarchy with his more specialized training can assist more actively by helping to locate suitable farms where this suggestion can be tried out. But this again cannot be neatly planned in quantitative terms and prescribed in advance as tasks to be fulfilled at successive levels. Not enough is known about soil and water conditions farm by farm, much less about the psychology of the farmers concerned, to plan this operation quantitatively, except as a type of development activity to promote. The basis of motivation here will be some demonstrable benefit to the participant, not an appeal to them on grounds of some abstract 'community' or 'national' well-being.

Perhaps on this basis in one village a farmer with a small tubewell would agree to raise seedlings for a group of ten, 20 or 30 farmers in his immediate neighbourhood whom he knows personally. Possibly in another village a big farmer who sees the possibility of making a sizeable profit by this activity would come forward to supply hundreds of farmers in a whole group of villages, provided the terms (prices, time of delivery, supply of foundation seed, etc.) could be agreed upon in advance. Because of his access to know-how and supplies, the local extension worker has perhaps some leverage here in seeing to it that by and large the operation is carried out equitably and efficiently without discrimination or exploitation. But there are limits here too. He may not want to arbitrate personally in regard to the terms. He can at best make suggestions which commend themselves by their good sense and impartiality rather than because the operation has the backing and the authority of government.

The essence of the operation is feasibility and profitability for the farmers themselves, and flexibility for the extension worker. Coercion is not assumed; there is no appeal to idealism which experience with CD programs shows to be an unreliable aid. At the same time any compulsion on the extension worker to fulfil targets or operate through predetermined agencies such as panchayats can set at nought this approach to catalyse development by what is in essence a proving method - looking for opportunities for development by local action rather than at targets to fulfil.
One advantage in this approach is that in as much as the role of each person, including the extension worker, is clearly understood by the participants, responsibility for the outcome would also perhaps become easier to allocate. Where the seed producer has taken the foundation seed supplied by the AEO and has raised the seed through his guidance, and yet the seed fails to pass germination and other tests later, the specialist has to account for the quality of the material supplied and the validity of the advice tendered by him. Perhaps this will inculcate a sense of responsibility for his actions directly to the farmers, a feature that is not particularly prominent in present methods of planning and implementation. In turn, this will call for better standards of work along the chain - the specialist producing foundation seed in a government farm, the plant breeder producing nucleus seed in his research station, the plant pathologist advising on seed treatment. This is a practical way in which the much sought-after two-way communication between and accountability of research and extension can be promoted, both the wings having their work assessed in farmers' fields rather than through progress reports to higher level officers.

It is not claimed of course that a flexible system of planning and operation that puts a premium on local initiative can by itself work miracles. The farmers will still need credit, expert advice and some insurance against risk. Only some parts of these obstacles can be got over by the approach suggested here. In the above illustration one may have helped a small farmer to gain access to good quality seed or seedlings locally through this method, thereby meeting a requirement for improved production which was unavailable to him otherwise for whatever reason - smallness of his operating unit, difficulties of commanding independent water supply, discrimination practised by entrenched institutions, etc. Quite possibly the extension worker, having committed his prestige to the operation at the stage of seed supply, is more likely to provide guidance and support in the subsequent phases of cultivation than might otherwise be the case. But all this will be of little avail if the farmer cannot get credit or the fertilizer because these are in short supply and he is not powerful enough to obtain his share. Other measures that have been proposed for correcting institutional imbalances, or for relieving overall scarcities are thus not obviated, but only made more important, by the type of planning and implementation that is suggested in these pages.

But we may note one important difference that the new
The approach makes possible, namely, it can help directly to augment the supply of a scarce input, in this case seed, by mobilizing local potential. This however will not be the invariable result if we are considering certain other inputs. For instance, no local action will significantly add to the supply of some sophisticated pest chemical which can only be produced under factory conditions. This is perhaps true also of credit, though the possibility should not be minimized of promoting thrift in course of time, taking advantage of higher productivity and channelling the savings thus generated to satisfy local credit needs.

There is one further implication to such an approach to agricultural development that may be mentioned. It may involve compromising on quality to some extent in some of the operations. For instance processing of seed is important in influencing its subsequent productivity. Some of the processing operations such as threshing, drying, cleaning, etc. can be undertaken at the village level itself under the guidance of the VLW or the AEO. Generally one can avoid having to invest in specialized equipment for these purposes. Some other processing operations, while not impossible to undertake, are perhaps less easily or effectively attempted locally, e.g. seed treatment with fungicide or insecticide. Here again the extension specialist can help by arranging supplies and providing guidance. The search for perfection often leads a government to look for sophisticated equipment such as air-screen cleaners, dimensional sizing equipment, spiral and magnetic separators, electronic colour-sorters, etc. Over a period of time, a climate is created where everyone tends to look down upon anything except the latest and the most sophisticated equipment. Given this bias the local operation proposed may be faulted as not sufficiently meeting rigorous technical requirements. But as the old saying goes, the best can be the enemy of the good. There is a case for settling for the second best where the search for the very best is futile.

Even unbiased technical opinion will perhaps show that the likely loss in quality by the failure to provide textbook treatment is after all only marginal in many instances. This point can not be asserted in the abstract, of course. It is possible that some particular aspect of the operation is so crucial to the outcome that if satisfactory observance cannot be ensured under local conditions, the operation may have to be curtailed or even abandoned altogether. But this is the whole point of the technique of planning and execution
that is being argued here - pragmatism and improvisation. There is in this sense a clear need for a 'barefoot-doctor technology' in agricultural planning and implementation in a vast country.

**Plant protection**

The importance of protecting plants at various stages of their growth from pests and diseases is well known. The problem assumes special significance for high-yielding varieties, particularly for the rice plant grown under tropical monsoon conditions. That effective protection can make a sizeable difference to crop yields and farmers income, in the context of the HYV seeds, needs no great elaboration. According to one general assessment (Palmer 1974:63) crop loss from pests and diseases can be as high as 25 to 45 per cent. Field studies in India indicate that actual losses are considerable, even if somewhat lower than the above general estimate (Swaminathan 1972:312; Gupta and others 1973:20).

One feature of the action to combat pests in agriculture dominated by small holdings is its externality. Most of the pests and some of the diseases spread from field to field during the growth cycle of a crop. As a result, action to prevent their emergence or control their spread is rarely effective at the level of the individual farmer. Even though the pest itself may show no discrimination between the big farm and the small farm, the bigger farmer is perhaps more likely to have a better command over the resources needed for preventing the attack and for insulating his farm at least partially.

It is part of the general responsibilities of the extension personnel to guide farmers in protecting their plants and to arrange for chemicals and spraying equipment to be sent to affected areas. Facilities for contract-spraying by commercial institutions are not particularly well-developed. The administration usually tries to treat whole areas *en masse* rather than particular plots where the occurrence is first noticed. In most of the states in India there is legislation to authorize government to arrange compulsory spraying of affected areas where expert opinion considers such a step necessary to save the crops. The cost is later recovered from the farmers, fully or in part in proportion to the area owned by them. In some States, such action requires the prior approval of the local authority -
the panchayat or the panchayat-samiti - in the form of a formal resolution from the council. The formalities connected with convening a meeting, of getting a resolution passed, etc. can often prove time-consuming. The method adopted for treatment in such extreme cases is aerial spraying, and local councils are usually sensitive to the criticism that aerial spraying pollutes water courses, endangering both human and animal life. Hence there is some reluctance on their part to approve of this measure, particularly where the crop affected is a minor one and also confined to a small geographical area in the village. While the pros and cons are being debated the disease may of course be spreading quite rapidly, making its subsequent control more difficult.

One way of getting round the problem of convincing councils representing an entire village or a group of villages to act decisively and in time when the problem is more localized may be to work on and activate the group of farmers whose crops are directly threatened. The operation, where it is not aerial spraying, usually involves mobilizing labour, equipment and chemicals. Speed in making a decision and acting on that decision with the assurance of neighbouring farmers acting in concert is crucial to success. The extension apparatus may or may not have to elaborately convince farmers about the need to control the disease. That will depend on how much awareness of this aspect of agricultural technology has already spread in a particular area. The point, however, is that even where awareness exists, the individual farmer with a few acres of land is hardly well-placed to act on his own. Nor are there ready-made institutions that can take over the task for a fee. One is thus thrown back upon local initiative in getting a group to act together. A local political body is not necessarily the best agency for mobilizing such action. Besides the reservations (referred to earlier) that they are likely to have, its controlling members may not feel involved in the matter to the same extent as the farmers whose crops are directly affected. The extension worker is likely to achieve a better response through mobilizing the group directly involved by emphasizing their stakes in the operation. This may mean working with a set of farmers within one village, or living within the borders of more than one village. Any system that ignores this need for flexibility and lays down rather rigidly the unit and agency for action in all types of developmental activity unnecessarily handicaps itself.
Here again, as in the seed production example, the emphasis is on group action, flexibility in operation, demonstrable benefits to the participants, with the extension worker playing the role not so much of an adviser but of a catalyst, filling gaps in organizations and markets. This he can do without setting up formal institutions or associations, but by stimulating local initiative and exploiting his links with agencies serving agricultural credit, material inputs, and technical advice.

The two examples given above relate to possibilities of group action and likely advantages from such action in current transactions. They need some but not much outside assistance in terms of credit or materials. In both cases, emphasis was in mobilizing certain needed inputs locally, overcoming institutional and organizational deficiencies.

We can now look into the possibility of securing similar results in respect of activities that are in the nature of fixed capital investment. They require more sophisticated advice and equipment, and above all, credit. Both the skills for planning the activity and the finance for carrying it out will probably go beyond what the local official or the farmers are likely to possess. But for this reason they do not necessarily cease to be feasible. After all, one of the assumptions of agricultural development policy is that injection of skills and materials from outside the agricultural sector is essential for generating growth at least in the initial stages. We are examining the possible role of local initiative, not in a vacuum, but as a supplement to or as a stretching arm of more general policies and macro institutions.

Water supply

For most of the cereals for which high-yielding seeds have been evolved by research scientists, availability or otherwise of irrigation water - measured in terms of adequacy of quantity and suitability for controlled supply makes a big difference to the farmer as to whether the benefit from the new seeds is substantial or only marginal.

