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AGRICULTURAL
INNOVATIONS IN
INDIAN VILLAGES

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Preface

SCIENTISTS, planners and laymen will agree that one of the most difficult challenges India faces today is the stepping up of her agricultural production. Experiences in countries such as the USA and Japan show that modernization of agricultural techniques has been instrumental in bringing about a revolution in agriculture in these countries. In the USA for example, about 6 per cent of the population produces enough agricultural commodities not only for the remaining 94 per cent but also to supply surplus products to other countries.

Improved agricultural practices are the products of modern science and every country has its own set of bright and enterprising scientists to produce techniques suited to local conditions. The problem starts, however, in disseminating these techniques among farmers who are the potential beneficiaries of these inventions. Many promising programmes have been frustrated at this point. Most developing nations have an extensive network of extension apparatus to act as the communication link between the research laboratory and the farmer. It has again been discovered that having such agencies located in different parts of the rural areas is not enough. Adoption of an improved practice by a farmer is not necessarily based on his rational evaluation of the usefulness or the profitability of the practice alone. The farmer does not live in a social vacuum and does not always operate as a rational, economic being. He is a member of a community and of various other groups. His personality is a product of his group-living. It is not surprising that the extension workers have found out that in order to introduce these techniques successfully they must know something about the persons they are dealing with and also about the social environment in which these persons live and operate.

Scientific research in the laboratory of the agronomist or the plant pathologist must, therefore, be supplemented by research on human factors that facilitate or inhibit adoption of new ideas. The research reported in the following pages eminently fills this need and has been expressly concerned with the human factors involved in the diffusion and adoption of improved agricultural practices in Indian villages. With sophisticated statistical analyses we have tried to isolate factors which help the spread of scientific knowledge and practices among our farmers.

The research reported here is part of a larger study entitled 'Diffusion of Innovations in Rural Societies', directed by Everett M. Rogers of the Department of Communication, Michigan State University, under

contract with the United States Agency for International Development, and has included three countries: Brazil, Nigeria and India.

For the India part of the study, an agreement was drawn and signed early in 1966 by the Department of Communication, Michigan State University, the National Institute of Community Development, the United States Agency for International Development, and the Ministry of Food, Agriculture, Community Development and Co-operation, Government of India. The actual operation of the research project was conducted jointly by the staff members of the Department of Communication, Michigan State University, and the National Institute of Community Development. 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 project consisted of three phases. In the first phase, the village was taken as the unit of study and factors that facilitate or inhibit the success of agricultural programmes for the whole village were studied. One hundred and eight villages were studied in the states of Maharashtra, Andhra Pradesh and West Bengal, for the first phase of the study, during September-December, 1966. The present report provides results that came out of the first phase.

Reports are in preparation for the remaining phases also. The second phase of the study included 680 farmers and the focus of study was on the individual farmer, his social environment, personality characteristics, and so on. The third phase of the project was devoted to a follow-up study of an experiment in mass communications, jointly conducted by the UNESCO and the National Institute of Community Development in 1965 in eight villages near Lucknow.

Data for this report were processed at the Computer Centre of the Programme Evaluation Organization, Planning Commission, New Delhi.

It is my hope that these data will prove useful to all who are interested in progress among rural people in our country as well as in other countries.

*National Institute of Community Development,
Hyderabad-30, India
24th November, 1967.*

GEORGE JACOB
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Purpose and Design of the Study

WITH a large and rapidly growing population, and quite apart from shortages of rainfall, there is general agreement that more food is needed in India. Drought during 1965-66 only dramatized the fact that available supplies even in a normal year are perilously close to being in balance with demand. Rapid population growth, the expanding *per capita* wants of a growing industrial labour force, and many other factors bring pressure to bear on food supply. The reasons are many and complex, but the end result is quite simple: more food is needed.

We see no reason to doubt that India's cultivators can produce more food. Nor do we seriously doubt that they can produce enough to satisfy the present, rapidly growing demand. The point at issue is how quickly this can be done and at what cost. Though tersely stated the problem is of course enormously complicated. Food production must compete with achievement of other societal goals in the allocation of scarce resources. And whatever the proportion of available resources devoted to increasing food production, these resources must be efficiently utilized. Administrators, scientists, merchants, manufacturers, extension agents, and cultivators are all directly involved in solving the problem.

We have not been so bold as to address ourselves to the entire problem of allocation and utilization of scarce productive resources. Our study design includes some detail on the characteristics of the agency which makes modern technology available to the farmer, some emphasis on the means by which change programs are conveyed to villages, and puts greatest emphasis on those characteristics of villages which seem likely to make a difference in the reception of information about new farm practices and thus affect program success.

Practical Objectives

Much still needs to be done in the years ahead to develop more and

better supplies of fertilizers, improved seeds and other inputs if agricultural production is to continue to rise. At the same time, however, many farmers do not avail themselves of all of the improved technology already at hand. The community development program as well as other agencies are striving to make information, supplies, and credit more readily available to the cultivator.¹ The practical objective of this study is to examine some aspects of this process of conveying modern production methods to the farmer to see whether there are certain predictable ways in which the transferral process could be made more efficient.

At the risk of repetition, we would like to make it quite clear that we are not attempting to evaluate the relative merits of various items of modern agricultural technology. Neither are we attempting to evaluate the efficiency of operation of a particular development organization. Nor are we attempting to measure actual increases in food production presumably resulting from use of modern technology. We are making certain assumptions, taking as given the existing technology and distributive machinery, and assuming that production or productivity benefits. Our concern is with the diffusion process, starting with the agricultural scientist, and going through the administrative machinery to the village, and ultimately to the farmer.

Research Objectives

In order to specify in somewhat greater detail the areas of content with which this study is concerned, we have listed below what might be called our research objectives. Before doing that, however, we must stress that we have chosen to focus on the village rather than on the individual villager as our unit of analysis. At a later stage of the broad research program of which this study is a part, we will also be concerned with the villager himself. For the present, however, it seemed important to obtain some comparative information on the larger social unit in which the cultivator carries on his daily work, the agricultural village. Nearly all Indian cultivators do live in villages, farming on plots of land at various points outside that village. Beyond the immediate family, the village is very probably the social unit which is most important in shaping the individual, making him the kind of cultivator he is.² Since very little information is yet available which permits systematic comparison of

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1. For a useful general reference, see C. C. Taylor, Douglas Ensminger, H. W. Johnson, and Jean Joyce, *India's Roots of Democracy*, Bombay: Orient Longmans, 1965.
 2. See Srinivas' defence of the village as the most important social unit beyond the family in M. N. Srinivas (ed.), *India's Villages*, Bombay: Asia Publishing House, 1960.

villages from different areas, differing in resources, differing in degree of isolation and so on, it seemed to us important to focus here on the agricultural village.³

Then, having decided on the village as our unit of analysis, it was of course imperative to determine to what extent villages differed in utilization of modern agricultural technology. For our purposes, the criterion of success in the process of conveying information and technology to the village is the extent to which the modern practices have been put to use in the village. Success or failure in conveying technology are relative terms. We needed a sensitive measure which would permit comparison among many different types of villages on the relative success or failure of agricultural change programs. The following chapter will detail how this measure was constructed.

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

1. We were interested in determining to what extent major differences in the way change programs are organized, administered, and executed might affect eventual success. For that reason we selected villages from three states, differing in the type and extent of citizen control over change programs. And we gathered information from both villagers and change agents about the way change programs were carried out in the villages.

2. However programs are administered, they must in one way or another reach the village. For that reason we thought it important to look at various indicators of both physical and social isolation, and differences in use of various media of communication, as factors affecting program success.

3. Differences among villages in the land and other resources available for agriculture are certain to affect the production process; therefore, we wanted to take such differences into account.

4. Then, the social structure of the village should have a bearing on program success. Information may reach a village but must penetrate

3. There are many village studies, some of which permit limited comparisons across villages. The point here is that available research does not permit inter-village comparisons on a systematic basis. Some of the better known studies of one or a few villages are: A. R. Beals, *Gopalpur: a South Indian Village*, New York: Holt, Rinehart and Winston, 1963; S. C. Dube, *India's Changing Villages*, Ithaca: Cornell University Press, 1958; O. Lewis, *Village Life in Northern India*, Urbana: University of Illinois Press, 1958; McKim Marriot (ed.), *Village India*, Chicago: University of Chicago Press, 1955; M. N. Srinivas, *India's Villages, op. cit.*, and *Religion and Society Among the Coorgs of South India*, Bombay: Asia Publishing House, 1965; and W. H. Wiser and C.V. Wiser, *Behind Mud Walls*, Berkeley: University of California Press, 1963. Among the very few attempts to compare larger numbers of villages on a regional or national basis are L. K. Sen and P. Roy, *Awareness of Community Development in Village India*, Hyderabad: National Institute of Community Development, 1966.

to all levels and all sub-groups within that village to be effective. Village structure will probably affect the degree of such penetration within the village.

5. And, similarly, the nature of village leadership may well affect program success. Intra-village diffusion of relevant information will, to some extent, depend on the change-proneness of leaders and on the location of these leaders at strategic points in the local social structure.

6. Finally, we felt that differences among villages in the level of development of social institutions such as schools, co-operatives or youth organizations, might account for some of the differences in success of agricultural change programs.

Each of the above broad areas of interest is taken up in one of the succeeding chapters. Tentative conclusions are drawn as to the particular aspects of isolation, social structure, and so on, which seem to make an important difference in the success of agricultural change programs at the village level. Then, in the final chapter, these several tentative conclusions are examined jointly. The apparently crucial variables from each of the earlier chapters are analyzed in a multivariate design and more general conclusions are drawn.

SAMPLE SELECTION

Our analysis is based on data from 108 villages. These villages were selected in such a way as to permit what we hope is the maximum achievement of our research objectives within the practical limits of available research talent and financial resources. A detailed description of the sampling design follows.

Sample Criteria

Conceptually, the sample of villages for the study was intended to allow generalizations for India rather than particular states or regions. This is admittedly a formidable task, given the great number and diversity of Indian villages. Within the definite limits of available resources, staff, and language skills, the sample was selected on the basis of the following criteria.

