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# AGRICULTURAL INNOVATION AMONG INDIAN FARMERS

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## Preface

This is the second Indian report on the Diffusion of Innovations research project which was undertaken in collaboration with Michigan State University. The first report was based on an analysis of 108 villages and has been published under the title 'Agricultural Innovations in Indian Villages' in March, 1968.

This second report is based on an analysis of 680 Indian farmers. The sample has been judiciously selected, comprising all farmers who cultivated 2.5 acres or more and were below 50 years of age in eight villages—three from West Godavari district of Andhra Pradesh, two from Yeotmal district in Maharashtra and three from Birbhum district of West Bengal. The sample thus consists of a wide range of Indian farmers so as to be sufficiently representative to analyse the major factors which facilitate or constrain adoption of modern agricultural practices.

The co-directors of the project were Frederick C. Fliegel and Prodipto Roy, who were assisted by associate directors Joseph E. Kivlin, Lalit K. Sen and James P. Bebermeyer. The field teams were supervised by Sanat K. Reddy, Sudhakar S. Thorat and Ajit K. Danda, and consisted of D. K. Bhowmik, S. Rudra, J. Sahabhowmik, P. K. Chatterjee, K. S. S. Raju, J. M. Rao, G. Subharatnam, J. V. R. Rao, B. R. Patil, P. M. Shingi, V. K. Surkar and S. K. Shelar. The manuscript was typed by G. Narayana Murthy. Data for this report were processed at the Computer Centre of the Programme Evaluation Organisation, Planning Commission, New Delhi, and also at the Michigan State University Computing Center.

*National Institute of  
Community Development, Hyderabad  
17th March, 1968.*

GEORGE JACOB  
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## Design and Execution of the Study

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### A. Introduction

THE research reported in this volume is part of a broader study concerned with the spread of modern technology among rural people.<sup>1</sup> Comparable data have been gathered in Brazil, Nigeria and India, three of the major developing nations of the world today. All three are predominantly rural nations and all are vitally interested in modernising agriculture and stimulating change among their rural people. We are concerned only with India in the present report.

In each of these three nations, the total research programme has been divided into three phases. First, an attempt was made to analyse the community setting in which rural people live, to determine to what extent the nature of the community itself affects the adoption of modern technology. In the case of India, this involved a study of 108 agricultural villages, which was published earlier.<sup>2</sup> Second, a study was made to determine what factors affect the innovative behaviour of the individual farmer within the community setting. It is the agricultural innovation correlates of this second phase of the broader study which are reported here.<sup>3</sup> The third phase, now being completed, involves carefully controlled experiments to induce greater acceptance of modern technology

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1. "Diffusion of Innovations in Rural Societies", under contract between the United States' Agency for International Development and Michigan State University, Everett M. Rogers, project director. The Indian part of the study was conducted in collaboration with the National Institute of Community Development, Hyderabad.
  2. Frederick C. Fliegel, Prodipto Roy, Lalit K. Sen, and Joseph E. Kivlin, *Agricultural Innovations in Indian Villages*, Hyderabad: National Institute of Community Development, March, 1968. Comparable reports are being prepared for Brazil and Nigeria.
  3. Again, comparable reports are being prepared for Brazil and Nigeria.

in a limited number of rural settings. Several means being employed to induce change will be studied, the effectiveness of the different methods will be compared, and inferences will be made about the optimum methods for bringing about greater acceptance of modern agricultural and health practices.

It should be apparent from this brief description that this volume is part of a research programme which has cast a wide net, both geographically and conceptually. Masses of data have been gathered and analysed. Many reports have been or will be written to integrate the findings from different phases of the study and from different countries.<sup>4</sup> All aspects of the research programme are concerned with the process by which the fruits of modern science come to be utilised by rural people in the developing nations.

In this volume we report an analysis of the Indian farmer as decision-maker in this broad change process. In a wider sense, our analysis can only contribute minutely to a better understanding of agricultural and economic development. However, in view of India's acute food shortage, one must recognise that it is ultimately the individual farmer who decides whether the nation will or will not be adequately fed. It is our hope that a better understanding of the farmer's decision-making processes will contribute to the achievement of higher levels of food production and to higher individual productivity.

#### B. Statement of Problem

Stated simply, our research problem is to determine why one farmer adopts a modern agricultural practice, say the use of chemical fertilizers, while another farmer, living in the same community, does not. Such differences are there. A given farmer may be highly progressive, but often even his immediate neighbour fails to accept modern production methods. If the reason or reasons for non-adoption can be isolated, then, perhaps, they can be overcome.

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4. Comparisons among the three countries will be reported by Everett M. Rogers.

Our approach to the problem is largely determined by two major considerations. First, we assume that farmers exercise their power to make choices, and that the differences among farmers can account for failure to accept modern technology. This is not to deny that fertilizers and other modern inputs of the economic infrastructure such as roads, supplies, credit and services, must be available to the farmer to make a meaningful choice. Within limits of availability and applicability, we are viewing the farmer as an individual who makes choices among options open to him. Our research task, then, is to isolate the constraints, both direct and indirect, which determine the choices actually made.

And second, having isolated the so-called constraints on decisions, we will try to demonstrate that they are in fact constraints. We will try to make causal inferences, in other words, and this will often take us beyond our data. To show, for example, that farmers who are exposed to radio are more prone to accept new ideas than those not exposed, does not in itself prove that radio causes such acceptance. We will attempt to demonstrate why exposure to radio makes a difference and how much difference it makes. Thus, by reasoning from various known factors in the situation, we will attempt to substantiate a causal argument. We feel fairly confident of being able to do this because of the large volume of research which has already been done on the diffusion process.<sup>5</sup> Though many of these<sup>6</sup> studies do not apply directly to India, there are studies conducted in India which provide some guidelines. We can draw on these and on many earlier studies to help in understanding the positive and negative influences on farmers' adoption choices in the Indian situation.<sup>7</sup> And if we can make causal inferences, then the way is prepared for implementation of programmes

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5. Everett M. Rogers, *Bibliography on the Diffusion of Innovations*, Diffusion of Innovations Research Report No. 4, East Lansing, Michigan : Michigan State University, Department of Communication, 1967.
  6. For a listing of studies conducted in India, see *Indian Journal of Extension Education*, 1 (4), 1965, and T. P. S. Chawdhari (Ed.), *Selected Readings on Community Development*, Hyderabad : National Institute of Community Development, August, 1967.
  7. Particularly helpful in this respect are the books by Herbert F. Lionberger, *Adoption of New Ideas and Practices*, Ames, Iowa : Iowa State University Press, 1960 ; and by Everett M. Rogers, *Diffusion of Innovations*, New York : The Free Press of Glencoe, 1962.

which can overcome some of the constraints on acceptance of modern farm production methods.

### C. Framework of Analysis

In designing this study we have relied on earlier studies. We, as well as many of our predecessors, have chosen to view the diffusion process as involving two types of people, those who, by profession or practice, advocate the acceptance of a given innovation, and those who are potential users of that innovation. These two types of people must be in communication with one another directly or indirectly for the transfer of the innovation to take place. And to be meaningful, for our purposes, the communication must be with reference to a particular new idea or a practice.<sup>8</sup> Focus on the new idea both structures the kinds of questions one might raise about the participants in the communication process and also provides the criterion of success or failure by which the process is evaluated.

If the potential user of a new practice accepts that practice, we regard the issue as closed. We are not, in other words, attempting to determine whether a new practice, once accepted, is put to use in an optimum manner and has the desired effect on food production. These are important questions, but questions which go well beyond the data obtained for this study and which we only touch upon.<sup>9</sup> Our concern is with the process by which the farmers come to know about and to accept modern farming practices.

Within the total diffusion process, as broadly outlined previously, we have chosen to focus on the farm setting in which decisions are made, the farmer himself and the social context in which he makes decisions, aspects of the communication process by which the farmer comes to learn about innovations in agriculture, and certain aspects of the farmer's social-psychological posture with regard to the world about

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8. This general approach to the study of diffusion of innovations is described in detail in H. G. Barnett, *Innovation ; the Basis of Cultural Change*, New York : McGraw-Hill, 1953.

9. See S. P. Bose, "Socio-cultural Factors in Farm Efficiency", *Indian Journal of Extension Education*, 1 (3), 1965, pp. 192-199, who raises some serious questions about the impact of adoption of modern practices.

him. Each of these content areas is later spelled out in somewhat greater detail, and each corresponds to one of the chapters in the present analysis.

1. 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 and in productive-man-work-units; labour efficiency; magnitude of production of major crops; degree of specialisation in particular farm products; 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. Our second major concern was to characterise the *farmer himself and his social setting*, recognising that no two individuals react to the same business 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 the nature of 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. 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 of modern technology, he must of course come to know of its existence and to know something about it. Here we wanted information on access and exposure to radio, film and printed communication channels, as well as knowledge about and exposure to various types of change agents. And further, we wanted information on several more subtle aspects of communication with the larger society: the extent to which the farmer was involved in and dependent on the local community *vs.* a broader geographic and social set of relationships; and the extent to which farmers tended to regard information coming from a given source as more credible than if it came from another source.

4. The last type of variability that we wanted to analyse with respect to farmers' decisions were social-psychological orientations. We were interested in a more general specification and understanding of possible differences among farmers in their *posture with regard to the world about them*. Here we wanted information about: ability to relate to other people; levels of aspiration and differential ability to plan and to forego immediate gratification in order to realise aspirations; willingness to take risks in order to achieve certain goals; and also certain aspects of value orientations. Variables of the type just mentioned are difficult to measure and to relate to decision-making, since the respondent himself may rarely articulate such considerations. They represent an attempt to specify differences among individuals which go well beyond the immediately apparent, such as differences in age and education.

#### D. Hypotheses

Having specified the framework of our analysis and the types of variability we have considered in our analysis, let us briefly indicate the general hypothesis which has guided that analysis. In its simplest form, the general hypothesis we have used in analysing acceptance of innovations among Indian farmers is as follows: *given that the modern agricultural technology stems from the larger society, the greater the integration of the farmer into the larger society—in economic, social and psychological terms—the greater will be his acceptance of that modern technology.*

In that very general form, our hypothesis is of course so obvious as to be almost useless in guiding the analysis. Specific research hypotheses will be explicated in the later analyses, which are typically restatements of the general hypothesis in more concrete, usually bivariate terms. The fact is that we know that the larger society and the sphere of activity of the individual farmer are not discrete entities. We do not know, however, whether a given identity between the two or a lack of such identity makes a critical difference in the acceptance of modern agricultural technology. We do not know whether mass media contact, level of education, and

degree of commercialisation, or all three combined, make a unique and predictable difference to diffusion of agricultural innovations.

Other variables could be cited but the above will suffice. We can and have stated within each chapter directional hypotheses about the effects of specific differences among farmers on their adoption of modern technology. We lack a coherent middle-range theory of diffusion of innovations, however. We do not know which aspects of integration into the larger society, singly or in various combinations, make a critical difference to the diffusion process. In a sense, the construction of such a middle-range theory is one of our goals. We have been able to gather a wide variety of data. By analysing these data in a multivariate design we expect to contribute to a more coherent understanding of the diffusion process.

#### E. Questionnaire Construction

Data for this study were obtained *via* personal interviews with farmers. Questions were phrased to elicit the desired information, relying heavily on the experience of others with regard to wording and format. The three-nation project outline and the revised operational plan for India formed the basis for the selection of variables. An operationalisation of certain variables was circulated among the three nations, and these were discussed in a Project Leaders Working Conference in the Fall of 1966. Two recent studies conducted by the National Institute of Community Development were particularly helpful in this respect. The first was a nationwide study entitled 'Awareness of Community Development', in which data were gathered from village leaders and a selected sample of men and women in 365 villages.<sup>10</sup> The second was a study of the communications aspects of the diffusion process conducted in the Lucknow area.<sup>11</sup>

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10. Lalit K. Sen and Prodipto Roy, *Awareness of Community Development in Village India*, Hyderabad : National Institute of Community Development, 1968.

11. Prodipto Roy, *The Impact of Communications on Rural Development in India*, Hyderabad : National Institute of Community Development, August, 1967 (Mimeo.).

In short, a questionnaire was constructed using operationalisation of variables similar to the above studies as well as the sister studies being done in Brazil and Nigeria as part of the Diffusion project. The questionnaire was first translated into Telugu and the format was given a substantial pre-testing in the state of Andhra Pradesh. The questions were revised in cases in which they obviously had not been understood, and also in those cases in which the distribution of individual responses tended to produce little variation.

After this first revision, the questionnaire was also translated into Marathi and Bengali, the languages of the other two states in which we proposed to work, as will be detailed in the following section. The questions were then pre-tested again in all the three languages. Responses were again tabulated and a few further revisions were made. Final reproduction of the questionnaire then resulted in three sets of bilingual *instruments*, corresponding to the three regional languages, with English, the common language. Particular attention was paid to the translations in order to use expressions familiar to the farmer and to maintain identity of meaning across the different languages. Here again the experience of earlier studies proved to be very useful.

#### F. Sample

As already implied, farmers were interviewed in three states, Andhra Pradesh, Maharashtra and West Bengal. The states had been selected for the first, or village-level phase of the study, both to provide geographic variability and to represent different types of development administration.<sup>12</sup> West Bengal is only beginning to introduce *panchayati raj* or citizen participation in development administration. Andhra Pradesh has introduced a substantial degree of citizen control at the level of the development block called the *panchayat samithi*. And Maharashtra follows a *zilla parishad* pattern of district-level citizen participation.<sup>13</sup>

12. Fliegel, Roy, Sen and Kivlin, *Agricultural Innovations . . . , op. cit.*

13. For the structure of the community development organisation and a description of local self-government involvement in administration, see George Jacob (Ed.), *Readings on Panchayati Raj*, Hyderabad : National Institute of Community Development, July, 1967.

Two to three villages were selected in each state from among the 108 villages which had been included in the first phase of the study. Selection was restricted to a single development block in each state to minimise travel costs and the logistics of field work. The basic criterion for selection was to obtain villages which were roughly typical of the range of variability on the success or failure of the agricultural programmes we had encountered in the sample of 108 villages from the first phase of the study.

Criteria for selecting farmers for interview were more narrowly specified. Selection was restricted to farm operators, those who actually made the day-to-day decisions on the farm, and who were farming at least 2.5 acres (one hectare) of land at the time of the data-gathering. Respondents could own or rent the land they farmed. We excluded the smallest farmers because we felt that many of the innovations are not practical for them. And we also excluded landless labourers, because they typically do not make decisions regarding the adoption of farm practices.

The Census of Agriculture quotes that about 24 per cent of the village population for the whole nation consists of landless labourers. The figures are, 42 per cent for Andhra Pradesh, 34 per cent for Maharashtra and 28 per cent for West Bengal.<sup>14</sup> Of the farmers who own some land, 40 per cent own less than 2.5 acres and 60 per cent 2.5 acres or more. Looked at another way, these latter 60 per cent, who own 2.5 acres or more, cultivate 93 per cent of the total arable area in the country. Our criterion of *cultivating* 2.5 acres (some of which could be rented) thus is a little more liberal and would probably encompass over 95 per cent of the cultivated land. More cogently, we were here concerned with agricultural innovations. Data from a previous study indicated that farmers below 2.5 acres adopted a little over half as many practices partly because some practices were not applicable.<sup>15</sup> In short, since this study was concerned

14. Government of India, *Agriculture in Brief*, New Delhi: Directorate of Economics and Statistics, 1966, p. 60.

15. Data cross-tabulated from the communications study cited above; Prodipto Roy, *loc. cit.* indicated that farmers with less than 2.5 acres adopted an average of 2.86 practices compared with 4.28 practices for those with 2.5 acres or more.

primarily with the adoption of new agricultural practices, we felt that by limiting ourselves to farmers with 2.5 acres or more, we would be dealing with the farmers who utilise 95 to 98 per cent of India's agricultural innovations.

Selection of farmer respondents was further restricted to those heads of farm households who were 50 years of age or younger at the time of the study. Our intent here was to avoid the ambiguous decision-making situation in which the older generation is gradually handing over responsibility to the younger. In such situations it is often difficult to determine who in fact makes farming decisions; thus it seemed wiser to restrict our attention to the relatively younger age group.

Having specified sample limits on the size of farm and the age of farm operator, we decided that 200 to 250 interviews in each state would permit the kind of detailed statistical analyses we wanted to make. Every farmer who fitted the size and age specifications in a given village was interviewed. In Maharashtra, two villages were sufficient to provide the minimum number of interviews. In the other two states, a third village was added to provide enough cases. In summary, interviews were conducted with all farm operators meeting the age and farm size criteria in eight villages, for a total of 680 interviews.<sup>16</sup>

Thus, while the sample we selected is not 'representative' of India in a statistical sense, that is, it cannot be used to predict estimates of the parameters, we have purposively included farmers covering a very wide range of agricultural modernisation. We tried to avoid extremes, so that the distribution of dependent and independent variables would be somewhat normal to permit correlation analysis. We have taken into consideration the state and village differences but all our analyses and measures have been devised to encompass the entire range of farmers. In short, we have treated the 680 farmers we interviewed as one sample of Indian farmers, and our analysis was directed at explaining the

16. The selected villages are: in Andhra Pradesh, Manchili (N=78), Kanchumarru (N=33), and Polamuru (N=99), all from West Godavari district; in Maharashtra, Pophali (N=100), and Mulawa (N=146), from Yeotmal district; and in West Bengal, Amdole (N=103), Harishpur (N=59), and Laxmi-Danga (N=62), from Birbhum district.

variance of agricultural adoption in this sample. In the final chapter, we have also shown how consistently various factors predict within community variance.

### G. Field Work

Field work was conducted during March and April of 1967. Interviewing was done by teams of four interviewers led by a supervisor in each of the three states. Because of language differences the team members, who spoke the appropriate regional language as their mother-tongue, could each work within only their home state. All team members had prior field interviewing experience and had participated in phase I interviewing in training sessions and pre-testing before going into the field.

The interviewing teams established residence in a sample village, usually in a private residence. Once settled, they made lists of eligible respondents by consulting voter registration lists and knowledgeable people in the village. They then divided the list among themselves and proceeded to interview eligible respondents. Eligibility was confirmed early in the interview situation and every effort was made to make sure that no eligible farm operator had been omitted from the list.

As far as possible, the interview was conducted in private, and typically lasted about one hour and fifteen minutes. Since the teams had already interviewed in these same villages during phase I of the study it was not as difficult to establish rapport. Also, the general purpose of the study was known from the earlier visit and this helped to make it possible to maintain privacy in the interview situation. People simply were no longer that curious about the study.

Interview schedules were checked by the supervisor in the field, making it possible to return to the respondent if one or another question had been omitted. When interviewing was completed in one village the teams moved on to the next, usually spending about two weeks in one location.

### H. Data Processing

After completing the field work, the team members coded

all interview data for computer processing. Code categories were established on the basis of a sub-sample and then the data were systematically converted to numerical form. All coding was checked for random as well as systematic error. Subsequently a variety of scales and indexes were constructed, comprising many of the variables discussed in subsequent chapters of analysis. All routine data processing as well as statistical analysis was done by the Computer Centre of the Programme Evaluation Organisation, Planning Commission, New Delhi. A few of the more complicated programmes were run at the Michigan State University Computing Center.

## Measuring Agricultural Innovativeness

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THE problem of constructing a dependent variable for 680 farmers scattered in three states of India was unlike the problem faced in phase I, of measuring agricultural development programmes, success across 108 villages. In phase I, we found that there were very few studies which had measured village adoption. The adoption of farm practices by individual farmers, however, is a topic which has a large number of studies. Rogers and Rogers<sup>1</sup> document 28 such studies which give measures of adoption almost exclusively from the United States. An equal number could probably be cited from India.<sup>2</sup> Hence the paucity of methodologies of phase I was now contrasted with an abundance of methodologies in phase II. But nearly all these studies done in India or the U.S., construct scales for farmers living in one state or one region but not across states or with different types of farming.

Although there is an abundance of studies using the innovativeness variable, only a few articles deal specifically with the methodology of adoption measurement. Two such articles are by Rogers and Rogers,<sup>1</sup> and Pareek and Chattopadhyay.<sup>3</sup> The former deals with validity, reliability, internal consistency and uni-dimensionality in measures of innovativeness and the latter stresses applicability, time of adoption and differential weighting. Based on a re-analysis of data

1. Everett M. Rogers and L. Edna Rogers, "A Methodological Analysis of Adoption Scales", *Rural Sociology*, 20, December, 1961, pp. 325-336.
2. See *Indian Journal of Extension Education*, 1(4), 1965.
3. Udai Pareek and S. N. Chattopadhyay, "Adoption Quotient: A Measure of Multi-practice Adoption Behaviour", *Journal of Applied Behavioural Sciences*, 2, January-March, 1966, pp. 95-108; see also S. N. Chattopadhyay and Udai Pareek, "Prediction of Multi-practice Adoption Behaviour from some Psychological Variables", *Rural Sociology*, 32, September, 1967, pp. 324-333.

from six studies, Rogers and Rogers felt that the measures used were valid and reliable. They felt that in regard to internal consistency and uni-dimensionality, the measures left something to be desired. Parcek and Chattopadhyay use an adoption coefficient with a complicated formula in which adoption was weighted for both difficulty of adoption and years of usage.<sup>3</sup> Thorat has also used a weightage by year of adoption but has given no empirical defence.<sup>4</sup>

Since the major method of analysis to be employed in this phase was Pearsonian correlation, with the considerable use of partial correlations and multiple correlation, it was felt that in addition to all the above considerations some logical and mathematical defence of the criterion variable should be presented. The primary considerations we took into account were: (a) cross-national applicability, (b) uni-dimensionality, and (c) a somewhat normal distribution. The problem of weighting, validity, reliability, and internal consistency were generally taken into consideration but not considered as serious problems in our study for reasons given below.