Group action for irrigation purposes can be relevant to a small farmer in two different ways. Firstly, in facilitating its availability by providing a commonly-owned source of irrigation; secondly, even where a public channel provides the water, in regulating its flow and distribution,
controlling drainage, etc. We are here looking at the first possibility. The second, which may be no less important, will be referred to a little later, as part of a larger problem of rational land and water-use, through co-operative action.

As we saw earlier in India, 22 per cent net area sown had irrigation facilities in 1970-71. Of the 31 m. hectares irrigated, the area irrigated by wells at 11.8 m. hectares was slightly in excess of 11.6 m. hectares irrigated by government canals by surface flow. During the past two decades, area irrigated by wells increased more rapidly than area irrigated by government canals (5.8 m. hectares as compared with 4.4 m. hectares). The following table brings out the rapid progress in the spread of private tubewells:

<table>
<thead>
<tr>
<th>Table 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Progress of private tubewells irrigation system</strong></td>
</tr>
<tr>
<td><strong>in India 1950-71</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>1950</th>
<th>1965</th>
<th>1969</th>
<th>1971 (anticipated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of private tubewells</td>
<td>3</td>
<td>100</td>
<td>279</td>
<td>470</td>
</tr>
<tr>
<td>No. of diesel pumpsets</td>
<td>66</td>
<td>471</td>
<td>837</td>
<td>1150</td>
</tr>
<tr>
<td>No. of electric pumpsets</td>
<td>19</td>
<td>513</td>
<td>1080</td>
<td>1620</td>
</tr>
</tbody>
</table>

Source: Vohra 1972:3-7.

The rapid spread of HY wheat varieties in the Punjab was greatly facilitated by and in turn gave a new spurt to well irrigation. Subject to availability of power for pumping, well irrigation affords a degree of control to the farmer in water management which as a rule is not obtainable under public canals. Hence the importance of this form of irrigation to the HYVs, particularly for rice.

In certain parts of India, the problem of salinity associated with indiscriminate exploitation of ground water is becoming a serious one. It is clear that any further large-scale expansion of irrigation facilities will need to be based on scientifically drawn-up surveys and plans for a
balanced use of surface and ground water, and an integrated use of available water and soil resources. This awareness is now growing among policy makers. It would seem that as indicated by the Irrigation Commission in its Report (1972, vol.1, p.206, para.10.13), the Gangetic basin in the north-east as well as the deltaic plains of the south have a great deal of water that can be harnessed to provide irrigation to the important rice-growing States of these regions. But when compared to Punjab, not only is the average size of the holding smaller, but the subdivision of holdings is more pronounced in these States that are said to be 'sitting on a lot of water'. The position is brought out in the following table.

Table 5

Parcelization of farm holdings in select states 1960-61

<table>
<thead>
<tr>
<th>State</th>
<th>Number of parcels per holding</th>
<th>Average size of parcel (hect.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Punjab</td>
<td>4.76</td>
<td>0.81</td>
</tr>
<tr>
<td>Bihar</td>
<td>7.18</td>
<td>0.21</td>
</tr>
<tr>
<td>W. Bengal</td>
<td>7.12</td>
<td>0.22</td>
</tr>
<tr>
<td>Orissa</td>
<td>6.39</td>
<td>0.31</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>7.78</td>
<td>0.23</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>4.96</td>
<td>0.30</td>
</tr>
</tbody>
</table>


Any privately-based ground water development for irrigation purposes on the Punjab model is therefore much less likely in these States, but these are the very States that need this facility most for achieving a yield breakthrough in rice. The difficulty arises primarily from the extremely small size of the operating farm unit for the large masses of cultivators. Consolidating the holdings on a voluntary or a compulsory basis would be one way out of this difficulty. Some of the States have of late shown commendable energy in pushing consolidation through. Judging from past experience, however, rapid progress is perhaps unlikely. Even with 100 per cent progress in consolidation,
the average sized farm in most of these States will in all probability still not be large enough to afford an independent tubewell and pumping arrangement. For a large body of farmers there may be no alternative to some form of shared ownership/distribution arrangement for tapping ground water in these States.

Sale of water among neighbouring cultivators is of course possible. Such private sharing arrangements sometimes work smoothly without the intervention of an outside agent. Given the smallness of holdings, it would be sensible for government to encourage such arrangements wherever feasible. The extension approach suggested here is, in fact, a more systematic exploitation of this device, bringing the parties together, clearing up legal and other formalities regarding title to land and water, locating responsibility for operation, arrangements for sharing of cost, etc., through the extension worker where that would help in overcoming existing handicaps to such co-operative action.

In India government-owned tubewells serving anything between 200 to 400 acres each is quite well known. There are about 16,000 such State tubewells in the country whose management is the responsibility of either departmental officials or local authorities. Management of such tubewells has not been very efficient; governments have increasingly encouraged the practice of compact groups of farmers constructing common wells and operating them on mutually agreed terms. Operation by the beneficiaries tends to be more efficient than operation by a third party - usually local government unit. In cases where rules still require that the well should be controlled by a local, public authority, such transfers are made on paper, but actual operation is left in the hands of the farmers concerned.

This is another area where considerable flexibility and improvisation is necessary if farmers whose farms or rather individual bits of whose farms are too small to warrant a private well and pump of their own, are to be encouraged to join hands to get over the indivisibility problem in irrigation technology that in turn can facilitate access to the HYV seed technology. The variables in the situation are many - the number of farmers, the type of irrigation work, the method of construction, the agency for operation, principles of sharing costs and benefits, the legal formalities for the ownership of the irrigation facility that is being created, etc.
Table 6

Details based on sample studies of locally sponsored common irrigation projects in three states

<table>
<thead>
<tr>
<th>Nature of the irrigation project</th>
<th>Maharashtra</th>
<th>Tamil Nadu</th>
<th>Kerala</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of works studied</td>
<td>12</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Number of participants per work</td>
<td>12</td>
<td>26</td>
<td>128</td>
</tr>
<tr>
<td>Area served per well/project (acres)</td>
<td>14</td>
<td>21</td>
<td>37</td>
</tr>
<tr>
<td>Area served per participant in a work (acres)</td>
<td>1.17</td>
<td>0.81</td>
<td>0.29</td>
</tr>
<tr>
<td>Cost per acre (Rs)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed cost</td>
<td>2000</td>
<td>1000</td>
<td>370</td>
</tr>
<tr>
<td>Operating cost</td>
<td>143</td>
<td>42</td>
<td>10</td>
</tr>
<tr>
<td>Agency initiating project</td>
<td>Farmers</td>
<td>Farmers - 6 Local officials - 4</td>
<td>Panchayat Union</td>
</tr>
<tr>
<td>Agency executing project</td>
<td>Local contractors</td>
<td>Local contractors</td>
<td>Local contractors</td>
</tr>
<tr>
<td>Agency owning the work</td>
<td>Collectively by farmers concerned</td>
<td>Local authority</td>
<td>Local authority</td>
</tr>
<tr>
<td>Agency operating project</td>
<td>Participants using a paid operator in some cases</td>
<td>Participants under official supervision</td>
<td>Delegated by Panchayat to the farmers concerned</td>
</tr>
</tbody>
</table>

Note: a This is a co-operative bank in which labourers working on such projects as well as landholders benefiting from them are members. The activities of the bank are substantially directed by officials.

2 Field work by author in Ramanathapuram Dt. Tamil Nadu, Jan. 1975.
Table 6 shows some details of a sample of commonly-owned irrigation works constructed and operated by groups of farmers, based on recent studies in three States in India. If there is one message that this table conveys to the planners, it is the need for flexibility and improvisation. The number of participants is as small as a dozen (in one case) and exceeds 100 in another. In some cases the participants preferred to work on the project themselves; in some others they entrusted it to a professional contractor. In some cases government sponsorship and initiative was crucial. In certain other cases, government came in only incidentally to straighten out formalities and provide some assistance. The point being made here is that this variety is inherent in the situation. It defies attempts at tight planning, targeting or straight-jacketing regarding the number of participants, the agency or the mode of execution. What all governments can and need to do is to awaken the farmers to the possibilities of such action in the particular local context, and then explore jointly with the farmers what will be the most effective way of enabling farmers with material and technical assistance to get this task done. This is the role of planning within an overall framework of policies and institutional support, to place agents to trigger development in sufficient proximity to the people concerned. Techniques of planning should encourage such initiative and flexibility rather than stifle them in the name of uniformity and control.

Soil and water management

Techniques of soil and water use in countries where a growing population constantly presses on a limited area of land are important not only from the short-term point of view of increasing land yields, but from the longer-term point of view of maintaining a proper resource balance. Unless handled with care, the search for short-term solutions can prove self-defeating in the long run, not just by disfiguring the environment in an aesthetic sense, but by making continued agricultural operations themselves unproductive.

Developing countries under pressure to increase food output face a dilemma. The choice of objectives is itself fraught with conflicting pulls. The problem is highlighted in the policies towards private exploitation of ground water. Even where additional wells in an area may not be a desirable long-term development, authorities hesitate to put a ban on
on activity that seems to be benefiting the individual immediately concerned. Faced with this dilemma a compromise is adopted - while pushing through production programs that promise quickest results, the planners take on hand other programs such as aorestation, bunding, etc., that are considered helpful in keeping natural resources under some balance.

But sooner or later, the combined effect of progressively smaller holdings and increasing parcelization of holdings under the impact of population growth in a system of inviolable proprietary rights in land begins to assert itself. It proves increasingly clear that a few conservation schemes on public land are not sufficient. It becomes necessary to teach and help private owners of land to use their natural resources carefully and scientifically. In the glow of optimism immediately following the introduction of new seeds and intensive use of fertilizers in the late 1960s, with its description as a land-augmenting technology, the sense of urgency on this score possibly receded in the minds of policy-makers. This was unfortunate because the new technology was in any case not water-augmenting. In general, it called for more and not less discipline in the management of soil and water resources.

