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TWO BLADES OF GRASS

A Summary of Two Studies on
Agricultural Innovation in India

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"And he gave it for his opinion . . . that whoever could make two ears of corn, or two blades of grass, to grow upon a spot of ground where only one grew before, would deserve better of mankind, and do more essential service to his country, than the whole race of politicians put together."

—Jonathan Swift

PREFACE

This brochure is dedicated to the proposition that all Indian farmers are striving for the good things of life; that scientists from various disciplines and from all nations can work harmoniously together for the good of farmers; and that there is a basic unity of all knowledge which can be harnessed for the benefit and use of all men.

This brochure is a condensation of two larger technical reports published by the National Institute of Community Development: *Agricultural Innovations in Indian Villages* and *Agricultural Innovation Among Indian Farmers*. These reports cast a wide net. In the first book, we reported the findings of a study of 108 Indian villages. In the second book, we reported the findings of a study of 680 Indian farmers.

The authors have drawn freely from their earlier writings. However, most of the technical jargon and the mathematical defence of measurements have been eliminated from the present brochure. Only parsimoniously selected and important variables have been described here, along with some practical implications and conclusions. We would urge the reader who wishes more proof, and who is interested in other variables, to read the earlier, more complete reports.

The brevity of this report will bring the findings of the two more extensive and intensive studies to a wider audience of administrators, politicians, agricultural scientists and extension workers.

This study is part of a larger three-nation study on the "Diffusion of Innovations in Rural Societies", directed by E. M. Rogers of Michigan State University. The Indian part of the study was directed by Prodipto Roy, Frederick Fliegel, Joseph Kivlin, and Lalit Sen. A. W. van den Ban was an adviser to the project. The field-teams were supervised by A. K. Danda, S. K. Reddy and S. S. Thorat. Members of the teams, who also did the bulk of the coding and tabulation, were D. K. Bhowmik, P. K. Chatterjee, B. R. Patil, K. S. S. Raju, J. M. Rao, J. V. R. Rao, S. Rudra, J. Sahabhowmik, S. K. Shelar, P. M. Shingi, G. Subharatnam and V. K. Surkar. The manuscript was typed by D. S. R. Anjaneyulu. Data for this report were processed mainly at the Computer Centre of the Programme Evaluation Organization, Planning Commission, New Delhi.

National Institute of
Community Development, Hyderabad
12th May, 1968.

GEORGE JACOB
Dean

CONTENTS

I

THE FRAMEWORK OF AGRICULTURAL DEVELOPMENT

HAS INDIAN AGRICULTURE FAILED ?

The cry has been heard often in India that 'agriculture has failed'. There is general agreement that India's rapidly growing population needs more food. Drought in 1965-66 only dramatised the fact that, even in a normal year, demand for food is perilously close to exceeding the available supplies. Foodgrain production improved from 61 million tons in 1949-50 to a welcome high of nearly 89 million tons in 1964-65.[1] In the next year of severe drought, however, production fell to 72 million tons. Production in 1968, in contrast, is expected to top 100 million tons for the first time in India's history.

These fitful ups and downs of production as a result of the whims of nature have always plagued Indian agriculture. Combined with the steady increase in population—now over 520 million—these fluctuations make the need for agriculture to perform better and more steadily, all the more imperative.

The task of increasing agricultural output in India will not be easy. Nowhere have we seen this problem described more forcefully than by Millikan and Hapgood in their book, *No Easy Harvest.*

> "Agriculture . . . is a 'systems problem'. It will perform effectively not if one or two or even several requirements are met, but only if a whole range of interacting conditions is satisfied . . . . It is urgently important to identify in each situation *which of the parts of the system are most limiting* in order to put limited efforts where they will do the most good.
>
> "We did not find a magic key to unlock the problems of agriculture, nor do we present a program likely, in ten years or a century, to assure the world's supply of food.
>
> "To get the people of the world a decent supply of food—that most basic of man's requirements—will require a gigantic

1. Government of India, *Fourth Five-Year Plan : A Draft Outline,* New Delhi : Planning Commission, 1966, p. 172.

> effort . . . It will cost a lot of money, but money is probably the easiest need to fill. The goal will not be met unless many millions of people—technicians, officials and, above all, farmers—are *willing to initiate a radical and often painful process of social change.*"[2] (Emphasis ours).

Returning now to our own study, we feel that it is one of those which Millikan and Hapgood have recommended. Our study attempts to identify which parts of the agricultural system are most limiting and which parts are most likely to bring about innovation on which increased production, to a large extent, depends. Agricultural innovation involves the scientist whose technology yields the innovation, extension agents who promote the innovation, and the farmer who uses the innovation and actually produces the food. We have not concerned ourselves with the scientist and the worth of his innovation. We have assumed that his innovations, if properly used, will lead to higher production. Our major concerns were with the farmer in his village setting, and with extension and other agencies linking him to the world outside the village. We focussed on whether agricultural innovations have indeed been adopted by the farmer, and on the conditions that facilitated or inhibited adoption.

To answer the question we first raised, 'has Indian agriculture failed ?', we found no reason to doubt that India's cultivators *can* produce enough to meet the present rapidly growing demand for food. Already, much has been accomplished. Agricultural services and supplies have been extended into the bulk of India's villages. The idea of change has been planted in the minds of many Indian farmers in those villages. This is a formidable task accomplished in the two decades since independence. Communication networks and agricultural supply lines, however precarious, now extend to almost every village in India. The basic institutions of education, health and welfare have reached out to every corner of India. For example, every village in our sample had a primary school. Voting in national elections and to local panchayati raj (village council) bodies has brought village people into active participation in the body politic of the modern nation state. A new agricultural elite has made its power felt, not only in the state legislatures but also in Parliament.

In short, the peasantry of old is fast disappearing. Indian cultivators are no longer the passive recipients of government hand-outs ;

2. M. F. Millikan and D. Hapgood, *No Easy Harvest*, Boston : Little, Brown and Company, 1967, pp. vii to xi.

they now demand and invigilate the execution of agricultural development. We regard what we found in our study as manifestation of a vigorous break-through or take-off into a modern agricultural era, not in the next century but in the next decade or two.

WHAT SHOULD WE STUDY ?

With a problem so vast as agricultural change, which implies certain radical alterations of the grass roots of India's agrarian culture, our first step was to circumscribe what we could accomplish, given the time, money and scientific manpower we had. Our study was part of a three-nation project comparing the diffusion of innovations in Brazil, Nigeria and India.[3] We followed certain broad objectives which had been laid down for the international study and adapted them to Indian conditions. More specifically, we studied the problem of innovation in two ways which conformed to the first two phases of our study.[4]

Phase I was a survey of 108 villages. We selected our villages from three states : Andhra Pradesh, Maharashtra and West Bengal. We wanted to select a range of Indian villages, from some of the most primitive and poor, to some of the most complex and affluent, avoiding peculiar extremes. We also tried to get villages with different strategies and inputs of development. Thus with a single snap-shot survey, taken at one time period, we could get a fairly wide range of success/failure of Indian agricultural villages and also a wide range of factors which may logically affect agricultural change. We could then determine relationships among these variables and, using careful statistical analyses and controls, determine some of the major factors which affect agricultural innovation in Indian villages.

In phase II of our study we examined differences in adoption behaviour among 680 farmers from eight villages in the same three

3. "Diffusion of Innovations in Rural Societies," under contract between the United States Agency for International Development and Michigan State University, E. M. Rogers, Project director. The Indian part of the study was done in collaboration with the National Institute of Community Development, Hyderabad.

4. We have drawn freely in the present report upon the two major publications reporting phase I and phase II of our study. These are : F.C. Fliegel, P. Roy, L. K. Sen and J. E. Kivlin, *Agricultural Innovations in Indian Villages*, and P. Roy, F.C. Fliegel, J.E. Kivlin and L. K. Sen, *Agricultural Innovation among Indian Farmers*, Hyderabad : National Institute of Community Development, 1968.

There was also a third phase of our study. In this phase, using a separate sample, we evaluated experiments with two different kinds of communication treatments, a radio farm forum and a literacy class with reading forum, to determine how effectively these channels brought about changes in knowledge and adoption of agricultural, health and family planning practices. This third phase of our study is reported in J. E. Kivlin, P. Roy, F. C. Fliegel and L. K. Sen, *Communication in India : Experiments in Introducing Change*, Hyderabad : National Institute of Community Development, 1968.

states. Within every village, there are progressive farmers who adopt most of the improved agricultural practices and laggards who adopt none. A great deal of research, both in India and in the West, has been done on factors which affect the adoption behaviour of an individual farmer.[5] We used the broad hypotheses of that research to guide our study.

PHASE I: INDIA'S CHANGING VILLAGES

In 1953, when the community development programme was being initiated, Professor S. C. Dube collected data for his provocative book entitled *India's Changing Villages.* Based on detailed information from one village, this book contains insightful observations on how village structure would affect the change programmes.[6] A decade and half later, we have taken a wide range of India's changing villages and have tried to analyse some of the structural factors and some of the linkages with the outside world which have affected agricultural change.

Nearly all cultivators in India, except to some extent in Kerala, live in villages rather than in isolated farmsteads. Like the Himalayas, the Indian village has been there for millenia, and has nurtured the agrarian culture. Beyond the family, the village is probably the social unit which is most important in shaping the individual and making him the kind of cultivator he is.[7] Hence, in phase I of our study, we focussed on the agricultural village, comparing a wide range of agricultural settings.

Having selected the village as our unit of analysis, our first research objective was to determine to what extent villages differ in the utilisation of modern agricultural technology. Since we had a wide variety of crops grown in our sample villages, which stretched across the breadth of India, we needed to get comparable items to construct a sensitive measure of success or failure in accepting new agricultural practices. In chapter 2, we describe these items and to what extent they were represented in our 108 phase I villages.

Turning then from the first research objective, measurement of the success or failure of agricultural change programmes, we have listed below some of the major types of differences among villages that, we felt, might contribute to greater or lesser programme success.

(1) Differences among villages in quality of land and in other natural and human resources which are likely to affect the productive process.

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5. See E. M. Rogers, *Diffusion of Innovations,* New York : The Free Press of Glencoe, 1962.
6. S. C. Dube, *India's Changing Villages,* Ithaca : Cornell University Press, 1958.
7. See Srinivas' defence of the village as the most important social unit beyond the family in M. N. Srinivas (Ed.), *India's Villages,* Bombay : Asia Publishing House, 1960.

(2) Differences among villages in the way the change programmes are organised, administered and executed. We gathered information from both village leaders and change agents about how change programmes were carried out in the village.

(3) Differences in social structure of villages. Information must not only reach a village but it must also penetrate to all levels and subgroups within the village if it is to be effective. Village structure will probably affect the degree of such penetration within the village.

(4) Differences in the nature of communication and of leadership may well affect programme success. Intra-village diffusion of relevant information will, to some extent, depend on the change-proneness of leaders and on the location of these leaders at strategic points in the local social structure.