1. The different strategies of development and the relative intensities of these strategies were to be incorporated. Hence at the state and district levels a *purposive selection* was made of three strategies of state development administration, and also of the relative intensities manifested by the intensive agricultural development program or package program

(IADP), the tribal development program, and the more or less normal development program.⁴

2. Beyond the purposive selection described above, the sampling was to be random. Hence, below the district level a *three-stage random* design was used to select three development blocks, six village level worker (VLW) circles, and 12 villages from each selected district.⁵ This tended to concentrate the sample villages so as to minimize logistic problems in field work, yet provide a normal spread of villages from the more successful to the less successful.

Selection of States

Three states were selected to represent different modes of involvement of local self-government (panchayat raj) in development administration. The three were: Andhra Pradesh, to represent locally elected people at the block level; Maharashtra, with locally elected people involved at the district level; and West Bengal, to represent areas in which the emphasis on local self-government has only recently been instituted, and popular control over development administration is thus still least direct, coming from the state level.⁶

Selection of Districts

Within each state the differing intensities of development input plus the range of differences in agricultural productivity were represented by purposive selection of three districts: (1) the IADP district was selected because it has the highest levels of development input, and with assured irrigation and relatively favorable agricultural conditions generally, tends to represent high levels of agricultural productivity;⁷ (2) a second district in which at least one of the blocks was organized under the tribal develop-

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4. A state in India generally corresponds to a linguistic region. There are 17 states at present. For administrative purposes each state is divided into several districts. At least one district in each state has been singled out for more intensive development efforts under a national programme known as the Intensive Agricultural Development Programme (often referred to as IADP or Package Programme, the latter in view of an emphasis on supplying inputs in combination, or in a 'package'). And further, areas having substantial proportions of tribal people are often provided different and more intensive development inputs under the national tribal development programme.
 5. Administrative districts are divided into development blocks, consisting of roughly 100 villages each. The block development staff is administered by a BDO who heads a team of specialists in agriculture, co-operatives, animal husbandry, and so on. The villages in a block are organized into circles of seven to ten villages, and at least one multi-purpose worker, called a VLW, is assigned to each circle. The VLW is supervised and advised by the block-level specialists.
 6. See *Panchayats at a Glance*, New Delhi: Ministry of Community Development and Co-operation, Government of India, 1962.
 7. See Taylor, *et al.*, *op. cit.*

ment program was selected, both to represent the higher level of development input under the tribal program, and to represent some of the less productive agricultural portions of each state, since tribals tend to be concentrated on less productive land;⁸ and (3) a third district with normal development inputs was selected to 'balance' the other two, so that the three districts added together were similar to the state as a whole with respect to certain characteristics (see Table 1).

TABLE 1: SAMPLE DISTRICTS COMPARED WITH SAMPLE STATES AND WITH ALL-INDIA TOTALS ON SELECTED CHARACTERISTICS
(Source: 1961 Census of India)

	Andhra Pradesh		Maharashtra		West Bengal		All-India
	Sample districts	State	Sample districts	State	Sample districts	State	
Per cent population, rural	69.1	82.6	82.7	71.8	87.0	75.6	82.0
Per cent adult population, literate ..	16.1	21.1	25.0	21.5	24.6	29.3	24.0
Per cent of total population, tribal ..	3.5	3.7	7.4	6.1	7.6	7.6	6.8
Acres of land per person..	1.2	1.1	1.4	1.6	0.5	0.4	0.4

Selection of Blocks

Within each of the selected districts three development blocks were selected at random, with one partial exception. In the district chosen to represent tribals, one block was selected at random from among the tribal blocks, and the remaining two blocks from that district were randomly selected from the non-tribal blocks.⁹ In total, then, there were nine blocks selected in each of the states.

Selection of Village Level Worker (VLW) Circles

Villages within a development block are typically organized into circles served by a given VLW. The number of villages in a circle depends on the level of program input but is typically about seven to ten in blocks or districts that have not been singled out for special treatment. Lists were made, in each sample block, of all VLW circles, and then those

8. See U. N. Dhebar, *Report of the Scheduled Areas and Scheduled Tribes Commission 1960-61*, New Delhi: Government of India, 1961; and Verrier Elwin, *Report of the Committee on Special Multipurpose Tribal Blocks*, New Delhi: Ministry of Home Affairs, Government of India, 1960.

9. Block selection in Maharashtra deviated from this pattern in that only the tribal block was selected from one district, and two additional blocks were randomly selected from a fourth district. This was done in order to provide greater geographic representation to the unusually diverse agro-climatic regions of that state. No tribal block was selected in West Bengal because none of the blocks in that state is organized under the tribal development programme.

circles in which the current VLW had been working for less than two years were eliminated. We intended to obtain data about the characteristics of the VLW and village receptivity to change programs, and felt that these data would be most meaningful if we restricted our sample of villages to those in which the VLW had been working continuously for two years or more. Two circles were then randomly selected from the list of eligible circles in each sample block.

Selection of Villages

Two villages were randomly selected from each of the circles we had chosen. We, therefore, had two villages from each of two circles, for a total of four villages per sample block. With nine blocks per state, this gave us 36 villages per state and, therefore, 108 villages for the nation. We should repeat at this point that we did not deliberately select 'good' or 'bad' villages. Sample villages were randomly selected, within the restrictions given above, to give us a more or less normal distribution of villages, ranging from the least successful to the most successful in terms of acceptance of agricultural development programs.

Selection of Village Respondents

Since we had decided to focus on the village as our unit of analysis, we were faced with three alternative procedures for obtaining data about the village: (a) we could depend entirely on village records and other secondary sources of data; or (b) we could interview all village residents and aggregate their responses to obtain village scores on particular variables; or (c) we could interview selected respondents in a village and aggregate across this lesser number to obtain village-level data.

For reasons of economy, we employed a combination of the first and third alternatives stated above. Much information about the village was obtained from village, block and other official records. And then, eight selected respondents were interviewed to provide further data on the village and to cross-check some of the data from official records.

Respondents were selected on the basis of leadership roles, on grounds that village leaders would be in the best position to give us accurate and reliable data on the village. Five formal leaders were systematically chosen from each village to include: (a) the president of the village governing body, the village panchayat, or the vice-president if the president was not available; (b) the village school teacher, and we might note here that all of the sample villages had primary schools;¹⁰ (c) the secretary of the

10. About 95 per cent of India's villages have primary schools. See L. K. Sen and P. Roy, *op. cit.*

local co-operative society, if the village had a co-operative; (d) a priest or minister, with the proviso that the person interviewed had to be paid for his religious services, i.e., we did not select what might be called informal religious leaders; and (e) the formal leader of a youth organization or some similar organization, with the field team exercising its own good judgment as to which person should be interviewed from among those fitting the general description.

Each of the formal leaders was then interviewed and in the process was asked to name several persons from the village to whom he would go for advice on agriculture. All of the choices (omitting choices of formal leaders who had already been interviewed) were then listed for the village as a whole, and three such persons who received the highest scores were interviewed.

With five formal leaders and three opinion leaders for each of 108 villages our design called for a total of 864 leader interviews. The specified pattern was followed in most villages but the number of leaders actually interviewed ranged from as few as six in several villages, to as high as ten in several others. Where several formal leadership positions were occupied by the same person, one or more additional informal leaders were interviewed. A smaller number of formal leaders, however, also meant a more restricted list of choices from which we could select informal leaders. For that reason, it seemed more meaningful to reduce the number of leader interviews in several villages. In contrast, in some villages there were several co-operatives and, therefore, several co-operative secretaries, several teachers, or several formal leaders of some other type and it seemed wiser to include them rather than risk missing a key individual. For that reason the number of leaders interviewed was increased in certain villages to nine or even ten.

The total number of village leaders interviewed was, therefore, 856 for an average of 7.9 per village. We cite these numbers here only for purposes of providing background information, for in this study we have consistently aggregated leader responses to yield a total village score. These village scores were computed so as to take into account the fact that the number of leader interviews was not constant for all villages.

Selection of Change Agency Respondents

In addition to the village records and village leader data, we also obtained information from community development personnel who were most directly involved with introducing modern agricultural technology into the sample villages. In each case we wanted information about program inputs as well as about perceived village acceptance of those inputs. We, therefore, obtained data from 66 VWs, all those serving

the 54 selected circles; from the 36 agricultural extension officers (AEOs) serving sample villages; and from 25 of the 27 block development officers (BDOs) in charge of the 27 sample blocks.¹¹

DESCRIPTION OF THE SAMPLE AREAS

The three states we selected span the breadth of India — one western coastal state, an eastern coastal state and a north-eastern state. *Agriculturally* the states taken together adequately represent Indian rice growing, cash crops such as jute, cotton and tobacco, and some of the millets like *jowar* and *bajra*. One weakness which was brought to our attention was the absence of the wheat growing areas. While negotiating the project in November 1965, we had considered several northern wheat states, but the Pakistan emergency made any long-term research effort in this sensitive area imprudent. In addition, a fairly substantial similar project had just been completed in Uttar Pradesh, a wheat growing state, which we would draw on for comparative purposes.¹² *Administratively*, the three states represent three strategies of community development administration in the rural areas. *Linguistically*, from the staff likely to be available, our talent was likely to be concentrated in two or three states. Anything beyond three languages with English as a link language seemed too formidable. In short, we felt that the three states selected, plus the comparable study in the Uttar Pradesh, would provide a fair cross-section of Indian villages.

Andhra Pradesh, the state in which the National Institute of Community Development, our research base, happens to be located, is agriculturally, administratively and culturally complex. It had a population of 36 million in 1961. It has three regions: *Circars*, the coastal region which is agriculturally rich with the deltas of the Godavari, Krishna and Pennar rivers, and which was previously a part of British India in Madras Presidency; *Telangana* was part of the old princely state of Hyderabad and is agriculturally poorer, linguistically more mixed, and has a higher proportion of tribals; *Rayalaseema* is also agriculturally poorer, with uncertain rainfall and irrigation. The soils of Rayalaseema and Telangana are red-laterites with some black-cotton areas. The linguistic state of Andhra Pradesh was carved out of Madras Presidency and

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11. Some circles, and hence sample villages, had more than one VJAW. Typically there is one AEO per block and, therefore, there would be 27 in total, but just as with circles, some blocks have more specialists assigned to them. Two BDOs were not available for interview because of extended leave and transfer.
 12. Prodipto Roy, *The Impact of Communication on Rural Development in India*, Hyderabad: National Institute of Community Development (in press). Comparisons with these data are for the most part implicit rather than explicit.