The legacy from hundreds of years of unregulated farming practices can pose a formidable challenge to the planner interested in promoting a more orderly and rational use of soil and water resources. In constructing, for example, an irrigation system, it is generally assumed that the planner will be given such details as the lie of the land, the pattern of holdings, of parcels, field boundaries, that make no allowance for gradients, and contours or wind patterns. Details of the works regarding the number and type of channels, principles of irrigation, and so on, are adjusted to the existing environment. But as the demands on the natural resources become more acute and technologies based on their intensive exploitation are sought to be promoted, the inefficiencies in the old pattern of use prove more and more costly. Farmers find it difficult even to move from one part of their holding to another. Too much water is being wasted because field alignments are not rational. Too many bunds have to be cut for water to flow through to as many parcels of land as possible. Water has to pass in large sheets by natural gravity from field to field because people will not give up small bits of land to provide for a regular channel. In the process, water gets wasted, soils
eroded, nutrients washed down, and standing plants get damaged. Controlled irrigation of any sort, or more generally, controlled and scientific management of natural resources becomes virtually impossible.

At the technical level, substantial skills are required to study the existing situation, draw up plans of action and supervise its execution. It is doubtful whether skill of the kind required exists in anything like adequate numbers in developing countries. An important deficiency may be at the middle and lower levels where the skill required is not the design of major irrigation or drainage schemes, but adaptation of known techniques and fairly standardized materials to tackle specific problems of slopes, ravines, drainage, seepage, erosion, etc. in each given environment and in the overall framework of the prevailing socio-political system.

In terms of the economics, evidence from scattered projects undertaken so far show that even limited investments in a few simple measures of land development and water use efficiency can produce very attractive gains. But one problem here is that individual farmers acting on their own can get but limited returns from such measures. To quote Dr Minhas:

... individual behaviour is frequently nonoptimal in the presence of externalities which, for institutional or other reasons, cannot be internalized. The fact of inter-dependence in public works programmes is obvious. Construction of drainage works in particular and, to a large extent levelling of land and digging of field channels are prime examples of inter-dependence in land development. There are also considerable economies of scale in these very activities. Regarding the question of information, it is of course trivial to show that a set of strategies based on the ignorance of the pay-off functions may well be disastrous. And that is precisely what is involved in not knowing what consolidation-cum-public works will do to the land (Minhas 1970:11).

The appreciation of the above problem is by itself not very difficult. What is difficult is the development of appropriate policies and organizations that encourage farmers to take action which collectively improves the situation all round.
Farmers will require some outside assistance before they can undertake scientific conservation measures collectively. The need arises under two counts: (a) technical skill beyond what farmers usually possess to make the plans and guide execution, and (b) given the essential interdependence of actions of farmers in a neighbourhood, some means of achieving co-ordinated action. On both these counts, governments or some outside catalyst agent may need to become involved. As a rule, it is they who can perform this role and also enforce compliance through coercion if necessary.

Let us assume that the technical skills and equipment for physical planning of this type are or can be mobilized. One has then to balance the advantages of a centrally controlled and directed program that will economize on skill requirements and facilitate quality control with the need for decentralized planning and implementation called for by a program of this kind, tuned to the local situation - topo surveys, cropping patterns, irrigation systems, wind and other climatic factors. Where the activity is to be planned and executed largely with the consent of the farmers so that compulsion will be the exception rather than the rule, there will be further advantages in making the unit of operation as small as possible so that the farmers concerned will have a clear cut idea as to what is being attempted and why.

It is interesting to see how different writers on the subject in India have argued the case for what may be called the physical and the human elements respectively in determining the unit of such an operation. Thus Professor Dandekar spelt out, in the address referred to in Chapter 3 (Dandekar 1967), a program of reorganizing the physical features of the rural economy. Central to his concept of reorganizing the agricultural production apparatus, was not a class of cultivators but a block of land with its soil and water resources. He visualized the appointment of a Farm Planning or an Area Planning Officer for each block of land who will survey the soil and water resources and prepare an inventory of development works-levelling, bunding, minor irrigation works, irrigation channels, paths, etc. to be undertaken in that block. This officer was expected to indicate, in consultation with an agronomist, suitable cropping patterns for the block to ensure a scientific use of the available soil and water resources.

Dr Minhas writing four years later (Minhas 1970:13) preferred a whole-village approach for rearranging irrigation
and drainage works; for drier areas, however, he thought the unit of operations for land-levelling, contour-bundling for soil and moisture conservation and construction of storage tanks for collection of rain water may have to be a group of villages at a time.

An interim report from the National Commission on Agriculture more recently suggested that a comprehensive program of soil conservation and land-shaping be undertaken for the entire village, and irrigation points be located in common at the best locations so that for the water available the largest area can be commanded effectively without waste. Among what the Commission considered the advantages of such a community approach were listed: (a) consolidation of holdings will automatically follow soil conservation and land-shaping, rather than the other way around; (b) irrigation sources will be common and a routine will be established for the best advantage of the village; and (c) cropping program can be so arranged as to make the maximum use of the available resources, including labour (India, National Commission on Agriculture 1973:4-5).

A Task Force on Integrated Agricultural Development Projects appointed by the Planning Commission recommended for canal-irrigated areas that the unit for planning of integrated development should comprise an area which has a substantial measure of homogeneity in terms of land and water resource situation. It recommended that a program of this sort be taken up in eleven locations experimentally, each falling within a command area of a major irrigation work recently or about to be completed, where the possibilities of carrying out such programs and the benefits to the cultivators are likely to be substantial (Task Force on Integrated Rural Development 1972:4).

It is clear that in planning a program of this kind the physical characteristics of the area will be important in choosing the unit. But this will not result in the same unit for planning a more rational use of the different resources for different purposes. The unit for reshaping land from the point of view of arresting erosion will not be the same as for planning water conservation in an entire irrigation network. Assuming that the 'right' size from a purely technical point of view for a given activity of this kind has been determined, one has to face up to a further problem. Is it technically feasible to split up the works, and what is the size of the operation that will be meaningful to the
farmers whose assets are to be significantly rearranged?

There is no simple answer to this question, of course. There are many factors to be taken into account. For one thing the agent for change must feel sufficiently well-informed about the costs and benefits that he is able, in the majority of cases at least, by a process of persuasion to overcome possible opposition to realignment of land boundaries, irrigation canals, pathways, etc. from the persons affected. The demonstration of the potential benefit as the rationale of the suggested action, and the assurance about neighbours joining in are also functions of the size of the group that is being activated. The smaller the group, other things being equal, the more concrete will the suggested lines of action and the potential benefits appear in the minds of the people concerned.

If experience with Community Development (CD) is any guide, a village-wide consensus on issues of this sort is not likely to materialize easily. Should one wait for that distant day when each village will develop a common will? Or will it be more practicable to alter one's tactics and instruments of action and try and get together smaller groups? We seem to be back with the problem of choosing between an 'elusive best' solution, and a 'workable second best' solution.

It seems worthwhile to see whether a more modest beginning with compact groups is not a feasible proposition. Provided that such action by an ad hoc group will fit a larger plan for a bigger area (or at least not run counter to it), there is no reason why farmers should not be encouraged to undertake such programs on a limited base. They will certainly need technical assistance from outside, perhaps even to identify, and much more so, to plan and execute projects for improved resource use for the particular tract of land in which they operate. Such outside assistance will be all the more required to make sure that this action can fit into a larger plan when once it does become possible to plan on a larger scale and to extend this operation to a whole village, group of villages, water sheds, etc. But everything need not be made to wait till such a grand solution becomes possible. Granted that the program has in essence to be put through voluntarily, for some of the areas at least in the future such a technically ideal solution may be unobtainable. The question then arises: is the approach to be given up altogether or can only coercion be effective? The argument here
is simply that more limited and somewhat second-best solutions seem to exist which can be exploited if the approach to planning becomes more flexible and pragmatic and moves away from the more ideal and comprehensive.

Nor is this mere speculation, a case argued only in the abstract. There are many examples where imaginatively-minded development workers, working somewhat against the more orthodox approach of authorities for total solutions, have achieved notable successes in limited areas and with limited groups of cultivators. The Planning Commission's Task Force on Integrated Rural Development (1972) referred to earlier documents a project undertaken for as little as 34 hectares for 38 cultivating households in a village in the State of Uttar Pradesh. The works carried out included land classification on the basis of a topo survey and contour map prepared for the project, demarcation of plots and their realignment along contours, exchange of parcels of land in order to consolidate them and make the operating unit bigger than before, construction of contour bunds to conserve soil and moisture, and levelling of plots. The work was undertaken on the basis of technical data provided by experts. The farmers executed some of the simpler works (as land levelling) with their own resources. They preferred to have the more complicated works such as building culverts executed by professional contractors. The full details of this work need not be gone into here, but it is of interest to note that it cost less than Rs. 200 per hectare for the farmers to execute the project. Also 2.6 hectares formerly wasted within the block of 39 hectares were added to the cultivable area as a result of this reorganization of physical facilities.

The National Commission on Agriculture in its interim report referred to has also cited a number of such instances where compact groups of farmers in small tracts were helped to reshape their land and rearrange their irrigation facilities at modest cost. The areas benefited vary from a handful of acres to hundreds of acres in whole tracts. The important point for our purpose is this: almost none of this project could have been neatly planned, targeted, prescribed as projects and controlled in advance from above. The agencies could not have been selected in advance. In one case it was the fertilizer factory which wanted to promote a balanced application of chemical nutrients based on soil properties of the area. In another case, a bank took the initiative. In yet another, a private voluntary agency. The emphasis in the projects varied from plant nutrition to moisture
conservation, from consolidation of holdings to use of particular new techniques of cultivation and crop protection. These were works that were carried out independently of each other, by different agencies, at different points of time and in different areas. The common feature linking them was as projects, none of these were at all likely to have found birth in the Planning Departments of State capitals. Local initiative backed up by technical skill at higher levels made certain types of development works feasible that were not quite plannable by a central authority. Not much imagination is needed to visualize what the outcome might have been if planners at the respective State capitals had attempted to fit such activities into a rigidly framed plan that stipulated the number of such projects in each area, the number of farmers to benefit, and the agencies to act. Government did, of course, play a major role in almost every case, supplying personnel, credit and backup facilities where needed. Different agencies had the freedom in these cases to try out whatever approach was felt most promising and which nevertheless fitted into an agreed broader strategy of agricultural development (more irrigation, better production technique, etc.). The farmers had the benefit of free technical advice. There was no compulsion to join. Only those who felt they would benefit from participation did so. There was no appeal to loftier sentiments about community enrichment. Supply of credit helped but was not invariably essential, as, given own labour and freedom about the timing of the action, uncluttered by government budget schedules, investment by the participants on their farms was not heavy per unit of land.