As indicated previously, we selected our sample of 108 villages from three states in India.[8] These were Andhra Pradesh which has mainly a block-level (panchayat samiti) control of development, Maharashtra which has a district-type (zila parishad) control of development, and West Bengal which has only recently instituted the panchayati raj system to control development programmes.[9] In each state, we purposively selected three districts to represent the diversity of the state, from the most progressive 'package' districts to the backward tribal areas. Besides the purposive selection of the state and district, we used a three-stage random design to select three development blocks, six village level worker (VLW) circles and 12 villages from each district. This concentration of sample villages in three districts minimised logistic problems of field-work and provided a normal range of villages from the more successful to the less successful.

Within each village, we obtained information from selected leaders and from the extension workers who were responsible for agricultural and health programmes in the village. We also used available village records. We interviewed five formal leaders, including representatives of the village panchayat, the school, a co-operative, a religious institution, and a youth or other organisation. We asked these formal leaders whom they consulted for advice on agriculture and, based on these responses, selected and interviewed three more opinion leaders. We also interviewed all the village level workers, the agricultural extension officers, and the block development officers responsible for these 108

8. For a detailed description of the sampling design, see F. C. Fliegel *et al.*, *Agricultural Innovations . . . , op. cit.*, pp. 4-10.

9. For a more detailed discussion of citizen control over development, see George Jacob (Ed.), *Readings on Panchayati Raj*, Hyderabad : National Institute of Community Development, 1967.

villages. Thus a total of 856 leaders and 127 extension workers were interviewed to obtain information for this phase of our analysis.

The three field-teams, each consisting of four interviewers and one supervisor, gathered data from 36 villages in each state. The research workers conducted the interview in their mother-tongue. Field-work was done from September to December in 1966. District collectors and block development officers were first informed about the study. Then team leaders set up headquarters in the block, randomly selected the sample villages, and the supervisors and interviewers proceeded to interview both the extension workers and the leaders connected with the selected villages. Establishment of rapport was not difficult as we were interviewing only leaders who already had contact with the larger society beyond the village. Data processing, tabulation and analysis were done by the field-workers on their return to Hyderabad, using McBee sort cards, Guttman scaling blocks and IBM computer analysis methods. The IBM data analysis was done mainly at the Programme Evaluation Organisation's Computing Centre in the Planning Commission at New Delhi.

PHASE II : FARMERS IN TRANSITION

Within the typical village community in India, there is a great deal of heterogeneity. There are usually several castes with hereditary occupations which can be ranked according to a traditional ritual hierarchy. There are rich cultivators who own large tracts of good land; there are medium-sized farmers ; there are small farmers with scattered holdings; there are landless artisans and labourers. There are village leaders who control traditional organisations like the temples, *Bhajan Mandalis* (religious associations), and the caste panchayats (councils); and there are leaders who control new social structures like the co-operatives, statutory panchayats, and the schools. Thus a village is not a monolithic, static community but a dynamic, organic whole with many functional parts.

Farmers in these changing villages have been confronted with a battery of agricultural innovations. Not all farmers have accepted or indeed can accept these innovations. For example, the landless people, who constituted 30 to 50 per cent of the families in our study villages, are not directly concerned with accepting new farm practices. The small marginal cultivator with less than one hectare (2.5 acres) of land, barely eking out a living, cannot afford to take many risks. Many of the innovations being propagated are just not economically feasible for his size of farming operations. Hence we turned our attention to the

medium-size farmer and the large farmer who together, control over 90 per cent of Indian village farm lands, but who may constitute only 25 to 40 per cent of the families in a village.[10] These farmers, we feel, are the chief adopters of agricultural innovations. We also restricted ourselves to heads of families who were not more than 50 years of age. In the Indian farm family, when sons get to be 30 years of age or over, decisions on farm operations are often made by more than one person, and we wanted to avoid this ambivalence.

Within this group of farmers, what distinguishes adopters from non-adopters? Our first problem in trying to answer this question was to construct a sensitive measure of the relative degree of adoption. As in phase I, we had to select practices which were applicable to all our study villages in three widely different farm settings. Having constructed this measure, we then wanted to study what factors were related to a high level of adoption or to a low level of adoption. We have listed below three major types of factors which we thought would be associated with adoption.

(1) Differences in farm setting. In order to describe the *farm setting* in which farmers' decisions are made, we set out to obtain information on farm size in acres, farm size in terms of labour used, labour efficiency, magnitude of production of major crops, degree of specialisation in particular farm products, fragmentation, and degree of commercialisation of the farm enterprise. Our intent here was to specify the nature of the farm firm, the business context in which production decisions are made.

(2) Differences in farmers. Our second major concern was to characterise the *farmer himself and his social setting*, recognising that no two individuals react to the same context in precisely the same manner. Here we set out to describe the individual in a gross sense: his age, formal education, literacy, and the extent of his involvement in non-farm employment. And we were also interested in the context of social relationships in which decisions were made. Thus we obtained information on size of family and family structure, religious affiliation, degree of involvement in formal and informal groups, and position in the village social structure, both in terms of caste and in terms of level of living.

(3) Differences in communication. Given a certain type of individual in a known social and economic context, we were interested in individual differences in access and exposure to *communication* about modern agricultural technology. If the farmer is to utilise a given item

10. Government of India, *Agriculture in Brief*, New Delhi: Directorate of Economics and Statistics, 1965, p. 66.

of modern technology, he must first come to know that it exists, and then come to know something in detail about it. Here we wanted information on access and exposure to radio, film and printed matter, as well as knowledge about and exposure to various types of formal change agents. And further, we wanted information on several more subtle aspects of linkage with the larger society. We wished to know the extent to which the farmer was involved in and dependent on the local community only, *versus* a broader geographic and social set of relationships. We also wanted to know the extent to which farmers tended to be more secular and rational in regard to the world around them.

As in phase I, a schedule was constructed to elicit data relating to the above hypotheses. It was pre-tested in all three languages—Telugu, Marathi, and Bengali—before finalisation. Field-work was conducted during March and April in 1967, by the same team of four interviewers and one supervisor as in phase I. Typically, the team set up residence in a private house in the village. They first listed all cultivators and then excluded those who did not meet the size of farm and age criteria. Interviews were conducted in private as far as possible. Rapport was easy to establish as the team had visited the village before and the people were just not that curious anymore. In one village, the team was so inconspicuous that the project leaders, on tour, were told that no research team was there. Only on a second search was it found that the team was indeed in the village. All responses were coded and tabulated for hand-counts and for IBM data processing by the interviewers themselves. The IBM data processing was again conducted largely by the Programme Evaluation Organisation's Computing Centre in the Planning Commission at New Delhi.

2

THE AGRARIAN VILLAGE IN TRANSITION

In this chapter, we will discuss in detail the findings of phase I of our study, which investigated the agricultural development of 108 villages.

AGRICULTURAL SUCCESS OR FAILURE

In spite of the diversity of crops being grown in different states of India, the national community development schematic budget has introduced some uniformity into the agricultural development programmes. However, quite a large number of programmes are being conducted. From among these, we had to determine which were the most pertinent programmes from which to select practices common to all our 108 villages. We started out by gathering a very large pool of items from several sources to cross-check our data. From these, we selected 30 to 40 practices which seemed to be the most applicable.

The wide range of agricultural programmes includes the development of land and irrigation, the introduction of specific innovations such as fertiliser, pesticides, and improved seeds, new implements, animal enterprises, allied services and credit. Since land and water are to a great extent natural endowments, and since the changes which have taken place under the new development administration are rather difficult to measure, we concentrated our measure of success around items related to new agricultural technology.

After narrowing the focus of our study of innovations to new agricultural technology, we devised questions which pertained to eight agricultural programmes : fertilisers, green manure, compost pits, new implements, improved seeds, pesticides, improved cattle and improved poultry. In retrospect, designing comparable measures proved to be a Himalayan statistical and logical task. Many hurdles have been crossed and many statistical camels have been swallowed to strain an empirical gnat. Anyone, involved in the exploratory venture of comparing 108 villages across the breadth of India, must wade through a great deal of chaff to sort out a valid, reliable and acceptable index with a somewhat 'normal' distribution.

We gathered some items of individual cultivator adoption, some items of village adoption, and some items of leader adoption, and used

various tests to determine whether these different types of data belonged to the same dimension.[1] We finally selected 17 practices which, we felt, had a reasonable amount of applicability to all the villages. Four of the practices pertained to improved seed; four dealt with fertilisers or manures; three dealt with farm implements; three dealt with use of pesticides; and three dealt with breeding of farm animals. The average amount of adoption of these 17 items in all 108 villages combined, is given in Table 1.

TABLE 1 : DEGREE OF ADOPTION OF PRACTICES SELECTED TO MEASURE SUCCESS OF AGRICULTURAL PROGRAMMES IN 108 INDIAN VILLAGES

	Practices	Degree of Adoption
1.	Average per cent of cultivators buying improved seed, first food crop mentioned (of all cultivators in the village)	21
2.	Average per cent of cultivators buying improved seed, second food crop mentioned	15
3.	Average per cent of cultivators buying improved seed, main cash crop ..	16
4.	Average per cent of leaders using improved seed (of eight leaders interviewed in each village)	60
5.	Average per cent of leaders using fertiliser	78
6.	Average per cent of leaders using green manure	47
7.	Average number of compost pits dug in village	42
8.	Average per cent of cultivators using green manure	24
9.	Average per cent of cultivators using first implement mentioned	27
10.	Average per cent of cultivators using second implement mentioned ..	23
11.	Average per cent of leaders using new implements	35
12.	Average per cent of leaders using pesticides	63
13.	Average number of acres of first food crop seed treated	162
14.	Average number of acres of second food crop seed treated	51
15.	Average per cent of leaders using improved cattle	12
16.	Average number of improved cattle in village	3
17.	Average number of artificial inseminations	3
	or improved bull services in village	12

Based on our analysis of each practice, we felt that the amount of adoption for each item could be differentially scored on a four-point range from 0 to 3, thereby giving a theoretical maximum score of 51, for the 17 practices for any one village. The actual range of scores is categorised in Table 2. This adoption index was used in all our charts in this chapter as the measure of success of agricultural innovation programmes in the village.

1. For a detailed discussion of scale and index construction used in this chapter, see F. C. Fliegel, P. Roy, L. K. Sen and J. E. Kivlin, *Agricultural Innovations in Indian Villages*, Hyderabad : National Institute of Community Development, 1968.

TABLE 2: NUMBER OF VILLAGES IN EACH CATEGORY OF AGRICULTURAL SUCCESS

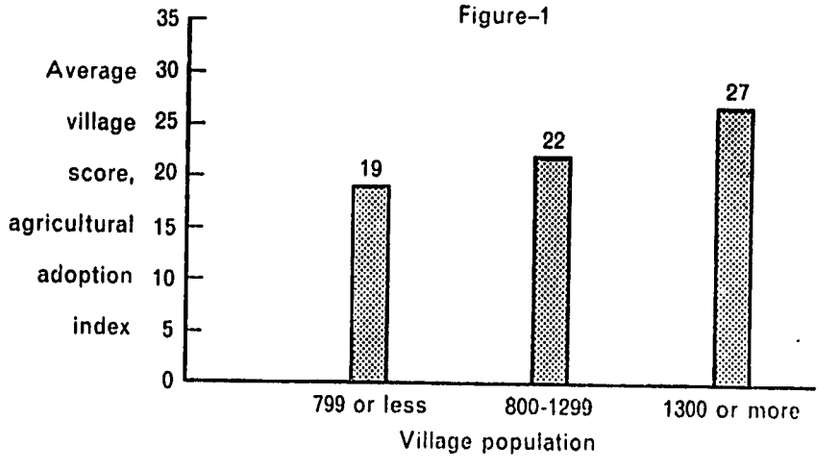
0 — 10	13
11 — 20	32
21 — 30	40
31 — 40	19
41 — 50	4

PEOPLE OR LAND?