Fliegel demonstrated that a differential factor weighting correlated .96 with his unit weighting, for a 11-item scale among 176 dairy farmers in Wisconsin.<sup>5</sup> In the present study, we felt the problem of weighting should be re-examined alongside the problem of uni-dimensionality and unless a clear superiority of differential weighting was indicated, the simpler unit weighting would be adequate. Validity and reliability, we felt, were both theoretically and pragmatically dealt with adequately in our measurement. The research team consisted of six scientists each of whom had conducted several studies using similar items to measure agricultural adoption, and this was coupled with two pre-tests in which items were selected based on careful observation of respondents in the field and of subsequent item-analysis. Internal consistency, we felt, would be adequately tested by Guttman

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4. S. S. Thorat, *Certain Social Factors Associated with the Adoption of Recommended Agricultural Practices by Rural Local Leaders and Ordinary Farmers in India*, Ph.D. Dissertation, Michigan State University, East Lansing, 1966.
  5. Frederick C. Fliegel, "A Multiple Correlation Analysis of Factors Associated with Adoption of Farm Practices", *Rural Sociology*, 21, 1956, pp. 284-292.

scaling of the items and from the correlation matrix used for the factor analysis.<sup>6</sup>

In short, the theoretical problem of measuring agricultural innovativeness from our sample of 680 Indian farmers resolved itself into three major considerations: (1) the intuitive and pragmatical selection of items which would be equally applicable to both poorer and better farmers in all three states; (2) the uni-dimensionality of the items; and (3) the examination of the distribution of the final measures to ensure a somewhat normal distribution. We decided to err on the side of simplicity in order to communicate the results of our findings and also to defend our statistical analysis.

#### A. Selection of Applicable Items

Based on information obtained in phase I and distribution of practices being used by leaders, we narrowed down the potential items which could be used, to 15. As in phase I, specific items related to the common denominators of agriculture in all eight villages were selected. As farmers included in our sample cultivated at least 2.5 acres of land, we felt that nearly all such farm families would possess cattle, either for power or for milk. Hence our innovations centred around fertilizers and manures for land, new seed varieties, insecticides and pesticides, and the breeding and protection of cattle.

The first pre-test had 14 items, the second pre-test 12 (one of which was not in the original 14), and the final schedule had ten items. We found that there were no specific high-yielding varieties of rice, *bajra* and *jowar* which were extant in all the eight villages. However, at least one of these high-yielding varieties was being propagated in each state and hence we reduced these separate, specific items to one item in the final coding. Similarly, the two specific insecticides we selected, Gammaxene and Malathion, were not equally

6. Fliegel had correlations ranging from  $-0.07$  to  $+0.45$  and four out of 55 were negative, *Ibid.*, 286; Copp, with a homogenous sample of cattlemen had correlations which ranged from  $-0.13$  to  $+0.60$  and had 26 per cent negative correlations, see James H. Copp, "Personal and Social Factors Associated with the Adoption of Recommended Practices among Cattlemen", Kansas AES Bulletin 83, Manhattan, Kansas, 1956, p.8; our three matrices of 45 intercorrelations each ranged from  $-0.01$  to  $+0.53$  and only one out of 135 was negative.

applicable in the three states and hence we simply enquired about the use of insecticides. Three of the four agricultural implements used, had very different distributions in the three states and hence only one could be retained in our final schedule. The initial pre-test had only one animal husbandry practice. A second was introduced in the second pre-test and both were finally retained.

The questions 'Do you know anything about...', 'Have you ever used...', and 'Are you still using...' were asked to elicit the three stages of adoption which are normally referred to as knowledge, trial and adoption, for each practice. The degree of innovativeness along these three stages of adoption in all the eight villages is given in Table 1.

The high-yielding varieties (HYV) of crops, which constitute an important part of the new strategy of agricultural development in India, seem to be known (66 per cent) but had the lowest levels of adoption (8 per cent).<sup>7</sup> On the other extreme, fertilizers generally had the highest levels of knowledge and usage. It will be noticed that the mixtures were most commonly used in West Bengal whereas Andhra Pradesh was more generally using ammonium sulphate. Usage of insecticides in West Bengal showed a high trial level and a low present-usage level. Table 1 shows some wide differences between trial and adoption: for example, the third village in Andhra Pradesh shows 72 per cent of trial for mixtures but only 19 per cent were using them, whereas in the third West Bengal village, 94 per cent had tried mixtures and 94 per cent were using them. Another similar practice in which there were differences was green manuring. We found quite often that non-availability rather than disadoption was the reason for lack of present-use. Another reason for lack of present-use, was that an item like green manuring had been tried but was not in the present year's rotation of crops. Similarly, insecticides are used only during pest attacks. For these reasons we felt that 'Have you ever used' might be a more reliable indicator of adoption than 'Are you still using'.

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7. Only in Andhra Pradesh was there any substantial level of adoption and a separate report on the correlates of HYV adoption in this state is being undertaken separately.

**Table 1 : Per cent of Respondents who indicated Knowledge, Trial and Adoption of Agricultural Innovations by Village and State**

	N	HYV			Ammonium sulphate			Superphosphate			Fertilizer 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
<i>Andhra Pradesh</i> .. ..	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
<i>Maharashtra</i> .. ..	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	78	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
<i>West Bengal</i> .. ..	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 1 (Continued) : Per cent of Respondents who indicated Knowledge, Trial and Adoption of Agricultural Innovations by Village and State**

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	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
<i>Andhra Pradesh</i> .. ..	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
<i>Maharashtra</i> .. ..	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
<i>West Bengal</i> .. ..	224	70	31	11	28	3	2	38	4	2	87	55	24	87	52	43
<b>Total</b> .. ..	<b>680</b>	<b>81</b>	<b>40</b>	<b>21</b>	<b>59</b>	<b>13</b>	<b>8</b>	<b>69</b>	<b>11</b>	<b>8</b>	<b>91</b>	<b>68</b>	<b>41</b>	<b>90</b>	<b>59</b>	<b>43</b>

Agricultural Innovation among Indian Farmers

## B. Uni-dimensionality

The second major consideration in the construction of the dependent variable was uni-dimensionality. It does not seem reasonable to use correlation and multiple correlation analysis to explain the linear variance of the dependent variable when one does not have a defensible uni-dimensional variable. The two methods used here to measure whether the items belong to a single dimension were Guttman scaling and factor analysis.

*Guttman scaling*

Every sixth respondent in our total sample was selected to provide a sample of 111 cases to test the scalability of the ten items in terms of knowledge, trial and adoption. A second sample was used to test reliability of the cutting-points and the coefficient of the reproducibility.

Table 2 presents the cutting-points and the errors of each item on the first sample scales in knowledge, trial and adoption. The dimension of knowledge has only a 5.67 per cent error but the cutting-points provide practically no discrimination at the lower end of the scale. About half the respondents have heard of all the practices. A re-test using the same size sample yielded a coefficient of reproducibility of 94.1 per cent and the same category order. In

**Table 2: Guttman scaling of Knowledge, Trial and Adoption Items in Dependent Variable (1st Sample, N=111)**

	Knowledge		Trial		Adoption	
	Num-ber aware	Errors	Num-ber tried	Errors	Num-ber adopted	Errors
Ammonium sulphate ..	109	1	103	17	84	16
Innoculation cattle ..	110	5	96	15	53	26
Fertilizer mixtures ..	106	3	77	22	71	20
Insecticides ..	106	7	69	7	57	12
Rat poison ..	104	7	84	19	47	10
Superphosphate ..	98	7	58	9	38	12
Green manure ..	91	5	39	9	19	14
Improved cattle ..	75	10	19	5	10	4
HYV ..	66	9	14	4	5	8
Cultivator ..	52	9	10	4	2	8
Total errors ..		63		111		130
Coefficient of reproducibility ..		94.33		90.00		87.75

the first solution, five items would need to be rejected because they had less than 10 per cent in the upper marginal frequency, whereas in the second solution only three items would need to be rejected. Thus only five to seven of the items could be used for a measure which would have a skewed distribution.

With respect to trial or 'ever used' a practice, the coefficient of reproducibility was 90 per cent for the first sample and 90.1 per cent for the second sample. Only two items, one with high frequencies and the other with low frequencies would be rejected from the first solution and only one item from the second, to meet the marginal frequency criterion. The scale patterns from both solutions form an even and somewhat normal distribution.

The adoption scale or the 'still using' dimension had a coefficient of reproducibility of 87.75 per cent in the first sample and 88.6 per cent in the second, showing the lowest level of uni-dimensionality of the three measures. In both scales, three items would have to be rejected to meet the marginal frequency criterion.

Thus the results of the Guttman scaling showed that all the three major innovations manifested the existence of a single dimension. The *knowledge* measure showed the highest degree of uni-dimensionality but in order to meet the second criterion of marginal frequencies being more than 10 per cent, a number of items would have to be dropped. The *trial* scales showed an acceptable level of scalability and on the second criterion of the marginal frequencies only one or two items were borderline cases. Actually, in both sample scales, all ten items could be used by stretching the marginal criterion. The *adoption* scales were both just below the acceptable level of 90 per cent coefficient of reproducibility and about three items would need to be rejected for the 10 per cent marginal criterion. Hence, among the three measures, the Guttman scale of the *trial* would give the best measure and could use all ten items providing the greatest degree of discrimination.

#### *Factor analysis*

The three intercorrelation matrices of the same items for knowledge, trial and adoption were subjected to factor analysis

to extract the principal component factor and determine the amount of variance that any single dimension would explain. The factor loadings of the first factor using the principal component factor is presented in Table 3.<sup>8</sup> All 30 factor loadings, except for two in the adoption dimension were over .400. The lowest loadings for knowledge was .544 and trial .446.

**Table 3: Factor Loadings of First Principal Component Factor of Knowledge, Trial and Adoption (N=680)**

Item	Knowledge	Trial	Adoption
1. HYV .. .. .	0.693	0.499	0.507
2. Ammonium sulphate .. .. .	0.544	0.672	0.685
3. Superphosphate .. .. .	0.671	0.715	0.609
4. Mixtures .. .. .	0.499	0.557	0.345
5. Insecticides .. .. .	0.688	0.747	0.746
6. Green manure .. .. .	0.723	0.679	0.567
7. Cultivator .. .. .	0.661	0.451	0.318
8. Improved breeding of cattle .. .. .	0.659	0.475	0.405
9. Animal inoculation .. .. .	0.578	0.446	0.511
10. Rat poison .. .. .	0.657	0.575	0.594
Eigen-values .. .. .	4.11	3.50	3.27

All three measures show a fair amount of uni-dimensionality as all loadings were positive. The eigen-value for adoption was 3.27, for trial 3.50 and for knowledge 4.11, again indicating that the knowledge measure had the highest level of uni-dimensionality.

### C. Distributions

Using all ten innovations, the total distribution curves for knowledge, trial and adoption are presented in Figure 1. The adoption curve was skewed to the right and shows a higher proportion of respondents at the lower end of the distribution. The trial curve shows a somewhat flattened normal distribution with the lower end not coming down to the abscissa. The knowledge curve was skewed to the left, showing that about 70 per cent of the respondents were in the three top categories of knowledge.

In order to obtain some degree of normality in the knowledge curve, the range would have to be collapsed to

8. The formulae for computing the principal component factor used by the Planning Commission Computing Centre are taken from Harry H. Harman, *Modern Factor Analysis*, Chicago: The University of Chicago Press, 1967.

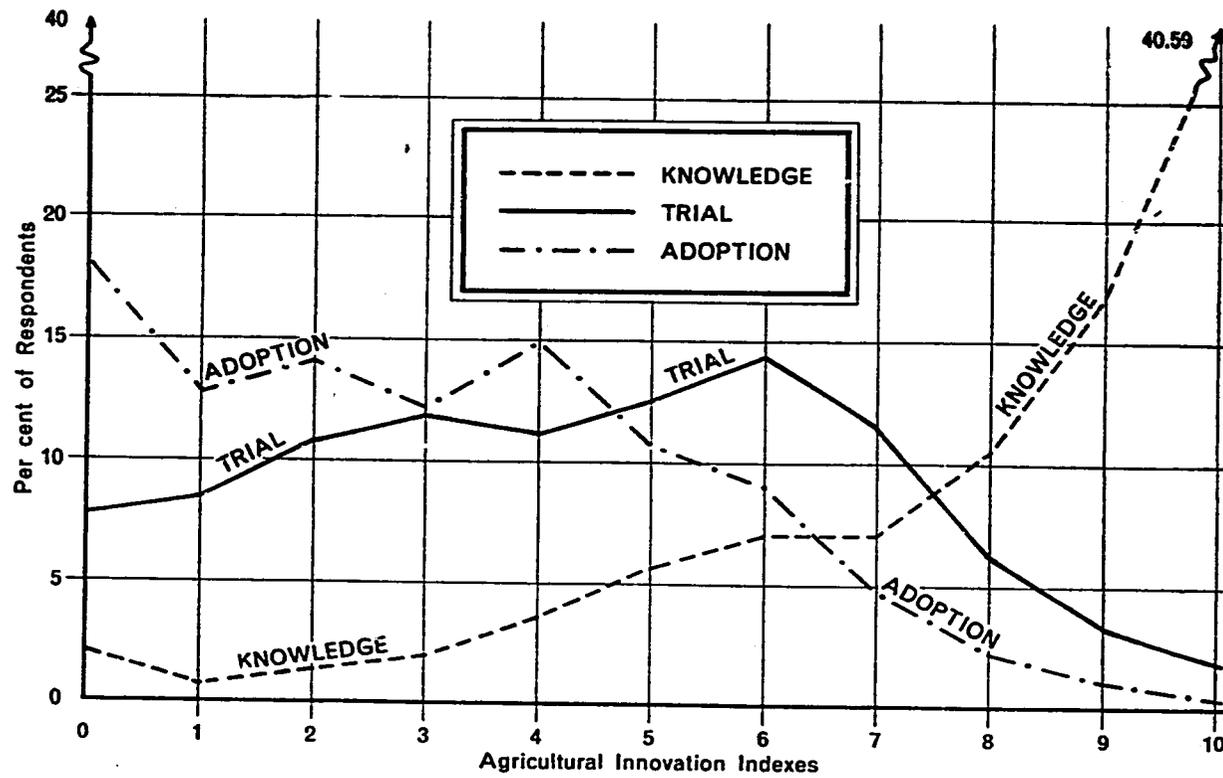


Fig. 1: DISTRIBUTION OF THREE MEASURES OF INNOVATIVENESS

about a three-point scale. Similarly, in order to get a normal distribution for the adoption curve, some sort of artificial collapsing of categories would need to be done to reduce the range to four or five points, whereas the trial curve using all ten items has a somewhat normal distribution.

The averages for the total scores of knowledge, trial and adoption for each of the eight villages are presented in Table 4. The knowledge scores show a variation from a high of 9.85 (out of a possible 10) to a low of 6.03. The adoption scores vary from 5.41 to 1.62. Trial scores range from 2.56 to 7.33. The villages of Andhra Pradesh in general show the highest scores and Maharashtra villages the lowest scores. These differences were, to some extent, expected as we used a package district block from Andhra Pradesh, and we wanted villages which ranged from high to low.

**Table 4: Average Scores of Knowledge, Trial and Adoption of the Sample Villages**

Village			Number of respondents	Knowledge	Trial	Adoption
<i>Andhra Pradesh</i>						
1. Manchili			78	9.45	6.46	5.41
2. Kanchumarru	..	..	33	9.85	7.33	5.00
3. Polamuru	..	..	99	9.70	6.65	4.14
<i>Maharashtra</i>						
4. Pophali	..	..	100	7.83	3.15	2.19
5. Mulawa	..	..	146	7.85	2.56	1.62
<i>West Bengal</i>						
6. Amdole	..	..	193	6.70	4.10	2.86
7. Harishpur	..	..	59	6.03	3.17	2.10
8. Laxmi-Danga	..	..	62	8.15	4.31	3.45
Total	..	..	680	3.10	4.37	3.07

#### D. Conclusions

We have tested the three-state applicability of the items, the uni-dimensionality, and the normality of the distribution of scores for the three measures in the knowledge, trial and adoption. In constructing and selecting one measure of the dependent variable of agricultural innovativeness, we felt

that the stage of usage would be a 'harder' manifestation of adoptive innovativeness rather than simply knowledge. Hence we have been mainly concerned between deciding whether 'Have you ever used' or 'Are you still using' is a better measure of adoption behaviour.

Based on the above deliberations, we feel that the measure of what is commonly labelled 'trial' is both logically and mathematically the best single measure of agricultural innovativeness. *First*, the way we phrased the question for the stage commonly called 'adoption' or 'Are you still using', often unjustly penalised farmers who had essentially used and had adopted a practice but for reasons of non-availability, or crop rotation, or lack of rational utility, were not using the practice currently. *Second*, the 'trial' stage of innovation showed a higher degree of uni-dimensionality than the 'adoption' stage using both Guttman scaling techniques and factor analysis. Further, if adoption were to be used, a number of items would not meet the scaling criterion of marginal frequencies. *Third*, the distribution of the scores clearly indicated that the 'trial' curve had a more normal distribution than 'adoption'.

In view of the above, and the fact that Pearsonian correlation was to be the major tool of analysis, we decided that 'ever having used' a practice was the best measure of adoptive innovativeness and selected this as *the* dependent variable for this phase of our study. All ten items were used and scored as a simple unit-weighted index. Either scale types for each farmer could have been determined, or factor weighting for each item could have been summed for each farmer. Both procedures are complicated and result in measures which are not significantly different from the unit weighting system, and hence, this simpler method was used. We have called this variable either innovativeness or adoption throughout this report.

### 3

## Relation of the Farm Setting to Agricultural Adoption

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**I**N this chapter we will begin with an overall description of farming in the eight sample villages of the three states and then consider some economic variables and their relation to agricultural adoption. Various measures of the size of the farm business were developed in an attempt to determine the relationship of this important factor with adoption. Related variables measuring fragmentation, commercialisation, diversification and farm efficiency will also be considered. Pearsonian zero-order correlation coefficients will mainly be used to express association of the economic variables with the dependent variable and to each other.

### A. Description of Farming in the Sample Villages

#### *Andhra Pradesh*

The Andhra Pradesh villages in the sample are part of the 'package district' in the state, those districts, one in each participating state, in which an intensive agricultural programme was established from 1961-1963. These programmes were designed to try to ensure that needed resources would be available—seeds, fertilizer, water, implements, credit and technical assistance—in a 'package', so that development could proceed at the maximum pace. Like most package districts, West Godavari in Andhra Pradesh is bountifully endowed with natural resources and presents an attractive picture of a generally prosperous agriculture. All three sample villages are within 13 miles of a town, within six miles of the block package programme agency and are near all-weather roads. The villages had populations of 1500, 2600, and 3400 persons respectively, in 1961. The District Census

Handbook of West Godavari, 1961,<sup>1</sup> reports that agricultural labourers form one-tenth of the total population of the district, yet our interviewers reported that cultivators complained of labour shortages. Reflecting this situation, wages were relatively high in the three villages, from three to five rupees per day. Many labourers are also engaged in share cropping under the *Magatha* system of an oral lease held for a year or two, and this undoubtedly adds to the condition of a labour shortage during peak planting and harvesting seasons.

Reflecting the labour shortages, modern implements have had some acceptance in the study villages. Iron ploughs, push-hoes, sprayers, and even some tractors are used in all the three villages. Similarly, high-yielding varieties of seeds, pesticides, improved cattle, and both manures and fertilizers are also used by some cultivators. These measures require considerable capital investment and a ready source of credit. All the three villages have had co-operative societies since 1958 and one has had a co-operative credit society since 1926. As might be expected, the latter village also had the highest percentage of its population as members, and 263 of the 547 members obtained loans for farm purposes in 1965. The local money-lenders' operations are said to be on the decrease, but apparently continue to play an important role in village credit, according to the informal observations of our interviewers.

Farming operations generally follow the typical Indian pattern of *khariff* (first crop season which begins in June-July) and *rabi* (second crop season which begins in October-November). In *khariff*, paddy is usually grown, although some farmers also grow groundnut and sugarcane. Paddy, sugarcane, banana and chillies make up the main *rabi* crops, of both long and short-term duration. The principal soil type is alluvial. Water is supplied by both canal networks from the Godavari river and by filter point wells. Both electric and oil-engine pump sets are used. Most crops raised for sale are offered to traders of nearby towns. Paddy is required to be sold to the Food Corporation of India under the government

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1. Government of Andhra Pradesh, *District Census Handbook, Godavari District*, Hyderabad : Government of Andhra Pradesh, 1961.

procurement policy which came into operation in 1964-65. Sugarcane contracts are usually made with factories in advance.

All the three sample villages have received prizes awarded to progressive villages for various programmes. Among these was the best village prize for introducing high-yielding variety seeds as part of a programme to promote early second crop production of paddy.

6.7.2  
1/22.0.1.

### *Maharashtra*

Agriculture is also the most important activity in the two sample Maharashtra villages, whose populations in 1961 were 1149 and 3348. Both villages are within ten miles of the town in which the block headquarters is located, and are on an all-weather road. State transport buses run on this road and are used sometimes to take produce to markets in nearby towns. However, bullock-carts are chiefly used for transportation of crops and produce.

As in Andhra Pradesh, much labour is hired, and there are occasional shortages in peak seasons, especially in the larger village. However, as in both the Andhra Pradesh and the West Bengal villages, labour is hired only when it can be afforded and the farming scale warrants. There is often a loss of social standing when the farm work is accomplished with family members. There are different modes of employing labour. First, of course, it may be hired outright for a daily wage. Second, there is a mode of employment called *Saldar*, in which a man is engaged for a year as a full-time farm labourer, for which he receives from rupees 300 to 400 (\$ 40 to 53), plus nine to ten quintals of grain (about one ton). Third, labour is sometimes hired on the basis of share-cropping in which the produce and cost of seeds are shared equally. The share-cropper provides labour, implements and bullocks while the owner furnishes the land and pays the land-tax.

Bullocks are used almost exclusively for field operations. Our field workers observed no tractors or power-drawn equipment. Most cultivators have at least one pair of bullocks which cost, on the average, from rupees 800 to 1000 (\$ 106 to 133). The veterinary dispensary near block headquarters

is often used for protecting cattle from disease, but there is relatively little use of opportunities to improve local varieties of cows and buffaloes.