Hyderabad in 1956. We took one district from each region in order to get geographic and agricultural representation of the state.

The state of Maharashtra is also fairly large and regionally perhaps even more complex than Andhra Pradesh. The total population of Maharashtra was just under 40 million in 1961. Maharashtra may also be viewed as three regions. *Vidarbha*, the eastern region, grows cotton, *jowar* and some wheat. The area has fertile black-cotton soil and has fairly assured rainfall. *Marathwada* is the region which was formerly part of Hyderabad state, a millet growing area with medium-black soils. The *Western Maharashtra* region was part of Bombay Presidency, and has a wide variation in agro-climatic zones. The coastal strip of this region has heavy rainfall, and with lateritic soils has rice in the plains and millets on the hill slopes. The *Western Ghats* (hills rising 3-6,000 ft) have heavy rain on the western slopes and light rains on the lee-ward side. The state was politically carved out of Bombay, the state of Madhya Pradesh, and the former state of Hyderabad.

West Bengal is politically the remnant of the excision of East Pakistan from India, plus one district formerly in the state of Bihar. It had a total population of 35 million in 1961. The major agricultural area consists of the lower reaches of the Ganges Valley and delta, growing rice and jute, and dominated by metropolitan Calcutta. This area has dense tropical forests in the lower reaches of the delta. The western region consists of plateau area, agriculturally poor with some tribal population, rich with coal and iron and constituting an industrial hinterland. A long neck of drier land connects the sub-montane northern tea-growing region with the rest of the state. For purposes of sampling, we selected one district from each area but excluded certain atypical influences: the metropolitan-industrial belt, and the highly commercialized tea growing plantation economy.

In each state, after several trials, three or four districts were selected and summed together. Then they were compared with the state as a whole with respect to certain broad agricultural and demographic characteristics. The comparisons of the sample areas with the states are given in Table 1 with respect to per cent rural population, literacy, per cent tribal population and the land-man ratio. We also compared the type of soil, amount of irrigation, proportion of commercial crops grown, productivity, and several other relevant characteristics before selecting the districts.

RESEARCH PROCEDURE

Personnel Selection and Training

Any major field study requires a substantial number of field workers if the data are to be gathered in a relatively short period. Restricting the

period of field work is fairly critical in most studies in that intra-sample comparisons can be distorted by variation in the cropping season in which data are gathered, to mention only one type of time-lapse problem. In addition, personnel needs are increased by the vast language differences within India which essentially restrict the utility of field workers to the area of their mother-tongue. Urban respondents can be interviewed in a national language, in many cases; but this is not usually possible in villages. We, therefore, had to recruit three separate field teams to interview in the three states, with of course the requirement that they all have at least one other language in common to communicate with each other and with other staff members.

For the reasons given above, three teams of five members each were recruited. One member of each team served as team leader to guide the team in establishing rapport, to supervise the interviewing process, and to deal with problem situations. Team leaders were selected from among candidates with doctorates in one of the social sciences. Team members, who were responsible for the bulk of the interviewing, were selected on the basis of having completed a master's degree in one of the social sciences, preferably having prior field experience, having a career interest in social science research, and of course the requisite ability to pursue such a career. Two of the interviewers were women and the remaining ten were men.

In spite of the relatively high level of training and research experience, the entire research staff was engaged in a substantial training program prior to beginning field work. The objectives of the training were to familiarize all staff members with the research objectives and design, and to gain a clear practical command over the various interview schedules. In addition to the formal training sessions, the field teams conducted two pre-tests of the interview schedules, partly to gain experience with the schedules and most directly to try out question wordings and format. In a sense, the climax of the training procedure was then to bring the teams together at the end of the training process, and to utilize both the understanding of the research objectives and the practical insight into question wordings toward the end of obtaining comparable vernacular translations of the interview schedules into the three regional languages.

Field Procedure

The field work itself was conducted from mid-September to mid-December, 1966. The typical procedure was for the field team to establish contact with development personnel in the headquarters of a given block, select sample villages, and interview the selected change agents at the block level. With this background information the team would proceed to a given village, obtain required data from village records and, on the

basis of contacts thus made, proceed with the personal interviews. In this manner the field workers usually spent only two to three days in one village. This meant that they could not, practically speaking, reside in the village but had to work doubly hard to establish rapport in a brief time. Establishment of rapport was of course facilitated by the fact that only those with most contact with the larger society, the village leaders, were interviewed.

Where interviewees were not available, a persistent effort was made to locate them and obtain the interview. This meant that the field team might have moved on to another village with one person returning to interview a respondent who had been away from the village earlier. The general intent was to minimize substitutions and, therefore, abide by the patterned selection of respondents. By and large, the intent was realized and few substitutions were made.

Methods of Analysis

Finally, we will conclude our description of the machinery of the research process with a few statements describing methods of analysis. Details of index construction and establishing relationships between indicators of various kinds will be given in the chapters describing the analysis. The general rule followed in constructing measures of various kinds was to devise a valid and parsimonious, but also relatively simple measure if at all possible. Thus we preferred proportions and percentages to a somewhat more complex ratio, for example, in order to maintain as much identity as possible between responses to specific questions and the abstract number which was eventually used in the analysis.

All of our data were by one means or another converted to numbers, to enable us to use punch cards, computers, and other techniques to manipulate these data.¹³ This was a choice based not only on questions of efficiency in data handling but was practically required by our research objectives. Our intent was of course not only to compare villages on a certain dimension but to conduct a multivariate analysis of the several dimensions which appeared to be critical in contributing to program success. Multivariate analysis is tremendously facilitated by the use of modern computers.

The general plan of the analysis is, therefore, to build from simple descriptive statistics and bivariate tests of hypotheses to an ever broader structure of relationships among interdependent variables. A village is, after all, a complex combination of interacting elements. Thus any analysis of villages demands consideration of complex inter-relationships.

13. Machine data processing was done by the Computer Centre, Programme Evaluation Organization, Planning Commission, Government of India, New Delhi.

Measurement of Change Program Success

CONCEPTUAL PROBLEMS OF MEASUREMENT

AGRICULTURE in India is an old and complex way of life. Many of the food and fibre crops and domestic animals of the world were originally developed in India, and have formed the basic economy of the land for millenia. The country is large and densely populated with little communication, resulting in separate sub-cultures of agricultural organization, which are reinforced by linguistic differences and differences in methods of agricultural production. Only for brief periods, such as the reign of Ashoka (third century, B.C.) and the Moghals (seventeenth century, A.D.), and latterly the British, was the country even politically unified. Today, under a modern nation state, efforts are being made to galvanise agriculture by radical changes in its technology.

In the present framework, agriculture is a 'state subject' and hence each state has autonomy in deciding its policy and methods of execution of agricultural development. The central government's department of agriculture acts only as an advisor, provides part of the funds, and attempts to formulate some broad national framework of policy. The national extension service (NES) and the community development program have administered the dissemination of new agricultural technology at the village level for the past 10 to 15 years. There is some national co-ordination of change programs, but the measurement of change program success is rather difficult in view of the diversity of the country.

Further, very few diffusion studies have used units of analysis other than the individual cultivator.¹ The unit of analysis we selected for this phase of the study was the village. The central problem of measurement

1. See C. Milton Coughenour, "The Rate of Technological Diffusion Among Locality Groups", *American Journal of Sociology*, 69 (January, 1964), pp. 325-339; A. V. van den Ban, "Locality Group Differences in the Adoption of New Farm Practices", *Rural Sociology*, 25 (September, 1960), pp. 308-320; and James A. Duncan and Burton W. Kreitlow, "Selected Cultural Characteristics and the Acceptance of Educational Programs and Practices", *Rural Sociology*, 19 (December, 1954), pp. 349-357. The latter two studies used 47 townships and 38 rural neighborhoods, respectively, and used an average adoption score for a sample of farmers as the measure of agricultural adoption.

then was to obtain reasonably *valid and reliable* data for comparisons among 108 villages from diverse regions of three states of India. Only the common denominator of program acceptance and specific items applicable to *all* villages could be used. More specifically, we addressed ourselves to three aspects of measurement. First, we tried to determine what was common in the agriculture of the nine districts selected from the three different states, and whether it could be statistically compared. Second, is the success of the village only an aggregate of cultivator adoption, or are there simpler measures such as village adoption or leaders' adoption which can be used? And third, should we use only objective measures of adoption or could we also use reputational items? If both, how do they relate to each other? Are the denotative referents for reputational measures, among different respondents, too widely disparate to include both objective and reputational items in a single measure?

All the three states in our sample have had a somewhat similar framework of agricultural development under the schematic block budget, with some differences in the degree of local self-government and pattern of administration. The wide range of agricultural programs includes the development of land, irrigation, the introduction of specific innovations such as fertilizer, pesticides, and improved seeds, new implements plus animal enterprises and allied services and credit. Since land and water are to a great extent natural endowments, and the changes which have taken place under the new development administration are rather difficult to measure, the relatively new agricultural technology was considered a more visible manifestation of agricultural innovation during the past decade or two. For those reasons, we concentrated our measure of the dependent variable around items related to new agricultural technology.

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

Perhaps an illustration will clarify the problems of computation. One of the questions put to VLW was: 'How much improved seed was distributed in this village last cropping season by the community development organization and other sources for the two major food crops and one major cash crop?'

Using other data along with responses to this question, the first major crop for which complete data were available was used to compute an improved seed index. The acreage of the crop grown, multiplied by the recommended seed-rate (obtained from the three state agricultural departments), was used as the denominator. The amount of improved seed, obtained from the above question, was used as the numerator and the fraction was expressed per cent. In spite of the fact that different crops were being grown with different acreages and seed-rates, the conceptually clear *percentage of acreage adoption for improved seed* for the most important food crop grown in the village was computed in a manner we considered to be acceptable.

In short, the problem of measuring the dependent variable resolved itself into a parsimonious selection of objective and reputational items, each of which were judged to be validly and reliably measuring a dimension from the general area of content labelled 'agricultural innovation'. Then we tested each of the item distributions for state differences. Finally, those items which proved to be pragmatically useful were logically organized in the most meaningful manner.