Many things may be regarded as resources when it comes to agricultural development — people, land, animals, machinery, or even education. One can have too much or too little of a given resource for the best result in development: too many people or too few people, too many cattle or too few cattle, too much land or too little land, or even too much education or too little education. In our more complete report, we examined many human and non-human resources to determine their effect on agricultural innovation. We will discuss here only those which we found to be most important.

First, we found that the size of the village, simply in terms of its population, was related to the amount of agricultural innovation. That is, the bigger villages scored higher on our adoption index. Figure 1 shows that villages with a population of less than 800 had an average agricultural adoption index of 19; villages with a population of 800 to 1299 had an average of 22; and villages with 1300 or more people had an average of 27.

Figure–1



In nearly all our subsequent tests, we attempted to control the effect of population size of the village. As far as possible, we standardised our measures on a *per capita* or per acre basis so that the size of the village itself did not account for differences in adoption. One example is the relation of literacy, shown in Figure 2. In this figure we used the per cent of male literacy, thus taking into account the effect of population size. All of our figures present a simple relationship only between agricultural success and one other factor. They do not, except for population, control other factors.

Figure–2

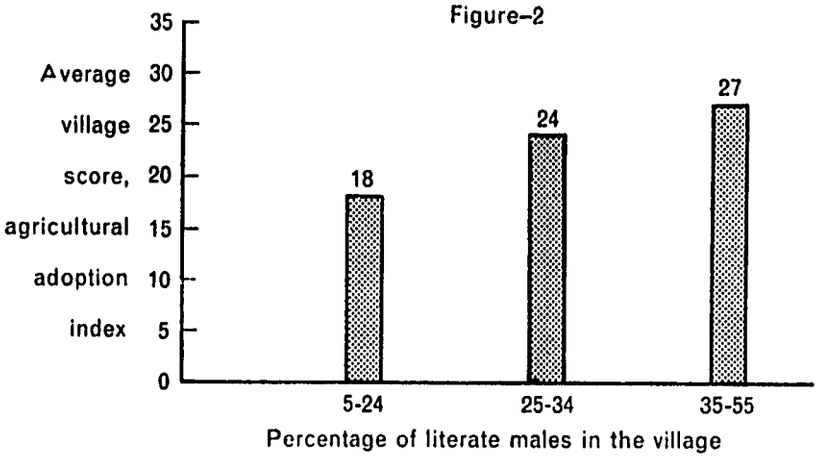


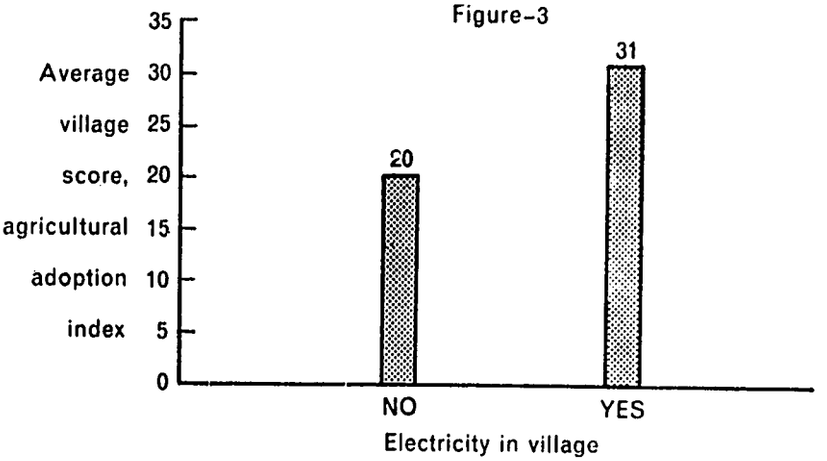
Figure 2 shows that male literacy is functionally related to agricultural success. Villages in which there were less than 25 per cent male literates scored an average of 18 on the agricultural adoption index, compared with 27 for villages with 35 per cent or more male literacy. We also found that the higher the per cent of female literacy in a village, the higher was the score of that village on the agricultural adoption index. Surprisingly, however, educational levels in the village were not related to adoption, perhaps because educational levels were generally quite low.

We also considered many non-human resources. With respect to the man-land ratio, we considered the acreage of cultivated land *per capita* and found no relationship with agricultural adoption. We then considered the amount of irrigated land and again found no relationship with agricultural adoption. Like land, cattle are also considered as another basic agricultural resource, but we did not find that the *per capita* number of cattle in the village was related to agricultural success.

In fact, our data showed that number of cattle in the village was weakly but negatively related to adoption. That is, with more cattle, there was slightly less adoption.

Electricity seemed to make a great deal of difference in agricultural adoption. Villages with no electricity had an average adoption index score of only 20, compared with the score of 31 for villages that did have electricity (Figure 3). This relationship held true even when other factors were controlled. Electricity can be viewed as a resource and also as an innovation. It opens up many consumption avenues like house-lighting, cooking, radios and also various production avenues, like electric motors for irrigation and agricultural industries. As one might expect, the larger villages were more apt to be electrified. We also found that the number of oil-engines and grain mills *per capita* were positively related to agricultural adoption in our study villages.

Figure-3



DOES VILLAGE STRUCTURE IMPEDE ?

The general feeling we get when we talk of institutions, political parties, organisations or caste structure is that they are conservative forces which impede the pace of progress. In India's villages, however, many of these 'structures' are themselves social innovations of very recent origin. We studied both vertical and horizontal dimensions of village structure, and both modern and traditional village institutions. In general, we found that the more varied a village was, in terms of number of organisations, number of political parties, number of institutions or even number of castes, the more agricultural innovation there was in that village, even when size and other factors were controlled.

The more caste differentiation there was, after controlling for size of village, the more agricultural development there was. Or, to put it in another way, if any single caste was clearly dominant numerically, it impeded change.

Occupational diversity in a village was only slightly related to agricultural development. We found that the higher the number of farm labourers per employed cultivator, the greater was the adoption of practices. As we will show later, this is a corollary to the fact that adoption increases with farm size and reflects the fact that agricultural innovation in India is at the present time labour-intensive.

The major social institutions and services which are associated with modern life have been penetrating the remote villages of India. We studied over 30 such institutions. S. K. Dey, the former Minister of Community Development in the Government of India, considered the school, the panchayat and the co-operative as the three pillars of democracy. All the villages we studied had a primary school, 90 per cent had a panchayat, and over 75 per cent had a co-operative.

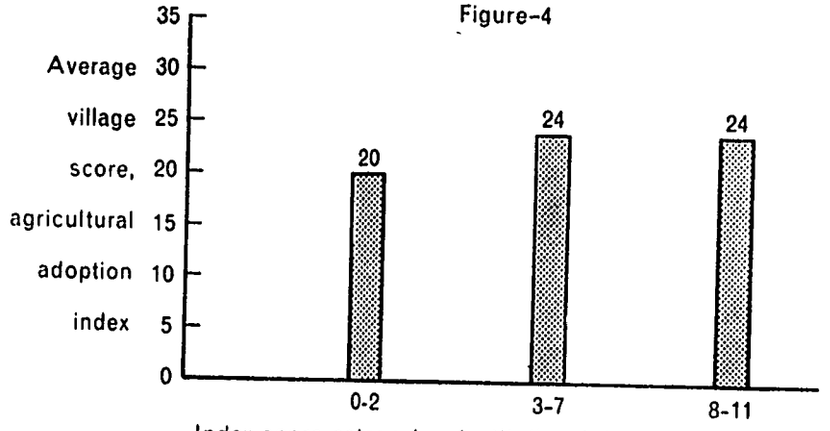
Some institutional services, like a primary school, were universally possessed and thus were not useful in constructing a scale to measure the relationship of institutional development with adoption. Out of the 30 institutions we considered, we used ten to construct an institutional development scale. The percentage of villages located at various distances from these ten institutions is given in Table 3. Villages possessing less than two institutions had an average agricultural index of 20, compared with villages with eight or more institutions which had an average score of 24 (Figure 4).

TABLE 3 : PERCENTAGES OF VILLAGES LOCATED AT VARIOUS DISTANCES FROM INSTITUTIONS

	Within village or within 1 mile	1-4·9 miles	5-9·9 miles	10 miles and over	No information	Total
Panchayat	89·8	6·5	2·8	·9	·0	100
Temples, mosques or churches	85·2	4·6	3·7	1·9	4·6	100
Village stores* ..	82·6	..	..	..	..	..
Co-operative society ..	75·9	18·5	4·6	·0	·9	100
Youth club	65·7	12·0	3·7	·0	18·5	100
Post-office	52·8	39·8	5·6	1·6	·0	100
Retail market	37·0	44·4	13·0	4·6	·9	100
Godown (warehouse) ..	19·4	33·3	27·8	12·0	7·4	100
Bicycle repair shop ..	19·4	40·7	23·2	16·7	·0	100
High school	13·9	50·0	22·2	13·9	·0	100

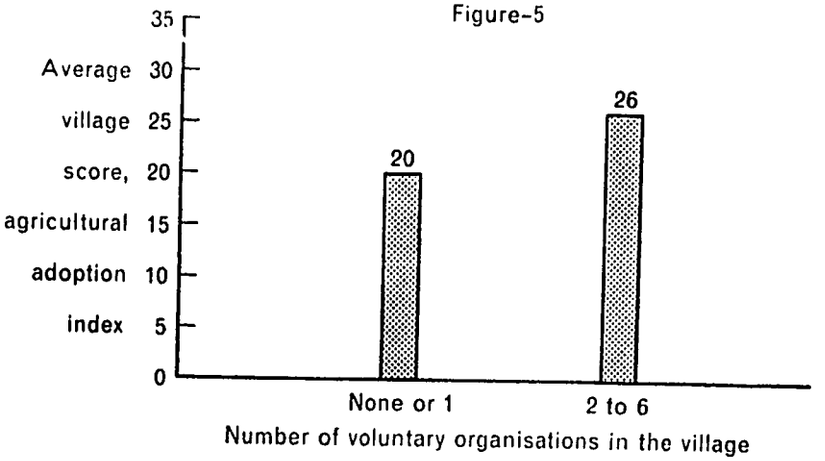
* Data on distance were not collected.