Electricity is available in both the villages but only a few land-owners have electric pumps or oil-engine sets. The chief implements used are the indigenous harrow, iron and wooden plow, hoe, sickle and local seed-drill. Improved modern implements were not often observed. There is no assured supply of irrigation water, and for this reason some villagers do not use fertilizer, believing it to be harmful in the absence of water. Most cultivators use local varieties of seeds. Only two cultivators in each village had tried hybrid *jowar*, for example. A slightly larger number of persons use high-yielding cottonseed variety number 197-3, and *Buri*, a variety which commands an especially high price.

As for credit facilities, again we find that farmers go to both private money-lenders and to co-operative lending societies, of which there are two in each village. Cultivators use these societies for both credit and marketing purposes, and a total of 260 persons in the two villages received loans last year.

The cycle of crop production is somewhat similar to Andhra Pradesh in that *khariif* and *rabi* seasons are recognised. However, the *rabi* crop makes up much less of the total than in Andhra, principally because of the lack of irrigation facilities. About 10 per cent of the land is double-cropped. Irrigation water sources such as streams, masonry and dug wells, tanks and tube-wells are largely undeveloped, although one tank has been partly completed in one village. The soil type is what is known as 'black-cotton soil', and *jowar* and cotton are the main crops. Pulses are sometimes sown mixed in the cotton fields. Wheat is principally grown in the *rabi* season.

Seasonal operations begin in early March, with ploughing and harrowing operations continuing until June. Seeding takes place after the first rains, and weeding is done about a month later. Mostly female labour is hired for weeding, which is often jobbed out to a leader who collects the money from the land-owner and distributes it according to established rates. Harvesting operations and preparations for the *rabi* crop occur in October and November. Between planting

and harvesting, the crops are watched both day and night to protect them from birds and cattle. After November there is a time for settling of accounts, negotiating marriages for children, and other family matters.

*West Bengal*

There are three sample villages in West Bengal and they differ from those in the other two states in several ways. There is more crop specialisation, much more land fragmentation, and there are fewer dependable sources of irrigation in a predominantly rice culture. The general pattern of farming operations, however, remains the same.

The three villages, of 2460, 1709, and 1573 population, are all located within 11 miles of the block headquarters but only one is situated on an all-weather road. The other two are rather difficult to reach in the rainy season. Agriculture is the predominant enterprise, but in one village 17 per cent of the workers are non-cultivators. As in the other two states, there is a prejudice against family members, especially females, working on the land, but economic forces often compel this. Share-cropping generally follows the patterns described for Andhra Pradesh and Maharashtra, with minor local variations.

Adoption of most improved practices ranked between the sample villages in the other two states. There were no additional acres reported as coming under irrigation for the past five years, a serious matter in view of the predominance of rice-growing. However, some cultivators do grow two paddy crops and there were reports of an occasional third crop, called *Boro*, in nearby villages. There were substantial adoptions of improved paddy seed, pesticides and of sprayers and dusters for the protection of paddy crops. There appears to be little interest in improved cattle.

Private money-lenders are the principal source of credit in these three villages. Two villages have no co-operative credit society and one has a single society of 28 members, all of whom took loans in 1966.

Rice cultivation follows the usual pattern of land preparation, transplanting, weeding, fertilizing, spraying or dust-

ing and harvesting. Second crop paddy is almost entirely dependent upon the limited irrigation water, and in its absence wheat and pulses are often grown, mostly for home consumption. Sugarcane is also an important cash crop.

Agricultural lands are highly fragmented in the sample West Bengal villages. For the 224 cultivators in our sample, the range varies from a low of three non-contiguous plots to an incredible 225 plots. Although this upper figure and a few others unduly affect the average for West Bengal, it may be stated that 60 per cent of the cultivators in the other two states combined had only one or two non-contiguous plots in their total acreage. The state average will be presented for comparison when the relationship of fragmentation with adoption is considered.

#### B. Economic Variables and Agricultural Adoption

##### *Measures of farm operation size*

Farm size has consistently been shown to be related positively and highly with adoption behaviour.<sup>2</sup> 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 high prices. Also, many innovations such as new equipment, require substantial capital 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 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

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2. Over 18 different studies were reported by Rogers in 1962, showing a positive relationship between farm income and adoption. There have been many others reported since 1962. See E. M. Rogers, *Diffusion of Innovations*, New York: The Free Press of Glencoe, 1962, pp. 175-176.

to higher profits, which permits more adoption and so forth, in a 'beneficent circle.' Development agencies, of course, are aware of this potential, and foster credit agencies, government-sharing of irrigation costs, and many other programmes.<sup>3</sup>

Because of the importance of farm size as an influence in adoption, we investigated six different measures of this variable. These were number of acres cultivated, value of products raised, kilograms of fertilizer purchased, amount of *panchayat* tax paid, reported labour input and productive-man-work-units. Intercorrelations among these measures and adoption are shown in Table 5 and demonstrate substantial internal consistency. That is, the intercorrelations are all positive and are quite high. They range from  $r = .36$  to  $r = .89$ , while those between adoption and each of the six measures (the top row of figures in Table 5) range from  $r = .24$  to  $r = .51$ . These high intercorrelations reassured us that all of the measures were reasonably valid and that we could choose from among them the one which seemed most appropriate. We chose 'value of agricultural products raised' on the grounds that it was probably the most reliable and direct of all our measures. We had confidence in the *relative* accuracy of the amount of product reported by the cultivators in our sample. There may have been a constant tendency to under-report in a cautious effort to avoid possible taxation. The position of one cultivator relative to another, however, on the basis of product reported, is probably quite accurately reflected in the figures given. The prices used were based on the actual yearly average for the state and marketing region appropriate for each product for the crop year reported.

We chose 'value of agricultural products raised' as our measure of farm operation size in preference to 'number of acres cultivated' because it takes into account differences in value of crops. These ranged widely in our sample from the very low return per acre of pulses to the high return of sugarcane and cotton. We recognise, however, that 'number

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3. We would like to recognise that the logical end-conclusion to be drawn from this brief analysis is that 'the bigger the farm, the better.' Apart from a possible point of diminishing returns, there are cultural, political and social welfare considerations which sharply restrict the advisability of advocating larger farms. Furthermore, the evidence is clear that farm size and other economic factors do not fully explain adoption behaviour.

of acres cultivated' is often used as a measure of farm size and would be appropriate in analysis of a homogenous farming area.

**Table 5: Intercorrelations Among Measures of Farm Operation Size and Agricultural Adoption**

Variable	Variable number						
	1	2	3	4	5	6	7
1. Agricultural adoption	—	.24	.43	.40	.34	.51	.40
2. Number of acres cultivated .. ..		—	.06	.40	.51	.59	.77
3. Value of agricultural products raised .. ..			—	.74	.56	.84	.80
4. Kilograms of fertilizer purchased .. ..				—	.36	.65	.63
5. Panchayat tax paid .. ..					—	.61	.61
6. Reported labour input .. ..						—	.84
7. Estimated labour input (PMWU) .. ..							—

We also preferred 'value of agricultural products raised' to either of the two measures of labour input, reported labour input and productive-man-work-units. Although the latter are also highly related to adoption, they are subject to more errors of recall and also fail to take into account value of product as directly as the measure we chose. The variable, kilograms of fertilizer purchased, was passed over because it comes close to our dependent variable and in fact, was a candidate for inclusion in the agricultural adoption index. The variable, *panchayat* tax paid, was an attempt to reflect net income, but is a much less direct measure of farm income and we rejected it on this account. Our chosen measure of farm operation size, then, was value of agricultural products raised (as opposed to only that product which was sold). The measure was obtained by multiplying the quantity of each product reported by the published actual market price appropriate for each product.

#### *Economic variables and agricultural adoption*

Relationships of five economic variables with agricultural adoption are expressed by Pearsonian correlation coefficients and are shown in Table 6. These variables are

Table 6 : Relationships of Selected Economic Variables with Agricultural Adoption

Variables	Zero-order correlation	Partial correlation @
1. Farm size—value of agricultural products raised†	.43**	—
2. Fragmentation index—number of non-contiguous places at which land was cultivated, per acre basis	— .13**	— .05
3. Commercialisation index—percentage of products raised which was sold	.09*	— .02
4. Specialisation index—number of different crops sold	.12**	.07
5. Farm efficiency index—rupees per day of labour input, data standardised for village differences††	.08*	— .02

@ These are first-order partial correlation coefficients, value of agricultural products held constant.

\* and \*\* Significant at the .05 and .01 per cent level respectively, two-tailed test. N varies from 645 to 680, as a missing data programme was used for analysis. With N=600, an  $r$  value of .08 and .11 is required for significance.

† Based on the latest yearly average prices for the state and marketing region appropriate for each product.

†† See footnote (†) of Table 7 for explanation of the standardised scores for farm efficiency.

farm size, fragmentation, commercialisation, specialisation, and efficiency. Because of the known importance of farm size in adoption research, and because our findings also showed a high correlation with adoption,  $r = .43$ , we controlled on this variable in further analysis.<sup>4</sup> That is, we determined by partial correlation whether the effects of the other four variables upon adoption were independent or were related through farm size. The correlations with adoption of all four indexes were substantially reduced when farm size was controlled and none of the correlations remained significant.

We have already discussed in some detail the importance of farm size as an economic variable. Adequate size is a *sine qua non* of successful farm operation and in most farming areas it will be strongly and positively related to adoption. It does not account for a very large proportion of the variability in adoption behaviour, however. Typically, as in our study, it accounts for less than 25 per cent. Other social and economic variables obviously must be considered to account for

4. Farm size was also related to non-economic variables such as mass media contact and extension agent contact, but less strongly, and thus these and other variables were not controlled on farm size.

the remainder of the variability or as much of it as possible. We considered four other economic variables and will discuss each of them separately.

(a) *Fragmentation*. Fragmentation has long been a problem in Indian agriculture. Whatever land the Indian cultivator managed to wrest from the landlord, often became divided upon the death of the head of the family or upon the breaking up of an extended family, as dissenting brothers went their separate ways. Fragmentation is closely associated with irrigated agriculture. Because of the necessity to equally divide land of different qualities and locations, many non-contiguous plots may come under a single ownership. Fragmentation does not necessarily result in lower adoption, of course. It is quite possible to cope with land-division and to adopt improved practices and even to acquire large aggregate amounts of land. The evidence is, however, that the larger and more commercialised farms are less apt to be fragmented. The fragmentation index was related negatively with value of agricultural products raised,  $r = -.21$ , and also with the commercialisation index,  $r = -.39$ .

The fragmentation index was constructed by converting the number of non-contiguous places at which land was cultivated to the number of plots per acre. This index was significantly and negatively related to adoption, as we had expected, but at a low level,  $r = -.13$ .<sup>5</sup> The partial correlation coefficient, with farm size controlled, is still lower,  $r = -.05$ . As reported earlier, the greatest amount of fragmentation of land was in the three West Bengal villages. The median actual number of plots was three for Andhra Pradesh, two for Maharashtra, and 13 for West Bengal. A full exploration of this variable would require more extensive state analysis, not available in this report. On the basis of the sample from the three states, we conclude that fragmentation has the expected negative effect but that it was not a serious deterrent to adoption except perhaps in West Bengal. Fragmentation may well curtail income and must inevitably affect farm efficiency, but it is apparent that most Indian cultivators have learned to cope with this fact of farming life.

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5. The correlation between number of plots (not on a per acre basis) and adoption is  $r = -.00$ .

Perhaps the most significant finding is that fragmentation was not a serious problem in our Andhra Pradesh and Maharashtra samples. Economic factors tending towards less fragmentation and larger farm size, under the impact of commercialisation and mechanisation, seem likely to counteract the tendency toward fragmentation as a function of inheritance and family customs.<sup>6</sup>

(b) *Commercialisation.* Commercialisation is usually taken as one of the major characteristics of agricultural development.<sup>7</sup> Commercialisation includes both a movement from subsistence production to commercial production and from family labour and farm produced inputs to hired labour and purchased inputs. This movement is largely achieved by adoption of improved agricultural practices and thus commercialisation should be a correlate of innovation.

Our measure of commercialisation was the percentage of products raised which was sold. The commercialisation index is positively related to adoption as we had expected,  $r = .09$ , but this coefficient is at a very low level and becomes negative when farm size is controlled,  $r = -.02$ . We must view these statistics with some caution as the distribution is skewed. Twenty per cent of the cultivators sold no products, despite the restriction of at least 2.5 acres of cultivated land which we imposed upon our sample. The distribution is otherwise normal, however, and ranges from zero to 100 per cent. As we indicated earlier, the commercialisation index is related negatively with fragmentation. Commercialisation is related positively with value of products raised, with percentage of cultivated land which is owned (rather than rented or share-cropped), and also with farm specialisation. These relationships, in general, support our expectations that the

6. Given the present small average land holding in India, it is reasonable to suppose that this will occur; farms will decrease in number and increase in size. The United States provides a striking recent example of the rapidity with which the average size of land holdings can increase. For the continental United States (excluding Hawaii and Alaska), between 1959 and 1964, the number of farms declined 18 per cent, from 3,710,503 to 3,157,804, while the average size of farm increased 10 per cent from 302.8 to 351.5 acres. See Bureau of Census, *1964 United States Census of Agriculture, Preliminary Report, United States Summary*, Washington, D.C.: Bureau of the Census, Series AC04 P-1, November, 1966, p. 2.

7. See, for example, C. R. Wharton, Jr., *Research on Agricultural Development in Southeast Asia*, New York: The Agricultural Development Council, 1966, pp. 8-13.

more commercialised farm enterprises will be more likely to accept modern practices.

Commercialisation can hardly be considered a good predictor of adoption behaviour. It is obvious that much adoption occurs at both low and high commercialisation levels. We conclude, as we have for fragmentation, that this economic variable is dwarfed in importance by the sheer size of the farm enterprise and thus we found that commercialisation by itself did not make any net contribution to the explanation of agricultural adoption.

(c) *Specialisation.* We took as a measure of specialisation the number of different crops which the cultivator sold. The number of crops sold is positively related to adoption at a low level,  $r = .12$ , and is reduced when farm size is controlled,  $r = .07$ . The larger the number of different crops sold by the cultivator, the more apt he was to adopt agricultural practices.<sup>8</sup> Conversely, the *higher* the adoption the *less* the specialisation. This finding is opposite to our expectations. It has seemed to us that it would be more consistent with rational and commercial orientations to specialise, so that maximum attention could be given to the particular needs of just one or two crops or farm enterprises. An alternative explanation, which could account for our finding, is that diversification might allow the cultivator to exploit more fully the unique features of his farm, as well as permit him to adjust to the presently expanding market opportunities. This explanation may well fit conditions as we found them in our sample villages in 1966, and such conditions may well continue in the foreseeable future in India as agriculture changes slowly from subsistence to commercial agriculture. In the long run, however, profit and efficiency advantages would seem to be with specialisation rather than with diversification. This has been the case in agriculture of the more developed nations. We would predict that this will be so in India and that higher adoption will come to be

8. Rogers reports one English and two American studies with opposite findings, in which number of farm enterprises was negatively related to adoption. However, in these studies the criterion of specialisation was somewhat wider than that which we employed. We considered "different crops" which could include closely related food grains as well as substantially different crops such as paddy, jowar and citrus fruits. See Rogers, *Diffusion of Innovations*, *op. cit.*, p. 177.

associated with greater specialisation. For the present, we recognise that adoption is related positively but at a low level with number of crops sold and conclude that this economic variable is not a good predictor of adoption behaviour at this time.

(d) *Labour efficiency.* The farm efficiency index reported in Table 6 is related positively but weakly to adoption at the zero-order level,  $r = .08$ , and becomes negative when farm size is controlled,  $r = -.02$ . It is apparent that this economic variable is also a poor predictor of adoption behaviour for our sample. There is a modest positive relationship between efficiency and farm size,  $r = .22$ , but otherwise intercorrelations with efficiency are at low levels.

The really signal finding, of course, is precisely this lack of relationship. We had expected that labour efficiency would be positively and strongly related to adoption and with farm size. Labour efficiency is considered to be part of the commercial-rational orientation in which agriculture must be viewed if it is to become more productive. In fact, labour efficiency and innovation are often taken to be almost the same. In the United States and in other nations with a highly productive agriculture, this belief is largely borne out. Agriculture in these countries is characterised by widespread adoption of labour-saving innovations and by great labour efficiency. As is well known, for example, only 6 per cent of the population of the United States is engaged in agriculture and produces enough for both domestic demand and substantial exports. The question arises, then, how is the Indian situation different? Especially, how does one reconcile the lack of relationship between efficiency and adoption on the one hand, with the generally strong relationships between adoption and such variables as mass media contact, education, literacy, level of living and farm size on the other?

Our data do not permit definitive answers but we can offer considerable evidence, as well as speculation. We first present four measures of labour efficiency which we investigated (Table 7). Columns C and D in Table 7 show values, by village and state, which measure how efficiently cultivators used their labour relative to a common standard, productive-man-work-units, for their particular crops. Pro-

**Table 7 : Comparison of Four Measures of Labour Efficiency, Eight Villages and Three States@**

	Value of agricultural products raised, in rupees—divided by—days of labour input		Productive-man-work-units@@—divided by—days of labour input	
	Standardised scores†	Raw scores	Median	Mean
	— median —			
	A	B	C	D
Andhra Pradesh .. ..	4.8	5.0	60	76
Village 'M' .. ..	4.8	5.5	72	79
Village 'K' .. ..	5.1	5.8	79	88
Village 'P' .. ..	4.8	5.0	60	68
Maharashtra .. ..	4.0	6.5	147	162
Village 'P' .. ..	4.8	6.3	157	180
Village 'M' .. ..	4.0	6.0	138	145
West Bengal .. ..	4.0	4.0	76	86
Village 'A' .. ..	4.8	5.0	78	79
Village 'H' .. ..	4.0	4.3	78	104
Village 'L' .. ..	4.0	5.1	68	80
Three States .. ..	4.8	5.7	88	110

@ There were 26 cases across all eight villages for which data were not available.

@@ Figures obtained from various sources for the three states, based on average requirements of labour inputs per acre of crop. The figures ranged from 11 hours required per acre for *jowar* in Maharashtra to 290 hours for sugarcane in West Bengal.

† Scores were standardised for village differences by the following formula:  $X_1 - \bar{X}$  Here,  $X_1$  = raw score, rupees return per day of labour input;  $\bar{X}$  = the average of raw scores for each village; std. dev. = standard deviation of the raw scores for each village.

ductive-man-work-units are estimates by agricultural economists of the number of days of labour usually required per acre of agricultural production. These vary by crop and region and were available for all of the major crops in each of the three states of our sample. Thus the figures in columns C and D are basically percentages, obtained by dividing the productive-man-work-units (estimated labour required according to a common set of standards) by the actual days of labour input used as reported by the operator. The higher the figure in columns C and D, the greater the indicated labour efficiency.

The first figures we obtained were means or averages which clearly show sharp state and village differences. Column C is of medians and shows a constant reduction in size, as compared to column D, as a result of the diminished effect of a few very efficient cultivators. This effect is the usual one of suppressing extreme values obtained by using the median as a measure of central tendency.

In both columns C and D it will be noted that the Maharashtra values are substantially higher than those of the other two states. We were, of course, concerned with regional differences of this magnitude. Because we knew that less rice and other labour intensive, high-value crops were grown in the two Maharashtra villages, we suspected two things. First, it seemed to us that value of crop should be taken into account directly. Crop values ranged from rupees 35.65 per quintal for onions to rupees 444 per quintal for chillies. Second, it appeared likely that innovations in rice culture increased the required input of labour and that our figures for productive-man-work-units did not take these additional inputs into account because figures were a few years old and some inputs were quite new. We then constructed two additional measures of labour efficiency, based upon the value of agricultural products raised. The values for these appear in columns A and B of Table 7 and measure the rupees per day return the cultivator got per day of labour input.<sup>9</sup>

It was immediately apparent that taking the value of products into account largely eliminated the state and village differences. The figures in column B vary much less than those in columns C and D, although Maharashtra still scores the highest of the three states. To completely remove the effect of regional differences in soils, crops, motivation and other factors, we applied a standardisation formula.<sup>10</sup> Scores for individual cultivators were standardised for village differences by subtracting the raw score, rupees return per day

9. The values of the labour efficiency index (columns C and D) related positively,  $r = .18$ , with the values of rupees per day of labour input index (column A). The labour efficiency index related negatively with adoption,  $r = -.24$ . The chief difference between the two indexes is probably explained by the fact that most new practices are labour intensive and the figures for productive-man-work-units do not take these additional required labour inputs into account.

10. Rogers, *Diffusion of Innovations, op. cit.*, pp. 103-104.

of labour input, from the village average of these scores, and dividing by the standard deviation of the raw scores for each village. The median values of these standardised scores, for village, state and the total sample, appear in column A of Table 7 and clearly indicate by their similarity that village differences have been removed. Village medians vary only from 4.3 to 5.1. Individual standardised scores ranged from 2.8 to 9.8. It was these individual standardised scores for each cultivator which were used in correlation analysis. As we reported earlier, these scores were related with adoption positively but at a low level,  $r = .08$ . We had expected a much higher positive correlation, and failure to obtain such a correlation led us to explore and control village differences.

Differences in farming conditions among study villages were also taken into account in a principal study of efficiency in West Bengal. This study by S. P. Bose, of 80 cultivators in ten villages, used highly detailed farm records taken for the year 1962-63.<sup>11</sup> Bose's results are very similar to those which we obtained. Bose found a positive but non-significant relationship between adoption and efficiency. He also found no significant associations between efficiency and the socio-cultural factors of education, general knowledge, contact with extension agent, participation in formal organisations and socio-economic status.<sup>12</sup> Bose concluded: (1) that Indian cultivators are less likely than those in more developed societies to be able to use innovations to advantage in increasing efficiency; (2) that in India, the cultivator innovates more under the influence of change agents than in a voluntary rational sense; (3) that the Indian cultivator is more motivated to adopt for prestige reasons; and (4) that he is often unable to integrate innovations into his farming system.<sup>13</sup>

Our conclusions are quite similar to those of Bose and they suggest that production results from adoption of innova-

11. S. P. Bose, "Socio-cultural Factors in Farm Efficiency", *The Indian Journal of Extension Education*, 1(3), 1965, pp. 192-199. Village differences were controlled by using a chi-square analysis in which cultivators in each village were divided into high and low groups.