ITEM SELECTION

Since measurement of the dependent (and many independent variables) at the village level was in many ways a pioneering venture, both the pre-test and the final interview schedules tended to be inclusive rather than exclusive. In other words, shot-gun approach was used to garner a large pool of items from which one could *ex post facto* select the most appropriate items. Initially a larger number of agricultural programs than the eight mentioned above were selected for pre-test, and many more items were used from administrative reports available from extension workers, and from other sources. The purpose was to get the same information from two or three sources in order to check reliability.

In general, the experience of the pre-test proved that far too much information was being gathered and that a great deal of culling was needed. It was found that some questions were redundant, and others of variable quality. Different informants were sometimes quoting from the same primary source. The general decision was ruthlessly to cut down the size of the schedules to be used for collecting the data. The most reliable source was selected, using a minimum of complementary items to check reliability.

The pre-test also showed that comparable data from all the three states and all districts were not available for many items and programs, or the distributions were such that comparison was difficult. For example,

the amount of fertilizer distributed in a village was generally at the ceiling of the supply available. Differences among villages in fertilizer use were then a function of the type of change program in force in the village, and these bureaucratic differences could not be standardized. Hence only a reputational measure of the perceived utility of fertilizers, and the number of leaders using fertilizer were used as measures of acceptance of this program. Even after careful screening, however, the final schedule contained some items for which reliable information was available from one or two states, and no data were available for the other state or from certain blocks and, therefore, the items had subsequently to be dropped.

Types of Data

Data for the dependent variable were obtained from extension agents at both block and village levels, from village leaders, and from village records. The information sometimes refers to the village as a whole, sometimes to the cultivators in the village, and sometimes to the selected leaders. A word of explanation is needed to logically and mathematically justify these data as measures of the village as a unit. Measures pertaining to the village as a whole were used as such or, as in the case of improved seed mentioned above, were standardized on a comparable unit such as the acreage of land. In some instances we have equated the village as a whole with the aggregate of its cultivators. This seemed justifiable because of our primary interest in agriculture. Thus a measure of the proportion of village cultivators using a certain practice was treated as a village measure. Then, we have treated the eight selected leaders as representative of an upper echelon of the village. We have assumed that adoption of innovations by this echelon reflects village adoption to some extent, and have essentially compared villages in terms of upper echelon performance.

Criteria for Item Selection

The first criterion for item selection was the occurrence of missing data or zero frequencies. If there was no information on the program for over five to ten villages normally the item was dropped. Exception to this rule were 'good' items which could be maintained by applying image-analysis in scaling, i.e., possession or non-possession of an item could be determined from whether or not it fell within the scale pattern. An illustration of this was the improved seeding index mentioned above which had 'missing data' for six villages, and was used in the improved seed sub-scale. It did not, however, scale with the other improved seed items and was subsequently eliminated (see Table 3-A, item 5). *Zero*

frequencies were of a similar nature but basically showed that a certain program definitely was not in operation in a number of villages. As long as state distributions were not different, even 20 to 30 villages with zero frequencies were tolerated.

A qualitative knowledge about programs and field work, the validity of an item response, overlapping with other items, and variation in meanings or variation in interviewing quality, were used in various combinations to reject items.

Quite often we used a second order *abstraction* of a concept rather than more specific items. For example, we could not use sale of ammonium sulphate or superphosphate but 'fertilizers'. Or the sale of paddy seed or wheat seed was abstracted to 'improved seed for first food crop'. Another similar mechanism we used was to contrive items by collapsing two items into one. For example, the number of artificial inseminations performed, and the number of improved-bull services, each had too many zero frequencies to use separately but, when combined, yielded a usable item. Logically, the programs are complementary.

The *distribution* of each item was analysed within states, between states and for the total. From knowledge of the local situation a decision was made as to whether the frequencies looked plausible and statistically acceptable. Thus distorted frequencies, high zero frequencies or other implausible total distributions were eliminated. Generally, we dropped items if the between-state differences were significant. One exception to this rule is given in Table 2: the acreage of plant protection in West Bengal for the first food crop was about one-tenth of the acreage in the other two states. The item was, however, kept and the cutting-point adjusted in the Guttman scale for pesticides (Table 3, sub-scale D). Although this adjustment did reduce errors, in order to maintain conceptual uniformity this differentiation was dropped in the final index of 17 items (cf. Table 3-D, item 8, and Table 7, item 11).

TABLE 2: VILLAGE DISTRIBUTION BY STATES FOR ACRES UNDER PLANT PROTECTION (FIRST FOOD CROP)

				A.P.	M.	W.B.	Total
500-	acres or more	..	..	7	8	0	15
200-499	" "	..	..	6	5	0	11
50-199	" "	..	..	10	11	6	27
10-49	" "	..	..	7	10	15	32
0-9	" "	..	..	4	2	15	21
No information	" "	..	..	2	0	0	2
	Total	..	..	36	36	36	108

Finally, the question of *circularity* prompted us to err on the side of caution. In the final selection, only items which specifically related to the success of the agricultural innovation program were included. Peripheral items, such as those relating to difficulty in obtaining fertilizer

or pesticides, were allocated to the independent variable of administrative services. To quote a well-worn maxim, no item included in the dependent variable should constitute an item in any independent variable. It is possible that two independent variables may use a common item.

In this manner the pool of items relating to the dependent variable was selected. The final pool of questions on the dependent variable included 20 which were put to village leaders, 20 put to the VLW, and two questions put to block level extension agents, for a total of 42 questions.

SCALES AND SUB-SCALES

Is there a single measurable dimension which can be termed village agricultural innovation? Do the objective and reputational items measure the same dimension? These two central questions will govern much of the ensuing discourse and the final construction of a measure of success or failure of the agricultural programs in the village. The questions were first tackled logically and the optimum solution was pragmatically determined, and then the questions were tackled empirically to test the logical solution and adjustments were made.

Objective and Reputational Items

It would seem logical that reputational or objective items dealing with agricultural innovations should have much in common. The man who adopts fertilizer should also feel that it is benefiting him or his village. The village which the VLW ranks high on a Cantril-type self-anchoring ladder,² designed to determine where 'the CD programs have been most successful', should be the village where agricultural innovations have been adopted.

However, there are slightly different denotative meanings which introduce an element of dissimilarity between some objective and reputational items. For example the above question refers to 'the CD program', whereas the objective measures refer only to eight of the 20 to 30 agricultural programs, and none of the non-agricultural programs. Or the village leader adopting fertilizer may feel that the unintelligent use of fertilizer is ruining some village crops. In short, the referents of some objective and reputational items are not exactly the same.

The reputational items generally had broader frames of reference, as illustrated above, and sometimes these frames of reference were not even the same for different respondents. For example, a Cantril-type ladder was used to rank village success by the leaders, the VLW, and block-level

2. See F. C. Kilpatrick and Hadley Cantril, "Self-Anchoring Scale, a Measure of Individuals' Unique Reality Worlds", *Journal of Individual Psychology*, 16 (2), 1960.

personnel. The VLW's stated frame of reference was 'in your circle'. Block-level respondents used as their frame of reference the villages 'in your block', whereas leaders used the self-anchoring ladder to evaluate how much change had taken place in five years to him 'in his village'. The ladders are thus estimates of within-village change, within-circle change and within-block change. Leaders, VLWs and block-level extension agents probably have some experience of other villages, circles, and blocks but, in the context of these questions, are only ranking within these confines. A defence of varying frames of references of the items is that they measure *relative* changes. What is regarded as successful agriculture in a poor tribal area may not be objectively comparable to successful agriculture in the Ganges delta, but the degree of change is relatively comparable.

It seemed to be most logical, therefore, to analyse the reputational items separately from the objective items. From the total pool of items on the final interview schedules there were in total 42 acceptable questions relating to agricultural innovations, which had relatively complete data with distributions which seemed plausible. Of these 42 questions, 28 questions were objective measures and 14 were reputational measures. It was decided to reduce these items to two summary scales.

Sub-scales

The 28 questions relating to objective measures yielded 39 items, and the 14 reputational questions yielded 14 items. The problem of item weighting was also considered along with logical and pragmatic collapsing and elimination of items. After a preliminary examination of distributions and content of all the items, it was decided that the items fell logically into sub-areas which could be analysed most efficiently by the use of Guttman scalogram blocks. These blocks permitted a four-point distribution for each item, manifested by four colours: black, red, grey and white. The sub-areas of the dependent variable were as follows: (1) Improved seed adoption (7 items); (2) Improved implement adoption (6 items); (3) Cattle and manure adoption (9 items collapsed to 7); (4) Pesticide treatment adoption (9 items); (5) Leaders' agricultural adoption (8 items); (6) Cantril ladders (6 items); and (7) Leaders' evaluation of agricultural innovations (8 items).

The first five sub-areas are objective measures and the last two sub-areas are reputational. The first four sub-areas were each reduced to three-item scales. These four sub-areas were then used as single four-point items and scaled with the fifth sub-area into a single summary objective scale. The last two sub-areas were combined into a single reputational scale. In this manner the seven sub-areas were reduced to two summary scales, one objective and the other reputational.

The purpose of the scalogram analysis was to pragmatically and logically accept or reject different items of measurement, by first empirically analysing distributions and setting up cutting-points with the four block colors, and then visually examining the scale pattern of the items in juxtaposition. A decision could then be arrived at on the basis of item scalability. The decision on cutting-points, prior to scaling an item, sometimes required that two or three measures had to be collapsed to obtain sufficient data. This is somewhat similar to the H-Technique employed in Guttman scaling.³ Even though items were pragmatically scalable, they were often logically dropped because two questions were overlapping measures of the same dimension, or the quality or meaning of one question seemed to yield a more valid measure than another. This method of qualitative weighing of items seemed to be essential for the kind of data that were being used for the dependent variable. The results of the scalogram analysis are presented in Table 3.