Figure-4



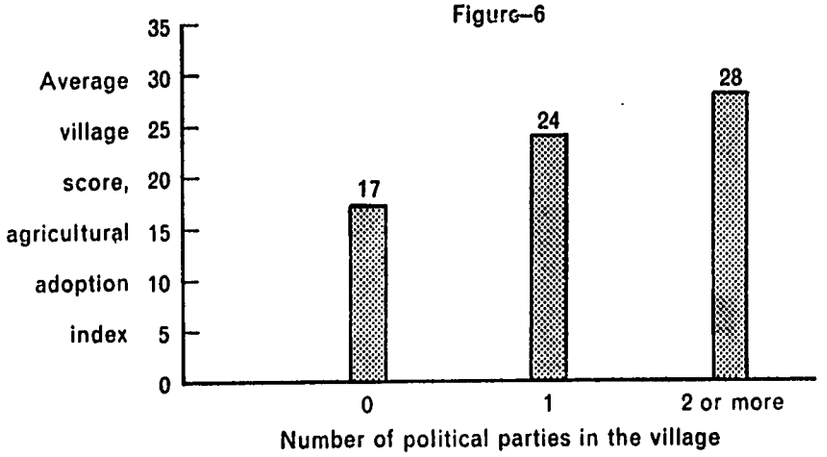
We found that the number of religious structures in a village was also positively related to agricultural adoption. Similarly, villages which had no voluntary organisations, or only one, had an average score of 20, compared with 26 for villages with two or more voluntary organisations (Figure 5). This relationship held true even when size of village was controlled.

Figure-5



Finally, we found that the number of political parties represented in a village was positively related to agricultural development, after controlling for other factors. Villages with no political parties represented had an average score of 17, villages with only one party represented had a score of 24, and villages with two or more parties represented had a score of over 28 (Figure 6).

Figure–6

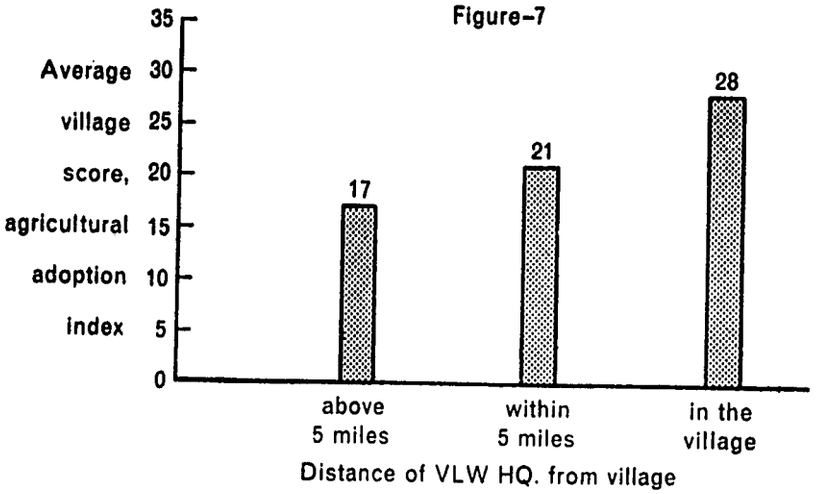


LET US ABOLISH EXTENSION

The scapegoat, which is commonly attacked whenever there is a drought and agricultural production shows a decline, is the community development programme. The community development programme during its first ten years of rapid expansion 'covered' the nation with development blocks. Between 1952 and 1963, over 98 per cent of the area of India was covered by the development programme and, at least theoretically, the block development officers, co-operatives, veterinary centres and various other services were established so that every village had greater or lesser access to these services. We found that the proximity of these services to the village was positively related to agricultural development. This was especially true for the headquarters of the VLW (Figure 7). The VLW is the front man for the community development programme. He is supposed to be a friend, philosopher and guide to the cultivators, as well as the jack of all trades for the programme. Villages which were more than five miles from VLW headquarters had an average index of 17; villages within five miles of the VLW headquarters had an average index of 21; and villages which were used as the VLW headquarters averaged 28.

Even if the VLW headquarters is in the village, does he really go there, and to the other villages in his jurisdiction ? A common complaint is that the VLW and the agricultural extension officer (AEO) simply collect their travel allowance and seldom visit the cultivator. We tested this assumption by asking the VLW and the AEO as to how often they visited the village in the past six months, and then related the

Figure-7



number of visits to success of the programme. Table 4 describes the average frequency of various kinds of contacts.

TABLE 4 : AGENTS' CONTACT WITH THE VILLAGE

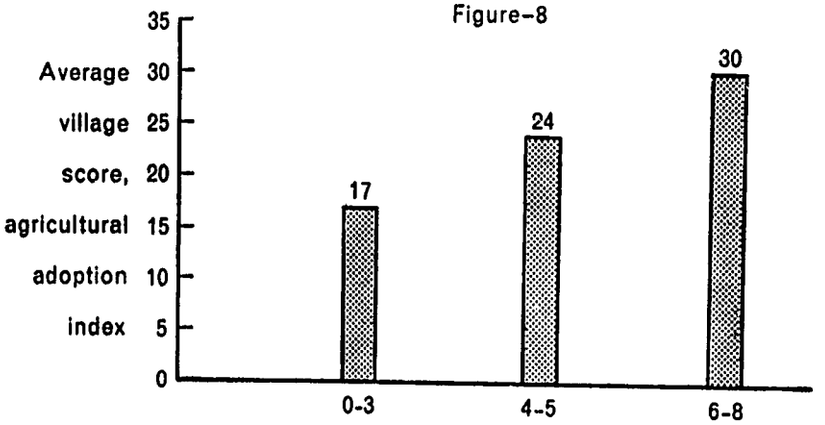
Average number of AEO's visits/six months	9·9
Average number of VLW's visits/six months	77·00*
Per cent of time VLW spent in sample village	31·64
Number of demonstrations per village in the past two years	6·78

* There were 33 villages which had VLW headquarters. Excluding these, the average will be 31·20.

In the villages in which the VLW lived, the number of visits to that village would, of course, be almost every day. The average number of visits to the villages in which he did not live was over 31 during the six-month period preceding the survey; that is, at least once a week on an average. The AEO made an average of about ten visits to each village in six months, an average of about one to two visits per month. Further, we asked the VLW to estimate what percentage of his time was spent in a particular village and to estimate the number of demonstrations which had been performed in that village during the past two years. The proportion of VLW's time per village was about one-third, but it should be recalled that some of our study villages were in the package districts and some in tribal blocks, both of which have higher numbers of VLWs per block. Location of VLW headquarters also affects the average. Our study villages averaged about seven demonstrations in the past two years.

A composite index of agents' contact with the village was constructed, giving a 0-1-2 weighting for low, medium, and high scores on each of the four measures of contact in Table 4. Villages which had an agent's contact score of 0 to 3 averaged 17 on the agricultural adoption index; villages with scores of 4 to 5 averaged 24; and villages with a contact score of 6 to 8 had an average of about 30, (Figure 8).

Figure-8



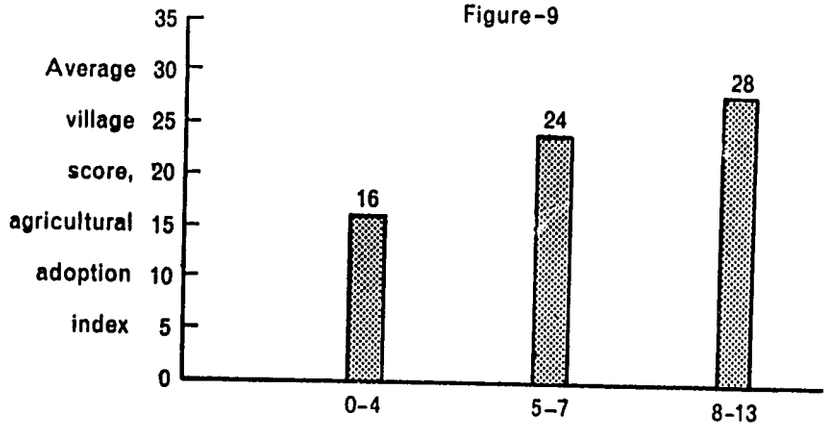
The number of times the agents visit a village is a good indicator of beginning of development, but it is when the village people start seeking out the agents that development really occurs. We asked the eight leaders in each village several questions eliciting how often they went to block headquarters, and how often they talked with the various extension agents. The average number of times that leaders talked with various agents is given in Table 5.

TABLE 5 : LEADERS' AVERAGE YEARLY CONTACT WITH AGRICULTURAL EXTENSION AGENTS

Average number of times leaders visited block headquarters	10·6
Average number of times leaders talked with VLW	94·3
Average number of times leaders talked with BDO	7·4
Average number of times leaders talked with EO (agriculture)	6·1
Average number of times leaders talked with EO (co-operative)	3·1
Average number of times leaders talked with EO (panchayat)	4·0
Average number of times leaders talked with veterinary doctor	4·7

Based on the seven items in Table 5, we constructed a leaders' contact index, again scoring each item in terms of low, medium, and high. The relationship of this index with agricultural adoption is shown in Figure 9. Villages with a score of leaders' contact from 0 to 4 averaged 16; villages which scored 5 to 7 averaged 24; and villages which scored 8 to 13 averaged 28 on the agricultural adoption index. This shows a strong relationship of leaders' contact with agricultural development.

Figure-9

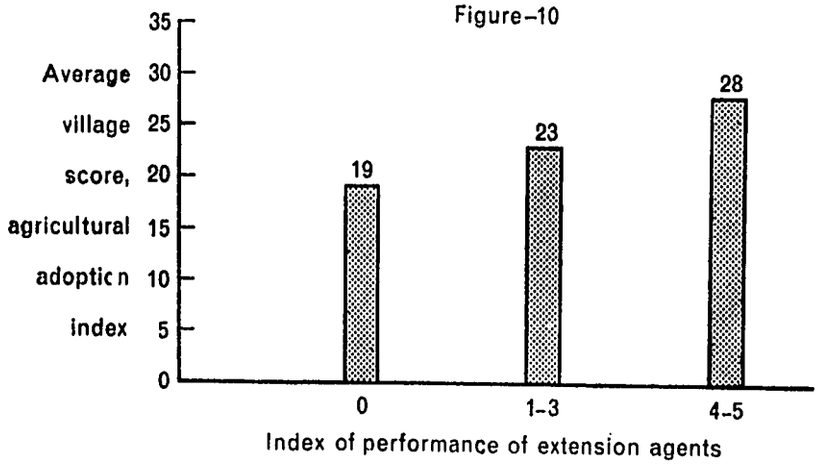


The community development programme has also come under a great deal of criticism because programmes were not properly executed. Frequently we hear that there are difficulties in getting supplies or that supplies do not arrive on time. We asked both the VLW and the village leaders how much difficulty farmers have in obtaining fertilisers seeds, credit, and implements. We found only an insignificant negative relationship between these factors and agricultural adoption. Similarly, delays in obtaining loans and broken promises of loans or supplies had only a slight detrimental effect on agricultural adoption. In effect we can state that lack of credit and supplies were not seriously hampering agricultural adoption in our study villages.