One could add to the list of specific activities in agriculture where the small group principle might be relevant. One could look beyond agriculture and argue its relevance in other rural development activities such as purchase of improved equipment by fishermen to improve their catch, collection of various types of wastes in the villages with a view to processing them into bio-gas, manures, etc. An examination of such possibilities in each given environment might produce interesting results. But let us now go on to analyse the underlying principles behind this phenomenon in more general terms.

In a recent review of local organizations – official and non-official – for rural development in 15 countries in Asia, Professors Uphoff and Esman (1974:xviii) suggested that for a local organization to make an effective contribution to development, it must combine the benefits of what they
called 'solidarity and scale'. While 'scale' is a function of technology, 'solidarity' in the sense in which we are considering it here, is an attribute of psychology in the face of an opportunity for economic change. The need for combined or co-ordinated effort in economic activities arises where there is an advantage of scale in such action for either of the two reasons suggested earlier, namely indivisibility of a technology (or its proxy, equipment), or, externality. The further point, however, is that the possibility of such co-ordinated or collective action on a largely voluntary basis being undertaken depends, among other things, on whether the size of the group and its composition is such that its members feel a sense of solidarity, of common purpose. This is the psychological dimension to voluntary group action, which is as important as the technical dimension.

In applying this general concept to problems of agricultural development, there are two general considerations to be kept in mind. One is that there is no one 'right' size from the 'scale' point of view in 'agricultural production' as such. The concept of the 'right' or the 'minimum' size from the point of view of a technology is more meaningful when considered for a particular operation, such as ploughing or irrigation. Five hundred farms (of some average size) may be the 'right' size for pest control work, but not for soil conservation. One hundred farms again may be the 'right' size for contour bunding, but not for producing seedlings. Twenty-five farms may be the 'right' size for drainage improvement under a public canal, but not say for providing a small dug well for irrigation.

Secondly, we must turn from a consideration of farms to farmers more explicitly. The proposition that is being suggested here is from the solidarity point of view, the smaller the size that offers some, even if not the maximum, of the benefit of scale, the better the chances of group action emerging. 'Small' is of course a relative term and can be understood only within the framework of a given activity, technology, and society. But subject to these qualifications, the approach itself is meaningful as a possible way of inducing micro-level group action, where macro-level action is not feasible or effective. There may be a 'trade-off' between solidarity and scale in the context in which we are here considering the concepts. If there is such a trade-off, it has important implications for policy in designing techniques of planning and patterns of organization and extension in agricultural development.
Partly, the trade-off arises from the sheer cost of disseminating information, establishing contacts, co-ordinating field activities - in short, cost of 'organization' - as the size of the group or unit of operation increases. This is particularly true in respect of rural development activities in countries served by poor facilities of transport, communication, markets, financial institutions, etc. But quite apart from the practical difficulties and costs of organizing large groups, there seem to be at least two other factors making for reduced effectiveness of larger as compared with smaller groups.

The first of these has to do with the fact that the larger the group the more difficult it is to achieve that degree of consensus without which co-ordinated action is frustrated. Even in a smaller group, there is no guarantee that the interests of all the participants will be identical. But the possibilities of divergence, if not conflict of interests, are likely to increase with the size of the group. Correspondingly, any workable arrangement that will evoke sufficient interest among the participants to make co-operative action feasible becomes more difficult. We can illustrate this with a common work for water sharing. Working out a system of turn-irrigation for a group of five, 20 or 40 farmers is one kind of an enterprise. The participants can understand the arrangements more easily than would be the case if the number was 500 or 1000. The mechanisms and the processes are easier to understand where the group size is small. Without this understanding, there is little basis for the participants to satisfy themselves about the rough costs and benefits to themselves and to others. But where the number runs to hundreds, encompassing farms and farmers outside the direct and daily touch of the individual participating farmer (the point becomes particularly relevant when we are considering group action among farmers with limited contacts and horizons), the possibility of their agreeing on and working to a suitable common arrangement through local group action becomes less likely. Action on these lines might be facilitated by a more formal intervention by government setting up impersonal rules of operation for this purpose. But not, it would seem, on a voluntary basis and by local action. This approach is also helpful in assessing where informal, small group action on local initiative can pay dividends; and where, on the other hand, more formalized action, through somewhat impersonal channels and organizations would be needed. The essence of agricultural development planning is to arrive at this appropriate mix of macro- and
micro-level policies of formalized and non-formalized collective action, of big and small groups for the range of relevant activities so that the objectives of policy are effectively realized.

The second reason which reduces the likelihood and effectiveness of large-sized group activity for the type of functions, and the context we have in mind, is that even without a conflict of interests, it becomes progressively more difficult for the individual to feel sufficiently involved in a joint action as the size of the group increases. For one thing, it becomes difficult to make the individual feel convinced that his action will make a difference to the final outcome for himself. For another, there is less and less assurance in the mind of the individual participant as the group size increases that others will play their part in participating in the activity and sharing in its cost. The likely result is withdrawal from the proposed activity altogether or attempts at deriving the benefit without participating in the effort where possible.

It is interesting to refer to the discussion of this concept in the context of a developed country by Mancur Olson. In The Logic of Collective Action, he presents the arguments in the following terms:

Whether a group will have the possibility of providing itself with a collective good without coercion or outside inducements therefore depends to a striking degree upon the number of individuals in the group, since the larger the group, the less likelihood that the contribution of anyone will be perceptible (Olson 1965:45).

The capacity of a group, whether of a market or non-market variety, to act in its group interest 'depends on whether the individual actions of any one or more members in a group are noticeable to any other individuals in the group. This is most obviously, but not exclusively, a function of the number in the group' (Olson 1965:45).

Mr Olson then goes on to illustrate this principle with reference to a phenomenon observed in the more advanced countries. He contrasts for this purpose the effectiveness of control exercised on management by shareholders in joint stock companies which have a large number of stockholders, with control on management in companies which have only a
limited number of stockholders. His explanation runs as follows:

... in a large corporation, with thousands of stockholders, any effort the typical stockholder makes to oust the management will probably be unsuccessful, and even if the stockholder should be successful most of the returns in the form of higher dividends and stock prices will go to the rest of the stockholders, since the typical stockholder owns only a trifling percentage of the outstanding stock. The income of the corporation is a collective good to the stockholders, and the stockholder who holds only a minute percentage of the total stock ... has no incentives to work in the group interest. Specifically he has no incentive to work in the group interest. Specifically he has no incentive to challenge the management of the company, however inept or corrupt it might be ... (Olson 1965).

Is this relevant to the rural situation in a country like India?

One of the commonly observed phenomena in India is the state of disrepair of irrigation works whose maintenance is the responsibility of the farmers who draw water from those works. In the past a feudal type of leadership in the villages more or less ensured that sufficient labour was mobilized in advance of the irrigation season to undertake such routine maintenance operations as removing silt, clearing obstructions to the free flow of water, minor masonry repairs, etc. In more recent years, however, such activity has failed to materialize in many cases. Planners have deplored the withering of what they regard as the old community spirit; local functionaries are flooded with instructions and exhortations to revive that spirit by an appeal to the farmers based partly on idealism and partly on self interest. But the results have been as a rule disappointing.

There are of course many factors behind this trend. But perhaps the principle of group action referred to above provides one plausible clue in understanding why farmers freed from feudal compulsions fail to act in their own interest voluntarily in such cases. The difficulty is that for the typical farmer (as for the typical stockholder in big companies in Mr Olson's example) there is no guarantee
of other people acting in concert. Even where action by an individual farmer is effective the benefit cannot be internalized by him. The result is that group action fails to materialize. Perhaps similar phenomena relative to agriculture and irrigation are observable elsewhere. David Penny (1967: 45-9) cites some concrete instances of the failure on the part of farmers in certain villages of West Java to engage in such simple but obviously profitable activities in maintenance of irrigation works, even though the resources for carrying out such works were well within the reach of the farmers concerned. He refers to the inability of the farmers to organize themselves to get such simple jobs done. While Dr Penny does not explicitly relate this phenomenon to the size of the group and the principles referred to above, it would appear that part of the explanation for such phenomena might be sought in the logic of group action as developed in Mr Olson's book.

In any case it seems plausible to argue that at least one of the reasons why much official exhortation in favour of co-operative group action by farmers has produced such disappointing results is that the size of the group being indifferently chosen, such strategy leaves the individual farmers unconvinced. The size of the group must, no doubt, be large enough for it to be technically feasible and profitable; but at the same time it should be small enough for the potential participant to understand what the activity is all about, what his part in it is, and that of the others and what roughly are the benefits to himself and to the others of common action. An incentive among the members of the group to see that the collective good is provided is a necessary condition for group action. But it is usually (in the absence of extraneous rewards or penalties) not a sufficient condition. The further requirement is that the individual member should be able to see and ensure whether others benefiting are playing a part in rough proportion to their share of the benefits. (Mr Olson (1965) also discusses the case where one particular individual has such a large stake in the outcome that he will embark on that activity, even though others also benefit but may not participate or otherwise share in the cost. This is an interesting theoretical possibility, but perhaps rare in practice in the context in which we are looking at this phenomenon here.)

The 'free-rider' problem as James Buchanan (1965:1-14) calls it, arising from the inability to internalize all the
benefits, is implicit in some categories of group action. This is of more general relevance and will be referred to again later in this study. The theory is not valid, of course, where there are a sufficiently large number of farmers in the community who are just not interested in bettering their output or incomes. There probably are such farmers completely impervious to considerations of economic rationality. Experience seems to suggest however that they are probably the exception rather than the rule. Whether one such typical farmer should be allowed to set at nought a group activity by say 100 (in, for example, taking a drainage channel through his field or getting rid of a pest in his plot of land) or whether some mechanisms to compel him to participate and if so under what conditions, will be touched upon a little later. But at this stage the point simply is that even in terms of social incentives or altruistic motives, the greater efficacy of small group action seems to hold good. A non-material incentive in terms of social approval or recognition, as Mr Olson has pointed out, is concrete in a compact social group and tends to be blurred or vague in a large group.