TABLE 3: SUB-SCALE ITEMS SHOWING CUTTING-POINTS, NUMBER OF ERRORS, AND ACCEPTANCE OR REJECTION (N = 108 VILLAGES)

Item	Cutting-point	Number of errors	Accepted or rejected
A. Improved Seed Scale			
1. 1 per cent or more bought high yielding variety for second food crop or cash crop ..	13	19	Out
2. 10 per cent or more of cultivators bought improved seed for cash crop ..	24	9	In
3. 10 per cent or more bought high yielding seed for first food crop ..	33	17	Out
4. 10 per cent or more of cultivators bought improved seed for second crop ..	44	14	In
5. 10 per cent or more acreage of most important crop was sown with improved seed ..	58	20	Out
6. 10 per cent or more of cultivators used improved seed for first food crop ..	69	11	In
7. VLW estimates that 10 per cent of cultivators would grow a new variety ..	83	23	Out
Total errors ..		113 = 14.9 per cent	
Final scale errors ..		34 = 10.5 per cent	
B. Improved Implement Scale			
1. 20 per cent or more using third implement	28	0	In
2. 1 or more third implement owned ..	52	6	Out
3. 1 per cent or more using second implement ..	79	5	In
4. 1 or more second implement owned ..	84	5	Out
5. 1 per cent or more using first implement ..	93	8	In
6. 1 or more first implement owned ..	94	4	Out
Total errors ..		28 = 4.3 per cent	
Final scale errors ..		13 = 4.0 per cent	

3. S. A. Stouffer, *et al.*, "A Technique for Improving Cumulative Scales", *Public Opinion Quarterly*, 16 (Summer, 1952), pp. 273-291.

TABLE 3 (Contd.)

C. *Animal and Manure Adoption Scale*

1.	20 or more artificial inseminations or improved bull natural inseminations	14	7	In*
2.	1 or more improved cattle supplied to village ..	28	10	In
3.	1 or more poultry birds supplied ..	43	12	In*
4.	10 per cent or more used green manure ..	80	8	In*
5.	4 or less local bulls in village	101	26	Out
6.	1 or more compost pit dug	103	13	In
Total errors ..		76	= 11.7 per cent	
Final scale errors ..		50	= 9.2 per cent	

D. *Pesticide Scale*

1.	10+ acres emergency use second food crop ..	0	11	Out
2.	10+ acres emergency use cash crop ..	6	14	Out
3.	10+ acres emergency use first food crop ..	8	19	Out
4.	10+ acres general use second food crop ..	15	18	Out
5.	50+ acres general use for cash crop ..	22	20	Out
6.	10+ acres total use for cash crop ..	34	12	In
7.	50+ acres total use for second food crop ..	42	20	In
8.	500+ acres total use for first crop (50+ acres for West Bengal)	65	8	In
9.	10+ acres general use for first food crop ..	85	20	Out
Total errors ..		142	= 14.7 per cent	
Final Scale errors ..		40	= 11.1 per cent	

* For a short-scale only these 3 items were used: Correlation with long-scale, $r = .88$

Summary scales

The four sub-scales above, each with four scale types, were then used as individual items for the summary objective agricultural innovation scale, along with the eight items of leaders' adoption, (see Table 4.) This summary scale analysis implicitly weights each item equally. Four of the final eleven items in the summary scale are based on estimates of cultivators' adoption of innovations, and seven on leaders' adoption of innovations. Perhaps the leaders' adoption has been overweighted, but the data were primary and were considered to be harder than the estimates of cultivators' adoption by the VLW, even where these were based on records.

The scaling technique also tests the unidimensionality of an area of content, and hence all of the items theoretically belong to the same universe or pool of items. The objective summary scale had 17.1 per cent error, or a co-efficient of reproducibility of about 83 per cent, and can, therefore, barely be considered a quasi-scale. The cutting-points of the items ranged from 16/108 to 97/108, fairly evenly dividing the villages into a flat distribution. The errors seemed to be randomly distributed and the pattern appeared visually to represent a relatively cohesive dimension.

Hence, in spite of the fact that according to Guttman scaling conventions the scale did not reach an acceptable level of scalability, it was decided that the summary measure was a good approximation of village agricultural innovation from the data available. Since extremely divergent types of information from several sources had been condensed to form items in the scale, it was felt that normal scaling conventions could be relaxed.

TABLE 4: SUMMARY OBJECTIVE AGRICULTURAL INNOVATION SCALE (N = 108 VILLAGES)

Item	Cutting-point	Errors	Acceptance or rejection
1. 1 or more leaders adopted poultry ..	.. 3	10	Out
2. Pesticide treatment scale (2 + 3) ..	.. 16	8	In
3. Improved seed scale (2 + 3) ..	.. 24	16	In
4. Animal and manure short scale (2 + 3) ..	.. 31	25	In
5. 6 or more leaders used improved seed ..	.. 39	22	In
6. 1 or more leaders used improved cattle ..	.. 46	24	In
7. 6 or more leaders used pesticides ..	.. 55	13	In
8. 7 or more leaders used fertilizers ..	.. 61	19	In
9. 2 or more leaders used new implements ..	.. 70	20	In
10. 3 or more leaders used green manure ..	.. 84	16	In
11. Implement scale (2 + 3) ..	.. 92	29	In
12. 3 or more leaders used compost pits ..	.. 97	13	In
Total errors ..	215	= 16.5 per cent	
Final scale errors ..	205	= 17.1 per cent	

Similarly, the 14 reputational items were tested for scalability, and ten items were selected (Table 5). The elimination of four items was on both empirical and logical grounds. For example, the VLW's ranking of the villages in his circle from high to low on a Cantril-type ladder had a 25 per cent scale error. In addition, logically the variation between the 54 circles is itself so great that it would not be reasonable to assume that this ranking could be valid across the 108 villages. On the other hand, the BDOs' and AEOs' ladder rankings, although they suffer from the same limitations to a degree, have a more universal all-India standard. This is because block officials are trained in regional training centres covering three to four states, and move all over their own states. Hence their rankings were logically more acceptable, and the errors at 14 and 18 per cent were less, pragmatically.

The reputational summary scale has a co-efficient of reproducibility of about 85 per cent and is again, therefore, only a quasi-scale. However, taking into account the fact that data were collected from four different respondents we considered this scale to be the best measure summarizing the reputational items into one dimension.

TABLE 5: SUMMARY REPUTATIONAL SCALE OF SUCCESS IN THE AGRICULTURAL PROGRAM

Item	Cutting-point	Errors	Acceptance or rejection
1. Leaders' rate utility of poultry 1+ ..	15	5	In
2. Average leaders' ladder difference between past and present, one step or more ..	31	24	In
3. Leaders' rate utility of improved cattle 2+ ..	44	17	In
4. Leaders' rate utility of new implements 2+ ..	60	14	In
5. Block development officer's ladder rating 3+ ..	69	14	In
6. Agricultural extension officer's ladder rating 4+ ..	73	18	In
7. Leaders' rate utility of pesticides 3+ ..	80	33	Out
8. Leaders' rate utility of compost 3+ ..	86	26	In
9. Leaders' rate utility of green manure 3+ ..	90	20	In
10. Leaders' rate utility of improved seed 3+ ..	97	9	In
11. Average leaders' ladder difference present to future 5+ ..	97	21	Out
12. Average leaders' ladder rating of present 4+ ..	99	21	Out
13. Leaders' rate utility of fertilizer 4+ ..	103	14	In
14. Village level worker's ladder rating of village 4+ ..	103	25	Out
Total errors (for 14 items) ..	261 = 17.1 per cent		
Final scale errors ..	161 = 14.9 per cent		

INTERCORRELATIONS AND FACTOR ANALYSES

The intercorrelation between the objective and reputational scales was .375, which is significant at the .01 level, but indicates less than 20 per cent common variance. As suggested in the discussion of the objective and reputational items, the problem of having slightly different referents for the items may explain why the two measures are not more closely related. The intercorrelation also suggests that the two areas of content are sufficiently different that they would be difficult to merge as a single dimension.

The final empirical defence of the Guttman scale was the implicit equal weighting of items as opposed to a differential weighting on the basis of the intercorrelation of items and factor loading. Two matrices of intercorrelations of all the raw items, both objective and reputational, were computed. In general the matrices showed a high proportion of low and statistically insignificant correlations, about 70 per cent. About 25 per cent of the total correlations were negative. This indicated that probably no single factor would explain much of the variance. These matrices also showed that the items selected by Guttman scaling seemed to have higher intercorrelations, within sub-scales, and did seem to be the best items empirically.

However, in order to test the possibility of differential weighting further, we selected only the raw items used in all the Guttman sub-scales for further analysis. The two correlation matrices, of 21 and 10 variables

respectively, were subjected to factor analysis, and the first five component factors were extracted from each matrix. The first five factors extracted from the reputational matrix explained 64.5 per cent of the variance. The first factor explained 20.8 per cent of the variance and the others about 10 per cent each. The first factor had four variables with more than .300 loading, the second factor had only two such variables, and the remaining three factors had only one variable each.

The factor analysis of the reputational items, thus, did not yield any one or two sufficiently coherent dimensions which could provide guidelines for a differential weighting system. On the contrary, the factor analysis indicated a lack of unidimensionality, and confirmed to some extent the results of the Guttman analysis. In the absence of any clear differential weighting, the quasi-scale with equal weighting of the items seemed to be the most appropriate single measure of success from the reputational items.

Similarly, the correlation matrix of 21 raw items, from which the sub-scales and summary scale of the objective items were constructed, was examined by factor analysis. From the matrix of 21 items, a crude summation of zero-order correlations was made. Three items included in the sub-scales or summary scale which had low weighted sums of correlations, and which also had the highest number of negative correlations, were eliminated. Since this eliminated the compost pit program, one item previously excluded from the long cattle and manure sub-scale which had an average weightage, was included. Thus 19 raw items were selected for factor analysis (Table 6).