Two measures relating to quality of extension services were tested. The first was a competency score in which the leaders and the agricultural extension officer rated the competence of the VLW. We found that the competence of the VLW was closely and positively related to agricultural adoption. Villages with more competent VLWs had a higher adoption index score. The second measure was a rating by the

leaders on how well the extension agents — the VLW, the agricultural extension officer, and the block development officer—actually performed their duties. We constructed a five-point scale based on these ratings. Villages which were rated zero on this performance scale had an average agricultural development score of 19 compared to 28 for villages that rated high on this performance scale (Figure 10).

Figure–10



In conclusion, we can say that every measure of penetration of the extension services into the villages—measures of contact of leaders with the agents, and measures relating to quality of extension services—led us to believe that the extension agency has been much maligned. The village level worker does tour around. He not only collects his travel allowance but he earns it. The stated performance of the agents and their adjudged competence were functionally related to adoption. If India wants more adoption of agricultural practices, far from abolishing the extension agency, agents and agencies need to be strengthened, both in quality and in quantity. Judicious expansion, with careful attention paid to both recruitment and retention standards, should pay big dividends in increased agricultural production. In this connection we should add that some of the more obvious criteria of agent selection such as age, education, and even training in agriculture, were not closely associated with success. Good performance seems to depend on more subtle factors.

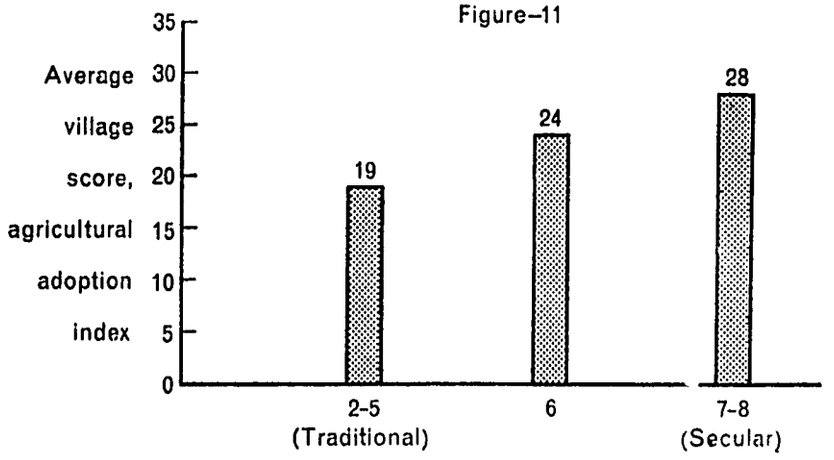
HOW TO COMMUNICATE WITH THE VILLAGE ?

Communication is an all-embracing word which can mean many things to different people. Under the schematic block budget of the

community development programme, communication simply means roads. We investigated the effect of roads and found that the distance of the village from an all-weather road and from a bus depot were factors that were inversely related to agricultural adoption. Villages with good roads were more apt to score high on our adoption index. Further, we found that sheer distance of the village from block headquarters was not related to agricultural adoption. This is additional evidence that physical isolation of villages from urban centres can be overcome by roads and other means of communication. Continued investment in building roads, which can link villages to towns and cities, should pay good dividends in development.

We also investigated possible mental isolation, the state of mind which cuts one off from communication stimuli. We found that villages in which leaders were favourably disposed towards various programmes of change were more apt to score high on our agricultural adoption index. Similarly, we found that villages in which leaders were secular rather than traditional, as measured by an eight-item secularism index, were also more apt to score high on agricultural adoption (Figure 11). Villages in which leaders were traditional had an average score of 19 on the agricultural adoption index, compared with a score of 28 for villages which had secular leaders.

Figure–11

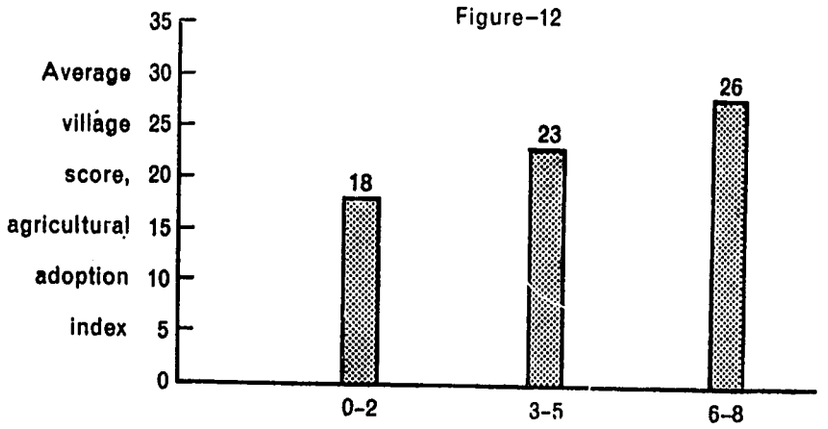


Urban contact was measured in various ways, through males migrating to the city, through officials residing in the village, and through leaders' contact with the city. All of these measures showed a positive relationship with agricultural adoption. These results reinforce our con-

viction that increased, selective efforts by extension and other agencies to communicate with villagers will pay dividends in the form of agricultural production.

We turn now to a consideration of the mass media, which have been widely used in agricultural extension programmes in India. Our findings indicate that they have been used to good effect. Villages with greater access to and contact with mass media channels of communication were more likely to score high on agricultural adoption. Number of radios *per capita*, number of newspapers *per capita*, and how often leaders went to the cinema were all positively related to the agricultural adoption score. For an illustration of this positive relationship with use of the mass media, we present the association of cinema-attendance with adoption (Figure 12). Villages in which leaders averaged zero to two films per year had an average agricultural adoption index score of 18, compared with a score of 26 for villages in which leaders had an average attendance of six to eight films per year.

Figure–12



Thus, just as with our measures of face-to-face contact with change agents, our data indicate that less direct linkages with the larger society contribute to the modernisation of agriculture. An infrastructure of good roads is an important factor. Leaders' receptivity to change can affect the whole village. And it seems likely that the mass media play an important role in the development process.

3

INDIAN FARMERS IN A CHANGING WORLD

In this chapter we discuss the findings of phase II of our study, in which we interviewed 680 cultivators in eight villages of Andhra Pradesh, Maharashtra and West Bengal.

WHAT IS INNOVATION ?

There are numerous studies measuring agricultural adoption or innovativeness. Rogers and Rogers[1], and Pareek and Chattopadhyay[2] have written special articles dealing with the methods of constructing these measures. The problems most researchers have faced were: (*a*) finding suitable practices which were applicable to all respondents; and (*b*) internal consistency, or whether the practices belonged to a single dimension.

In our study, the first problem of finding suitable practices for farmers living in three widely different states was quite formidable. As in our phase I comparison of 108 villages, we selected practices from the major programmes of agricultural development — fertilisers, the new high-yielding varieties of seeds, insecticides, pesticides, green manure, implements and animal husbandry. After pre-testing, we finally selected ten practices which were reasonably extant throughout our eight villages. We asked the farmer three questions about every practice : (*a*) "Do you know anything about ....."; (*b*) "Have you ever used ....."; and (*c*) "Were you still using ..... in 1966". The per cent of our sample of farmers who knew about, had ever used, or were still using each practice is given in Table 6, by village and state.

The high-yielding varieties (HYV) of crops, which are part of 'the new strategy of agriculture' in India, are still relatively unknown and had the lowest levels of adoption. On the other extreme, chemical fertilisers generally had the highest level of knowledge and usage. It will be noticed in Table 6 that fertiliser mixtures were most commonly

1. E. M. Rogers and L. E. Rogers, "A Methodological Analysis of Adoption Scales", *Rural Sociology*, 26 (December, 1961), pp. 325-336.
2. U. Pareek and S. N. Chattopadhyay, "Adoption Quotient : A Measure of Multipractice Adoption Behaviour", *Journal of Applied Behavioural Sciences*, 2 (March, 1966), pp. 95-108.

TABLE 6 : PER CENT OF RESPONDENTS WHO INDICATED KNOWLEDGE, TRIAL AND ADOPTION OF AGRICULTURAL INNOVATIONS, BY VILLAGE AND STATE

	N	HYV			Ammonium sulphate			Superphosphate			Mixtures			Insecticides		
		K	T	A	K	T	A	K	T	A	K	T	A	K	T	A
Manchili	78	94	24	21	97	95	83	97	72	54	88	76	62	100	97	95
Kanchumarru	33	97	48	42	100	91	64	97	88	52	100	82	33	100	100	85
Polamuru	99	98	20	17	100	97	75	98	80	28	98	72	19	100	97	79
Andhra Pradesh	*210*	*97*	*26*	*22*	*99*	*95*	*76*	*98*	*78*	*41*	*95*	*75*	*37*	*100*	*98*	*86*
Pophali	100	74	0	0	97	48	32	90	37	28	76	21	17	90	41	32
Mulawa	146	71	1	1	86	54	40	81	30	23	66	17	13	86	32	25
Maharashtra	*246*	*72*	*1*	*1*	*91*	*52*	*37*	*85*	*33*	*25*	*70*	*19*	*15*	*88*	*36*	*28*
Amdole	103	22	2	2	97	79	58	77	53	35	100	91	80	79	30	19
Harishpur	59	7	0	0	93	63	49	73	31	25	98	85	75	73	24	12
Laxmi-Danga	62	71	3	0	97	74	69	76	40	39	100	94	94	95	61	48
West Bengal	*224*	*32*	*2*	*1*	*96*	*73*	*59*	*77*	*44*	*33*	*100*	*90*	*82*	*82*	*37*	*25*
Total	**680**	**66**	**9**	**8**	**95**	**72**	**56**	**86**	**50**	**33**	**87**	**60**	**44**	**89**	**55**	**45**

TABLE 6 : (*continued*).

	N	Green manure			Cultivator			Improved breeding of cattle			Animal inoculation			Rat poison		
		K	T	A	K	T	A	K	T	A	K	T	A	K	T	A
Manchili	78	100	74	59	79	21	10	94	21	19	96	79	60	99	87	78
Kanchumarru	33	100	79	55	100	33	12	94	33	24	97	88	67	100	94	67
Polamuru	99	100	79	39	91	23	7	89	28	17	98	89	68	96	77	63
Andhra Pradesh	*210*	*100*	*77*	*49*	*88*	*24*	*9*	*92*	*26*	*19*	*97*	*86*	*65*	*98*	*83*	*69*
Pophali	100	72	21	9	60	19	18	73	6	6	92	74	55	89	51	22
Mulawa	146	79	12	5	64	7	7	79	5	5	89	55	22	84	40	21
Maharashtra	*246*	*76*	*16*	*7*	*62*	*12*	*11*	*76*	*6*	*5*	*90*	*63*	*35*	*86*	*45*	*22*
Amdole	103	62	29	15	37	4	4	33	3	2	90	76	38	82	43	34
Harishpur	59	61	20	3	12	0	0	22	3	0	73	42	12	86	49	34
Laxmi-Danga	62	92	45	11	29	5	0	63	5	3	95	34	13	97	69	66
West Bengal	*224*	*70*	*31*	*11*	*28*	*3*	*2*	*38*	*4*	*2*	*87*	*55*	*24*	*87*	*52*	*43*
Total	**680**	**81**	**40**	**21**	**59**	**13**	**8**	**69**	**11**	**8**	**91**	**68**	**41**	**90**	**59**	**43**

used in West Bengal whereas Andhra Pradesh was more generally using only ammonium sulphate. The data on insecticides in West Bengal showed a high trial level and sometimes a low present-usage level. There were some wide differences between trial and adoption of fertilisers : for example, the third village in Andhra Pradesh shows that 72 per cent had tried mixtures but only 19 per cent of the cultivators were using them at the time of the study; whereas in the third West Bengal village, 94 per cent had tried mixtures and 94 per cent were still using them. We found quite often that non-availability of fertiliser rather than dissatisfaction with it was the reason for lack of present-use. Another reason for lack of present-use was that a practice, like green manuring, had been tried and accepted but was just not suitable for the current year's rotation of crops. Similarly, insecticides are sometimes used only during pest attacks. For these reasons, we felt that 'Have you ever used' would be a more reliable indicator of adoption than 'Were you still using'.