As regards altruistic action, one cannot do better than cite the example given in Mr Olson's book:

A farmer who placed the interests of other farmers above his own would not necessarily restrict his production to raise farm prices, since he would know that his sacrifice would not bring a noticeable benefit to any one ... Selfless behaviour that has no perceptible effect is sometimes not even considered praiseworthy. A man who tried to hold back a flood with a pail would probably be considered more of a crank than a saint, even by those he was trying to help (Olson 1965:64).
Chapter 8

The implications

The 'solidarity-plus scale' principle provides one clue in understanding why the effective size for co-ordinated action at the working level is likely to be small. The Cornell study on Asian Rural Local Organizations (Uphoff and Esman 1974), referred to in Chapter 7, illustrates this phenomenon concretely, for different socio-economic environments. This principle appears to have been in evidence quite persistently. But more recent events seem to invest it with added importance.

The rising concern with the inability of small farmers to participate in national programs designed to improve techniques of production adds urgency to the search for the 'right' organization that would help small farmers to get over the handicap of smallness. One of the lessons for policy of this situation is a reallocation of development resources in favour of the small farmers. But as we tried to show in preceding chapters, the very nature of agricultural operations and the characteristics of the technology that is being pushed through seem to imply that the problem goes beyond reallocation of seeds, fertilizers and credit. The returns from the technology is also a function of the immediate environment in which the farmer operates. As the International Rice Research Institute (IRRI) put it:

... poor management practices are a major factor constraining yields on many farms, but also ... poor environment has a substantial yield-reducing impact too. Further, several factors that were beyond the individual farmer's control, but which are potentially controllable by institutional or group action also constrain yields under farm conditions (IRRI 1974:195).

Part of the poor management may have to be traced to the poor environment. This is true of both small and big
farms; but the smaller the farm, the less probable is the ability to control the surrounding environment. Correspondingly the greater the importance of group action for these farmers.

Organized group action among farmers could, broadly speaking, take two forms. One is organization on the basis of physical contiguity of farms, the size being determined by whatever is considered efficient or workable with reference to the tasks on hand or the capabilities of the instruments available for promoting organization. The other type is organization cutting across physical contiguity, and based on commonality of interests. In societies characterized by sizeable inequalities in the ownership of rural assets, a strong case can be made out for grouping farmers on the basis of the size of small-holdings. A series of field workshops convened by the Asian regional office of the FAO in 1974 saw merits in the latter course for many of the countries in this region (FAO 1974).

The choice between these alternatives has to be related to the particular socio-economic environment as well as the objectives of policy. The illustrations of small group action described earlier will not readily fit into one or the other types for all activities. Thus, for purposes of seed production there is no reason why land contiguity need be the criterion for selection of participants. Provided the agro-climatic conditions are uniform enough to permit the planting of a given variety of seed at a given time, the participants could be chosen on any principle that one may like to choose. Perhaps it is a set of small farmers who, driven by their inability to get certified seeds from existing agencies, would feel sufficiently interested in creating a local source. The bigger farmers may not need group action in order to satisfy this particular requirement. In a group of 50 farmers of whom 40 are small and who do have a need for a local source of this input, the fact that there are also ten who do not share this need does not mean that group action for those who desire it will be frustrated. It may be frustrated for other reasons, of course. These 40 may not be lucky enough to find a farmer somewhere in the neighbourhood who has the extra land and water to take on this supply function on mutually acceptable terms. But it need not be frustrated by reason of the fact that a few farmers within a block of land choose to opt out. The principle of small group action is consistent with the principle of interest-group organization, in this particular example.
But land contiguity becomes an important criterion in programs connected with reshaping land, improving drainage, or controlling plant diseases. Given that the holdings of the big and the small farmers are mixed up, in a physical sense, the approach to group action based on holding-size may not be very effective. Unless therefore it is assumed that the big holdings have been abolished and do not interpose themselves in a mass of smallholdings (in which case, of course, the rationale for grouping by farm-size would also presumably have vanished) the question arises whether it is realistic to pursue this principle of group action.

The answer depends on whether one is inclined to deny any possibility of the 'big' and the 'small' working together, even on an ad hoc basis, in rural society. Where such a view is taken there can be no group action for a common purpose. An alternative view is also possible, namely, that while the potential for conflict is to be recognized, it is also realistic to think of the 'big' and the 'small' acting together for specific purposes. Such accommodation could emerge in the face of a common threat (e.g. a pest attack on a standing crop), or when co-operative action can be mutually beneficial (e.g. controlling drainage). Farmers with varying farm sizes may feel it worthwhile to act together under such circumstances.

One device to keep in check possible domination by an entrenched elite of decisions about group action, either positively or negatively, is to keep the groups small, informal and purely functional. The group organizers could also be specially trained to be on their guard against possible distortion or disruption of group activity by particular elements in the villages. All these are less than perfect devices, however. One may have to fall back upon more direct control mechanisms, based on coercion.

Coercion itself can take many forms. At the simplest, it may amount to no more than taxing away a windfall profit which may accrue to those who cannot be effectively excluded from the benefits of group action, but who nevertheless refuse to share in the effort. This is the type of case where the individual merely seeks a 'free-ride', but is not opposed to the group action. This can happen, for instance, in the maintenance of an irrigation source. It is easy to justify imposition of a tax on an occasional evader. Similarly, where inaction by one results in external diseconomies — failure to control plant disease by one farmer causes damage
to the crop nearby - there will be general agreement about enforcement through penalties. It is where an individual wants to keep out of group action or positively opposes it, on the basis of a genuine doubt about the benefit or on an expectation that his personal interests will actually suffer (obstruction to a new well which needs a facility, such as access for a distributory channel through land owned by an individual who anticipates that completion of the work will mean the end of a business in sale of irrigation water to neighbouring farmers, for example), that use of coercion will be controversial. This is the kind of issue that arises in the course of economic development, and which calls for clear-cut policy decisions. In India, there is already legislation providing for compulsion in regard to pest control, soil conservation, and in some cases, consolidation of holdings. There are clearly laid down principles as to who can be compelled, for what purposes and by whom. Rarely is the local functionary allowed the discretion to apply compulsion. There are requirements for consultations upwards within the bureaucracy and horizontally with elected councils. Subject to these safeguards, there are good grounds for arguing that a society cannot have modern technology without the discipline that goes with it.

We have already hinted at the changes in the approach to planning and in its techniques implied by this view of agricultural development based on local initiative, and 'projectization' only in consultation with farmers. Planning for the agricultural sector will have to be indicative rather than prescriptive. This will, in turn, call for innovations in financing mechanisms, budgeting and monitoring procedures at successive levels of government, particularly in a federal set-up. These can be explored in concrete detail when once the basic idea is accepted.

Some specific comments on the organizational aspects for promoting agricultural development and on personnel for extension work will be in order at this stage.

On the organizational aspect, one way to assess the changes needed is to look at approaches so far tried, precisely where the aim has been to promote group action and see in what respect they have been found wanting. The two types that we shall consider here are the Community Development-Panchayat Raj (CD-PR) system and the traditional type of co-operative societies.
Since its inception, the CD-PR has had strong advocates as well as vigorous critics in India. Speaking about this experiment in promoting rural development through locally elected councils, Nehru (1969:88) had in 1961 claimed (on a slight variation of the Leninist theme) that for India progress is panchayats plus electric power. Yet, only six years later, the Administrative Reforms Commission came out with the finding that 'The impact of Panchayati Raj on agricultural production has been only negative' and recommended specifically that these institutions should not be entrusted with agricultural administration (India, Admin. Reforms Commission 1967:41). This is not the place to get involved in a general assessment of the system. There is no doubt that as an agency to get the rural people thinking in terms of improving their lot, of experimenting with new methods of cultivation, etc. - and as an institutional infrastructure for broad-based extension work in the villages the achievement has been quite impressive. But the demands on the system today are not what they were earlier. In most areas now, it is no longer a question of merely giving general lectures about the need for change, to experiment with new inputs, etc. This need while it continues is being overshadowed by the need to organize specific acts of improvement. And it is in this context that an unchanging extension set-up is showing up its inadequacies.

The point is not simply that local councils tend to be dominated by the rural elite. Even where new interest groups come into prominence, action to bring about basic changes in the pattern of land and water use can be blunted - the 'why provoke trouble' type of argument is common in a group that has an eye on the next election. Even where a council does want to act positively, it is likely to find itself as a clumsy unit organizationally. Action that can improve production conditions for a handful of ten or 20 farmers is unlikely to interest a whole council. And without the whole council concurring, no worthwhile initiative may be possible. A similar difficulty arises where the activity cuts across council boundaries. Even where a decision does emerge in favour of some action, it is perhaps after much delay. And delay in matters connected with agricultural operations could be fatal. This is not to deny, of course, that some of the panchayats-run CD Blocks have done extremely well. The point is only that as a fairly rigid pattern of organization for carrying out the type of operations that have been described and which appear essential for promoting further development, it is perhaps not the best that could
be devised. A similar handicap afflicts the bureaucracy too, in those areas where panchayats have been, by and large, kept out of the developmental activities. In this case also lack of manoeuvrability is a serious handicap.

The limitations of the usual type of co-operative societies for performing the trigger role for group action is again the rigidity of its structure and organization. The size of membership is rarely chosen with reference to the solidarity principle mentioned earlier; this is a particular weakness in societies that have been officially sponsored and set up, and have not emerged voluntarily to perform a specific function. Even in the latter type of case, unless the size, structure and composition of the society is specifically related to the particular activity that is proposed to be undertaken jointly, difficulties can arise. A society that takes in as many members as possible either because it thinks it is a good thing in itself, or because the membership is related to that activity which thrives on the broadest base (e.g. retailing groceries) can find that it has handicapped itself for other activities where a more compact group is of greater advantage (e.g. digging an irrigation well). One can, of course, have different societies for different purposes; but the very act of formalization into a registered society with a defined membership, rules of behaviour, of management, etc. can curb initiative. What is being suggested here is the co-operative society principle, but without formalization or structuring, functional but flexible.