12. Bose, *Ibid.*, pp. 194-195.

13. Bose, *Ibid.*, p. 198.

tions must not be expected too rapidly. For every cultivator who doubles or triples his paddy crop with successful applications of rice culture innovations, there may be several who first have indifferent or even negative results.

Let us consider in somewhat more detail and with some additional evidence the reasons we have listed for the lack of relationship between innovation and efficiency in our sample. First, many of the innovations are highly technical and require considerable sophistication in understanding for successful application. A review of the practices in our adoption index (chapter 2), shows that several require careful application, in co-ordination with the adoption of other practices. Improved paddy seed, for example, requires improved use of water, fertilizer and other inputs. Furthermore, some practices may not immediately result in an increase in farm efficiency. Improved breeding of livestock and animal inoculation for example, are essentially long-term investments, the effect of which may even be vitiated over time. A second point also concerns our dependent variable. We have defined adoption in the sense of 'having ever tried' an agricultural practice. The percentage of our sample which not only tried but also 'continued to use' a practice is much lower. For example, 123, or 18 per cent of the cultivators, said that they were not currently using any of the ten practices in our index. Thus current adoption for our sample is at a fairly low level and provides a further indication that adoption has not yet been translated very effectively into increased efficiency. Some 'scale' of adoption is undoubtedly necessary for this to occur and to be reflected in a significant positive relationship between efficiency and adoption.

A third explanation for the lack of this relationship seems to be in the heavy dependence of Indian cultivators upon extension contacts. Studies typically report a high association between extension agent contact and adoption, as we do for this study in chapter 5.<sup>14</sup> This is to be expected, for there are few alternative channels of direct communication about improved practices. It is likely, however, that

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14. Also see our earlier study, F. C. Fliegel, P. Roy, L. K. Sen and J. E. Kivlin, *Agricultural Innovations in Indian Villages*, Hyderabad: National Institute of Community Development, 1968.

considerable adoption occurs which mainly reflects the concern of an agent for meeting targets and which is not motivated by a concern for efficiency by the cultivator.

A closely related fourth explanation for the lack of a significant relationship between efficiency and adoption is that Indian cultivators seem more likely to adopt for reasons of prestige than for reasons of profitability and efficiency. There is recent and direct evidence for this point in a study by Fliegel, Kivlin and Sekhon.<sup>15</sup> This study compared perceptions of innovations as factors in adoption for a sample of Punjabi cultivators and two similarly selected and controlled samples of U.S. dairymen. The Punjabi crop farmers clearly were more influenced by social approval and less by financial return. Thus, while Indian cultivators are interested in a return on their investment in an innovation, this return on their investment in an innovation is not necessarily financial and may not result in increased efficiency.

### C. Summary and Conclusions

In this chapter we have briefly described farming in the eight sample villages and then considered five economic variables and their relation to agricultural adoption.

The first economic variable to be considered was farm size. We investigated six different measures of farm size and of these, chose value of farm products raised as the most direct and reliable measure to carry into correlation analysis. The six measures of farm size were highly intercorrelated, increasing our confidence in the worth of our data. Farm size was highly related to adoption,  $r = .43$ , and because of the known importance of this variable in adoption research, we used it as a control variable. The correlation coefficients of the four other economic variables with adoption were all reduced in size when farm size was controlled.

We conclude that, by itself, farm size is a good predictor

15. See F. C. Fliegel, J. E. Kivlin and G. S. Sekhon, "A Cross-National Comparison of Farmers' Perceptions of Innovations as Related to Adoption Behavior" (Unpublished manuscript), Hyderabad: National Institute of Community Development, 1967. For a trenchant and provocative general discussion of prestige standards, see F. C. Fliegel, "Differences in Prestige Standards and Orientation to Change in a Traditional Agricultural Setting", *Rural Sociology*, 30, September, 1965, pp. 278-290.

of adoption behaviour. Adequate farm size permits a cultivator to make capital investments and to take risks of adoption which are denied to those with smaller units. In the short run there is not much that can be done to increase average farm size. There are cultural, social welfare and political reasons why this is so. In the long run, however, we have argued that India is likely to follow the trend of the United States and other developed nations toward larger farm size. As mechanisation and other farm technologies become integrated into Indian agriculture, the more efficient and aggressive cultivators will likely increase their farm holdings. This is not to deny that very large holdings and other tenure problems may still be serious problems in India and elsewhere. However, once these inequities have been eliminated, it seems inevitable that average farm size will increase. It should be necessary only to ensure that the natural progression in this direction is not unduly hindered by social welfare and political considerations. It follows, of course, that some such considerations are vital for the displaced small cultivator. In short, if maximum agricultural production is desired then it is most likely to come from the larger farm units. Aid to very small units should be considered more as social welfare than as development.

Fragmentation, commercialisation, and labour efficiency were related to adoption as we had expected, but specialisation was not. None of these economic variables was a good predictor of adoption behaviour. Fragmentation was negatively related to adoption but was a serious problem only in West Bengal. For the sample as a whole we concluded that it was not a serious deterrent to adoption and that counter-trends toward increased farm size were likely to offset the effects of increasing population and inheritance customs.

Commercialisation was positively related to adoption but it too was dwarfed by farm size and was a poor predictor of adoption behaviour. We believe that this variable will increase in importance as a predictor, as Indian agriculture becomes more rationally oriented. The low level of association between commercialisation and adoption is about what one would expect in a developing nation in which agriculture is characterised by much subsistence farming and many

small land holdings.

The number of different crops sold, our measure of farm specialisation, was related positively with adoption. That is, the less the farm specialisation the more the adoption by cultivators in our sample. We had expected the opposite findings on the grounds that they would be more consistent with a rational orientation to agriculture, which is in general associated with higher levels of adoption. However, like our other economic variables, except for size of the farm business, the association of specialisation with adoption was quite low and was reduced further when the effect of farm size was controlled.

We dwelt at length on the variable of farm efficiency, measuring it on the basis of time-efficiency in the use of farm labour and in terms of rupees per day return for labour input. The latter measure was used in analyses because it took value of product into account. We attempted to explain the low positive correlation between this measure of efficiency and adoption by reference to the present state of Indian agriculture. It is one of rapid change and of low, although rising, levels of adoption of innovations. Because of the complexity and interrelatedness of many new practices, it is often difficult for the Indian cultivator to integrate them into his ongoing farm enterprises. Many cultivators may be prone to follow extension recommendations somewhat blindly. We cited evidence that Indian farmers may be more apt to adopt for reasons of prestige rather than for financial return or efficiency. We concluded that the relationship of efficiency with adoption, like that of the other economic variables, was basically consistent with the present state of Indian agriculture. The view to take of these relationships, it seems to us, is not that they are low and non-significant, but that they are, in general, consistently related with each other and with adoption. They represent past progress toward development and promise more for the future.

## The Farmer, his Social Setting, and Agricultural Adoption

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**I**N this chapter we will analyse personal characteristics of farmers, and certain aspects of the social context in which farmers make decisions, for their effect on adoption of modern practices. In designing the study we took the position that, in general, the younger, better educated, higher status farmer, if he is linked with social systems beyond the immediate family, should be in the best position to know about and to accept innovations in agriculture. These propositions have been tested in many different situations and are hardly considered controversial here.<sup>1</sup> It was our intent to establish to what extent the propositions held for the present sample and also, in our multivariate analysis, to combine the personal and social variables with those describing the farm setting, communication, and so on, so as to assess the relative importance of the different types of variables in accounting for adoption behaviour.

### A. Personal Characteristics

The results of our analysis are presented in Tables 8-11. In Table 8 we have listed a variety of personal characteristics of the farm operator himself, and showed their relationships with the dependent variable, agricultural adoption. This Table, and the other Tables in this chapter, reflect the fact that we used both correlation and chi-square techniques in analysing our data. Throughout the analysis we have tried to use correlation where appropriate. Several of the independent variables in this chapter, however, do not have continuous distributions. Literacy is an example, being a

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1. Everett M. Rogers, *Diffusion of Innovations*, New York: The Free Press of Glencoe, 1962, pp. 148-192.

**Table 8: Personal Characteristics of Sample Cultivators as Related to Adoption of Farm Practices**

Variable	Relationship
1. Age .. .. .	$r = .04$
2. Literacy (can read newspaper) .. ..	$\chi^2 = 51.5, 1 \text{ d.f.}^{**}$
3. Education .. .. .	$r = .36^{**}$
4. Education of children .. .. .	$r = .20^{**}$
5. Other employment (none—some) .. ..	$\chi^2 = 10.3, 1 \text{ d.f.}^{**}$
6. Family size .. .. .	$r = .09^*$
7. Family structure (nuclear—extended) ..	$\chi^2 = 0.4, 1 \text{ d.f.}$
8. Religion .. .. .	$\chi^2 = 58.0, 2 \text{ d.f.}^{**}$
9. Caste (ritual status) .. .. .	$r = .29^{**}$

For all Tables in this chapter,  $r$  values of  $.08^*$  and  $.11^{**}$  are required for significance at the 5 and 1 per cent levels, respectively, with  $N = 600$ .

The relevant chi-square values are 3.84 and 6.04 for 1 degree of freedom, and 5.99 and 9.21 for 2 degrees of freedom.

dichotomy as we have defined it. Some other independent variables had severely skewed distributions. For example, 75 per cent of the respondents were not members of any formal organisations. In these situations, where our measures or the distributions obtained, were not appropriate for correlation analysis, we used the chi-square test of significance.

As shown in Table 8, age is not related to adoption for our sample. This is partly a function of the fact that we excluded farmers over 50 years of age from the sample. In fact our exclusion of the older farmer was on the grounds that the farm enterprise would tend to be in a transitional state, in the process of transfer to the next generation, and that adoption behaviour would be affected by the transition. It is not too surprising, therefore, that for the sample of young to middle-aged farmers, age makes no difference to adoption of modern practices.<sup>2</sup>

Both literacy and education are significantly associated with adoption, as expected.<sup>3</sup> To what extent these associations are a function of socio-economic status will become clear in the later multivariate analysis. For the moment, we can conclude that the literate farmer and the better educated are significantly more prone to accept innovations

2. See Herbert F. Lionberger, *Adoption of New Ideas and Practices*, Ames, Iowa: Iowa State University Press, 1960, pp. 96-97.

3. See also E. M. Rogers and William Herzog, "Functional Literacy Among Colombian Peasants", *Economic Development and Cultural Change*, 14, 1960; pp. 190-203.

in agriculture. The same conclusion can also be drawn with reference to our indirect measure of educational attainment. We constructed an index reflecting the extent to which each respondent's children had attained formal schooling up to the secondary school level. This index also relates positively to agricultural adoption,  $r = .29$ .

We had expected that off-farm employment would contribute to higher levels of adoption, on grounds that off-farm employment can broaden mental horizons and also provide income for investment in the farm.<sup>4</sup> The two variables are significantly related (Table 8), but the relationship is negative. That is to say, off-farm employment contributes to lower levels of adoption for this sample. Only one-third of the sample are involved in any occupation outside their own farm enterprise, and most of these are in non-farm work. These are clearly secondary occupations. Only 3 per cent of the sample indicated that farming was not their primary occupation. In spite of the secondary nature of the off-farm job, however, it seems to have a moderately negative influence on adoption behaviour. Rather than broadening mental horizons, or providing additional investment capital, the off-farm job may divert attention from the farm so that less than optimum results are achieved.

Neither family size nor family structure are meaningfully related to agricultural adoption. We had expected that larger families and structurally more complex families would tend to be lower in adoption because it might be more difficult to make adoption decisions in such families. The average respondent family has between five and six members. Family size relates positively with adoption, indicating that farmers with larger families adopt more practices. The relationship is statistically significant at the 5 per cent level. It is so low, however, at  $r = .09$ , that family size cannot be viewed as an important determinant of adoption behaviour. We have not made an analysis of this relationship by stage of family life-cycle. It is likely, however, that many larger families are in the middle stages of the cycle, with children

4. Compare F. C. Fliegel, "Aspirations of Low-Income Farmers and their Performance and Potential for Change", *Rural Sociology*, 24, September, 1959, pp. 205-214.

not yet old enough for marriage. Demands on productive resources for family maintenance would thus be at their peak, possibly accounting for higher adoption among large families.

Respondent families were classified as nuclear if only the respondent, his spouse and any unmarried off-spring lived in the household. Two types of extended families were recognised: the vertical extended family, with nuclear families of two or more generations living in the same household; and the horizontal extended family, with two or more nuclear families of the same generation sharing the household. For the test reported in Table 8, the 13 families which did not fit into any of these categories were eliminated, and since the two types of extended families were not different in adoption behaviour they were combined into a single category. <sup>5</sup> Thirty-five per cent of the families in the sample are extended families, but they are no different from nuclear families in adoption behaviour, according to the chi-square test. Also, there is no indication in the present data that vertical and horizontal extended families differ in adoption behaviour.

Respondents' religious affiliation does make a difference in adoption behaviour (Table 8), with the majority religious community tending toward higher adoption levels. For present purposes, we compared Hindus (67 per cent of the sample), with Muslims (26 per cent), and a residual category including Christians and others (7 per cent). The latter tended to be lowest in adoption, followed by Muslims and Hindus, in that order.<sup>6</sup> This may reflect the lower and more marginal status position of the minority religious communities in Indian society as a whole.<sup>6</sup> Elsewhere in this report we will show that client contact with the change agency is an important factor in adoption of modern practices. It may be more difficult for members of minority religious groups to communicate easily with extension workers who would in most cases be drawn from the majority community.<sup>7</sup>

5. The bulk of the Muslims in the sample were concentrated in West Bengal. For that reason our analysis was repeated, by states, to rule out a regional effect. The same results were obtained in the sub-analysis.

6. See Lalit K. Sen, "Status Inconsistency in Four Indian Villages", in T. P. S. Chawdhari (Ed.), *Selected Readings on Community Development*, Hyderabad: National Institute of Community Development, 1967, especially p. 83.

7. Another study suggests that value differences may account for differences in adoption levels. See S. P. Bose, "Peasant Values and Innovation in India", *American Journal of Sociology*, 67, March, 1962, pp. 552-560.

Finally, farmers' caste status is significantly related to adoption levels (Table 8). Caste rankings were obtained for the analysis by asking knowledgeable respondents in each village to rank photographs of people at work in caste occupations in terms of ritual status for that village.<sup>8</sup> Ritual status is defined on the basis of interdining and sharing of water. Later, the separate rankings for the eight sample villages were standardised and combined into a single rank order. It had been expected that higher caste status would be related to higher adoption.<sup>9</sup> For the present sample, caste status relates positively with other status measure; for example, the relationship with the level of living index is  $r = .47$ . As expected, caste status is positively related with adoption behaviour. The correlation at  $r = .29$  explains 8 per cent of the variance in adoption behaviour, not an excessively large amount in view of the attention given to caste in attempting to account for various kinds of behaviour in India.<sup>10</sup>

#### B. Socio-Economic Status

Table 9 shows the results of several tests of hypotheses which refer more explicitly to socio-economic status than is the case for caste. Almost all studies of individual differences contributing to adoption behaviour show that higher status farmers are quicker to adopt modern practices, and adopt more of such practices.<sup>11</sup> This may stem to some extent from the fact that change agents work more closely with higher status farmers, but it probably also reflects the availability of means to adopt and a generally greater involvement in commercial agriculture. In any case, all of the variables listed in Table 9, with one exception, were related to adoption of farm practices in the expected way, high status contributing to higher adoption.

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8. Respondents in two West Bengal villages which were predominantly Muslim were excluded from this test since no meaningful caste rankings could be obtained. The number of cases for the test is, therefore, 457.

9. Lionberger, *Adoption of New Ideas* . . . , *op. cit.*, pp. 100-104.

10. As an example of caste as a major explanatory variable, and exerting a negative influence on agricultural adoption, see N. Patnaik, "Adoption of Agricultural Practices in a Peasant Community in Orissa", in T. P. S. Chawdhari (Ed.), *Selected Readings* . . . , *op. cit.*, pp. 89-100.

11. Lionberger, *Adoption of New Ideas* . . . , *op. cit.*, pp. 100-104.

**Table 9: Socio-economic Status as Related to Adoption of Farm Practices**

Variable	Relationship
1. Taxes paid last year .. .. .	$\chi^2 = 70.3, 2 \text{ d.f.}^{**}$
2. Material possessions index .. .. .	$r = .55^{**}$
3. Housing index .. .. .	$r = .51^{**}$
4. Level of living index (sum of possessions and housing) .. .. .	$r = .59^{**}$
5. Proportion of land owned .. .. .	$\chi^2 = 9.0, 2 \text{ d.f.}^*$

For explanation, see footnote under Table 8.

The first of the variables is a measure of the amount of village tax paid in the year preceding the survey. This is a house and personal property tax, and was taken to reflect differences in wealth. With almost half the sample at the low end of the distribution, paying rupees five or less, we chose to use chi-square for the test and conclude that the more wealthy are also higher adopters.

As indirect measures of wealth, we constructed indexes of material possessions and housing, and then summed these two into what we have called a level of living index. The material possessions index was based on family possession or non-possession of various personal effects.<sup>12</sup> The housing index contained items describing the type of housing and a measure of crowding.<sup>13</sup> Both indexes and the summary level of living index were subjected to scale analysis to ensure internal consistency. All measures met minimum standards of acceptability as scales but were scored as indexes as a matter of convenience. The relationships with level of adoption, shown in Table 9, are all in the expected direction and of substantial size. These relationships clearly demonstrate that the farmer who is better off economically is also higher in adoption of modern farm practices.

Finally, we wanted to determine whether land-ownership, a traditional criterion of status in agricultural societies, con-

12. Material possession items are: good dress, shoes, good jewellery, wrist watch or clock, torch light, wooden or metal furniture, mosquito nets, and bicycle.
13. Housing items are: brick or stone walls, windows with shutters, cement or stone floor, tiled/tin/asbestos or cement roof, separate sitting room, own well, and separate bathroom or latrine; plus a dichotomous item reflecting the respondent's position as high or low in the sample distribution of rooms per person. Another item, double-storied house, was eliminated in the scale analysis.

tributed to higher levels of adoption. Our sample excluded landless labourers; therefore, we are concerned here with the proportion of the land cultivated by the farmer which he owns. Two-thirds of our sample owned 75 per cent or more of the land they were farming at the time of the study. We expected this category, those who owned all or most of their farm-land, to be higher in adoption, but this is not the case. The two variables are significantly related but it is the low ownership category which ranks high in adoption. Among farmers owning less than one-fourth of their farm-land, 62 per cent ranked above the sample median in adoption of practices. This compares with 46 per cent above the median in adoption for the top ownership group, owning 75 per cent or more of their land. Our finding gives no support to the popular view that land ownership is an important first step in achieving modernisation in agriculture, but is consistent with findings from more highly developed societies where the part-owner is sometimes more progressive than the full owner.<sup>14</sup>

### C. Social Participation

We included several measures of social participation in our study design to determine to what extent intra-community links with others would facilitate adoption of modern practices. We expected that membership and office in formal organisations would relate positively to adoption, a relationship which has frequently been demonstrated.<sup>15</sup> Only 25 per cent of our sample were members of any formal organisation and they were not higher in adoption (Table 10). Holding office, however, showed the expected relationship. A possible inference is that formal organisations do not play a vital role in the village community, except for those few individuals who control the organisations. When we combined membership and holding office into a single index, the relationship with adoption is significant, as shown in Table 10. Since we have already demonstrated the separate effects of membership and holding office, however, the index can have little meaning.

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14. Lionberger, *Adoption of New Ideas . . .*, *op. cit.*, pp. 101-102.

15. *Ibid.*, pp. 82-84.

**Table 10: Social Participation as Related to Adoption of Farm Practices**

Variable	Relationship
<b>A. Formal participation</b>	
1. Membership in some organisation ..	$\chi^2 = .03, 1 \text{ d.f.}$
2. Holding office in some organisation ..	$\chi^2 = 21.1, 1 \text{ d.f.}^{**}$
3. Membership and holding office combined	$\chi^2 = 4.4, 1 \text{ d.f.}^*$
<b>B. Visiting non-relatives</b>	
4. Farm operator .. .. .	$\chi^2 = 0.2, 1 \text{ d.f.}$
5. Spouse .. .. .	$\chi^2 = 1.4, 1 \text{ d.f.}$

For explanation, see footnote under Table 8.

In order to assess the role of informal social relationships in the community we asked respondents to indicate with whom they visited most frequently, and then determined whether the person visited was a relative or a non-relative. Respondents were asked the same questions about their wives' visiting patterns. In both cases, we expected that extra-family visiting would contribute to higher levels of adoption in that it should enhance knowledge about new practices. Neither relationship is significant, although extra-family visiting by wives shows a modest tendency in the expected, positive direction.

We also attempted to determine whether visiting outside the village would contribute to higher adoption. Only 2 per cent of either husbands or wives were reported visiting outside the village with any frequency, however, so a test did not seem feasible. From the present data we can conclude, then, that informal visiting does not seem to make a difference in adoption of modern farm practices.

#### D. Extra-village Contacts

Finally, we pursued the question of extra-village linkages beyond the matter of visiting patterns, and asked respondents whether they had previously lived in another place, and also how frequently they visited any town or city in the past year. Results of this analysis are shown in Table 11, which support our expectation that extra-village contacts are positively associated with adoption of modern practices. The rationale for the expectation is essentially that greater contact with

the larger society should broaden mental horizons, should make for higher levels of aspiration, and should enhance knowledge about techniques of production.