We then tested responses to the ten practices for internal consistency by Guttman scaling and factor analysis. All ten items of the trial dimension were retained and together made an acceptable index in which scores varied from 0 to 10. It is this index which is used in the figures we present in this chapter to show relationships between agricultural adoption and other factors.

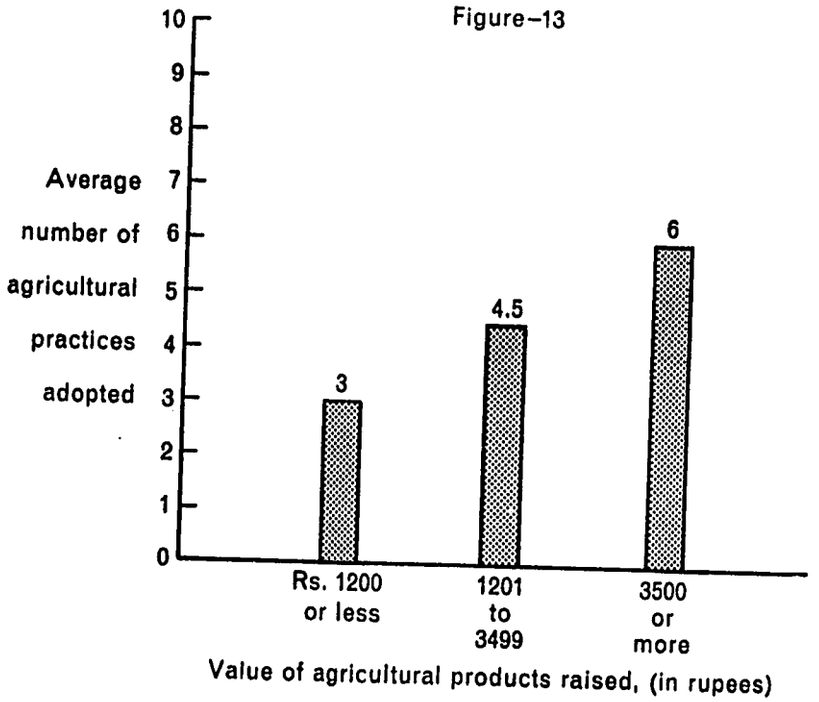
HOW BIG SHOULD INDIAN FARMS BE ?

Farm size has consistently been shown to be related positively and highly to adoption behaviour.[2] It is the larger and wealthier cultivator who is apt to adopt more practices and to adopt any given practice sooner. Reasons for this relationship seem clear. There are often financial advantages from early adoption, as in the case of early production of a new seed which sells for a high price. Also, many innovations such as new equipment or even trying a new high-yielding variety of a crop, require substantial financial outlay, which is beyond the investment and credit resources of the smaller cultivator. Over and above the requirements of capital outlay is the matter of risk-taking. Even a widely tested innovation such as the currently popular Taichung Native I paddy seed involves substantial risk of crop failure, if timely pest control measures are not taken. While the reasons why farm size and adoption are positively related, seem clear, the directions of cause and effect are much less clear. They appear to be complex and to a large degree reciprocal and interlocking. Availability of capital permits adoption, which leads to higher profits, which permits more adoption and so forth, in a 'beneficent circle'. Development agencies, of course,

are aware of this potential, and thus foster credit agencies, government-sharing of irrigation costs, and many other programmes.

Because of the importance of this factor, we investigated several measures of farm size—acreage cultivated, value of agricultural products raised and two measures of labour input—and found that all were closely related to adoption, and with each other. We selected the yearly value of agricultural products raised as our fairest measure of farm size for the different types of farming in our eight villages. The relationship of this measure of farm size with adoption is shown in Figure 13. Farmers who had raised only Rs. 1200 or less of products had an average adoption score of three practices; farmers who raised products worth Rs. 1201 to 3499 had an average adoption score of 4.5 practices; and farmers who raised products worth Rs. 3500 or more had an average of six practices adopted. It should be recalled that we were here studying only the farmers who cultivated 2.5 acres or more and, therefore, our sample probably constituted the upper third of farmers in the village in respect of socio-economic status. If we extrapolated our correlations beyond the range of our data, we would probably find very little adoption among the smaller farmers with less than 2.5 acres. Or, conversely,

Figure–13



we could state that farmers with less than 2.5 acres or raising products worth much less than Rs. 1000 do not adopt many new practices.

We examined three other economic factors related to adoption. The first of these, fragmentation, has long been a problem in Indian farming and nearly all state governments have initiated measures to encourage consolidation of holdings. We found that fragmentation had only a slight detrimental effect on adoption and this effect became insignificant when farm size was taken into consideration. Similarly, commercialisation (the proportion of products raised which was sold), and specialisation (the number of different crops which were sold), also had low correlations with adoption which became insignificant when farm size was controlled. These factors are undoubtedly important in some farming situations, but they were not important factors affecting adoption behaviour in our study.

One surprising finding of our study was that agricultural adoption was just barely related to labour efficiency. There was only a slight tendency for those with higher adoption scores to be more efficient. In western countries, nearly all agricultural innovations are labour-saving. In our study, however, we found evidence that agricultural innovations in India are labour-intensive. That is, the farmers with higher adoption scores used more labour. Other studies have shown that Indian farmers may adopt more for reasons of prestige, mass-media persuasion and extension contact, rather than for reasons of sheer efficiency.[3]

In short, an analysis shows that size of farm operation is clearly the dominant economic factor related to innovation. Only the bigger farmers are really adopting new practices. Even though we selected the upper third of bigger farmers in the village, who cultivated 2.5 acres or more, we found a clear, strong relationship between size and adoption which overshadowed all other factors. As the competition for innovations increases, the farmers with less than 2.5 acres or raising products worth less than Rs. 1,000 will find it increasingly difficult to obtain these scarce resources.

DO ADOPTERS DIFFER BY STATUS?

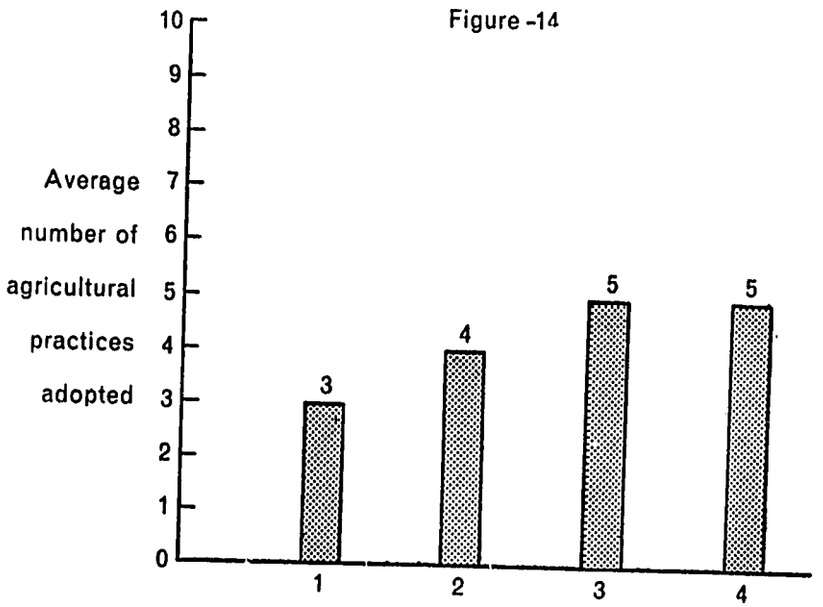
We used several measures to answer this question. Traditionally, socio-economic status as measured by sociologists connotes education,

3. See S. P. Bose, "Socio-cultural Factors in Farm Efficiency", *The Indian Journal of Extension Education*, 1 (No. 3, 1965), pp. 192-199, and an unpublished manuscript by F. C. Fliegel, J. E. Kivlin and G. S. Sekhon, "A Cross-National Comparison of Farmers' Perceptions of Innovations as Related to Adoption Behaviour", Hyderabad : National Institute of Community Development, 1968.

level of living and social participation. In India, on account of the pervasive influence of caste, we included this measure as well.

We first made an intra-village ranking of the different castes, based on ritual purity in terms of inter-dining and sharing of water. Then, for purposes of comparing status across villages, we collapsed the larger number of castes into four groups, approximately equal in size. Two of the West Bengal villages were solely Muslim and hence were excluded from analysis of caste. Using this four-point scale of inter-village caste ranking, we found a positive relationship between caste and adoption, (Figure 14.) The higher castes had adopted a higher average number of practices. It seems likely that the traditional influence, often attributed to caste, is giving way to the positive influence of education and higher income which are associated with caste. The upper 'cleaner' castes, for example, were adopting practices like insecticides, animal inoculation and rat poison, which could be considered ritually impure.