Flexibility will not come about automatically; nor can it be left to chance. It has to be provided for quite deliberately. It is assumed that the role of government is paramount. If there is one view that seems to be shared both by the intellectuals and by the peasants themselves in developing countries, it is the view that, in the words of Professor Rosen (1975:27) the government is 'the only institution with the prestige to initiate major changes in direction and to introduce new institutions on a large scale'. Religious and voluntary agencies may be able to help at select locations. While their experience may provide valuable lessons to the planners, it seems realistic to assume that the general body of development workers must have links with a central power base, and to a body that has direct responsibility to promote development in the country. Whether these workers belong to a party cadre, the civil bureaucracy, or the military establishment, the field tasks will remain the
same, given the overall objectives of policy. The approach to work and the degree of effectiveness will, of course, vary between these categories of workers. We are looking at the situation where the objective is to bring about technological changes among the masses of cultivators and the main instrument of change is the civil bureaucracy.

Given the nature and the processes of technological change in agriculture on the lines explained earlier, it follows that the development agent at the local level has to be not merely an 'extender' of know-how, but an organizer of farmers. Without the coming together of the farmers, the possibilities of their improving either their 'environment' or their 'management practices' will remain restricted. This is what analysis as well as experience seems to indicate.

This brings up the question of what kind of extension agent, or more appropriately, development worker, one would need at the local level to work the kind of arrangements that we have in mind. Obviously, the answer will depend on the local situation. The type of qualities or qualifications that one may need in a State like Punjab would not be the same as those that one may have to build in for a less dynamic region. But one can perhaps advance a few general points about the worker himself, and about him as part of a larger chain.

One problem to consider is whether a worker with a high school base plus some 18 months special training in agriculture and in extension methods would suffice, or whether one should look for a more elaborately trained worker, with perhaps a graduate degree in agriculture. On the face of it, it would seem that the type of role here envisaged will require technical competence of a substantial order. The local worker must have a reasonable grasp of the principles of crop husbandry, soil management, irrigation, etc., before he can start 'fomenting' improvement. As technological change begins to occur, the level of technical skill needed in the extension worker also keeps going up. The demands on the VLW today are not what they were 20 years back.

But one must also take into account the practical possibility of finding sufficient highly trained extension workers in close proximity to the farmers. In the Indian situation, for instance, there is one VLW for every ten villages; and ten VLWs for every graduate extension worker in agriculture. Given difficulties of communication,
transport, etc., the number of contact points have to be necessarily large. The type of close organizational, probing-approach based development that is being suggested here will not permit a reduction in the existing number of contact points. While the availability of graduate extension workers can and should be increased, there may be no alternative, for the foreseeable future, to working with para-technical aides at the level closest to the farmer.

Moreover, it is not clear in exactly what discipline the VLW must be an expert for this type of activity, if the expert path to development is considered vital. He cannot possibly be an expert in agronomy, soil science, irrigation, etc. all at once. It would be virtually impossible for the last link in the chain, or for that matter for a link anywhere in the chain, to combine expertise in all these disciplines. From a practical point of view, therefore, all one can hope to establish at the village level is a para-technical aide who has access to several experts located at higher levels. That there is an urgent need for expanding the pool of such specialist back-up staff in extension as agricultural technical change proceeds will be readily appreciated. In India it is explicitly acknowledged in the Draft of the Fifth Five Year Plan (India, Planning Commission 1973, Part I, p.102).

One final comment while on this point. Perhaps there is some trade-off between technical sophistication and the ability to enter into a dialogue and influence the actions of illiterate farmers. One does not have to be a full subscriber to the 'cultural revolution' principle of China to concede the possibility of such trade-off. Much will, of course, depend on the orientation and bias of the graduates coming out of the universities. If the bias happens to be away from the rural environment, the ability of the products of such institutions of higher learning to work closely and directly with farmers and be effective in that environment is likely to be limited. This is more than an academic point in the Indian context.

Thus we arrive at a view of effectiveness of the village level extension worker which is partly a function of technical skill and partly also of backgrounds and attitudes which influence acceptability in the first instance. Without this acceptability, the sophisticated extension worker is in danger of losing his audience.
We must now turn to consider whether the kind of person now on the job in India is a promising enough raw material for undertaking the new tasks that have been outlined in this study. Over the years, there has been some disenchancement with the potential for positive action on the part of the VLW. Opinions vary as to whether the VLW is up to his job at all. Some have presented a picture of him as a disgruntled man of low competence; some as a worker who is not particularly known in the villages where he is supposed to be working (Chambers and Wickremanayake 1974; Govt of Kerala Report 1971:24). Others have recorded, on the basis of field studies, the extent of his contact and influence with farmers (Programme Evaluation Organisation 1968:72, Table 3.3; Programme Evaluation Organisation, November 1969: 20-1). The truth is perhaps in between these extreme versions. One point noted by independent, non-official observers has been that the system of planning and administration that is being practised leaves but little room for the VLW to exhibit any initiative that he may have (Dube 1958:157-92; Johnson 1972:345). With a deliberate change in planning and administrative techniques designed to encourage local initiative, the effectiveness of the local worker would be better put to test. What does seem to be established as of now is that the VLW is by and large an accepted category among the farmers, that the farmers do take him seriously and in fact turn to him for advice in matters relating to new techniques of production and management. This is good enough to go by, until conclusive evidence comes in to show that the kind of non-expert local extension worker now in position is unfit to trigger off any worthwhile change. That would be the time to start considering a brand new extension staff for the 550,000 villages of India.

The local extension worker does not, of course, work in a vacuum and it is necessary to examine his links with the rest of the administration. The strength of the VLW derives from the fact that he has access to experts and institutions that are meant to serve agriculture, but are located outside and beyond the immediate contact of the farmer. It is these links that will need to be systematically strengthened in a functional sense. Whether this would mean that the VLW should himself be given powers of allocation of scarce inputs has been debated in India. The argument in favour of following this course is that it would enable

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1 E.g. A.D. Gorwala in Mysore Administration, quoted in Hanson 1966:427.
the VLW to follow up his advice with supplies, and that as a consequence, he can be held responsible for the final results. On the other hand, there are some who consider that entrustment of distribution work to the extension staff takes their time and attention away from the more basic responsibilities of teaching farmers how to farm better (India, Admin. Reforms Commission 1967:149-87). The arguments are somewhat evenly balanced; but from the point of view of preserving the general acceptability of the extension worker among the masses of farmers, there would be advantages in not giving him powers of patronage.

There is one further point and that touches 'status'. This is important in determining effectiveness and promoting self-confidence in Indian administration. Block Development Offices in India have not been immune to concerns for status (Beteille 1974:65), and to the extent that the very agent through whom government is to communicate with farmers is assigned a low status, he is not likely to develop qualities of initiative and leadership. This is a problem that needs to be tackled anyway, irrespective of changes in planning philosophy or of extension techniques. It assumes added significance in the context of a more ambitious approach to extension. A variety of measures may have to be considered for this purpose. These would include direct upgrading of status within the hierarchy, higher emoluments, and freedom for the village worker to establish links and get decisions from above, cutting across hierarchy.

We have been using the two terms - the local extension agent and VLW who is a specific functionary under the CD set-up - somewhat interchangeably so far. The time has come to clarify this point. For reasons already gone into, the complement of extension personnel already in position are being thought of as the first candidates for triggering development among farmers. They need not, however, be the exclusive agents of change. What the FAO regional seminar referred to as the 'extra-governmental' sector can be usefully pressed into service. Even now other agencies play a part - a cigarette-manufacturing company in tobacco development at one place, and a sugar company in cane development elsewhere. Local agents of banks and other commercial organizations, school teachers, university students who are interested, or who could be induced to take an interest in such work can play a very useful role. When such persons do come in, they will probably bring to bear approaches and styles of work which may be unobtainable
within the bureaucracy. In the more advanced areas, private consultancy as a commercial proposition may become feasible. The following extract from a recent report from one of the States will be of interest:

Government should encourage private initiative in the field of agricultural services. Since all the advice and services of the department are presently offered free of charge, they partake the character of selective patronage ... Also the fact that the service is offered free of charge by civil servants whose stake in the consequences of their advice/service is so minimal as to be almost non-existent detracts seriously from the value and the quality of the service. It would therefore appear to be desirable to promote private initiative in such fields as farm consultancy, production and sale of seeds ... and also in the field of pest control. There is no reason why individual graduates or a small group of them cannot offer a farm consultancy service covering the area of one or two villages, for a modest fee and earn a comfortable living out of such a venture (Tamil Nadu, Admin. Reforms Commission 1974:147-8; India, Planning Commission 1973, Part II, p.12).

It would be unrealistic to assume that such extra-governmental agents can take over from the regular staff as a general pattern everywhere. It will thus be necessary to rely on the official extension agent as a rule, but provide sufficient flexibility in the apparatus so that where a different agent happens to be available for either a given area or a given activity, that agent is also made use of, as a colleague or as a replacement for the regular agent. It may well happen that there are individuals in an area — within the bureaucratic frame or outside it — who are good at organizing farmers in constructing small irrigation works; others who may prove their worth in getting a plant protection campaign going; and yet others who understand how to raise common nurseries. There will be obvious merit in shifting such people around from area to area, so that they propagate a particular practice to some effect and get it generally accepted. The extension machinery should build such flexibility as an essential part of its structure and work style.

We can now turn to look at the processes by which developmental work of this nature in the rural areas might
work, or be made to work. The first step is for the planners to define a framework of policy, the objectives and strategies. The next step is for the technical experts to translate the general strategy in more concrete terms in each local context. Without this step being taken, neither the extension workers nor the farmers are likely to know where to begin and what type of project they should examine. This translation will be in terms of the types of activities that are considered useful in a particular environment - water control, additional irrigation, preventive action against plant diseases, soil conservation, production of quality seeds, etc., or the particular combination that promises the best and the most concrete payoff. The next step is one of reconnaissance at the very local level, for parts of a village. This is an activity which the village level worker can as a rule undertake, though higher level experts would also do well to try a little reconnaissance of their own, to make sure, if for no other reason, that what they are prescribing is relevant to the environment and makes sense to the farmers. It is on the basis of such reconnaissance that the next stage of probing can start: contacting a group of farmers to raise the possibility of their undertaking a specific activity, the manner of attempting it, the resources they can raise themselves and the help they will need from the outside. Assuming some positive response, the local extension worker will have to throw the ball back into the court of the higher level experts, so that the acceptance of a particular idea could be made manifest in a specific project, with all the technical and financial details. The suggestion will then have to go back to the farmers concerned for its final acceptance. The way this description has been developed, it would appear as a smooth, iterative operation. In practice, the path may have to be more jagged. But that is precisely what is involved in the so-called feedback process of agricultural planning.