TABLE 6: FACTOR LOADING OF 19 OBJECTIVE ITEMS ON FIRST COMMON FACTOR

Variable	Loading
1. Number of leaders using pesticide .. ..	.645
2. Number of leaders using improved cattle .. ..	.415
3. Per cent cultivators bought improved seed, first food crop .. ..	.397
4. Per cent cultivators bought improved seed, second food crop .. ..	.453
5. Per cent cultivators bought improved seed, cash food crop .. ..	.477
6. Per cent cultivators using first implement .. ..	.287
7. Per cent cultivators using second implement .. ..	.219
8. Number of improved cattle supplied to village .. ..	.517
9. Number of improved cattle in village .. ..	.513
10. Per cent cultivators using green manure .. ..	.528
11. Number of compost pits dug in village .. ..	.431
12. Number of improved bull inseminations in village .. ..	.498
13. Number of artificial inseminations in village .. ..	.480
14. Acres of plant protection of seed, first food crop .. ..	.487
15. Acres of plant protection of seed, second food crop .. ..	.284
16. Number of leaders using fertilizer .. ..	.443
17. Number of leaders using green manure .. ..	.434
18. Number of leaders using improved implements .. ..	.350
19. Number of leaders using improved seed .. ..	.599
Latent root	3.97
Per cent of variance	42.05

The factor analysis of the intercorrelations of these 19 items yielded a first component factor which explained 42 per cent of the variance. All of the items made a positive contribution to this first factor, with loadings varying from .65 to .22. Fifteen variables had loadings of .40 or above. Four more factors were extracted, explaining descending proportions of the variance. The five factors together explained 96 per cent of the variance. The remaining four factors, however, had a number of negative loadings suggesting that the first factor alone constituted a dimension toward which all items made a positive contribution. The factor analysis thus showed that all the 19 items were positively related to the most important component factor. The factor loadings of each item are given in Table 6.

RESCALING AND INDEXING

Four of the 19 objective items used for factor analysis were collapsed into two contrived items due to high zero-frequencies and complementarity of programs. The final 17 items thus selected for rescaling comprised six leader adoption items, six cultivator adoption items, and five village adoption items. The Guttman scale had a coefficient of reproducibility of 81.2 per cent, manifesting, as was expected, a slightly lower degree of unidimensionality than the 12-item summary scale. However, the cultivator items and village items seemed to be more evenly balanced.

The scale suffered from two defects. First, the distribution was slightly skewed and uneven, with 19 villages in the highest scale type and only four in the lowest. In addition, several of the intermediate scale-types had only one or two villages. And second, it was observed from the color-pattern of the blocks, that on account of the number of errors and combining of categories, some of the discrimination within scale-types and also across scale types was being sacrificed.

In order to remedy these defects it was decided to compute an index giving an equal weight for each item, and a 3-2-1-0 scoring for each item, depending on the amount of discrimination within each item. This new summary index had a more normal distribution with a range of scores from 2 to 51.

The items comprising the final scale, showing the scale-type cutting-points, errors, and the final index-scoring are given in Table 7. The index had a better distribution for purposes of correlation analysis and had better discrimination. The index was selected over the scale as the best measure of the objective items related to agricultural innovation. This objective index was selected as *the main dependent variable* for use in our analysis, over the summary reputational scale.

TABLE 7: REVISED SUMMARY SCALE-TYPES WITH CUTTING-POINTS, ERRORS, AND INDEX-SCORING OF ITEMS

Item	Guttman Scale		Final Index-Item Scoring			
	Cutting-Points	No. of errors	Black 3	Red* 2	Grey 1	White 0
1. Number of leaders using green manure ..	10+	30	5+	3-4		0-2
2. Per cent of cultivators using first implement ..	99	12	20+	1-19		0
3. Per cent of cultivators using second implement ..	96	18	20+	1-19		0
4. Number of compost pits dug in village ..	94	13	100+	10-90		0
5. Number of leaders using new implements ..	85	23	5+	2-4		0-1
6. Number of leaders using fertilizer ..	76	24	8+	7	6	0-5
7. Number of leaders using pesticides ..	71	21	7+	6	4-5	0-3
8. Per cent cultivators buying improved seed, first food crop ..	64	20	25+	10-24		0-9
9. Per cent cultivators using green manure.. ..	63	18	50+	10-49		0-9
10. Number of leaders using improved cattle ..	54	19	1+			0
11. Acres of first food crop seed treated ..	44	19	500+	100-499		0-100
12. Number of leaders using improved seed ..	35	28	7+	6	4-5	0-3
13. Number of improved cattle supplied or in village ..	33	25	1+			0
14. Number of artificial inseminations or improved bull services in village ..	28	26	20+	1-19		0
15. Per cent cultivators buying improved seed second food crop ..	24	19	25+	10-24		0-9
16. Acres of second food crop seed treated ..	23	21	50+			0-49
17. Per cent cultivators buying improved seed, cash crop	19	10	25+	10-24		0-9
			Total errors	..	346	
			Per cent error	..	18.8 per cent	

* The Guttman scale item category cutting-point for all items was between black and red combined *versus* grey and white combined.

Development Administration and the Success or Failure of Agricultural Change Programs

IN this chapter we will attempt to appraise how agricultural program administration has affected agricultural development in the villages. The 'government' or administration in India connotes an all-pervasive power, manifest in a labyrinthine bureaucracy which 'deals' with the total agricultural program. *First*, we will briefly describe the historical origins of the government departments connected with agriculture, their penetration to the village level, and whether the years of service rendered is related to the amount of agricultural adoption. *Second*, we will examine the effects of the major thrust of panchayati raj as to whether the delegation of power or decentralization of power affected agricultural adoption. *Third*, even within states, the Indian administration has experimented with more intensive administrative inputs like the 'package' program and the tribal development program. Here we will examine whether there is more agricultural adoption in those villages with more administrative input or not. *Fourth*, we will examine whether specific characteristics of extension agents and the manner in which they work, affect the degree of adoption in the villages. *Finally*, we will attempt to assess the relative importance of the several different aspects of administration with regard to agricultural adoption.

ORIGINS OF AGRICULTURAL CHANGE PROGRAM

The administration of the agricultural programs for the villages of India today stems historically from two main sources — the department of agriculture (and animal husbandry), and the community development

program. The former was established before the turn of the century, along with agricultural research and agricultural education,¹ and the latter was instituted in 1952. In 1966, both these departments were merged in the central government. Most states have, however, not yet merged these departments.

Directly associated with the agricultural program is the co-operative department, for supplies and services; the revenue department for land improvement loans; the irrigation department, for major, medium and minor irrigation; and latterly the panchayati raj department. Indirectly associated with the agricultural program are: the public works department which is concerned with the building of godowns, or storage facilities, roads and other structures; the industries department which is connected with agro-based village industries; and the electricity department which is concerned with the supply of power. If one wished to stretch the bureaucratic labyrinth farther, to the provision of basic amenities for farmers like drinking water, schools and medicines, then the departments of health, social welfare, and education are also involved. In this chapter we will deal only with the departments most directly concerned with the administration of agricultural programs.

The department of agriculture was established in India before the turn of the century and was strengthened as a consequence of the famine in 1880. Its tasks included agricultural research, agricultural education, and agricultural extension or development. The veterinary department also started just before the turn of the century, and has latterly taken over animal husbandry and a production orientation to animal industries. The co-operative department was formally started in the early 1900s as a credit organization.³ Prior to independence, there were the three departments which were directly concerned with agriculture. Except for revenue and law and order officials, there was no government agency which had its staff living in or going to the villages on a regular basis. The lowest rung of the British development ladder stretched mainly to the district sub-division, each of which covered about 500 villages, with some states having one agricultural department at the taluk, or approximately the present block level. The department staff at the taluk, the sub-division or the district level is hopelessly inadequate to contact all village families under their jurisdiction.

The community development program, which aims at the comprehensive development of total village life in which

1. Nitya Gopal Mukerji, *Handbook of Indian Agriculture*, Calcutta: Government of India, 1915, p. 1.
2. See *Livestock Census of India 1956*, New Delhi: Government of India, 1956.
3. E. M. Haugh (Revised by K. Madhava), *The Co-operative Movement in India*, Oxford: Oxford University Press, 1959.

be a part, perhaps the most important part, was preceded by various governmental and non-governmental endeavours. Gandhi's example at Sevagram,⁴ Tagore's scheme at Sriniketan,⁵ Hatch's work in Kerala,⁶ the Wisers' work in Uttar Pradesh,⁷ Brayne in the Punjab,⁸ the Firka development of Madras, and the rural development department of Bihar⁹ were the precursors which pointed toward a more integrated pattern of total rural development. The immediate precursor was Albert Mayer's pilot project in Etawah district in Uttar Pradesh.¹⁰

The community development program was formally instituted in 55 community development projects in 1952, under a project director, S. K. Dey, who had worked in refugee re-settlement at Nilokheri.¹¹ S. K. Dey subsequently became the Union minister for community development, and was the main architect of the program for over a decade. These initial community development projects were intensive area development schemes. They had adequate financial resources, and were designed to be economic initiators which would act as multipliers. Seven months after the initiation of the program, the first five-year plan was issued. The fact that the main author of the Grow More Food Campaign Enquiry,¹² V. T. Krishnamachari, became deputy chairman of the planning commission, and that he had as the Deputy Chief Administrator) of Baroda in the thirties conceived of an integrated approach to all aspects of village life, perhaps made him the arbiter of the pattern of growth of the community development program. Thus, after a short intensive beginning, the community development program very quickly became an extensive program, designed to spread over the entire rural area of the nation in a phased manner within ten years. By 1963, except for certain inaccessible areas, the entire nation was covered by about 5,000 community development blocks.¹³ The program has been in operation for five years which reflect the level of financing by the central government and state governments under what is called a schematic budget.

The objectives of the community development program are spelled out in both specific and abstract terms at the

4. For Sevagram, see M. Pyarelal, *Mahatma Gandhi*, Ahmedabad: Navrang Traders, 1959.
5. Sugata Das Gupta, *A Poet and a Plan* (Tagore's Experiment in Sriniketan), Calcutta: Thacker Spink and Company, 1963.
6. D. Spencer Hatch, *Up From Poverty*, Calcutta: Oxford University Press, 1963.
7. William and Charlotte Wiser, *Behind Mud Walls, 1930-1950*, Berkeley: University of California Press, 1963.
8. F. L. Brayne, *Better Villages*, London: Oxford University Press, 1958.
9. N. K. Roy, *Model Village Republics*, Calcutta: Thacker Spink and Company, 1958.
10. Albert Mayer and others, *Pilot Project India*, Berkeley: University of California Press, 1958.
11. S. K. Dey, *Nilokheri*, Bombay: Asia Publishing House, 1963.
12. *Report of the Grow More Food Enquiry Committee*, New Delhi: Government of India, 1958.
13. *Community Development at a Glance*, New Delhi: Government of India, 1963.
14. B. Mukerji, *Community Development in India*, Calcutta: Orient Longmans, 1963.

reiterated in a seminar held at the National Institute of Community Development in late 1966.¹⁵ In general, the broad purposes of the program were an all-round development of villages through economic development, social welfare and political participation. The welfare component may also be viewed as the social infrastructure of education, health, communications and housing, which were considered the necessary conditions for economic growth. The emphasis of the program has shifted from tenancy reforms to agriculture, to panchayati raj, and now back to agriculture. These emphases are reflected in the financial inputs, personnel inputs and volume of legislation.