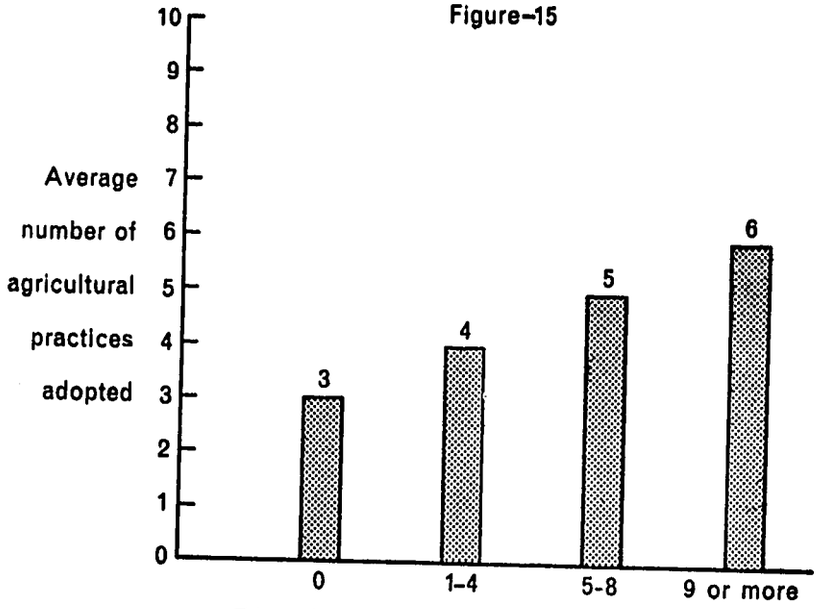
Figure -14



Inter-village ritual caste ranking:
(castes arranged on a four-point scale,
one-low; four-high)

We found that literacy and education were positively related to adoption. The literate, more educated cultivators were more apt to adopt agricultural practices (Figure 15). Farmers who had no schooling adopted an average of three practices ; those with primary schooling

Figure–15



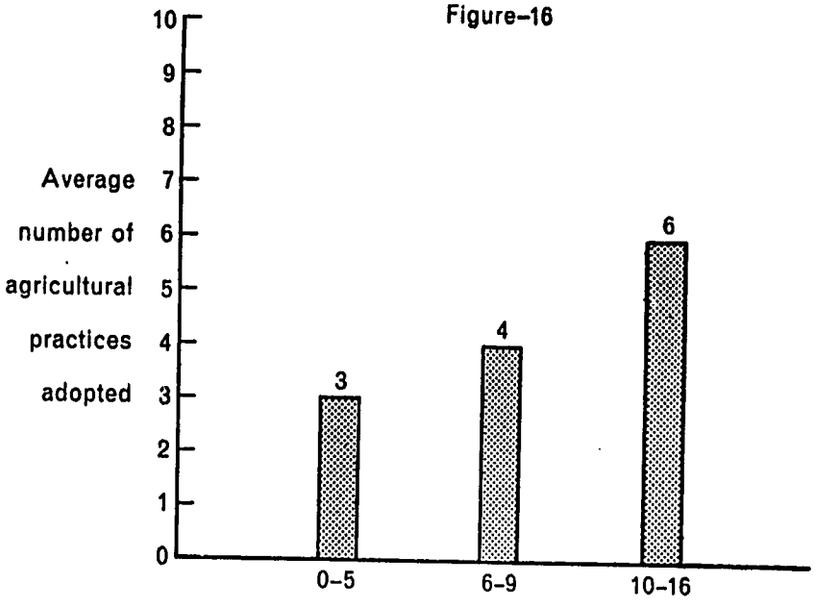
adopted four practices ; those with middle school education adopted five practices ; and those with nine years or more of schooling adopted six practices, on the average. The trend seems to be continuous and may even extend beyond high school.

Level of living, the most stable measure of material well-being, was measured by an index composed of 16 material possessions and housing features. Poor farmers, with level of living scores of only 0 to 5, adopted less than three practices, while richer farmers with level of living scores of over 10, adopted more than six practices (Figure 16). Level of living showed a very strong relationship with agricultural adoption.

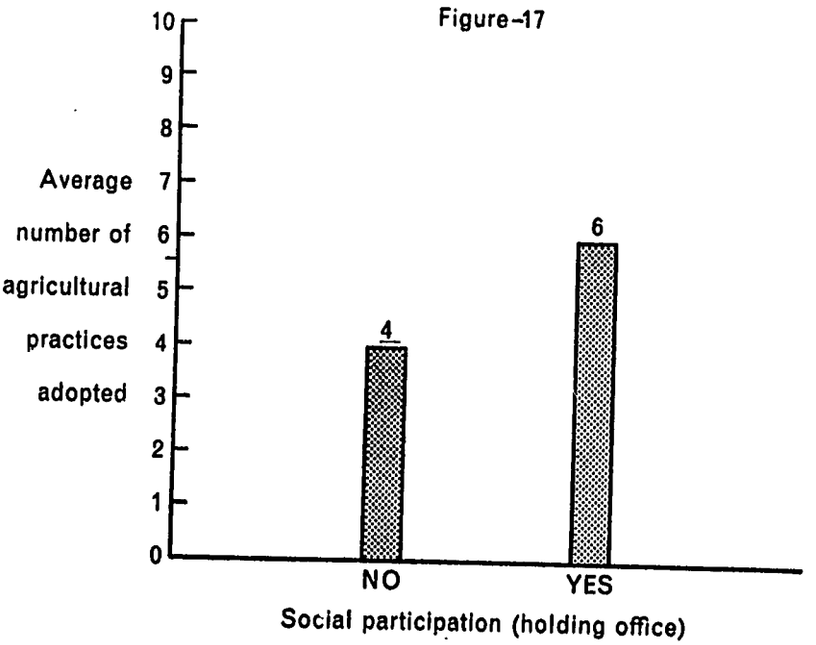
The last mark of status we considered was whether a farmer held an office in any voluntary organisations. Those who did not hold office adopted only four practices, compared with an average of six practices for the farmers who held an office (Figure 17).

Thus, our data snow that adopters definitely do differ by status : they belong to the higher castes, they have more education, they have a higher level of living and they hold office in formal organisations. These marks of status and material well-being seem to be the necessary conditions for early adopters. It is the farmers with higher socio-economic status who can take the risks that most innovations require. These

Figure–16



Figure–17



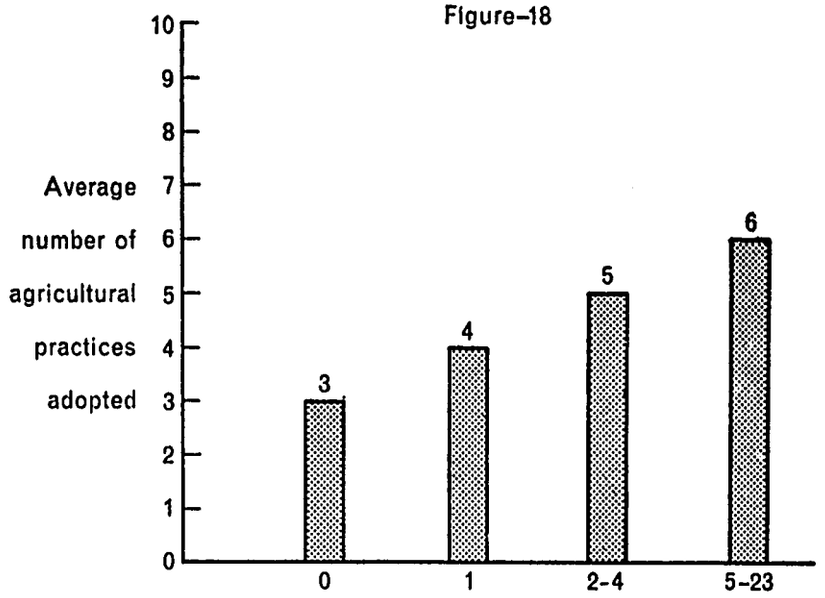
farmers can take occasional losses and persist with innovations not only because of better economic resources but also because of superior education. Education helps them to understand that it is usually some extraneous factor and not the basic innovation which is responsible for losses.

THE COSMOPOLITES

Our general thesis for agricultural innovation in villages was that farmers who have linkages with the outside world are more likely to adopt new practices. This linkage may be *personal*, through contacts with extension agents or by visits to the city; or, it may be *impersonal* through the mass-media, by going to cinemas, listening to the radio or reading newspapers; or, this linkage may be *psychological*, by having knowledge about the political world outside or having a secular orientation to life.

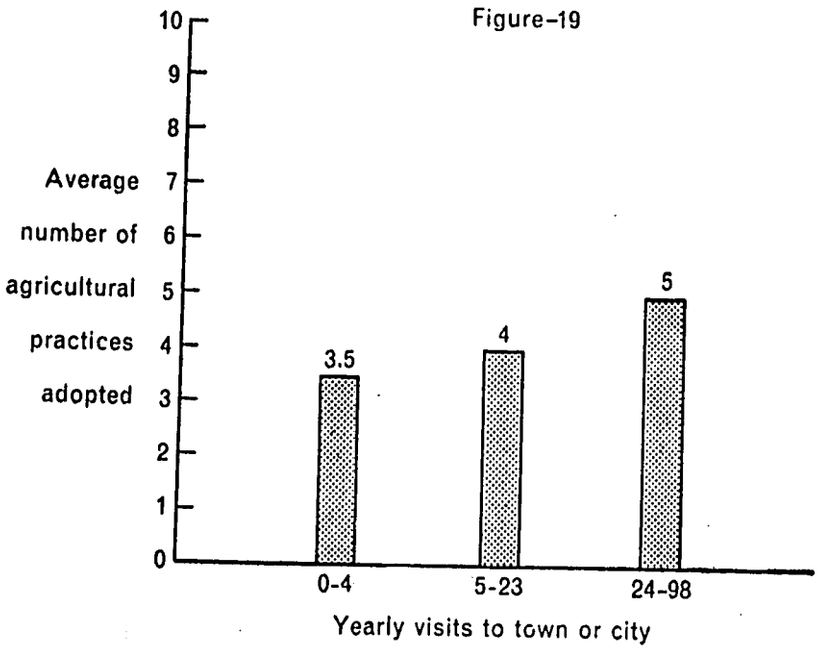
We asked each farmer how often he had spoken with the BDO and the VLW, and also how many demonstrations and block films he had seen during the past year. We found that during the past year, only 17 per cent of the farmers had spoken with the BDO, 67 per cent had spoken with the VLW, 33 per cent had seen a demonstration, and 27

Figure–18



per cent had seen a block film. Each of these items was differentially weighted from 0 to 8, permitting a maximum score of 32 for the index (Figure 18). Farmers with no extension contact had adopted an average of only three practices. Figure 18 shows a steady rise in average number of practices adopted as the extension contact increases. Farmers with a high degree of contact with the extension agency had adopted over six practices. There seems to be no doubt that contact with the extension services affected agricultural adoption. However, it should be noted that over half of our sample of 680 cultivators had little contact with extension agents and there is much scope for increased contact.

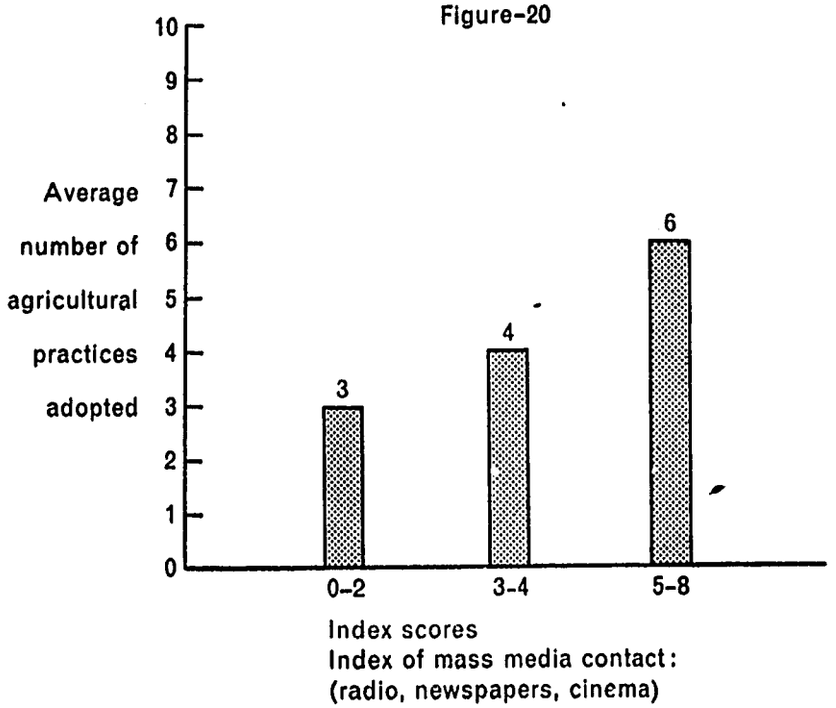
We asked the farmer how many times he had been to a town or a city during the past year. People who went to town less than five times per year adopted an average of only 3.5 practices, compared with five practices for those who went to town 24 or more times yearly (Figure 19).