No detailed comparison with the process by which planning and implementation takes place now is necessary. The points that the National Commission on Agriculture made in its interim report on agricultural research, extension and training - about involvement of the scientists in the university with extension in the farmers' field, close liaison between the extension personnel and the higher level experts in government departments, universities, etc. - are, of course, important. What we have tried to do is to suggest ways of work in the rural areas that would build such involvement and liaison into the processes of developmental
action, and to relate all this to a new style of planning. This link with overall techniques of planning and implementation are important, at least in the Indian context, and needs to be explicitly spelt out. Our earlier discussion shows that merely adding to the size of the extension contingent, enhancing their technical skills, promoting exchange of staff between universities and departments of governments, while all necessary, may not be fully effective in terms of the overall objectives of policy without some change in the vision and the approach to planning for agricultural development.
Chapter 9

The perspective

The discussion of the organizational and extension types of activities for technological change in the agricultural sector has been in the specific context of the rice crop, grown on numerous small-sized farms. Some of the concepts developed here have perhaps a larger relevance; but, obviously, there is a 'varietal selection' problem for organizations and techniques of action for different crops and different institutional settings. Focus on the rice crop is explained by two factors. It is the single most important agricultural crop grown in India, in terms of output and also area planted. IRRI (1974:xiii) estimates that the primary or secondary staple food of nine-tenths of the low income people in the most densely populated regions of the world is rice. The other consideration is that it is in respect of rice that particularly intractable problems of diffusion of innovation have been encountered in South and South East Asia compared to, say, wheat or corn in the same area or elsewhere in recent past.

We examined the problems of organization at the local level; and its links with bigger organizations. But the interest in organization itself has to be put in some perspective. We looked at organizational behaviour and patterns not in the abstract, but in the specific context of changing techniques of cultivation among masses of farmers. The assumption has been that technology is, in a sense, the mainspring of growth, and that mere organizational innovations without the underpinning of a technological breakthrough are not likely to be very productive. The Indian Community Development experience and the 'Great Leap Forward' experiment of China during the fifties illustrate this point.

Minor changes in some aspect or the other of agricultural production and processing become feasible or are devised from time to time. Major advances in productivity, however, occur but infrequently. They are like securing bridgeheads in a
military campaign, requiring careful planning and investment of resources. In agriculture this can take the form of either a decisive improvement in a technique, the development of a new input, or of a big infra-structural investment. In a large developing country, at any given time there are perhaps areas where without such a new bridgehead being secured - a new irrigation/flood control work, a new seed that can thrive under extreme moisture stress, or under recurrent flooding as the case may be - extension activity for farmers is possibly no more than scratching the surface. At the same time we should keep in mind that there are sizeable areas where one could advance on the bridgehead already secured. In H. Myint's words:

Unlike in the advanced countries, the more important 'residual' factors of economic growth in the underdeveloped countries may be found in the better utilisation, adaptation and diffusion of the already existing technology rather than in 'dynamic' changes in technological knowledge and innovations; in the development of market institutions which improve the transmission of the relevant economic information rather than crash programmes in education and massive investments in human capital; in overcoming the 'indismissibilities in the small' which confront the small economic units in the 'unorganised' sector in trying to invest in small scale but highly productive pieces of capital equipment rather than in overcoming the 'indismissibilities in the large', or the huge lumpy investments required by modern technology in the field of heavy industries (Hla Myint 1973:4-5).

The organizational factor assumes a special significance in areas and during periods when absorbing available technology is itself a main challenge.

What the experience in India and perhaps a few other countries in the region seems to indicate in regard to absorption of new technology in rice cultivation is the complexity of the mopping-up operation on a potential for advance already opened up. Experience further suggests that what we need to seek is not one unique pattern of organization that will work everywhere, but a range from which individual selection has to take note of conditions of farmers, farms and the farming environment. The suggestions made here are
offered as a candidate for field tests in administration and organization for a particular set of these factors.

There are two different aspects in the spread of HYV technology whose implications together deserve special attention. The first aspect is the package concept, based on the complementarity of inputs. The other is the anxiety, under compulsions of socio-economic policy among developing countries (and this is certainly true of India) to extend the technology as rapidly and as widely as possible, often beyond what available supplies of essential inputs would perhaps warrant. In India the pattern of farm holdings among rice cultivators separately is not known. But on the basis of the overall pattern, it would be seen that starting at the top and drawing the line at around 3 hectares, one could cover about 70 per cent of the area by reaching only 25 per cent of the total farmers. This might sound like a cheap administrative route to modernization; but such an approach is ruled out because the objective of policy is to modernize on a broad base, 'to weave the processes of distribution into the processes of production' and ensure that everyone benefits from the new technology. Writing about the tasks of extension in the context of the HYV technology, Dr Steir (1974:453) argued for instance, and quite rightly, that extension service must take its cue from more basic objectives of a country's agricultural strategy and concentrate on certain areas or on certain progressive farmers if an increase in total crop production is the major concern, and that the approach should be different if income distribution is of major concern. We need to look also at situations where these two objectives cannot be neatly separated.

One implication of the package technology that came to be highlighted in the earlier years was that farmers must be taught how to manage the new inputs together, with some understanding and discipline. The approach to extension was based on this philosophy; emphasis was on demonstration. Demonstration is of course basic to diffusion, but soon doubts began to emerge. Perhaps what was missing among those who were not 'innovating' was not some superior knowledge, but simple wherewithall - the resources. Field investigations which showed that awareness spread faster than adoption seemed to lend weight to this view (Kivlin and others 1968:1; Programme Evaluation Organisation, June 1969:237-8, Table 7.6). There followed a flood of literature dealing with allocation of inputs, credit, fertilizers, etc., etc. The emphasis was on who should get the scarce inputs. Some of the writers
(Rao 1974) argued that a reallocation in favour of the small and hitherto neglected farmers was not only an equitable but also an efficient (in terms of the overall effect on output) solution. Whether there would be enough of the crucial inputs to go round even for the small farmers was itself not specifically investigated. What would be the impact on output under conditions of partial package and less than perfect management, whether for the large or for the small farmer was also not very clear. In the meanwhile, a third candidate came into prominence as a factor in explaining poor yields on actual farm conditions as compared with experimental data. IRRI has undertaken special studies to try and isolate the contribution of poor management and of poor environment to sub-optimal yields. Whether one is in a position or not to exactly and quantitatively gauge the influence of particular sets of factors such as 'management', 'resources', or 'environment' on yields under the HYV technology under field conditions, it would seem that all these three factors have to be tackled before any broad-based modernization can occur.

It is in this overall context, in terms of its potential for conveying knowledge, to augment resources locally, and to reshape the physical environment, that the concept of small group action has been considered in this study. The point is not that this is an unknown principle, but that its systematic exploitation can lead to good results. It would be of interest to see, even if very briefly, how this principle has been utilised in a few other countries, either by the farmers themselves, or by act of deliberate policy by the government. We shall only look at a few countries that have a distinct tradition of rice farming and that too in small farms.

Even countries which have socialized land ownership seem to pay special attention to this principle of small or compact group action, as a simple practice of management. This is despite the fact that the greater the proliferation of the basic units of management, the more difficult is the problem of co-ordination and monitoring activities and exercising control in such societies. In China, for instance, the basic unit for planning and operational purposes in the rural areas was, to start with, the commune, with an average of 4000 to 5000 households. Within a few years, however, the size of the commune was drastically reduced. This was achieved by subdividing some 27,000 communes into about 74,000 communes. While there was perhaps more than one cause
for this development, one of the considerations seems to have been ease in management, and possibly the solidarity principle for concerted action locally. What is most interesting, however, is the fact that in the course of time the basic management unit appears to have become the Production Team, composed of 20 to 60 families living in a hamlet or a village. It is this production team, and not the commune, which is said to own the farmland, and most farm tools and draught animals. Higher level formations such as brigades and communes appear to come in essentially in a co-ordinating role, as far as agricultural management is concerned (Stavis 1974a:46-61).

In North Vietnam, the farming co-operative on an average was said to cover less than 60 families (Chaliand 1969:44).

The same principle appears to have weighed with farmers and policy makers in two other Asian countries, but which prize private ownership in land. Historically, hamlet settlements, typically containing 50 farm families (and not more than 100 families if non-farming families are included), have functioned for a long time as important units of agricultural production in Japan. Despite the fact that growing commercialism has made inroads into the neighbourhood spirit of an earlier age which helped to knit the hamlet together, and that village level political institutions came into prominence towards the close of the nineteenth century, hamlet groups still appear to play a significant role in agricultural operations. Fukutake (1967:Ch.VI) reports that some 84 per cent of the hamlets spray their lands together collectively, and in 80 per cent of these cases, the Agricultural Practice Union (which is the organized body in the hamlet to help improve cultivation practices) is the body which organizes it. Forty-eight per cent of hamlets are said to make communal use of machinery and in 80 per cent of these cases, the machinery is owned either by the Union or by the hamlet, rather than by the Agricultural Co-operative which covers the whole village area (Fukutake 1967:92-3).

Taiwan, with its pronounced tendency for structured control had to resort to the 'agricultural small group' principle, with a membership of 150 to 250 on an average for operational purposes in agricultural activities, though for marketing of inputs and for larger planning and co-ordination roles, Farmers' Associations, with much larger membership and coverage are the important units. Even within the Agricultural Small Groups, it would appear that when it
comes to propagating some new aspects of farm management, the basic unit for the extension worker is a group of 15 to 20 farmers (Stavis 1974b:64-5).

The Compact Farm scheme of agricultural development in the Philippines also appears to lend support to the general principle that is being put forth in this paper.