**Table 11: Contacts Beyond the Village as Related to Adoption of Farm Practices**

Variable	Relationship
1. Have lived in another village, town, or city	$\chi^2 = 23.3, 1 \text{ d.f.}^{**}$
2. Urban contact (visits to town or city)	$r = .30^{**}$

For explanation, see footnote under Table 8.

Only 13 per cent of the sample had ever lived outside the village in which they were residing at the time of the data-gathering. Most of the positive responses to this question referred to living in another village, rather than a town or city. Nevertheless, the comparison between those who had lived outside and those who had not, showed a significantly higher level of adoption for the more mobile category.<sup>10</sup> The index of urban contact, a simple sum of the number of visits to any town or city in the past year, was also positively and significantly related to adoption. Similar questions, dealing with contact with the larger society, are pursued more extensively in other parts of this volume, especially the chapter on communication. Only a few items have been included here to describe the level of mobility of the farm operator, treating mobility as a personal characteristic. We can conclude from this limited analysis, however, that personal contacts which go beyond village boundaries contribute to greater acceptance of modern practices.

#### E. Summary

Having analysed various personal characteristics of the farmer, we can conclude, tentatively, that upper caste Hindus who have some formal education and who devote themselves exclusively to agriculture are likely to be most receptive to modern practices in agriculture. Although we had expected

10. For a more extensive discussion of mobility as related to adoption, see F. E. Emery and O. A. Oeser, *Information, Decision and Action*, New York: Cambridge University Press, 1958, pp. 17-30.

both family size and family structure to affect adoption levels, largely on grounds that larger size and more complex structure would make it more difficult to achieve adoption decisions, the family variables do not relate to adoption for this sample. Similarly, if we exclude the oldest age group which is likely to be nearing retirement, we find that age is not related to adoption.

We can conclude that farmers who are better off economically are likely to be most receptive to modern agricultural practices. We view wealth here as a permissive factor, making it possible to take risks and make investments. We also recognise that higher levels of adoption of modern technology should make for greater wealth, however. The one indication of status which did not relate to adoption in the expected manner is the degree of land ownership. A likely explanation for this finding, consistent with experience in more highly developed settings is that the part-owner is in a better position to invest more of his capital in productive inputs other than land.

Finally, our indicators referring to social relationships permit us to conclude, again tentatively, that holding office in a formal organisation, and both having lived in and visiting places other than the home village, are conducive to higher levels of adoption. Sheer membership in organisations and local visiting patterns which cut across family lines within the village seem to have no effect on adoption, for this sample. All of these conclusions are tentative, however, until we examine these variables again in our multivariate analysis, where the effects of other variables will be taken into consideration.

## 5

# Communication and Agricultural Adoption

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COMMUNICATION is the transmission of messages from one person or institution to another. The means or channels of communication can be direct, as when information about a new agricultural practice is imparted to a cultivator by a change agent. They can also be indirect and perhaps less purposeful, as when a village leader passes along information during social intercourse or when a cultivator 'sees for himself' by observing a neighbour's field.<sup>1</sup> Communication channels can also be compared on the basis of personal or face-to-face contact *vs.* the impersonal channels of the mass media.

In this chapter we will consider various channels of communication in order to identify their role and influence in the adoption of agricultural practices. This knowledge should provide useful guidelines for change agents in developing a communication strategy for diffusing these recommended practices. In general, we expect that respondents who are exposed to information from the larger society, whether by extension contact or through the mass media, are more likely to accept modern practices.<sup>2</sup> Hence in this chapter, we will be using the knowledge dimension as well as the adoption dimension. The former will only be used as a dichotomous measure here and not a continuous variable.

We first describe communication channel use in regard to how news is obtained about events in district headquarters

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1. There has been considerable research, of course, in what is called the two-step or multi-step flow of communication. For an early and definitive study, see E. Katz and P. F. Lazarsfeld, *Personal Influence*, Glencoe, Illinois: The Free Press, 1955.

2. For a review of communication behaviour in adoption, see E. M. Rogers, *Diffusion of Innovations*, New York: The Free Press of Glencoe, 1962, pp. 178-182; see also P. J. Deutschmann and O. Fals Borda, *Communication and Adoption Patterns in an Andean Village*, San José, Costa Rica: Programa-Inter-americano de Información Popular, 1962.

and other villages, and mass characteristics of users of interpersonal channels as compared with respondents who use the mass media. Then we analyse extension knowledge and contact, urban contact, and contact with the mass media of radio, cinema and newspapers. We close with a consideration of the credibility of information sources and of types of radio-listening.

#### A. Communication Channel Use: Interpersonal Vs. Mass Media

As we indicated earlier, it is possible to classify communication channels in many different ways. One of the most important contrasts is that of informal, interpersonal channels (friends, neighbours, relatives or other cultivators) with those of the mass media. This was the contrast which emerged from the responses to a general question we asked, 'How do you hear about things happening in district headquarters?' (Table 12).<sup>3</sup> For this sample, the district headquarters represents, in most cases, the nearest city of substantial size. The bulk of the answers fell into the two categories described in Table 12. Only one respondent mentioned a formal change agent. There were a larger number of respondents who made some mention of radio or newspapers, 318 as compared to 236 for friends, neighbours, relatives or other cultivators. The average number of radios reported in working order for the sample villages was 21 per village, while for the sample as a whole, 420 out of 680 respondents said that they could read a newspaper. There is obviously considerable access to mass media in these villages, making for an effective contrast between those who report using the mass media and those who report interpersonal channels only.

The first comparison in Table 12, referring to knowledge of agricultural practices, demonstrates the expected strong association between high knowledge and use of the mass media as sources of information. Those with more knowledge

3. We also gathered data on channel use at different stages of adoption of high-yielding varieties of seeds and of two methods of family planning. These data will be given in separate reports, but in general they parallel those given here for the adoption stage of the diffusion process.

**Table 12 : How do You Hear About Things Happening in District Headquarters ?**

Variable	Inter-personal (Friends, neighbours, relatives or other cultivators)	Some mention of mass media- radio or newspapers
—per cent—		
<b>Knowledge of agricultural practices</b>		
Low on knowledge index .. .. .	53	18
High on index .. .. .	47	82
$\chi^2=73.85^{**}$ , 1 d.f. .. .. .	(230)	(318) N†
<b>Adoption of agricultural practices</b>		
Low on adoption index .. .. .	62	38
High on index .. .. .	38	62
$\chi^2=29.96^{**}$ , 1 d.f. .. .. .	(230)	(318) N†

† The unaccounted-for data in both sub-Tables consisted of one respondent who mentioned a change agent, 15 who mentioned a place only, such as town or market, ten miscellaneous responses which contained no reference to mass media, and 100 'don't know' responses. It could not be definitely determined that these 'don't know' responses meant that the respondents had no channel of communication about district headquarters. However, the majority of such responses in both sub-Tables were by respondents who scored low on the knowledge and adoption indexes.

\*\* Significant at the .01 per cent level, two-tailed test for chi-square.

of practices are much more apt to hear about innovations from the mass media. The second relationship in Table 12, with adoption, is lower but still highly significant and in the same direction. Those adopting more practices are also more apt to make some mention of the mass media.

Because of these demonstrated relationships between knowledge and adoption of practices on the one hand, and mention of the mass media on the other, we have investigated a large number of characteristics of users of the mass media (Tables 13 and 14). These characteristics are, in general, among the most important variables which we have previously considered in this report such as age, literacy and education of the respondent. They are usually considered in adoption research and presentation here may aid cross-national comparisons.<sup>4</sup>

In both Table 13 and Table 14 we list the characteristic, give the direction of the relationship between the characteris-

4. See Rogers, *Diffusion of Innovations*, *op. cit.*, p. 35 and elsewhere.

tic and use of the mass media, and then give the chi-square value. For example, in Table 13 the first characteristic is education. We found that the more educated respondents were most apt to hear about things at district headquarters from the mass media rather than from the interpersonal channels of communication of friends, neighbours and acquaintances. The size of the chi-square value is an imprecise but adequate indication of the strength of the relationship when the sample size is kept constant. For the variable of education, the chi-square value was 28.95, reflecting the fact that, of the 300 cultivators who had 0 to 4 years of education, 67 per cent used interpersonal channels as compared to only 44 per cent who used the mass media. Conversely, of the 254 cultivators who had five or more years of education, only 33 per cent used interpersonal channels as compared with 56 per cent who used the mass media: when the chi-square value is lower, the percentage differences will be lower; when the value is higher, the percentage differences will be higher. Thus, the relative size of the chi-square value is a better indicator of strength of relationship than level of significance, mainly because of the large size of our sample. Significance levels reflect the number of observations as well as the degree of association. We will not attempt to analyse these 23 characteristics of users of mass media in an exhaustive manner. Our main purpose was to provide data for possible use in cross-national comparisons. We would like to point out, however, that most of the variables are related about, as one would expect. It is reasonable to expect, for example, that the more educated respondents would make more use of the mass media.

Education of the respondent's wife was even more highly related to use of mass media than was education of respondent (Table 13). Almost two-thirds of the wives were reported as having no formal education. Hindus were much more apt to use mass media than Muslims. What is being reflected in this figure is probably the relatively low status of Muslims in our sample villages. As one might expect, the more literate respondents and those with higher caste prestige were more apt to use the mass media than interpersonal channels of communication. Literacy was based on the

**Table 13: Some Demographic Characteristics of Users of Mass Media as Compared with those who Use Interpersonal Channels of Communication to hear about things at District Headquarters**

Characteristic†	Direction of relationship	Chi-square value
Education	More educated respondent more apt to use mass media .. .. .	28.95**
Education of wife of respondent	Respondents with more educated wives more apt to use mass media .. .. .	40.00**
Religion	Hindu respondents more apt to use mass media than Muslim respondents .. .. .	84.96**
Literacy	Literate respondents more apt to use mass media .. .. .	65.21**
Caste	High caste more apt to use mass media than low and mediura caste .. .. .	16.42**
Family structure	Nuclear family more apt to use mass media than joint family .. .. .	0.37
Number of living children	Respondents with fewer children more apt to use mass media .. .. .	2.28
Age	Younger respondent more apt to use mass media .. .. .	0.80

†Except where stated, all characteristics refer to the respondents in our sample, all of whom cultivated 2.5 or more acres of land in 1966 and were not more than 50 years old at the time of interview in 1967.

\*\*Significant at the .01 per cent level. For all comparisons, d.f. = 1, and a chi-square value of 6.64 is required for significance, two-tailed test. N varied somewhat from 476 to 554 with most variables having an N of 554. The missing data, except for 'caste', are explained in footnote † of Table 12. For caste there were additional missing data as caste ratings were not obtained for two Muslim villages in West Bengal.

respondent's statement that he could read a newspaper. Caste rankings were inter-village, composite, ritual caste rankings.<sup>5</sup> Family structure (whether nuclear or joint family), number of living children, and age were not related significantly to use of the mass media. The finding that joint families, which made up about two-fifths of our sample, did not differ from nuclear families, is an interesting one. Joint families are generally considered to be more conservative and traditional in their attitudes and behaviour and we expected to find that they used the mass media less than the nuclear families.

Table 14 shows the relationships of some socio-economic and other characteristics of users of mass media as compared

5. For details on construction of caste rankings and of other variables in Tables 12 and 13, see discussions of these variables in other chapters in this report.

**Table 14: Some Socio-economic and other Characteristics of Users of Mass Media as Compared with those who Use Interpersonal Channels of Communication to hear about things at District Headquarters**

Characteristic†	Direction of relationship	Chi-square value
Level of living	Respondents with higher level of living more apt to use mass media .. .. .	25.61**
Off-farm employment	Respondents with more off-farm employment more apt to use mass media .. .. .	9.00**
Level of commercialisation	More highly commercialised respondents more apt to use mass media .. .. .	28.52**
Contact with agricultural agency	Respondents with greater contact more apt to use mass media .. .. .	115.09**
Number of commercial films seen	Respondents who see more films more apt to use mass media .. .. .	51.14**
Urban contact	Respondents with more urban contact more apt to use mass media .. .. .	76.80**
Political knowledgeability	More knowledgeable respondents more apt to use mass media .. .. .	67.25**
Knowledge of high-yielding varieties of seeds	More knowledgeable respondents more apt to use mass media .. .. .	93.84**
Empathy (can take role of another)	Respondents scoring higher on empathy index more apt to use mass media .. .. .	14.30**
Secular orientation	Less secular respondents more apt to use mass media .. .. .	8.67**
Achievement motivation	Respondents with less achievement motivation more apt to use mass media .. .. .	2.24
Social participation	Respondents with greater participation more apt to use mass media .. .. .	4.31
Tenure status	Respondents with greater percentage of land owned more apt to use mass media .. .. .	0.31
Number of acres cultivated	Respondents with smaller acreage more apt to use mass media .. .. .	2.40

†All characteristics refer to the respondents in our sample, all of whom cultivated 2.5 or more acres of land in 1966 and were not more than 50 years old at the time of interview in 1967.

\*\*Significant at the .01 per cent level. For all comparisons, d.f.=1, and a chi-square value of 6.64 is required for significance, two-tailed test. N varied from 546 to 554. The missing data are explained in footnote † of Table 12.

with those who use interpersonal channels of communication to hear about things at district headquarters. Again, most relationships were significant and all but three were in the direction hypothesized. For added emphasis we have underlined these opposite findings. Respondents with higher level of living, more off-farm employment and a higher level

of commercialisation were more apt to use mass media. The same positive relationships were obtained with extension agency contact, number of commercial films seen and urban contact. In other analyses, we have found these variables positively interrelated and such relationships were expected with use of mass media.

The next five characteristics in Table 14 are what we might call 'modernisation' variables. That is, they are often used as indicators or predictors of modernisation of developing nations.<sup>6</sup> Political knowledgeability, knowledge of high-yielding varieties of seeds, and empathy are all positively and strongly related to use of the mass media. Secular orientation and achievement motivation however, contrary to our expectations, are negatively related. That is, the less secular respondents and those less highly motivated toward achievement goals are more apt to use mass media channels of communication. While secular orientation has been a good predictor of adoption behaviour in our project research, it has been somewhat inconsistently interrelated with the other independent variables shown in Tables 13 and 14. Achievement motivation has rather consistently been not related to adoption behaviour and other variables, as has been the case here. The remaining three variables in Table 14, social participation, tenure status and number of acres cultivated are not significantly related to use of the mass media.

We conclude from this brief listing of relationships between use of the mass media and some demographic and socio-economic variables, that users, in general, exhibit expected characteristics. It is apparent that mass media channels are widely used and that promotional efforts *via* them are likely to be successful. Users, in general, have the education, knowledge and experience necessary to put mass media information to good use.

To further explore communication channel use we asked another question, 'How do you hear about things happening in neighbouring villages?' (Table 15). This was used

6. L. K. Sen, "Main Concepts in Modernization", (unpublished manuscript), Hyderabad: National Institute of Community Development, p. 25. See also D. Lerner, *The Passing of Traditional Society: Modernizing the Middle East*, New York: The Free Press, 1964.

**Table 15: How do You Hear about Things Happening in Other Villages ?**

Variable	Inter-personal (Friends, neighbours, relatives or other culti- vators)	Some men- tion of mass media—radio or newspaper
<i>per cent</i>		
Knowledge of agricultural practices		
Low on knowledge index	40	22
High on index	60	78
$\chi^2 = 5.12^*$ , 1 d.f.	(543)	(41) N†
Adoption of agricultural practices		
Low on adoption index	40	37
High on index	51	63
$\chi^2 = 2.49$ , 1 d.f.	(543)	(41) N†

†The unaccounted-for data in both Tables consisted of three respondents who mentioned a change agent, 35 who mentioned a place only, such as town or market, 21 miscellaneous responses which contained no reference to mass media, and 36 'don't know' responses.

largely as a leading question to the one about district headquarters. It is obvious that the mass media seldom carry news about a village to people in other villages. Only 41 respondents mention the mass media as a source of such information. However, the question and its responses provide further support for the distinction we have made between those who used interpersonal channels and those who used the mass media. That is, interpersonal channels are very commonly used and remain an important source of news. They were mentioned by the vast majority of those responding. The relationships of communication channel use with knowledge and adoption of agricultural practices, showed that level of knowledge was significant whereas adoption was not significant. Both trends were in the same direction for the question about things happening at district headquarters. Respondents who mentioned the mass media were more apt to know about practices and also more apt to adopt them.

#### B. Extension Knowledge and Contact

In this section and in the remainder of the chapter, we will use correlation analysis because of the essentially conti-

nuous nature of the data. In some cases we use items which are 'yes-no' dichotomies or whose distributions make them essentially dichotomous. We do this because the items are combined for indexing with other, truly quantitative items which have normal distributions. This technique will also render these data amenable to multivariate analysis in the final chapter of our report.

Extension knowledge was measured by asking respondents if they knew the names and positions of any agricultural development workers who came to the village or were assigned to work there.<sup>7</sup> The measure is strongly and positively related to agricultural adoption,  $r = .47$  (Table 16). As we have noted in other chapters the significance level is not a very good indicator of the importance of a variable because of our large sample size of 680. Therefore, we will sometimes describe relationships as 'strong' or 'weak' when we discuss them. Another useful indicator of the importance of a variable, the amount of variability explained, can be quickly obtained by mentally squaring the zero-order coefficient. An  $r$  of .47 for example, means that a little less than 25 per cent of the variability in agricultural adoption for our sample can be explained by considering extension knowledge.<sup>8</sup> Thus, while all of the zero-order coefficients in Table 16 are significant at the .01 per cent level, none by itself explains more than 25 per cent of the variance in adoption.

The next four coefficients in Table 16 are for different measures of agricultural extension contact. The codes for these measures were summed to form an index of extension contact, which relates more strongly with adoption than any of the items taken singly,  $r = .49$ . Although the four measures are somewhat diverse, they all relate positively and at substantial levels with each other and with the index, providing internal validity for the index. The index is also

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7. This index was scored by counting one point for the name and one point for the position known of the first two workers mentioned. Thus the index scores ranged from zero to four. They were normally distributed.

8. We recognise, of course, that the correlation coefficient tells us nothing of the direction of cause and effect. As in most relationships, this one is reciprocal in that each variable to some extent 'causes' the other. We are mainly interested in agricultural adoption as a variable to be explained, however, and assume that our independent variables are potentially good predictors.

**Table 16: Relationship of Selected Communication Variables with Agricultural Adoption**

Variable	Zero-order correlation coefficient
<b>Extension knowledge and contact</b>	
Agricultural development officers known	.47**
Times talked with block development officer	.30**
Times talked with village level worker	.40**
Times seen an agricultural demonstration	.35**
Times seen a block film	.14**
Index of extension contact (Sum of above items except 'agricultural development officers known')	.49**
<b>Urban contact</b>	
Index of urban contact (Times visited a town plus times visited a city)	.30**
<b>Mass media contact</b>	
Respondent listens to radio	.29**
Family listens to radio	.41**
Number of commercial films seen	.27**
Newspapers read/read to respondent	.35**
Total mass media index (Radio items plus film plus newsprint)	.50**

\*\* Significant at the .01 per cent level, two-tailed test. N varies slightly from 660 to 680, as a missing data programme was used for analysis. With N=600, an  $r$  value of .11 is required for significance at the 1 per cent level.

normally distributed. This will enable us to carry forward into multivariate analysis only the index, making for a more parsimonious use of the data.

The first two measures of extension contact are of 'times talked' with the block development officer (BDO) and with the village level worker (VLW). It is with the latter that cultivators have most contact and this is reflected in the distribution of the responses. It is only slightly skewed for times talked with the VLW and ranges from zero to more than once a day. For the BDO, however, the distribution is essentially a dichotomy of zero times talked *vs.* once or more in the past year. Over four-fifths of the cultivators reported that they had not talked with the BDO in the last year. The relationship with adoption is positive and substantial, however,  $r = .30$ , and serves as a useful predictor of adoption behaviour. The measure for the VLW, of course, is a better one as the coefficient with adoption is higher and only a third of the cultivators reported no contact with the VLW in the past year.

The last two measures of extension contact focus on extension techniques of getting messages across to the cultivators. The demonstration of agricultural practices in the field and the showing of block films on agriculture were investigated.<sup>9</sup> Cultivators were asked how often they had seen these two in the past year. Here, too, the distributions were skewed to the low side, yielding essentially a dichotomy of none seen *vs.* one or more seen. Two-thirds of the cultivators had not seen a demonstration and a larger number had not seen a block film. Both measures are positively related to adoption, but the more widely used demonstration has a much higher coefficient,  $r = .35$ , and is undoubtedly the better predictor.

We interpret these positive and generally high correlations of measures of extension knowledge and contact with agricultural adoption to mean that, by itself, this channel of communication is important in that it helps to open the way for increased adoption of innovations. This in itself will not necessarily increase agricultural productivity. But if the practices are relevant to the farm setting of the bulk of the cultivators and necessary resources are provided, increased production seems a likely result. The inference is strong that enhanced contact, especially at the village level, and in conjunction with timely agricultural demonstrations, will materially aid development.

### C. Urban Contact

Urban contact is measured in a simple index obtained by summing times visited a town and times visited a city in the past year. It is related to adoption positively and at a substantial level,  $r = .30$  (Table 16). This is the same variable used in chapter 4, 'The farmer and his social setting', where it formed part of a discussion of mobility of the cultivator. Here we are considering urban contact as both a direct

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9. The demonstration as the preferred medium of the VLW was one of the important variables in multivariate analysis in our previous report, see F. C. Fliegel, P. Roy, L. K. Sen and J. E. Kivlin, *Agricultural Innovations in Indian Villages*, Hyderabad: National Institute of Community Development, March, 1968, pp. 102-103.

and indirect channel of communication. The cultivator's visit to an urban place may be for the express purpose of obtaining credit or seeds at block headquarters. The visit may also be for purposes not related to agricultural production. Here the influence is indirect and may serve to enhance the cultivator's awareness of the larger society or to make him more rationally and commercially oriented. Whatever the nature of the effect, urban contact by itself seems to be a good predictor of adoption in our sample, as it has been in most diffusion studies.