Within the broad framework of rural development, agriculture still looms as the central objective of the program. Agriculture as 'a way of life' applies more to India than to most developed or underdeveloped countries. Perhaps China, and certain other South Asian countries, are the only comparable 'agrarian cultures'. This agrarian culture has been nurtured for millenia in the agricultural village, which has been idealized in Indian literature as a self-sufficient village republic — *Grama Panchayat*. The strategy of development has been to make the village self-sufficient in food and services. This strategy has been questioned¹⁶ and the village may no longer be explicitly or implicitly considered the sole unit of development.¹⁷ Notwithstanding, the village as *the* pattern of agrarian settlement is 'there'. Very few farmers in India, except in Kerala, live in isolated homesteads. The fact that this agrarian settlement has a socially meaningful set of relations that can be sociologically identified as a 'village community', we do not feel can be questioned. Hence we decided to study the village as the most meaningful social unit, above the farm family, in which agricultural change takes place. We do not mean to imply that other larger political units like the block, or a district, or a state are not meaningful units of study for agricultural development. But we do mean that the village is sociologically *one* unit which can be studied, and is perhaps the most meaningful social entity within which agricultural change takes place.

The program has been spread over the nation between 1952 and 1963. A brief decade and barely three years have elapsed before the effect of the program is being gauged. At the end of 1966, there were in India 1,853 stage I blocks, 2,220 stage II blocks, and 1,191 post-stage II or stage III blocks.¹⁸ This is not quite the same as the distribution of villages

15. U. C. Ghildyal, *Objectives of Community Development and its Role in National Development*, Proceedings of the Seminar held on 7-8 October, 1966, Hyderabad: National Institute of Community Development, 1967.

16. John P. Lewis, *Quiet Crisis in India*, Bombay: Asia Publishing House, 1965.

17. U. C. Ghildyal, *op. cit.*

18. See *Report 1966-67 of the Department of Community Development*, Ministry of Food, Agriculture, Community Development and Co-operation, New Delhi: Government of India, 1967, p. 6.

in each stage in India. Our sample had 24 stage I villages, 36 stage II villages and 28 stage III villages. Twenty villages, mainly in Andhra Pradesh, could not be unambiguously assigned a stage because of the reorganization of blocks in Andhra Pradesh in 1965.

Did the villages we selected which were in stage III and, therefore, had more than ten years of exposure to the community development program, show more agricultural innovation than the villages with less exposure? We correlated the adoption index with the stages measuring period of development exposure. The data show an association which was statistically significant at 1 per cent level (see Table 8). The agricultural programs have been accelerated in recent years and hence the stages do not in fact show marked differences. The existing differences are in the expected direction, however.

Next, we determined when each of the specific institutions which provide agricultural services was started, to see if the years of service of each institution affected the degree to which agricultural practices were adopted. Table 8 shows the years of service of each of the agricultural service institutions and the correlation with agricultural innovation. In all cases longer service is associated with higher levels of adoption. Besides the stage of the block, only the years of service of the VLW headquarters and the panchayat headquarters were significantly related to agricultural adoption, however.

Another way of showing the extension of agricultural administration into the villages is to determine how far the cultivator has to go to obtain various agricultural services. Is proximity of each of these services related to success of the agricultural program? Except for the panchayat and the block headquarters, the distance of the village from the agricultural services was significantly related to adoption. The distances of the VLW headquarters, the co-operative, and the veterinary center had the greatest effect on level of adoption. Ninety-seven villages had panchayat headquarters within one mile.

TABLE 8: YEAR WHEN AGRICULTURAL SERVICE INSTITUTIONS WERE STARTED AS RELATED TO AGRICULTURAL ADOPTION

Institution	1963-66	1959-62	Before 1958	D.K.†	Correlation Coefficient
1. Stage of block ..	24	36	28	20	.25**
2. VLW headquarters ..	25	38	28	17	.22*
3. Co-operative ..	10	33	55	10	.06
4. Panchayat ..	20	27	53	8	.33**
5. Veterinary center ..	5	31	45	27	.10
6. Godown ..	35	25	16	32	.03

* Statistically significant at 5 per cent level.

** Statistically significant at 1 per cent level.

† The high 'don't-know' responses for stage of block and VLW headquarters were due to reorganization of block areas. Co-operatives, veterinary centers, and godowns were initially started under the British and, therefore, exact dates were frequently not known.

Because the distribution was skewed, the correlation analysis did not show a significant association. A scale of the proximity of these six institutions was constructed.¹⁹ This proximity scale was very significantly related with agricultural adoption, but not more closely than two of the individual services.

TABLE 9: DISTANCE OF AGRICULTURAL SERVICES FROM SAMPLE VILLAGES, AND THE RELATIONSHIP OF DISTANCE WITH AGRICULTURAL ADOPTION

Service	In Village	Under 1 mile	1-4.9 miles	5-9.9 miles	Over 10 miles	Correlation Coefficient
1. VLW headquarters ..	40	12	45	9	2	.38**
2. Co-operative† ..	76	6	20	5	0	.30**
3. Panchayat ..	89	8	7	3	1	.14
4. Veterinary center† ..	8	3	42	33	20	.25**
5. Godown† ..	17	4	36	30	13	.21*
6. Block headquarters ..	4	0	23	41	40	.16
7. Proximity scale ..	—	—	—	—	—	.28**

* Statistically significant at 5 per cent level.

** Statistically significant at 1 per cent level.

† These rows do not add up to 108 because of missing information.

DEGREE OF LOCAL SELF-GOVERNMENT

The major recommendation of the Committee on Plan Projects which was set up to study the community projects and the national extension service was the 'decentralization of the responsibility and power . . . to a body which . . . will have the entire charge of all development within its jurisdiction'.²⁰ The report goes on to specify that the term development work covers 'agriculture, animal husbandry, co-operatives, minor irrigation, village industries, primary education, local communications, sanitation, health and medical relief, local amenities and similar subjects'.²¹ The Committee differentiated between the delegation of power to lower

19. The Guttman scale had a coefficient of reproducibility of 89.4 per cent. The scale consisted of the following items:

	Cutting-point	Errors
Block headquarters less than 5 miles ..	89	8
Veterinary dispensary less than 5 miles ..	64	9
Godown less than 5 miles ..	59	12
VLW headquarters in village ..	47	20
Co-operative in village ..	23	13
Panchayat headquarters in village ..	11	8
Total errors: ..		70 = 10.6 per cent

20. *Report of the Team for the Study of Community Projects and National Extension Service*, Vol. I, Committee on Plan Projects, New Delhi: Government of India Press, November, 1957. (This is commonly referred to as the Balwantrai Mehta Committee Report).

21. *Ibid.*

levels and the decentralization of power to elected bodies. In this study, these two aspects have been treated separately. The Committee went on to anticipate that decentralization might result in a fall in efficiency in the short run.

Consequent on this report, each state has passed its own legislation and developed its own pattern of panchayati raj. Andhra Pradesh and Rajasthan were the first states to institute panchayati raj in 1959, using a block-level body — the panchayat samiti — to which the majority of the power and responsibility for development work was devolved. Other states like Maharashtra and Gujarat followed, using a higher level body at the district level, upon which power was devolved. A third group of states, including West Bengal, has been slower in passing panchayati raj legislation, and they have essentially not yet devolved full power and responsibility to local bodies. Our sample included one state from each of these three categories, to be representative of the different strategies of agricultural program administration.

In this study we asked three of the development workers — the BDO, the AEO, and the VLW — and also the leaders of each village, to tell us who decides various things related to agricultural development; who controls the community development program; who decides targets or how many acres will be planted with improved seed; or how will subsidies be distributed. Each respondent was asked four to ten such questions in order to determine whether, in the eyes of the agent or the leader, an elected body or an official controlled development, and also whether control was at a local level or at a higher level.²² In short, we tried to find out how much decentralization of power to elected people had taken place, and how much delegation of power to local bodies had taken place, as perceived by these actors in the village situation. Based on the total distribution of responses, an index was set up for each type of respondent.

22. For example, a question such as the following asked of the respondents: "Who decides the targets for the number of acres to be planted with improved seed?" Each such question was coded two ways:

Delegation, or level of decision-making			
0	District and above	..	0 Appointed official
1	District, block, anchal, and village	..	1 Appointed official
2	Block only	..	2 Appointed official
3	Block and anchal	..	3 Appointed official
4	Block and village	..	4 Elected official
5	Anchal	..	5 Elected official
6	Anchal and village	..	6 Community committee
7	Village (From panchayat opinion leaders of village)	..	7 People's committee
8	Individual, cultivators	..	8 People's committee

Since it was expected that state distributions would be different, no attempt was made to adjust for state differences. Thus a democratic decision-making or decentralization score was computed for each respondent, and also a level of decision making or delegation score.²³

The distributions in Table 10 show that the three states are different on both the degree of delegation and decentralization of power. However, the change agents and leaders do not always agree on rating the states on these two dimensions. To put it in other words, the four actors we interviewed, most closely associated with the administering of agricultural programs, did not unambiguously perceive any one state as the highest on decentralization or delegation of powers. Using crude sums of the four rankings, two surprising estimations emerge: (1) West Bengal, which has not yet really executed its panchayati raj program, was perceived as having the most delegation of power, and (2) Maharashtra, which is often held up as a model of panchayati raj, was perceived as having the least delegation and decentralization of power.