It would be absurd to suggest that it is the attachment to the small group principle that explains agricultural progress in these countries, with their diverse ideologies, administrative structures, etc. But this common thread is an interesting phenomenon, as also the resort to more flexible group formations to deal with specific problems in agricultural management. Nor is this reference meant to ignore the role of other incentives and penalties that these systems exhibit and within which agriculture functions.

One final word that may be worth noting explicitly is the fact that behind all these discussions about the right sizes for, and techniques of organization, is the assumption that what the planners are trying to do for agriculture corresponds, in some broad measure with what farmers think is worth doing. There is no a priori reason why this correspondence should always exist. The point is, however, that the divergence between the two where it exists is likely to show up better under the type of planning here envisaged than in a situation where officials at the periphery are mechanically fulfilling targets set for them at the Centre.

There is of course the larger question as to whom or to which sections within the rural society the objectives are acceptable. Even a little experience in working development programs is sufficient to bring home this fact of conflict, or the potential for conflict, of interests among different sections of the rural community. There is no unique general will which the planner by some extra diligence can ascertain and translate into action for the good of all. More specifically, we must consider the fact that in pushing new techniques, one may be generating forces that worsen the problems of tenants, or threatens the livelihood of the landless. The consequences of the chosen strategy need to be evaluated in full. Effective implementation can serve, at the least, to bring into clearer focus what the overall bias in planning really is, and to what extent and in what manner certain traditional social structures, economic organizations or institutions of private property and the
like are, in fact, promoting or impeding progress.

The thrust of development activities proposed here is improved farm management, not just immediately but in a more enduring sense. This it seeks to do by improving the use of land and water resources. This approach will call for the introduction of additional labour inputs on a sizeable scale, not under a traditional public works program, but in improving the quality of a whole complex of public as well as privately-held land. The principles of flexible planning, innovative implementation and small group action can be used to advantage for this purpose. A graded system of making farmers pay for the improvement over a period of time can be devised, to make the program as self-sustaining as possible, and also on grounds of equity. The harnessing of science to systematically utilize under-utilized labour for improving under- and badly-utilized natural resources would seem to provide an acceptable, even an attractive, philosophy of development in the conditions of Indian agriculture, and possibly elsewhere in Asian agriculture.
## Appendix I

### Pattern of investment for agricultural development in India

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(a)</td>
<td>(b)</td>
<td>(a)</td>
<td>(b)</td>
<td>(a)</td>
</tr>
<tr>
<td><strong>Agricultural Development Programs:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I. Research and Education</td>
<td>Negligible</td>
<td>14</td>
<td>1.52</td>
<td>28</td>
<td>1.88</td>
</tr>
<tr>
<td>II. Extension and Organization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) National Extension Service and Panchayat Development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii) Co-operatives for credit marketing and warehousing</td>
<td>101</td>
<td>212</td>
<td>288</td>
<td>115</td>
<td>129</td>
</tr>
<tr>
<td>iii) Agri. Credit Organizations, other than co-operatives</td>
<td>7</td>
<td>47</td>
<td>103</td>
<td>273</td>
<td>557</td>
</tr>
<tr>
<td>Sub-total:</td>
<td>108</td>
<td>11.44</td>
<td>259</td>
<td>28.15</td>
<td>391</td>
</tr>
<tr>
<td>III. Infrastructure Development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Irrigation</td>
<td>595</td>
<td>447</td>
<td>776</td>
<td>1,470</td>
<td>3,202</td>
</tr>
<tr>
<td>ii) Rural Electrification</td>
<td>27</td>
<td>75</td>
<td>105</td>
<td>445</td>
<td>1,098</td>
</tr>
<tr>
<td>iii) Soil Conservation</td>
<td>-</td>
<td>20</td>
<td>11</td>
<td>159</td>
<td>299</td>
</tr>
<tr>
<td>iv) Local Dev. Works</td>
<td>15</td>
<td>15</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sub-total:</td>
<td>637</td>
<td>67.48</td>
<td>557</td>
<td>60.54</td>
<td>892</td>
</tr>
<tr>
<td>IV. Other Dev. Programs</td>
<td>199</td>
<td>21.08</td>
<td>90</td>
<td>9.78</td>
<td>175</td>
</tr>
<tr>
<td>All Programs:</td>
<td>944</td>
<td>100.00</td>
<td>920</td>
<td>100.00</td>
<td>1,486</td>
</tr>
<tr>
<td>Total Plan Outlay:</td>
<td>2,069</td>
<td>4,800</td>
<td>7,500</td>
<td>15,902</td>
<td>37,250</td>
</tr>
</tbody>
</table>

**Note:** A word of caution is necessary in interpreting these data. The outlays given above are what are technically classified as 'Plan' expenditure. This gives only a partial measure of total resources committed for any given purpose. Also some of the programs do not neatly fit into the above classifications. To some extent, therefore, there is some arbitrariness in the grouping.

(a) Outlay in crores of Rs.  
(b) %

**Source:** Successive Plan documents.
Appendix II

Trend in the use of agricultural inputs

<table>
<thead>
<tr>
<th>Year</th>
<th>Improved seeds (coverage in m. hectares)</th>
<th>Gross irrigated area (m. hект.)</th>
<th>Chemical fertilizers used (NPK-m. tonnes)</th>
<th>Green manure (coverage by m. hect.)</th>
<th>Plant protection (coverage by m. hect.)</th>
<th>Soil conservation (coverage by m. hect.)</th>
<th>Credit advanced per year by credit co-op. society (Rs. crores, short, medium, plus long term)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950-51</td>
<td>1.9</td>
<td>25.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>24.3</td>
</tr>
<tr>
<td>1955-56</td>
<td>19.8</td>
<td>28.0</td>
<td>0.3</td>
<td>4.5</td>
<td>6.5</td>
<td>1.0</td>
<td>52.5</td>
</tr>
<tr>
<td>1960-61</td>
<td>48.6</td>
<td>30.9</td>
<td>0.8</td>
<td>8.7</td>
<td>16.6</td>
<td>4.0</td>
<td>214.4</td>
</tr>
<tr>
<td>1965-66</td>
<td>9.2</td>
<td>35.4</td>
<td>1.8</td>
<td>7.5</td>
<td>40.0</td>
<td>-</td>
<td>342.0</td>
</tr>
<tr>
<td>1969-70</td>
<td>11.4</td>
<td>37.3</td>
<td>2.0</td>
<td>6.3</td>
<td>46.0</td>
<td>1.2</td>
<td>652.1</td>
</tr>
<tr>
<td>1970-71</td>
<td>15.4</td>
<td>38.6</td>
<td>2.3</td>
<td>5.9</td>
<td>52.0</td>
<td>1.3</td>
<td>697.5</td>
</tr>
<tr>
<td>1971-72</td>
<td>18.2</td>
<td>39.5</td>
<td>2.7</td>
<td>7.8</td>
<td>58.0</td>
<td>1.4</td>
<td>748.2</td>
</tr>
<tr>
<td>1972-73</td>
<td>22.1</td>
<td>40.1</td>
<td>2.8</td>
<td>8.3</td>
<td>64.0</td>
<td>1.4</td>
<td>768.9</td>
</tr>
<tr>
<td>1973-74</td>
<td>25.5</td>
<td>41.1</td>
<td>2.8</td>
<td>6.0</td>
<td>60.5</td>
<td>1.1</td>
<td>956.7</td>
</tr>
</tbody>
</table>

Note:  

a Figures up to 1965-66 relate to coverage by improved local varieties. For subsequent years, they relate to High Yielding Varieties Seeds only.  

b Relate to additional agricultural area covered during the previous five years, up to 1965-66, and annual additions beyond 1968-69.  

c Comparable data not available; there is indirect evidence to suggest that the expansion continued after 1970-71 also, roughly at the rate of 2 m. hectares per year. Economic Survey 1974-75, p.67.

Sources:  

4 Draft Fifth Five Year Plan, Part II, pp.4-6.
## Appendix III

The community development program
Infrastructure for rural development - some details

<table>
<thead>
<tr>
<th>Nature of the staff</th>
<th>Number in position</th>
<th>Nature of the facility</th>
<th>Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block Development Officer</td>
<td>4,464</td>
<td>Seed Multiplication Farms</td>
<td>1,917</td>
</tr>
<tr>
<td>Gram Sewak (village level extension worker)</td>
<td>58,002</td>
<td>Workshops for the manufacture of agricultural implements</td>
<td>7,597</td>
</tr>
<tr>
<td>Gram Sevika (village level female extension worker)</td>
<td>6,227</td>
<td>Veterinary Hospitals under qualified veterinary doctors</td>
<td>7,863</td>
</tr>
<tr>
<td>Animal Husbandry Officer</td>
<td>5,553</td>
<td>Stockmen Centres under para-technical aides</td>
<td>7,770</td>
</tr>
<tr>
<td>Agricultural Extension Officer</td>
<td>6,123</td>
<td>Artificial Insemination main centres</td>
<td>1,724</td>
</tr>
<tr>
<td>Co-operative Activities Extension Officer</td>
<td>4,376</td>
<td>Artificial Insemination sub-centres</td>
<td>5,770</td>
</tr>
<tr>
<td>Rural Inds. Dev. Officer</td>
<td>1,176</td>
<td>Cattle breeding farms</td>
<td>969</td>
</tr>
<tr>
<td>Social Education, local self-government dev. worker</td>
<td>5,793</td>
<td>Repair workshops for agricultural implements</td>
<td>1,427</td>
</tr>
<tr>
<td>Mukhya Sevika (Block level female extension worker)</td>
<td>1,992</td>
<td>Primary Health Centres</td>
<td>4,681</td>
</tr>
<tr>
<td>Engineering Assistant</td>
<td>4,836</td>
<td>Rural Dispensaries</td>
<td>16,158</td>
</tr>
<tr>
<td>Medical Officer</td>
<td>2,679</td>
<td>Maternity and Child Welfare Centres</td>
<td>11,199</td>
</tr>
<tr>
<td>Progress Assistant</td>
<td>3,068</td>
<td>Family Planning Centres</td>
<td>9,226</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>104,289</strong></td>
<td></td>
<td><strong>1970-71</strong></td>
</tr>
</tbody>
</table>

Number of C.D. Blocks: 4,893
Population covered: 405 m.
Villages covered: 566,900
Area covered: 3.2 m. sq. km.

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