#### D. Mass Media Contact

We proceed now to a consideration of the mass media of radio, films, and newspapers, and their effect on agricultural adoption. In our discussion of communication channel use, earlier in this chapter, we indicated that the mass media were widely used in learning about things at district headquarters and we contrasted their use with that of interpersonal communication, as between friends and neighbours. Here we present four separate measures, two for radio and one each for films and newspapers, and then combine these four into a mass media index which we will carry forward to multivariate analysis. These four items, like those for extension contact, are related positively with each other, with the index, and with agricultural adoption.

At the risk of 'overweighting' the index, we have included two measures of radio-listening, one for respondent listening and one for family listening. We wished to measure both the direct effect of radio-listening by the cultivator himself and the indirect effect through members of his family. Presumably, they might have more time for radio-listening, while the cultivator was about his farm work. The two measures are only moderately interrelated,  $r = .36$ , and both are 'yes-no' dichotomies. Family listening has a higher relationship with adoption and two-thirds of the respondents reported that their family did no radio-listening. Less than one-quarter of the respondents said that they themselves did not listen to the radio. We regard both measures as important predictors of adoption.

The third measure of mass media contact was number of commercial films seen in the past year. It is positively related to adoption,  $r = .27$ , and may be usefully contrasted with the measure of times the respondent sees a block film,  $r = .14$  (Table 16). Commercial films are much more readily available and were seen more than 100 times a year by some cultivators. Less than one-third of our sample said that they had seen no films. Because few, if any, commercial films carry messages about agricultural innovations, the positive correlation of cinema attendance with adoption can be explained only through other variables. It is likely that films, as well as radio and the other mass media, contribute to a rational commercial orientation which tends to encourage greater adoption. In this same connection, it will be interesting to follow the results of the current film campaign mounted by family planning agencies. It was virtually impossible to attend a commercial film showing in 1967 without seeing a slide, cartoon or short film urging adoption of family planning. While it would be more difficult to propagandise cultivators in commercial films because they form the lesser part of most audiences, some advances in this medium should be tried. We consider commercial films and commercially-produced block films to represent a potentially valuable avenue for diffusion of farm practices.

The fourth measure of mass media contact was whether newspapers were either read by the respondent or were read to him. It is also positively related to adoption at a substantial level,  $r = .35$ . This item is a dichotomy with two-thirds of the respondents having read no newspapers. Only eight respondents had had newspapers read to them, a figure considerably lower than we had expected. This measure of newspaper reading follows closely the measure for literacy which was discussed in chapter 4, 'Can you read a newspaper?' It is worth noting that only 50 per cent of those who said they could read a newspaper, had done so in the week previous to the interview.<sup>10</sup> Notwithstanding this additional

10. For two previous studies reporting a similar per cent of literates who actually read newspapers, see J. M. Kapoor, "Villagers and the Newspaper" (Unpublished manuscript), Hyderabad: National Institute of Community Development, 1967; and L. K. Sen and P. Roy, *Awareness of Community Development in Village India*, Hyderabad: National Institute of Community Development, 1967, p. 32.

evidence that literacy does not automatically lead to greater newspaper exposure, and from there to greater adoption, we regard newspaper exposure as a good predictor of adoption. It will be part of the mass media index which will be carried forward for multivariate analysis in our final chapter. This mass media index is strongly related to adoption,  $r = .50$ .

#### E. Credibility of Information Source

One of the aspects of communication behaviour in which we were interested was what we call credibility of communication source. That is, we wanted to determine how much reliance cultivators placed on one source as compared to another. We decided to compare four much-used sources, radio, the VLW, neighbours and the agricultural demonstration. Respondents were asked a series of six forced-choice questions, in which each of the four sources was compared with every other source. Thus each source could be chosen from zero to three times by each respondent. The question asked was 'If you heard about a new variety of crop that was said to improve your income, would you be more likely to try it if you heard about it from the radio or from the VLW. . . from the VLW or from a neighbour . . . from a neighbour or by a demonstration . . .' and so forth, until all possible comparisons had been made. The number of times each source was chosen is shown in Table 17 which clearly indicates that cultivators placed the most reliance upon agricultural demonstrations. Only six respondents did not choose it over all other sources. This finding is consistent with the substantial correlation between adoption and the number of times a demonstration had been seen,  $r = .35$ , reported earlier in this chapter, and reinforces the conclusion we drew then. Seeing for himself is important to the Indian cultivator, hard-pressed as he is by rising prices of inputs, ceilings on farm prices, and uncertain sources of credit and supplies. For most cultivators, adoption of innovations increases the already substantial risks involved in the farm business.

Table 17 indicates that cultivators would place the least reliance on radio as a basis for trying out a new variety of crop, with the VLW and neighbour having intermediate positions.

**Table 17 : Number of Times Respondents chose Information Source**

Information source	Number of times source was chosen				
	0	1	2	3	No answer
Radio .. ..	308	199	67	8	8
Village level worker .. ..	128	255	243	44	10
Neighbour .. ..	150	193	284	36	11
Demonstration .. ..	6	18	97	561	8

We had expected a greater reliance upon the VLW because of the importance of this official in the community development framework, but otherwise we were not surprised at these results. Radio is obviously a secondary information source, one not so easily subject to verification. It is likely to be of greatest value in supplying first knowledge about innovations. Pronouncements of both neighbours and the VLW about recommended practices, however, can be questioned on the spot, and innovation results in a demonstration can be more easily verified, short of trying the innovation oneself.

#### F. Four Types of Radio-listening

We close the analysis of this chapter with a brief discussion of four types of radio programmes and the relationship of listening to them with agricultural adoption (Table 18). The programmes — songs, news, radio farm forum and 'other' — were not explored in depth because of the necessary reduction in data-gathering imposed by the large number of variables we wished to investigate. We present these limited data on radio listening in recognition of the importance we attach to this medium and in the hope that they will provide some basis for continued research in this area. If the medium of the radio is to be most efficiently enlisted in the cause of agricultural development, then, close attention must be paid to its programming.

All eight items in Table 18 are 'yes-no' dichotomies. We have used correlation statistics mainly because the coefficients may then be compared directly with those of other items in our analyses of communication variables.

We also report the per cent of our sample of 680 who listened to each type of programme. It is apparent that the respondent, in almost all cases the nominal head of the family as well as the chief decision-maker, listens to the radio considerably more than does his family. About 50 per cent of the respondents reported that they listened to songs, news and radio farm forum, compared with 30 per cent or less for family listening of these programmes. These types of programmes apparently account for most of the listening, as the 'other programmes' category showed only 14 per cent of respondents listening and eight per cent of family listening.

**Table 18: Relationship of Selected Types of Radio-listening with Agricultural Adoption**

Radio-listening†	Zero-order correlation coefficient	Per cent who listened††
Respondent listens to songs .. .. .	-.01	53
Family listens to songs .. .. .	-.01	30
Respondent listens to news .. .. .	.11	59
Family listens to news .. .. .	.05	15
Respondent listens to radio farm forum .. .. .	.19**	48
Family listens to radio farm forum .. .. .	.07	7
Respondent listens to other programmes .. .. .	.08	14
Family listens to other programmes .. .. .	.11	8

† For the four items of respondent listening there were 158 of the 680 respondents who reported that they did not listen to the radio and hence were excluded from analysis. For the four items of family listening there were 445 of the 680 respondents excluded who reported that their family did not listen to the radio.

\*\* Significant at the .01 level, two-tailed test with  $N = 500$ , an  $r$  value of .12 is required for significance.

†† These percentages are of the total  $N$  of the sample, 680.

The correlation coefficients for type of radio-listening and agricultural adoption are quite low. Only the respondent listening to radio farm forum variable is significant. These findings are somewhat at odds with the quite high coefficients we obtained for radio-listening without reference to type of programme,  $r = .29$  for respondent listening and  $r = .41$  for family listening. Although we recognised the limitations of this dichotomous data, we had expected type of programme to be related more strongly with adoption and we had hoped to distinguish more clearly among programme efficiency relative to adoption. What does emerge from these data,

however, is generally consistent with other data we have presented in this chapter. There is substantial radio-listening by both respondent and his family. An audience clearly exists for radio communication about agricultural innovations. The programmes most appropriate to communication about adoption, news and radio farm forum, show the highest relationships with adoption. We conclude that radio listening is an important predictor of adoption behaviour and that more detailed research on programming is needed to fully utilise its potential for development.

#### G. Summary and Conclusions

In this chapter we considered various channels of communication about agricultural practices. The objective was to identify the role and influence of these channels in the adoption process. Our findings, in general, parallel those obtained in research done in the United States and elsewhere. Respondents who were exposed to information from the larger society, whether by extension contact, urban contact, or through contact with the mass media, were more likely to accept modern practices. We set forth a large number of characteristics of users of mass media channels of communication as compared to those who used the interpersonal channels of friends, relatives or other cultivators. Users of the mass media generally had the education, knowledge and experience necessary to put mass media information to good use. Some departures from this rational-cosmopolite complex of characteristics were noted.

Indices of extension knowledge, extension contact, urban contact and contact with the mass media were all highly related to adoption of agricultural practices and will be carried forward to multivariate analysis. They appear to be good predictors of adoption behaviour and give support to efforts made *via* these channels to induce adoption and agricultural development. We would like to recognise that adoption of practices in turn tends to increase these various kinds of knowledge and contact. The relationships we presented do not imply only a direction of increase in adoption. Furthermore, it is likely that such variables as farm size and socio-

economic status account for some of the relationship with adoption, as we indicate elsewhere in this report. However, the goal of much of development work is to motivate adoption, and whether any particular adoption precedes or follows contact with a channel of communication is of little consequence. With adoption at low levels, and with demonstrated high relationships between adoption and communication channel use, it is reasonable to suppose that there is substantial influence by these communication channels toward higher adoption.

Our limited investigation of credibility of information source revealed that the cultivator wanted to see for himself before trying a new practice, in this instance a new variety of crop. Overwhelmingly, the demonstration was most often chosen, over VLW, radio and neighbour, as a reliable source on the basis of which to risk a trial of the new seed. Radio, a more likely source of information for first knowledge than as a verified source on which to base action decisions, was least often chosen.

Our investigation of the relationships between types of radio-listening and adoption showed that there is a substantial potential for this channel of communication but that adoption was not strongly related to any one type of listening. Radio farm forum and news, however, did stand out as programmes in positive relationship to adoption. Cultivators who listened to these programmes were more apt to adopt agricultural practices.

## 6

# Social-Psychological Correlates of Adoption of Agricultural Innovations

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**I**N the previous chapters we studied situational factors that surround the farmer and how these factors influence his adoption of agricultural innovations. We propose in this chapter to examine the influence of the social-psychological make-up of the farmer on his adoption behaviour. A study of the total personality of an individual is understandably difficult. First, we are still not aware of all the ingredients of a person's total personality. Second, we cannot be sure of the ones that we think are such ingredients. Third, measurement of these various ingredients is difficult and sometimes impossible. Yet the fact remains, as any psychologist or social psychologist will testify, that personality variables are important determinants of behaviour.<sup>1</sup> The issue here is not *whether* personality variables are important enough to study but *which* personality variables should one study?

For purposes of this chapter, we have selected a few personality variables that are thought to be related to one's change-proneness and are measurable. Our main purpose here is to observe relationships between these variables and adoption of agricultural practices, and then sort out the ones that make a significant impact on adoption behaviour.

It should be pointed out here that the decision-making of an individual at a point in time is the product of a complex interplay of both situational and personality factors.<sup>2</sup> In this chapter, our focus is on the personality factors only. In the next chapter of this report, we have put the personality

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1. See for example, C. Kluckhohn and H. A. Murray (Eds.), *Personality in Nature, Society and Culture*, New York: Alfred A. Knopf, 1955, pp. 3-52.

2. *Ibid.*, pp. 485-507.

variables into a multivariate analysis along with other situational variables in order to isolate the most meaningful configuration of factors, personality-wise as well as situational, that influences the individual farmer's adoption of agricultural innovations.

So far we have made references to personality variables in a general way. The variables we have studied in this chapter are attitudes or orientations.<sup>3</sup> The origin and the development of attitudes or orientations have been extensively written upon.<sup>4</sup> Without repeating what has already been said and written, we must just say that these are predispositions to act in a certain way in a given situation. These predispositions develop as the individual grows in experience and sees himself in certain relationships with the rest of his group. Ideally speaking, an individual's self-image is an internalised set of logically interconnected self-evaluations of what others think of him. Once the self-image is thus internalised, the individual reacts to situations in more or less predictable ways. Attitudes or orientations are, ideally speaking, psychic counterparts of concrete actions taken by the individual. We must point out again that, in actual reality, the overt action or decision-making is the result of both psychic and situational factors.<sup>5</sup> However, a knowledge of the attitudes of an individual helps a great deal in predicting, other things being equal, how he will act in a given situation.

What attitudes should one study for a predictive knowledge of whether a farmer will accept changes in his farming techniques or not? As we have indicated before, our knowledge of the human mind is still limited and we pro-

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3. Social psychologists and sociologists have used these terms more or less interchangeably. While the term 'attitude' was popular with social psychologists in the 1920's and 1930's, 'orientation' has been popularised in recent times by Talcott Parsons and others. In drawing a comparison between these two terms James Olds notes that the 'orientation' of the actor to a situation is "almost the same thing as . . . one's attitude toward a situation". For reference see Kimball Young (Ed.), *Social Attitudes*, New York: H. Holt & Co., 1931; John Dewey, *Human Nature and Conduct*, New York: H. Holt & Co., 1922; Talcott Parsons, *The Social System*, Glencoe, Illinois: The Free Press, 1951; James Olds "Memorandum on A General Theory of Action" (mimeographed), and Max Black (Ed.), *The Social Theories of Talcott Parsons*, New Jersey: Prentice Hall, 1961, p. 22.

4. C. Kluckhohn and H. A. Murray (Eds.), *op. cit.*, pp. 53-84.

5. A. Inkeles, "Some Sociological Observations on Culture and Personality Studies", in C. Kluckhohn and H. A. Murray (Eds.), *ibid.*, pp. 508-504.

ceed on a trial and error basis in order to eliminate factors which are irrelevant and keep those which stand our test of verification. In the past, several studies have suggested factors which are significant.<sup>6</sup> This chapter has attempted to validate some of these findings and has added a few new ones for further testing.

### A. Variables Studied

We have studied, in this chapter, eleven such attitudes in relation to the individual farmer's adoption of agricultural innovations. Brief descriptions of these variables and their measures are presented here.

1. *Credit orientation.* In a subsistence-level agricultural economy, it is difficult to break out of the vicious circle of traditional methods of agriculture, low production and shortage of capital.<sup>7</sup> For the average cultivator, this circle may be broken if new capital is introduced in the form of credit. Borrowing credit for commercial purposes presupposes an ability to see the future with confidence. The investment may or may not be justified in the light of actual production, but the willingness to take the risk is important and should come first. We, therefore, expect a positive relationship between credit orientation and adoption of agricultural practices.

Credit orientation was measured by responses given to the questions, 'Did you use any credit for farm purposes last year?' and 'Would you have used (some/some more) had it been available at reasonable interest?'

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6. An almost complete list of these studies appears in Everett M. Rogers, *Bibliography on the Diffusion of Innovations*, Diffusion of Innovations Research Report No. 4, East Lansing, Michigan: Michigan State University, Department of Communication, 1967 (mimeographed). For a list of studies pertinent to the Indian village situation, see S. N. Chattopadhyay, "Psychological Correlates and Adoption of Innovation", in T. P. S. Chawdhari (Ed.), *Selected Readings on Community Development*, Hyderabad: National Institute of Community Development, 1967.

7. This is the central theme of some of the most incisive analyses of the problems of traditional agriculture. See for example, T. W. Schultz, *Transforming Traditional Agriculture*, New Haven: Yale University Press, 1964; W. W. Rostow, *The Stages of Economic Growth*, Cambridge, England: Cambridge University Press, 1960; and M. F. Millikan and D. Hapgood, *No Easy Harvest*, Boston: Little, Brown and Company, 1967.

2. *Planning orientation.* The wish to plan for the future indicates an awareness of possibilities other than the given set of circumstances at present. It also reflects a recognition of the fact that environmental conditions are manipulable. Planning also reflects a rational approach toward life by weighing assets against liabilities and taking various factors into consideration over a period of time.

Our measure of planning orientation is based upon responses to the question, 'Are you planning any changes on your farm in the next few years, changes in the crops for example?'

3. *Self-reliance.* Self-reliance is conceptually related to credit orientation and planning orientation. Borrowing capital for introducing changes in farming and to do it in a planned way presuppose confidence in oneself along with the realisation that all environmental factors are not inscrutable supernatural forces beyond our control.

The question used to measure self-reliance (as opposed to fatalism) was, 'How much of your future depends on yourself? Out of a rupee, would you say 16 annas, 8 annas, 4 annas or none?'

4. *Deferred gratification.* Deferred gratification is an important element in rational thinking.<sup>8</sup> Planning for the future involves some amount of sacrifice for the present. This makes the difference between using up capital for immediate needs and saving it or investing it in a long-term project.

Deferred gratification was measured in the present study by the open-ended question, 'Suppose that your cash returns from the farm last year had been twice your actual income; what would you do with extra money?' The responses were scored depending on the nature of gratification. The response categories used for scoring from low to high were: (0) family expenses or consumption on food, clothes, furniture, jewellery, repairs or additions to home; (1) social obligations, wedding, birth-rite, feast, pilgrimage; (2) pay off debts; (3) save without qualification; (4) purchase or save to purchase land; (5) purchase or save money to purchase agricultural inputs; (6) invest or save money to invest in

8. See for example, L. Schneider and S. Lysgaard, "The Deferred Gratification Pattern", *American Sociological Review*, 18, April, 1953, pp. 142-149.

non-agricultural business; (7) education.

5. *Secular orientation.* Secular (non-traditional) orientation for purposes of this study has been measured by a set of questions with only two alternative answers, one favouring traditionalism and the other, secularism. Originally, ten such questions were asked and the responses were subjected to scaling techniques. The scale retained eight of these questions,<sup>9</sup> which are : (1) should Harijans (untouchables) be allowed to draw water from all common wells in the village; (2) should Harijans and other children take meals together in schools ; (3) can evil eye cause disease ; (4) do you think Harijans should be allowed to enter and worship in all temples of the village ; (5) what do you do with bullocks who are too old to work ; (6) should non-Hindus be allowed to eat beef ; (7) if your son wanted to marry a lower caste girl, would you allow it ; (8) in your opinion, is an illiterate village Brahmin superior to a lower caste college graduate ?

The items retained by the secular orientation scale refer to two most important elements of the village society, the caste system and the norms surrounding the cow. Responses that deviated from the traditional norm regarding these two subjects were scored as secular.

6. *Income aspiration.* A lack of ambition among Indian farmers has been the subject of many learned treatises.<sup>10</sup> The absence of a profit motive and a high income aspiration among our farmers have been mentioned as important reasons for the backwardness of agriculture. On the other hand, we hear about the rising expectations and the resultant frustrations due to an inability to meet these expectations. In order to examine the influence of income aspiration on agricultural adoption, the variable was operationalised by an open-ended question, 'How much money does your family need per month to live comfortably in this village ?'

7. *Achievement motivation.* Achievement motivation has been defined as the desire to excel regardless of social rewards.<sup>11</sup>

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9. A Guttman scale was used which had a coefficient of scalability of 90 per cent.

10. See for example, Eleanor Roosevelt, *India and the Awakening East*, New York: Harper & Bros., 1953, pp. 196-202.

11. D. C. McClelland, "The Achievement Motive in Economic Growth" in B. F. Hoselitz and W. E. Moore (Eds.), *Industrialization and Society*, Paris: UNESCO-Mouton, 1960, pp. 74-95.

It has been suggested that this motivation is the mainspring of western civilisation and its economic prosperity.<sup>12</sup> We propose to discuss the relevance of this concept among Indian farmers at a later stage. For testing the hypothetical influence of achievement motivation on economic development, the variable was operationalised with the help of a set of statements with which, the respondents were asked either to agree or to disagree. The statements are: (1) work should come first, even if one cannot get proper rest; (2) one should succeed in his occupation even if one has been neglectful of his family; (3) one should have determination and driving ambition even if these qualities make him unpopular.<sup>13</sup>

8. *Educational aspiration for children.* Individual aspirations can be frustrated by practical circumstances. Thus one's own educational aspirations may remain unattained due to various reasons. It is expected, however, that one who has understood the significance of education, would try to project this aspiration to the next generation. Our measure for educational aspiration for children, therefore, refers to one's acceptance of education as a significant method of improving one's condition. This acceptance should be seen in the light of sacrifices that one has to make in order to send children to school. Education is a long-term investment and in the Indian village situation, may look like a dubious venture for the parents as education cuts down on the family labour and is most often associated with outmigration to cities. High educational aspiration for children, therefore, reflects the conviction that education is important regardless of the sacrifices.

9. *Empathy.* Empathy has been defined as the ability to take other roles.<sup>14</sup> It is a psychological precondition for successful behavioural links with other systems. Empathy

12. D. C. McClelland, *The Achieving Society*, Princeton, New Jersey: D. Van Nostrand Co. Inc., 1961, p. 59 ff.

13. It should be noted that our measure of achievement motivation is different from those used in other well-known studies. Our conclusions are considerably different from theirs. It is possible that these differences are a reflection of the measurement differences. See D. C. McClelland, *op. cit.*, and D. Morrison "Achievement Motivation of Farm Operators: A Measurement Study", *Rural Sociology*, 29, December, 1964, pp. 367-384.

14. Daniel Lerner, *The Passing of Traditional Society*, New York: The Free Press of Glencoe, First Paper-back Edition, 1964, p. 49.

helps people to be flexible and adjustable in a situation of change by making them aware of alternative norms and roles. It is expected that highly empathic persons will be more amenable to change than others and will also be more willing to adopt new ideas and practices.

Empathy for this study was measured by a set of questions in the form, 'If you were ..... (a role) then what would you do to ..... (solve a relevant problem)?' The roles suggested were those of the district administrative officer, the block development officer, village *panchayat* president and a day labourer.