We found that exposure to all types of mass-media that we examined was positively related to agricultural adoption. In our sample, 76 per cent of the farmers listened to the radio (though not necessarily very often), 34 per cent of their families listened to the radio, 67 per cent of the respondents had seen a film, and 31 per cent read newspapers.

These items were given a low, medium or high weighting and combined into a mass-media index. Farmers with a mass-media index score of two or less adopted an average of only three practices, compared with six practices for those with a mass-media score of five or more (Figure 20).

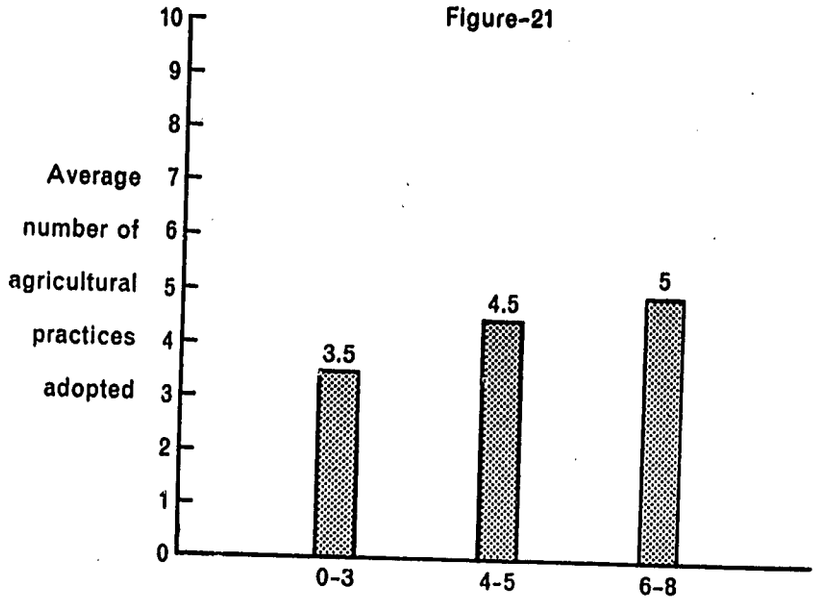
Figure-20



We studied the secular orientation of the farmer by asking eight questions about his attitude toward disease, caste, and cows, and constructed a scale based on these items. Farmers who scored low on this secularism scale adopted an average of only 3.5 practices, compared with five for farmers who scored high on this scale (Figure 21).

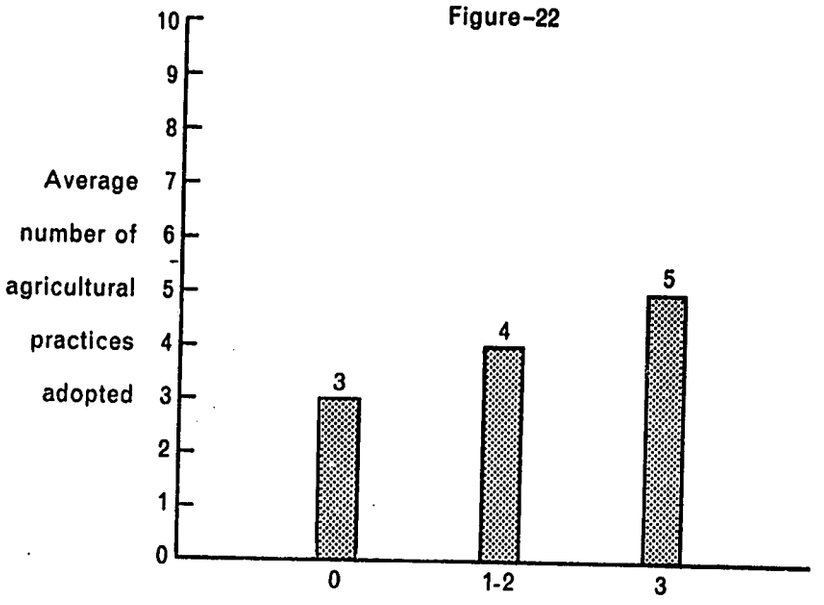
Finally, we tried to measure how much a farmer knows about the outside political world by asking if he knew who was his new MLA (member of Legislative Assembly), who was the chief minister of his state, and who was the prime minister of India. Our interviewing was conducted one or two months after the national and state elections. Based on these three items, we constructed, by simple addition, a scale of political knowledge ranging from 0 to 3 (Figure 22). Farmers who

Figure-21



Number of secular responses
Index of secular orientation:
(Attitudes toward disease, caste and cows)

Figure-22



Index of political knowledge:
(Number of political leaders' names known)

answered all questions incorrectly adopted an average of only three practices, compared with five practices for farmers who answered all questions correctly.

All our measures of contact with the outside world or cosmopoliteness, were positively related to agricultural adoption: personal contact with extension agents, visits to the city, the amount of mass-media contact, the secular orientation of the respondent and his knowledge of political leaders. Thus it is not only his direct contact with extension agents but also the indirect influence of urban contact and the mass-media which help a cultivator to adopt new practices.

4

WHAT SHOULD BE DONE ?

O why does agriculture lag ?
The answers all are in the bag,
But the bag in which the answers lie
Turns out to have enormous size.

Kenneth Boulding[1]

POUR MORE MONEY INTO EXTENSION ?

It was abundantly clear from our study that, both at the village and the individual level, every measure of agricultural extension contact was positively and significantly related to agricultural innovation. We can state with confidence that much agricultural change has been brought about by extension contact. Our data lead us to believe that the leaders and the better farmers are now actively seeking out the extension agents and hence the demand for agricultural services will increase. As a larger and larger volume of fertilisers, credit, pesticides and other supplies and expert information flows through extension channels, the more efficient these channels will need to be. First, the *quantity* of agricultural supplies and services is going to increase several fold and more personnel are going to be needed to handle them. Second, faulty or incomplete advice on new capital-intensive varieties of crops could spell disaster, and hence the *quality* of extension services will need to be immensely improved. In other words, more money will be needed both for additional personnel and for better quality personnel.

The draft of India's Fourth Plan envisages that almost 50 per cent more agricultural graduates will be needed during the Fifth Plan.[2] Like the investment in the Indian Institute of Technology, the investments in the quality of the agricultural universities will be a welcome change. As we have indicated earlier, the development of agriculture depends not only on the agricultural scientist, but also on the deve-

1. M. F. Millikan and D. Hapgood, *No Easy Harvest*, Boston : Little, Brown and Company, 1967, p. xii.
2. Government of India, *Fourth Five-Year Plan : A Draft Outline*, New Delhi : Planning Commission, 1966, p. 195.

lopment official and the farmer. Investments should be made not only in agricultural technology but also in the social sciences—Agricultural Economics, Rural Sociology, Social Psychology and Public Administration. There are many human problems involved in increasing agricultural production, far more than have been tackled in this particular study.

The country must take a harder look at how much we have really invested on 80 per cent of the population who are rural people, compared with that invested on 20 per cent who are urban people. What kind of health, education and other institutional amenities have been provided to stimulate and develop agriculture and the agriculturist? We found that the supporting institutional development was positively related to agricultural adoption. These 'welfare' institutions should be viewed as a necessary part of the social infrastructure which builds a more educated and healthier farmer and agricultural labour force; these institutions are not luxuries but necessities which a poor nation cannot do without.

STRENGTHEN MASS COMMUNICATIONS

Our second unambiguous finding was that every avenue of mass communication was positively related to agricultural innovation. Mass communications have both a specific and a global beneficial effect. First, listening to radio farm forums and weather broadcasts, reading papers, and seeing block films provide specific information about modern agricultural practices and help to persuade farmers to adopt them. Second, the mass-media help to bring the outside world nearer to the farmer and this general knowledge is also functional for agricultural innovation. We found a strong association between adoption and this linkage with the outside world.

Transistors have brought radio prices down, but radios are still taxed as though they were a luxury. Rural radio-listening could, perhaps, be increased a great deal if some form of tax relief could be provided for the rural listerner. Our study of radio forums (in another part of our project) leads us to feel that a more serious organisational effort to use radio forums would produce increased agricultural innovation. The broadcasting end has already been set up, and could perhaps be improved, but at the receiving end the organisation of forums is a human skill which will need considerable investment in manpower in the future.

Literacy still remains largely a slogan in India. Making even half of the 70 per cent of India's population which is illiterate functionally

able to read and write will require a very large investment in men and materials. Even though an adult literacy class may collapse four or five years of youth education into one year or less, literacy programmes will require a higher quality teacher input, and a colossal adult farmer input, before an essentially literate population can be achieved. Massive literacy drives should be taken away from slogan-mongers and a realistic estimate of pragmatic cost-benefits should be made. The costs may be high but the pay-off *via* increased communication efficiency may also be great.

New media like television need to be assessed and again, realistic costs of innovations such as tele-clubs, in terms of manpower, transmission and receivers, should be made relative to the benefits which can accrue.

FORGET THE SMALL FARMER?

The findings of phase II of our study lead us to conclude that it is cultivators who have medium-sized and large farms who will monopolise the lion's share of modern agricultural innovations. And among them, it is the larger farmers who innovate more. While 20 years of land legislation may have slowed down somewhat the polarisation of agriculture into very large and very small farms, we should now take a closer and more dispassionate look at the effects of land legislation. Modern farming, whether practised in China, Russia or America, has steadily increased the unit of management. If Indian agriculture modernises, as it inexorably will do, the average size of farm units is going to rise.

If profit margins on the new high-yielding varieties and other innovations start getting bigger, investment in agriculture will become more attractive. The bigger farmers who can afford the higher inputs will reap higher profits and push up costs of land. Then, few will be able to afford to farm in the old traditional way.

What will happen to the small farmer and the landless labourer? Fortunately most agricultural innovations, such as the use of fertilisers, use of insecticides, and the Japanese method of paddy cultivation, have hitherto been labour-intensive. Hence, along with innovation, the demand for agricultural labour has gone up. Wages of agricultural labour have also risen. However, this felicitous result may not prevail for very long as mechanisation increases. Since our study focussed on middle-sized and large farmers we recommended that research studies on how these new practices are affecting the small farmer and the landless labourer, who constitute 60-70 per cent of the village population,

should be made. We need to know what further adjustments can be made in the agrarian structure which is already changing. One of the concomitants of the agricultural revolution in India may soon be a release of manpower. Before mechanization starts unleshing this tide of labour on to the industrial market, we should start planning. What alternative avenues of employment do we have for half of India's peasantry?