10. *Political knowledge.* An awareness of the political events and personalities at the local and national levels represents another dimension of the psychic link of an individual with other systems. This awareness is one manifestation of the respondent's participation in the body politic of the larger society : it reflects sensitivity to the happenings outside of the village and an ability to see oneself and one's own community in a broader perspective. Political knowledge was measured by an informal knowledge test asking the respondent to identify by names (1) the prime minister of India ; (2) the chief minister of the state; and (3) the elected representative to the state legislature from that area.

11. *Urban pull.* Potential migrants from villages to cities may be motivated by several factors. Starting from purely economic reasons these factors may include such intangibles as attraction to the urban way of life, a change in occupation, social mobility, or a wish to participate in the larger society by being in close contact with centres of activities that encompass a larger area than the village. Whatever the motivation, the wish to migrate to a city indicates that the reference group of the potential migrant is no longer his village society. We have named this wish to migrate to a city as 'urban pull' and, in order to locate this wish, we have used the question, 'If you are offered a job in a city with double your present income, will you go?' The economic incentive mentioned in the question was deliberately used in order to balance off the higher cost of living in cities.

## B. Control Variable : Level of Living

Social scientists have observed in several studies that an individual's life chances are limited by his socio-economic environment.<sup>15</sup> Attitudes are integrally related to one's actual performance in life and are generated by the same set of objective conditions as those that limit a person's chances to achieve. From this point of view, it is necessary to know which attitude variables are merely functions of one's socio-economic environment. For this chapter, we have used level of living as the control variable. We are interested in this chapter only in those attitudes which are not functions of one's level of living and influence one's adoption behaviour regardless of the individual's economic conditions. The selection of level of living as the control variable was also justified by the very high correlation with adoption in our study ( $r = .59$ ).

The index for level of living was constructed on the basis of the ownership of certain household items, type of house and the number of rooms.<sup>16</sup>

## C. Data Analysis

The attitudes listed above were subjected to correlation analyses with our dependent variable, the index for adoption of improved agricultural practices. Table 19 below presents the correlation coefficients for both the zero-order and the first-order partial analyses.<sup>17</sup>

Data presented in Table 19 illustrate the powerful influence that one's level of living exerts on one's attitudes. Of

15. See for example, Hans Gerth and C. Wright Mills, *Character and Social Structure*, New York: Harcourt Brace & Co., 1954, p. 313.

16. The level of living index was based on the following items: (1) ownership of good dress, shoes, good jewellery, wrist watch or clock, torch light, wooden or metal furniture, mosquito nets, and bicycle; (2) houses with brick or stone wall, shuttered windows, bathroom, well, and number of stories; (3) number of rooms in the house. A much longer list was pre-tested. Only items which showed fair distributions were retained. For the presence of each item in (1) and (2) a score of 1 was given. For (3), a score of 1 was given for each room. The index was a summation of these scores.

17. Because of the size of our sample, the significance levels are low: .105 at 1 per cent level and .081 at 5 per cent level. For a final analysis and more discrimination, we have arbitrarily decided to use .105 as the significant cutting-point.

the nine variables which were found to be significantly related to the adoption of improved agricultural practices at the zero-order level, only four remained significant, once the influence of the level of living was removed. Thus planning orientation, self-reliance, income aspiration, educational aspiration for children and empathy were all found to be functions of one's level of living. On the other hand, the removal of the influence of level of living on credit orientation and deferred gratification accentuated the relationships between the latter two variables with adoption of improved agricultural practices.

**Table 19: Correlation Coefficients between Attitudes of Farmers and their Adoption of Improved Agricultural Practices**

Attitudes	Zero-order correlation	Partial correlation controlling level of living
Credit orientation .. .. .	.13*	.20*
Planning orientation .. .. .	.18*	.08
Self-reliance .. .. .	.17*	.08
Deferred gratification .. .. .	-.02	-.11*
Secular orientation .. .. .	.27*	.18*
Income aspiration .. .. .	.21*	-.00
Achievement motivation .. .. .	.04	.01
Educational aspiration for children .. .. .	.10*	-.08
Empathy .. .. .	.14*	.00
Political knowledge .. .. .	.37*	.15*
Urban pull .. .. .	.18*	.16*

\* Significant at 1 per cent level of confidence.

Achievement motivation does not show significant relationships with adoption either at the zero-order or after level of living is partialled. Our measure of this variable was based upon McClelland's definition of the term that achievement-motivated persons try to excel in their work regardless of social rewards. Items included in the measure provided alternatives between work orientation devoid of social rewards on the one hand, and social rewards without reference to work on the other. In our data, neither of the two alternatives made a difference as far as adoption behaviour is concerned. A very tentative observation based on the data presented here is that farmers in our sample will take the trouble of modernising their farming techniques only when they have

certain goals in view. When one has to choose work in opposition to social rewards or *vice versa*, as was indicated in our questions, the choice becomes meaningless in terms of actual motivation.

Among the five variables that have remained significant after controlling level of living, *credit orientation* of the farmers seems most important in explaining the variance of their degree of adoption of agricultural innovations. This may seem obvious as investment in new practices needs capital and in the capital-short economy of our villages, credit is the most important source of capital. As we have seen before, however, such rational considerations do not always make our farmers credit-minded. The risk involved in taking credit, the confidence in oneself in making good and long-term planning for making the investment worthwhile are important factors that contribute to one's credit orientation. These considerations become magnified in a situation where the credit market had been dominated by the exploitative local money-lenders. Past memories of the consequences of taking out a loan are frequently bitter. The importance of credit orientation should be understood in this light. Credit oriented people who are free of the fear generated by past associations are also self-reliant ( $r = .07$ ), planning oriented ( $r = .12$ ) and prefer deferred gratification ( $r = .12$ ). The zero-order coefficients mentioned here are low but in view of our previous observation of the effect of level of living on credit orientation, these relationships become meaningful.

Credit orientation also relates with secular orientation ( $r = .13$ ) and urban pull ( $r = .13$ ) but with none of the remaining attitude variables listed in Table 19. This is explained by the fact that credit orientation does not relate to level of living ( $r = -.05$ ) on which many of these attitudes are dependent. We also have an indication here that to be credit-minded one has to rise above traditional conventions as reflected in secular orientation and be enterprising enough to seek alternative ways of living one's life such as migrating to a city. Credit orientation, therefore, may not be the norm in Indian villages. This contention is supported by the correlation coefficients between credit orientation and several behavioural variables which were found in previous chapters

to be significantly related with adoption. Thus our analyses show that credit orientation is either unrelated or negatively related with some of the accepted standards of life in village societies such as level of living ( $r = -.05$ ), but related to others, caste position ( $r = .12$ ) and amount of land cultivated ( $r = .15$ ).

After credit orientation, *secular orientation* is the second most important attitude variable that explains the adoption behaviour of the respondent. It relates with urban pull, self-reliance, income aspiration, political knowledge, and empathy.<sup>18</sup> Among behavioural variables, it relates positively with exposure to radio, literacy, education and level of living.<sup>19</sup> It may be recalled that our measure of secular orientation revolved around two major themes that still dominate the rural ethos in India — the caste system and the sacredness of cattle. Secular orientation was measured by the degree of deviation expressed in terms of attitudes from the norms regarding the two themes. It is clear that a higher level of living encourages an attitudinal deviation from traditional norms. Because of the high correlation between level of living and secular orientation, attitudes such as self-reliance, income aspiration and empathy, which are dependent upon level of living, are also related with secular orientation. The significant relationships between urban pull, political knowledge, education, exposure to radio and literacy on the one hand, and secular orientation on the other, are indicative of the fact that a person's psychic linkage with systems external to the village, encourages him to deviate from traditional norms.

*Urban pull* is the third most important variable that explains the adoption behaviour of the respondent. It is obvious that people who consider migrating to a city as an alternative to farming do not necessarily lose interest in their present occupation. Since our measure of urban pull is based upon a hypothetical question, it is at best an index of the mental

18. The correlation coefficients are: urban pull ( $r = .11$ ), self-reliance ( $r = .27$ ), income aspiration ( $r = .13$ ), political knowledge ( $r = .12$ ) and empathy ( $r = .13$ ).

19. The correlation coefficients between secular orientation and behavioural variables are: exposure to radio ( $r = .11$ ), literacy ( $r = .10$ ), education ( $r = .16$ ) and level of living ( $r = .23$ ).

flexibility of the respondent which helps him consider alternatives. This same flexibility also helps him consider newer and better methods of farming. What is of interest here is that urban pull relates positively and significantly with all other systemic linkage variables which were found to be related with adoption of improved agricultural practices. Thus urban pull is related with education, exposure to radio, literacy, exposure to newspaper and political knowledge.<sup>20</sup>

*Political knowledge* shows a positive and significant relation with adoption of agricultural innovation. It also relates with most of the other attitude variables such as, planning orientation, urban pull, educational aspiration for children, deferred gratification, income aspiration, secular orientation and empathy.<sup>21</sup> Political knowledge was also found related with the following behavioural variables: education, urban contact, exposure to radio, exposure to films, literacy, exposure to newspaper, extension agency contact and level of living.<sup>22</sup> In short, political knowledgeability relates with most of the attitude variables that we found related with adoption. It also relates highly with mass media exposure and other systemic linkage variables.

The last variable that showed a significant (negative) relation with our dependent variable is *deferred gratification*. Deferred gratification as opposed to immediate gratification has been mentioned by many scholars as indicative of rationality.<sup>23</sup> Our data somewhat support this idea by bringing out relationships between deferred gratification and variables which indicate rationality such as, planning orientation ( $r = .15$ ), educational aspiration for children ( $r = .23$ ), income aspiration ( $r = .12$ ) and empathy ( $r = .16$ ). It also shows relationships with variables which are thought to

20. The correlation coefficients are: education ( $r = .11$ ), exposure to radio ( $r = .12$ ), literacy ( $r = .10$ ), exposure to newspaper ( $r = .10$ ) and political knowledge ( $r = .11$ ).

21. Relevant coefficients are: planning orientation ( $r = .30$ ), urban pull ( $r = .41$ ), educational aspiration for children ( $r = .38$ ), self-reliance ( $r = .21$ ), deferred gratification ( $r = .12$ ), income aspiration ( $r = .12$ ), secular orientation ( $r = .12$ ) and empathy ( $r = .41$ ).

22. Correlation coefficients: education ( $r = .54$ ), urban pull ( $r = .38$ ), exposure to radio ( $r = .42$ ), exposure to film ( $r = .27$ ), literacy ( $r = .55$ ), exposure to newspaper ( $r = .51$ ), extension agency contact ( $r = .41$ ) and level of living ( $r = .44$ ).

23. L. Schneider and S. Lygaard, *The Deferred Gratification Pattern . . . . .*, *op cit.*

be conducive to rational thinking such as, education ( $r = .14$ ), change agency contact ( $r = .12$ ), literacy ( $r = .13$ ), exposure to newspaper ( $r = .11$ ) and political knowledge ( $r = .12$ ).

We have seen in Table 19 that deferred gratification does not show a significant relation with the dependent variable at the zero-order level but with the removal of the influence of level of living, the relation becomes significant and in the negative direction. The only explanation we can offer here is that immediate gratification provides the incentive to modernise agriculture. Deferred gratification as a goal does not inspire our farmers to adopt new methods of farming. In an impoverished economy, many may feel that long-term saving is unrealistic especially when credit is available from official agencies. In the Indian village situation and in the present stage of the village economy, deferred gratification loses its meaning as a rational attitude. On the contrary, immediate gratification in terms of food, clothes, shelter, repayment of debts, etc. provides a much more powerful incentive to increase agricultural production by adopting new practices.

#### D. Summary and Conclusions

Eleven attitude variables were studied in relationships with the adoption of improved agricultural practices among 680 farmers.

Zero-order and first-order partial correlation analyses were used to study these relationships. Control on the level of living of the respondents produced five significant attitude variables (credit orientation, secular orientation, urban pull, political knowledge and deferred gratification), which were found related with adoption of improved agricultural practices.

It was found that attitudes such as planning orientation, self-reliance, income aspiration, educational aspiration for children and empathy, all significant at the zero-order level, become insignificant once the influence of the level of living was removed. This indicated that these attitudes are functions of the level of living of the respondents.

Achievement motivation of the respondents did not show any significant relationship with their adoption of modern agricultural practices.

Our main findings are that people who are willing to deviate from traditional norms (secularly oriented,) to borrow money on credit for farming (credit oriented), to consider alternative ways of life as real possibilities (urban pull) and are aware of the events and personalities in the larger society (political knowledgeability), also are more amenable to modernise their farming procedures. We have also found that one of the major incentives to such receptivity is the prospect of being able to raise the standard of living (immediate gratification). In the Indian village, this means a change from the hand-to-mouth existence to a more comfortable living rather than to a life characterised by unlimited and unproductive expenditure.

## 7

# The Major Factors Affecting Agricultural Innovations

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### A. Summary

#### *Design*

**T**HE first phase of this study attempted to explain the variation among 108 villages, the social unit within which most farmers in India live. We concluded that (1) contact with the extension services, (2) secular, cosmopolite leadership, (3) a high level of male literacy, (4) electricity in the village, and (5) village heterogeneity were conducive to more agricultural development in the village.<sup>1</sup> Within both the most successful and least successful villages, we find a wide range of farmers who are highly innovative and farmers who remain traditional. This second phase of the study was designed to determine the major factors which facilitate innovation or constrain a cultivator within his village community from adopting recommended farm practices.

We have cast a wide net, both geographically and conceptually. The global study of which this is a part includes 108 Indian villages, 71 Nigerian villages and 76 Brazilian communities. In the second phase, 680 Indian farmers, about 1400 Nigerian farmers, and 1700 Brazilian farmers were interviewed. A great mass of data has been gathered using some of the most sophisticated methods and some of the most rapid data processing techniques. Conceptual and empirical safeguards have been used, because while we were 'standing on the shoulders of giants', our heads were partly in the clouds. Although a great deal of research findings and methods in the United States and India were useful to conceptualise our

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1. See Frederick C. Fliegel, Prodipto Roy, Lalit K. Sen and Joseph E. Kivlin, *Agricultural Innovations in Indian Villages*, Hyderabad: National Institute of Community Development, March, 1968.

design, we found that we had to blaze new trails, operationalise variables in new ways and, in general, break new ground.

No study, either in the United States or India, has ever tried to explain the variation among villages or among farmers across a nation so wide and so complex. In fact no studies have had the financial resources to capitalise on so much intellectual energy and computational complexity. It is fitting that the United States, where much of the sociology of farming began, should collaborate in the present study with India where much of the world agricultural revolution is now taking place.

On account of the gigantic nature of the problem, this report does not pretend to have arrived at any final conclusions as to what makes the Indian farmer modernise. We do feel, however, that the findings presented have taken a long step forward in determining the major factors that help an Indian farmer to adopt new practices.

The design of the study has made certain broad assumptions and set limits to our scope which we wish to reiterate here. *First*, we have assumed that the farmer is the ultimate decision-maker in adopting or not adopting new agricultural technology. Granted, constraints such as availability of supplies, credit, advice and price incentives can make this technology more or less attractive. But despite all these constraints there are still personal and social factors about a farmer and his farm setting which make it more conducive to adopt new practices. *Second*, we have limited the study to the diffusion of recommended practices. We have assumed that new seeds, fertilizer, or insecticides produce more crops and, therefore, we have not been so bold as to evaluate the feasibility of the recommended agricultural technology, or to carefully measure productivity. The job of development administration is to take new recommended practices from the experiment station and, with reasonable speed, hand them over to the farmer. *Third*, we assume that we have focussed our study on the most sensitive areas in the communication network which connects, directly or indirectly, the potential user of agricultural technology with the donor.

Briefly the design of our study consisted of the following : *First*, we devised an yardstick to measure the degree of innova-

tion achieved by the potential user, the farmer. *Second*, we examined the various aspects of the farm setting to determine if these affected the degree of innovativeness. *Third*, we looked at the farmers' personal characteristics and social setting to test their relation to adoption of agricultural practices. *Fourth*, we stated the personal and impersonal channels of communication a farmer uses to see if these were severally or jointly related to agricultural innovation. *Fifth*, we examined various social-psychological orientations of the farmer to see if these were conducive to agricultural change. And *finally* in this chapter we have brought all these assorted variables together to assess the relative importance of various factors.

#### *Measuring innovativeness*

Our problem in constructing one index was to judiciously decide on the best innovations common to the breadth of India, contributing to a single measure of success or failure in the Indian context. We purposively selected villages, from the three states to roughly represent the range of agricultural development we encountered in the 108 phase I villages. Thus, affluent farmers from West Godavari in Andhra Pradesh and average and poorer farmers from Birbhum in West Bengal and Yeotmal in Maharashtra were selected. In order to limit logistic requirements and provide some homogeneity, villages from each state were taken from one development block. To provide sufficient variation for analysis we felt that at least 200 farmers from each state were needed. We limited our study to farmers cultivating 2.5 acres (one hectare) or more of land because these farmers cultivate over 90 per cent of India's arable land and probably utilise over 95 per cent of the agricultural innovations being propagated. To exclude the generational ambivalence of decision-making in the Indian family, we limited ourselves to farmers below 50 years of age. Based on our data from phase I, we had a fair amount of information on the crops being grown in the 108 villages. The selection of the villages was done on a trial and error basis in order to obtain the minimum sample of appropriate farmers with the least logistics and the greatest

comparability. We attempted to obtain a wide range of good and poor farmers both within each village and across the range of villages. Thus, the 680 farmers selected here may be viewed as a cross-section of Indian farmers, sufficiently representative to analyse factors that affect various degrees of innovativeness.

Our major considerations in constructing the scale were : (a) that items would be applicable to all three farming areas, (b) all items would contribute to a uni-dimensional scale, and (c) the final yardstick would have a somewhat normal distribution.

We have presented the practices selected and the degree of innovativeness in terms of the stages of knowledge, trial and adoption in chapter 2, to show the variation between villages and states. Knowledge about the ten practices selected varied from a low of 59 per cent for an improved cultivator, to a high of 91 per cent for animal inoculation. Adoption varied from only 8 per cent of farmers using cultivators or high-yielding varieties to 55 per cent using ammonium sulphate. We tested the items for uni-dimensionality and we tested the normality of the distributions of the three measures. Both on logical and mathematical grounds, the measure for 'trial' was selected as the best measure of agricultural adoption or innovation. Thus, we define innovativeness or adoption as ever having used a practice.

#### *The farm setting*

The major factor affecting adoption that clearly emerges from the correlation analysis of the farm setting variables was farm size. All the six different measures used for farm size were closely interrelated with value of agricultural products raised, and it was selected as the best measure of farm size. This measure correlated with adoption with an  $r$  value of .43.

In the short run, perhaps, nothing can be done to increase farm size, because of various welfare and political reasons. In the long run, however, it seems clear that, whether India follows a capitalistic or socialistic trend, the unit of farm operation will rapidly increase as in other developed agri-

cultural economies. With the increasing technological sophistication of Indian farming and the economies of scale and management, it seems inevitable that farm units in India will get larger. If maximum production and marginal surpluses are desired then they are likely to come from larger farm units. The protection of small farmers should be viewed more as social welfare than as development.

We also examined the correlation between other economic variables such as fragmentation, commercialisation, specialisation and farm efficiency. All the variables were related to adoption in the expected direction. But the coefficients were low and just barely significant. The lack of a strong relation with labour efficiency was further explored. Farm size did show a significant, positive relation with labour efficiency, indicating that larger farms do get as much or more per unit with increasing inputs of labour. However, similar to Bose's<sup>2</sup> findings, we found little association between adoption and labour efficiency. This finding led us to conclude that Indian farmers adopt practices more on account of extension contacts and prestige rather than efficiency. We found that when we controlled on farm size all the remaining farm setting variables became insignificant. Therefore, we decided to carry through to multivariate analysis only size of farm, as measured by the value of the agricultural products raised.

#### *The farmer and his social setting*

We tested three measures of education. These were (1) literacy, in terms of ability to read a newspaper, (2) education of respondent, and (3) one measure of children's education. We found that all three were strongly related to adoption. Size of family and family composition, whether joint or nuclear, did not show any strong association with adoption. Caste rank, religion, taxes and three measures of level of living were all very highly related to adoption.

Ownership of land has often been used in India and elsewhere as a status measure. A great deal of legislative energy in India has gone into abolishing landlordism on the blithe

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2. S. P. Bose, "Socio-cultural Factors in Farm Efficiency", *The Indian Journal of Extension Education*, 1 (3), 1965, pp. 192-199.

assumption that ownership would help farmers to invest in new agricultural technology. This was not found to be the case; in fact the farmers who owned less than one-fourth of their land showed a higher level of adoption than full owner-cultivators. Out of the three measures of social participation, only holding office in organisations seemed to be highly significantly related to adoption. Informal visiting patterns did not show any association with adoption. Extra-village contact in terms of having lived outside the village and the degree of urban contact were related to adoption.

A multiple correlation coefficient using five independent variables—family size, education of respondent, urban contact, caste rank and level of living explained about 36 per cent of the variance in agricultural adoption. The zero-order and the highest-order partial correlations of these variables with agricultural adoption are given in Table 20.

**Table 20: Zero-order and Highest-order Partial Correlations of Agricultural Innovation with Selected Variables†**

Variable	Zero-order correlation	Highest-order partial correlation
Family size .. .. .	.09*	.00
Education .. .. .	.36**	.03
Urban contact .. .. .	.30**	.11**
Level of living .. .. .	.59**	.47**
Caste rank .. .. .	.29**	-.01

\* and \*\* significant at .05 and .01 per cent levels.

† Social participation, particularly holding office, was found significantly related using chi-square test. It is later included in the multiple correlation analysis.

The highest-order partial correlations of each variable, when the effect of all other variables is controlled, shows that the level of living and urban contact remain as the two variables which make a significant net contribution to explain innovativeness. Both education and caste rank may be overshadowed by level of living, or by each other, since all three are highly intercorrelated; hence all three, along with urban contact are carried forward into the final multiple correlation analysis.

*Communications*

In our analysis, we *first* characterised the respondents who predominantly use only interpersonal channels as compared to those who use mass media channels. It was found that the better educated, high caste Hindus more frequently use mass media channels. Further, as would be expected, the respondents with a high level of living and a better knowledge and contact with the outside world also were more apt to use mass media.

*Second*, we found that every measure of knowledge about and contact with the extension agency was highly significantly related with innovativeness. The knowledge of extension officers ( $r = .47$ ), the number of times the respondent talked with the block development officer ( $r = .30$ ) or the VLW ( $r = .40$ ), the number of demonstrations the respondent had seen ( $r = .35$ ), and the number of block films he had seen ( $r = .14$ ), were all positively related with innovation. The four items of extension agent contact were combined into one index and this index of extension contact correlated with agricultural adoption with an  $r$  of .49.

*Third*, we found that the mass media variables are related highly significantly with agricultural innovativeness: the respondent or the family listening to the radio ( $r = .29$  and  $.41$ ), the number of commercial films seen ( $r = .27$ ) and newspapers read ( $r = .35$ ) were all positively correlated with adoption. An index combining these items was strongly correlated with adoption with an  $r$  of .50.

These two variables, the index of extension contact and the index of mass media contact, along with urban contact, were put into a multiple regression analysis and the highest order partials were computed (Table 21).

**Table 21: Zero-order and Highest-order Partial Correlation Coefficients of Agricultural Adoption with Selected Variables**

Variables	Zero-order correlation	Highest-order partial correlation
Urban contact	.30**	.02
Extension contact	.49**	.29**
Mass media index	.50**	.31**

\*\* Significant at .01 per cent level.

The extension contact index continued to make a net contribution to adoption, but urban contact here was partialled out, since it is highly correlated with both extension contact and mass media contact. It is still carried forward because it made a net contribution with the social setting variables and may still make a contribution in a broader configuration.

*Social-psychological characteristics of the farmer*

We examined a few selected variables which have been found to discriminate between adoptors and non-adoptors. These variables, in general, measured the areas of a secular or rational outlook, a faith in the future, and a cosmopolite orientation. The measures of secular orientation were a secular-traditional scale, tapping norms with regard to caste and cows, and a self-reliance scale. The aspects of faith in the future, credit orientation, planning orientation, deferred gratification, education and income aspiration, and achievement motivation were measured. Finally, in the area of a cosmopolite orientation and linkage to the external world, we measured political knowledge, empathy and urban pull.

The zero-order correlations in general did not show any strong correlations, varying from .04 to .37, although nine of 11 coefficients were significant at the 1 per cent level. At the zero-order level, political knowledge ( $r = .37$ ), secular orientation ( $r = .27$ ), and income aspiration ( $r = .21$ ) showed the highest correlations. When the effect of level of living was controlled, five variables—credit orientation, deferred gratification, secularity, urban pull, and political knowledge continued to have a significant association.

A multiple regression analysis using eight selected variables explained only 23 per cent of the variation and the highest-order partials indicated that political knowledge and secularity made the greatest net contributions.

B. Multiple Correlation Analysis

Selected variables from each of the four analysis chapters have been carried forward for a summary multiple correlation analysis, in order to determine the relative importance of each

variable, the total variance explained by all variables, and the net contribution of each variable. In addition, a parsimonious serial deletion for the least significant variable was computed until all insignificant variables were deleted.

The criteria for inclusion of the 15 variables in Table 22 were, the size of the zero-order correlation, its logical overlap with other variables (and hence its partialling out within the chapter) and finally some intuition based on a natural scepticism of high-order partials sometimes eliminating closely related variables. When variables clearly overlapped—like the six measures of size of farm operation—and one had been selected as the best measure, it would be redundant to use all the measures in the multiple correlation analysis. On the other hand, among the socio-economic status variables (Table 20) level of living seems to overshadow education and caste rank, although each of them have high zero-order correlations and are conceptually and operationally not quite the same as level of living; hence, education and caste rank were both intuitively retained, and re-tested in the broader multiple R configuration.

Table 22 presents the zero-order correlations and two sets of highest-order partials. The first set is for the 15-variable solution and the second set is for a 10-variable solution after the insignificant variables had been deleted. The 15-variable multiple R was .72 and explained 52 per cent of the variance, whereas the 10-variable solution multiple R was .71 and explained 51 per cent of the variance. The two sets of partials are very similar, except that the second includes one more variable, empathy, which was just barely significant.

Three *background* variables—level of living, size of farm operations and education of respondent—show strong zero-order correlations with agricultural adoption. Taken together with caste rank, these variables strongly suggest that the farm operators who are highest in the social structure, and those with larger farm operations, are the farmers who have the highest levels of adoption. Education and caste rank again become insignificant when the highest-order partials are used. Level of living and farm operation size continue to make high net contributions. These correlations indicate that the rich farmer is modernising more rapidly than the poor farmer and

**Table 22: Zero-order and Highest-order Partial Correlation Coefficients of Agricultural Innovation with 15 Selected Variables (N=680)**

Variable	Zero-order correlation	Highest-order partial correlation	Highest-order partials after deleting insignificant variables
1. Education of respondent .. .. .	.36**	-.07	
2. Caste rank .. .. .	.20**	.00	
3. Level of living .. .. .	.59**	.32**	.34**
4. Social participation (holding office) .. .. .	.24**	.04	
5. Value of agricultural products raised .. .. .	.43**	.21**	.21**
6. Mass media contact .. .. .	.50**	.08*	.08*
7. Urban contact .. .. .	.30**	-.01	
8. Extension contact .. .. .	.40**	.22**	.23**
9. Political knowledge .. .. .	.37**	.09*	.08*
10. Secular orientation .. .. .	.27**	.19**	.18**
11. Educational aspiration .. .. .	.19**	-.08*	-.08*
12. Urban pull .. .. .	.18**	.11**	.10**
13. Empathy .. .. .	.14**	-.07	-.08*
14. Credit orientation .. .. .	.13**	.21**	.21**
16. Deferred gratification .. .. .	-.02	-.06	

\* and \*\* Significant at .05 and .01 per cent level.

will continue to get richer. He not only adopts more practices but as the demand for innovations such as fertilizers and insecticides increases he will tend to monopolise these scarce resources and thereby force the small farmer out of modern agriculture. Looking at it the other way, the smaller farm operator (and here we did not consider those with less than 2.5 acres) is not using modern practices; and as the marginal returns of these practices increase, he will not be able to compete for these modern agricultural necessities. He will be forced to remain a traditional farmer or to leave farming only to those who can do it in a more productive way. This inexorable trend toward larger farm units is a natural concomitant of social and economic forces and we do not view it unfavourably. The trend must continue if Indian farming is to modernise. The political pressures to keep ceilings on farm size we view as welfare measures which run counter to agricultural modernisation.

We had earlier indicated that farmers in India were adopting new practices for prestige rather than for efficiency. That is, the larger operators were using more labour and more

innovations: the output of agricultural products per labourer was not more, but neither was it less than the small operator. This finding was unexpected because in western countries nearly all innovations have been labour-saving and hence their concern with labour-efficiency. In India, we find that agricultural innovation is highly correlated with larger inputs of labour. Further, with the farmers' incomplete knowledge about the new practices, with bottlenecks in channels of supplies and services, the economies of scale have not yet become manifest. The new high-yielding varieties which demand a far higher sophistication about agriculture and far greater inputs of supplies and have radically higher marginal returns, may suffer initially from some setbacks, but will set the pace for a far greater degree of agricultural innovation and further polarise the modern and the traditional farmers.

Three *communication* variables—total mass media contact, personal contact with the extension agents, and a physical contact with urban centres—all show strong correlations. As we had generally hypothesized, the greater the communication between those propagating practices and those using them the more adoption there will be. The indirect means of communication of radio, newsprint, cinema or just visiting a city very strongly affect whether or not a farmer will adopt innovations. Thus the general linkage of the farmer with the larger world seems to be positively related to agricultural modernisation. However, the highest-order partials for the mass media index and urban contact drop very low—the former from .50 to .08 which is just barely significant. Taken together with political knowledge, a third cosmopolite variable which drops from .37 to .09, the importance of the general linkage with the external world should be viewed with some caution, as to how functional this dimension is for agricultural adoption. Our conclusions are a little ambivalent. The zero-order correlations are high but the highest-order partials are very low.

Further, as we had expected, the number of times a farmer has talked with agricultural extension agents is functionally related to the degree of his agricultural adoption. We found that every measure of *contact with extension agents* was highly correlated with innovation. Agents have often been accused

of working only with the bigger and higher-status farmers in each village. Initially this may have been a parsimonious strategy of the two-step flow, from agents to influential leaders, and leaders to the people. Today when the tide has turned and the bigger cultivator is seeking out the agents (and here we have measured the farmers' contacts with the agents) and these measures continue to be singly and jointly correlated with adoption, we infer that there is going to be greater need for extension services in the decade ahead, as India turns the corner on agricultural production and takes off into a modern agricultural era. This need will probably be not only in the quantity of services but probably in the quality of services.

Finally we found certain *social-psychological* orientations to be correlated with adoption. The highest-order partials indicated that credit orientation, secular orientation, urban pull and political knowledge were significantly related with adoption. Secularity and political knowledge of the outside world are an attitudinal extension of the general linkage with the larger society manifested under communications. To some extent, urban pull, as measured by the statement that respondents would migrate to an urban occupation if offered more pay, is also a measure of this orientation to the outside world. Accepting rational credit from formal sources is a break with tradition which shows confidence in and participation of extra-village financial structures. Thus all the four social-psychological variables indicate a psychological participation and faith in a more rational outside world.

Having completed the correlation analysis for the 680 farmers as one sample, we tested how consistent the independent variables were, when applied separately in each of the eight communities. Did the same variables explain agricultural adoption? Table 23 gives the zero-order correlates of adoption of the same 15 variables with adoption in each of the eight villages.

The correlates do manifest a great deal of consistency. Using the 1 per cent level of significance, two communication variables—mass media contact and extension contact—were highly significant in seven out of eight villages. The social structure variables—level of living, education, caste rank and social participation—were highly significant in over half the

**Table 23: Zero-order Correlations of Adoption of Agricultural Innovations with 15 Selected Variables, by Village**

	V <sub>1</sub>	V <sub>2</sub>	V <sub>3</sub>	V <sub>4</sub>	V <sub>5</sub>	V <sub>6</sub>	V <sub>7</sub>	V <sub>8</sub>
1. Education of respondent .. ..	.13	.47	.40	.48*	.55	.47	.24	.31
2. Caste rank .. ..	.18	.32	.33	.28	.37	.42	**	**
3. Level of living .. ..	.25	.60*	.52	.53	.64*	.52*	.38	.21
4. Social participation (holding office) ..	.13	.20	.24	.30	.32	.42	.27	.33
5. Value of agricultural products raised	.34*	.41	.47*	.54*	.65*	.31	.28	.15
6. Mass media contact	.30	.47	.35	.37*	.50	.45	.37	.30
7. Urban contact .. ..	-.05	.46	.20	.46	.48	.43	.39	.17
8. Extension contact .. ..	.18	.47	.45*	.37	.69*	.47*	.36	.43
9. Political knowledge	-.01	.36	.37	.45	.56*	.50*	.22	.40
10. Secular orientation	.18	.16	-.08	.26	.15	.14	.20	.11
11. Educational aspirations .. ..	.08	.38	.09	.20	.37	.30	.33	.28
12. Urban pull .. ..	.04	-.10	-.12	-.07	.00	.31	.13	-.06
13. Empathy .. ..	.04	.17	.12	.43*	.33	.31	.12	.07
14. Credit orientation .. ..	-.04	.03	-.08	.06	.20*	.06	-.11	-.15
15. Deferred gratification .. ..	.04	.38*	.26	.24*	.18	.22	.11	.10
N .. ..	78	33	99	100	146	103	59	62
Value of $r$ , .05 level .. ..	.23	.34	.20	.20	.18	.20	.27	.25
Value of $r$ , .01 level .. ..	.30	.44	.26	.26	.23	.26	.35	.33
Multiple R .. ..	.57	.78	.66	.73	.84	.69	**	**

\* Significant variables after parsimonious deletion up to 5 per cent criterion.

\*\* Caste rankings were not available for these villages, hence a comparable multiple R could not be computed for all 15 variables.

villages. Farm operation size continued to be very important in five out of eight villages. Only one psychological variable—political knowledge—was highly significant in five villages. The other psychological dimensions never did have high correlation coefficients, and are only significant in one or two villages.

The multiple R for each village is presented and it varies from a high of .84 to a low of .57. For two West Bengal villages which were primarily Muslim, caste ranking could not be done and hence a comparable multiple R could not be computed. We expected that more of the within-village variance would be explained because the homogeneity of respondents would result in more normal and less diverse distributions on both the dependent and independent variables. However, this did not prove to be the case—in three villages we explained more and in three villages less variance than in the total sample.

Table 23 also shows the variables that remain after the non-significant variables are serially deleted. Value of agricultural products raised remains a significant variable in four out of six villages. Level of living and extension contact are significant in three out of six villages. Two psychological variables—political knowledge and deferred gratification—are significant in two villages each. The more general modernisation variables—mass media contact, urban contact, urban pull and empathy—are not significant predictors of agricultural adoption and were nearly always deleted when this parsimonious serial deleting process was used.

### C. Conclusions

1. The first conclusion we can make from these data bears out the main thesis of this study—the closer we bring the farmer to the propagators of modern technology the greater will be his rate of adoption. This may be done by direct contact with extension agents or indirectly through demonstrations or with mass media. Our data indicate that direct extension contact remains more functional for agricultural adoption.

2. Second, size of farm operation seems to be a necessary pre-condition to modernisation. We feel that the ox is now

before the cart and the pace of modernisation will inexorably force the size of farm units upwards, resulting in a greater polarisation of modern, large-size farm operators and traditional, marginal, small farm operators. This latter group may be viewed as a welfare problem. Happily, the larger farms which are modernising are also intensifying labour inputs and could fruitfully use this surplus labour.

3. Third, the general socio-economic status of the farmer in terms of his level of living, education and caste rank, we found was strongly and positively related with innovativeness.

4. Fourth, the closer the farmer's linkage with the outside world, either in terms of behaviour or attitude, the higher was his level of adoption. These indirect linkage variables, however, are masked by the three variables mentioned above.

Finally, it should be pointed out that we explained a little over 50 per cent of the variance of our measure of innovativeness using 15 independent variables and there is, therefore, a great deal of room for more research. Many of the variables, particularly the social-psychological variables, have suggested areas which could be measured with better instruments and add substantially to the total variance explained.

## Bibliography

- H. G. Barnett, *Innovation, the Basis of Cultural Change*, New York: McGraw-Hill Book Co., 1953.
- M. Black (Ed.), *The Social Theories of Talcott Parsons*, New Jersey: Prentice Hall, 1961.
- S. P. Bose, "Socio-cultural Factors in Farm Efficiency", *The Indian Journal of Extension Education*, 1 (3), 1965, pp. 192-199.
- S. P. Bose, "Peasant Values and Innovation in India", *American Journal of Sociology*, 67, March, 1962, pp. 552-560.
- Bureau of Census, *1964 United States Census of Agriculture, Preliminary Report, United States Summary*, Washington, D.C.: Bureau of the Census, Series AC 64 P-1, November, 1966.
- S. N. Chattopadhyay, "Psychological Correlates and Adoption of Innovations", in T.P.S. Chawdhari (Ed.), *Selected Readings on Community Development*, Hyderabad: National Institute of Community Development, August, 1967.
- S. N. Chattopadhyay and U. Pareek, "Prediction of Multipractice Adoption Behaviour from Some Psychological Variables", *Rural Sociology*, 32, September, 1967, pp. 324-333.
- T. P. S. Chawdhari (Ed.), *Selected Readings on Community Development*, Hyderabad: National Institute of Community Development, August, 1967.
- P. J. Deutschmann and O. F. Borda, *Communication and Adoption Patterns in an Andean Village*, San Jose, Costa Rica: Programa Inter-americano de Informacion Popular, 1962.
- J. Dewey, *Human Nature and Conduct*, New York: H. Holt and Co., 1922.
- F. E. Emery and O.A. Oeser, *Information, Decision and Action*, New York: Cambridge University Press, 1958.
- F. C. Fliegel, "A Multiple Correlation Analysis of Factors Associated with Adoption of Farm Practices", *Rural Sociology*, 21, 1956, pp. 284-292.
- F. C. Fliegel, "Aspirations of Low-income Farmers and Their Performance and Potential for Change", *Rural Sociology*, 24, September, 1959, pp. 205-214.
- F. C. Fliegel, "Differences in Prestige Standards and Orientation to Change in a Traditional Agricultural Setting", *Rural Sociology*, 30, September, 1965, pp. 278-290.
- F. C. Fliegel, J. E. Kivlin and G. S. Sekhon, "A Cross-National Comparison of Farmers' Perceptions of Innovations as Related to Adoption Behaviour" (Unpublished manuscript). Hyderabad: National Institute of Community Development, 1967.
- F. C. Fliegel, P. Roy, L. K. Sen and J. E. Kivlin, *Agricultural Innovations in Indian Villages*, Hyderabad: National Institute of Community Development, March, 1968.
- H. Gerth and C. W. Mills, *Character and Social Structure*, New York: Harcourt Brace and Co., 1954.

- Government of Andhra Pradesh, *District Census Handbook, Godavari District*, Hyderabad : Government of Andhra Pradesh, 1961.
- Government of India, *Agriculture in Brief*, New Delhi : Directorate of Economics and Statistics, 1965.
- Harry H. Harman, *Modern Factor Analysis*, Chicago : The University of Chicago Press, 1967.
- A. Inkeles, "Some Sociological Observations on Culture and Personality Studies", in C. Kluckhohn and H. A. Murry (Eds.) *Personality in Nature, Society and Culture*, New York : Alfred A. Knopf, 1959, pp. 577-592.
- G. Jacob, (Ed.), *Readings on Panchayati Raj*, Hyderabad : National Institute of Community Development, July, 1967.
- J. M. Kapoor, "Villagers and the Newspaper" (Unpublished manuscript), Hyderabad : National Institute of Community Development, 1967.
- E. Katz and P. F. Lazarsfeld, *Personal Influence*, Glencoe, Illinois : The Free Press, 1955.
- C. Kluckhohn and H. A. Murray, (Eds.) *Personality in Nature, Society and Culture*. New York : Alfred A. Knopf, 1955.
- D. Lerner, *The Passing of Traditional Society : Modernizing the Middle East*, New York : The Free Press, 1964.
- H. F. Lionberger, *Adoption of New Ideas and Practices*, Ames, Iowa : Iowa State University Press, 1960.
- D. C. McClelland, *The Achieving Society*, Princeton, New Jersey : D. Van Nostrand Co., Inc., 1961.
- D. C. McClelland, "The Achievement Motive in Economic Growth", in B. F. Hoselitz and W. E. Moore (Eds.), *Industrialization and Society*, Paris : UNESCO-Mouton, 1966, pp. 74-95.
- M. F. Millikan and D. Hapgood, *No Easy Harvest*, Boston : Little, Brown and Company, 1967.
- D. Morrison, "Achievement Motivation of Farm Operators : A Measurement Study", *Rural Sociology*, 29, December, 1964, pp. 367-384.
- J. Olds, "Memorandum on A General Theory of Action" (mimeographed).
- U. Pareek and S. N. Chattopadhyay, "Adoption Quotient : A Measure of Multipractice Adoption Behaviour", *Journal of Applied Behavioural Sciences*, 2, January-March, 1966, pp. 95-108.
- T. Parsons, *The Social System*, Glencoe, Illinois : The Free Press, 1951.
- N. Patnaik, "Adoption of Agricultural Practices in a Peasant Community in Orissa", in T. P. S. Chawdhari (Ed.), *Selected Readings on Community Development*, Hyderabad : National Institute of Community Development, 1967.
- E. M. Rogers, *Diffusion of Innovations*, New York : The Free Press of Glencoe, 1962.
- E. M. Rogers, *Bibliography on the Diffusion of Innovations*, Diffusion of Innovations Research Report No. 4, East Lansing, Michigan : Michigan State University, Department of Communication, 1966.

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- E. M. Rogers and W. Herzog, "Functional Literacy Among Colombian Peasants", *Economic Development and Cultural Change*, 14, 1966, pp. 190-203.
- E. M. Rogers and L. E. Rogers, "A Methodological Analysis of Adoption Scales", *Rural Sociology*, 26, December, 1961, pp. 325-336.
- E. Roosevelt, *India and the Awakening East*, New York : Harper and Bros., 1953.
- W. W. Rostow, *The Stages of Economic Growth*, Cambridge, England : Cambridge University Press, 1960.
- P. Roy, *The Impact of Communications on Rural Development in India*, Hyderabad : National Institute of Community Development, August, 1967, (Mimeo.)
- L. Schneider and S. Lysgaard, "The Deferred Gratification Pattern", *American Sociological Review*, 18, April, 1953, pp. 142-149.
- T. W. Schultz, *Transforming Traditional Agriculture*, New Haven : Yale University Press, 1964.
- L. K. Sen, "Main Concepts in Modernization", (Unpublished manuscript), Hyderabad : National Institute of Community Development, 1967.
- L. K. Sen, "Status Inconsistency in Four Indian Villages", in T. P. S. Chawdhari (Ed.), *Selected Readings on Community Development*, Hyderabad : National Institute of Community Development, August, 1967.
- L. K. Sen and P. Roy, *Awareness of Community Development in Village India*, Hyderabad : National Institute of Community Development, 1967.
- S. S. Thorat, *Certain Social Factors Associated with the Adoption of Recommended Agricultural Practices by Rural Local Leaders and Ordinary Farmers in India*, Ph.D. Dissertation, Michigan State University, East Lansing, 1966.
- C. V. Wharton, Jr., *Research on Agricultural Development in South East Asia*, New York : The Agricultural Development Council, Inc., 630 Fifth Avenue, 1965.
- K. Young (Ed.), *Social Attitudes*, New York : H. Holt and Co., 1931.

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