TABLE 10: DISTRIBUTION OF VILLAGES, BY STATES, IN TERMS OF EXTENSION AGENTS' AND LEADERS' PERCEPTIONS OF DELEGATION AND DECENTRALIZATION OF POWER

		Local Delegation			Democratic Decentralization		
		AP	M	WB	AP	M	WB
BDO	Low ..	12	24	12	16	20	24
	High ..	24	12	24	20	16	12
	Total ..	36	36	36	36	36	36
AEO	Low ..	12	16	18	22	26	14
	High ..	24	20	18	14	10	22
	Total ..	36	36	36	36	36	36
VLW	Low ..	16	20	11	8	14	21
	High ..	20	16	25	28	22	15
	Total ..	36	36	36	36	36	36
Village Leaders	Low ..	29	27	10	30	27	4
	High ..	7	9	26	6	9	32
	Total ..	36	36	36	36	36	36

23. For example, in scoring for indexes of agents and leaders, and by assigning a weight of 1 to each question, a simple arithmetic sum of the codes listed was used. Items constituting the AEO index are given below:

	Delegation	Decentralization
Who selects demonstrators ..	..	..
Who decides seeding targets ..	1+	4+
Division of seed among villages ..	..	..
Who controls CID ..	..	..
Subsidies among villages ..	4+	7+
Subsidies within villages ..	4+	4+
	4+	7+

Disregarding state differences we then tested whether the decentralization or delegation indexes of each agent and the leaders was related with agricultural adoption. A preliminary analysis, not shown here in detail, yielded almost no evidence of relationship between these indexes and agricultural adoption. These findings seem to belie the assumptions made by the Committee on Plan Projects that decentralization would result in more development. On the other hand, the criticism received from the bureaucratic officials that the agricultural programs are inefficient because of panchayati raj is also not upheld. If anything, there is a slight positive relationship, showing that the villages in which leaders and agents felt power had been decentralized to elected bodies, were slightly more successful in administering agricultural programs than the villages where this had not been done.

From the above we may generally infer that states which have instituted panchayati raj have not necessarily decentralized or delegated power in quite the way that the broad outlines of legislation would lead one to expect, and that villages with higher levels of delegation and decentralization do not seem to have correspondingly higher levels of agricultural adoption. We then simply asked the agents and leaders we interviewed if they felt community development was better executed before or after panchayati raj. The opinions expressed were, in general, favorable. A majority of the leaders in 83 of the 108 villages said that development administration was better after panchayati raj. The same favorable opinion was expressed by half the VLWs and BDOs, but only 31 per cent of the AEOs.

We then asked a number of questions trying to determine whether the general critique that panchayats were favoring their own caste or group was hindering agricultural adoption. We found that in villages where leaders felt the panchayat worked for all people there was a somewhat higher level of agricultural adoption. Contrariwise, in villages where the VLW felt that panchayats were mainly interested in their caste or relatives there was a negative effect on adoption. Analysis of responses from the block-level change agents showed a similar relationship. Though none of the relationships was strong, in general the criticism is upheld by the data, that where panchayats are interested in their own group, caste, or relatives, there is less agricultural adoption.

THE TYPES OF ADMINISTRATIVE INPUTS

Two notable variations on the normal pattern of development have been the 'package' districts and the special multi-purpose tribal blocks. The package program stems from a Ford Foundation team's 'Report on

India's Food Crisis and Steps to Meet It'.²⁴ The report does not spell out the pattern of intensified personnel, credit and supply inputs envisaged in the package districts. These were developed subsequently. Briefly, the program first selected one district in each of seven states which had a relatively high level of assured water resources. In these districts, the extension personnel input was virtually doubled, along with a substantial increase in the availability of credit and supplies. The extension emphasis was to propagate a 'package' of practices — seed, fertilizer and pesticides — so that with the assured irrigation, substantial visible increases in agricultural production would accrue. There are now package districts in almost all states, and these have been supplemented by partial package districts, intensive agricultural areas, and various modifications of the more intensive agricultural administration.

The second variation on the normal block program was the tribal development program. India has about 25 million people who are classified in the census as belonging to scheduled tribes. These tribes were provided special privileges and treatment under the British administration, and were in many ways 'protected from exploitation'. The tribal people occupy the most forested, least accessible, and agriculturally the poorest sections of the country. A special program to intensify the development of these areas, and the tribal people, was instituted in 1956-57, and later formulated into a policy as a result of the Dhebar Presidential Commission report.²⁵

We did not intend to evaluate either the package program or the tribal development program but rather sample areas which would provide a wide range of villages with high and low agricultural development, and also different types and intensities of administrative strategy. In each state we selected one package district and a total of 36 package villages. We tried to select one tribal block in each state, but since West Bengal legally has no tribal blocks, our sample contained only eight tribal villages. The remaining 64 villages are called 'normal' villages.

We found that the villages in the package districts had a somewhat higher level of agent contact than the normal block (the contact measures are described below). Leaders from the package district, however, did not show higher levels of contact with agricultural agents than those in either tribal or normal blocks. We compared the success of agricultural adoption in the three types of program and found that villages in the tribal blocks were inferior to the package and normal villages. In short,

24. *Report on India's Food Crisis and Steps to Meet It*, New Delhi: Government of India, April, 1959. See also *India's Roots of Democracy*, by Carl C. Taylor, Douglas Enslinger, et al., Bombay: Orient Longmans, 1965, pp. 249-259.

25. *Report on the Working of the Special Multipurpose Tribal Blocks*, New Delhi: Government of India, 1959. See also, *Report of the Scheduled Areas and Scheduled Tribes Commission*, New Delhi: Government of India, 1961.

the three strategies of administrative input we sampled did not categorically manifest very great differences in terms of agents' contact or leaders' contact, nor were these sampled areas very different in success or failure of the agricultural program.

Having looked at various intensities of administrative inputs, another basic concern was to more accurately determine whether the amount of contact that each village had with the extension agent was related to agricultural adoption. Village contact with extension agents was measured in two ways: (a) agents' statements as to their visits to the village; and (b) leaders' visits to the block, and the number of times leaders had talked to various agents.

TABLE 11: AGENTS' CONTACT, LEADERS' CONTACT AND AGRICULTURAL ADOPTION IN PACKAGE, TRIBAL AND NORMAL ADMINISTRATION VILLAGES

			Package	Tribal	Normal
Agents' contact with village	Low	..	17	6	39
	Higher	..	19	2	25
	Total	..	36	8	64
			$X^2 = 2.87$	d.f.2	
Leaders' contact with agents	Low	..	15	3	25
	Higher	..	21	5	39
	Total	..	36	8	64
			$X^2 = .09$	d.f.2	
Agricultural adoption	Low	..	20	7	28
	Higher	..	16	1	36
	Total	..	36	8	64
			$X^2 = 5.92$	d.f.2	

TABLE 12: GOVERNMENT AGENTS' CONTACT WITH VILLAGE AS RELATED TO AGRICULTURAL ADOPTION

Type of agent contact	Correlation Coefficient
1. Number of AEO visits to village in past six months	.. .. .25**
2. Number of VAW visits in past six months	.. .. .38**
3. Per cent of VAW time in village	.. .. .34**
4. Number of agricultural demonstrations in village	.. .. .39**
5. Index of agent contact	.. .. .50**
6. VAW lives in village	.. .. .37**
7. Number of government officials residing in village	.. .. .32**

** Statistically significant at 1 per cent level.

The correlation between agricultural adoption and each of the items of agent contact are given in Table 12. Each of the first four items, which directly measure intensity of agent contact, are very highly correlated with adoption. A combined index of these four items was constructed.²⁶ This cumulative agent contact index correlated with a coefficient of .50, which was higher than any of the individual items. Whether the VLW lived in the village, and the number of government officials living in the village, were both correlated with agricultural adoption. In short, every measure of agent contact with the village demonstrated a significant relationship with agricultural adoption.

The other way we measured contact with the extension agency was to determine to what extent the leaders made visits to the block headquarters and spoke with various agents. Each of these items was significantly related to the success or failure of the agricultural development program. The average number of times the leaders talked with the AEO was most closely associated with agricultural adoption, followed by the number of times talked with the VLW and the BDO. A combined index of all these items was constructed.²⁷ This index of leaders' contact with the extension agents correlated with a coefficient of .52 with agricultural adoption.

TABLE 13: LEADERS' CONTACT WITH AGRICULTURAL AGENTS AS RELATED TO AGRICULTURAL ADOPTION

Item	Correlation
1. Leaders' visits to block headquarters .. .. .	.19*
2. Average number of times talked with VLW .. .. .	.44**
3. Average number of times talked with BDO .. .. .	.41**
4. Average number of times talked with AEO .. .. .	.51**
5. Average number of times talked with extension officer for co-operatives	.36**
6. Average number of times talked with extension officer for panchayats	.35**
7. Average number of times talked with veterinary doctor .. .. .	.30**
8. Index of leaders' contact .. .. .	.52**

* Statistically significant at 5 per cent level.

** Statistically significant at 1 per cent level.

26. A Guttman scale only yielded a coefficient of reproducibility of 84 per cent and hence an equally weighted 2:1:0 index was used, based on the distribution of each item:

	0	1	2
AEO visits/six months	0-2	3-9	10+
VLW visits to village/six months	0-3	4-9.7	9.8+
Per cent of VLW time in village	0-15	16-29	30+
Number of demonstrations in two years	0-0	1-4	5+

27. The extension performance index consisted of the following items, weighted 1 each:

- VLW listens to big cultivators a 'lot', 3 or more leaders.
- VLW listens to small cultivators a 'lot', 3 or more leaders.
- VLW 'very helpful', 3 or more leaders.
- BDO 'helpful', 3 or more leaders.
- AEO 'helpful', 3 or more leaders.

The agricultural program has been criticised in various ways: difficulties in obtaining supplies, delays in getting loans, broken promises by agents, and so on. We asked the VLW and the leaders the following question: 'Provided the farmers were willing to pay for it, how much difficulty did they have last year to get sufficient fertilizers? Would you say much, some or none?' The same question was asked about pesticides, seeds, credit and implements. A simple three-point scoring based on these responses was used for the leaders and for the VLW.²⁸ Similar questions were asked with respect to delays and broken promises. In Table 14 the correlation between the evaluation of leaders with respect to difficulties, delays and broken promises and agricultural adoption is given. The four correlations between *difficulties* and *delays* and agricultural adoption are all in the expected direction, but only one, relating to delays in getting loans for fertilizers, was significantly related at 5 per cent level.

TABLE 14: RELATION OF DIFFICULTIES, DELAYS, AND BROKEN PROMISES WITH AGRICULTURAL ADOPTION

Item	Correlation
1. VLW index of <i>difficulties</i>	-.13
2. Leaders' index of <i>difficulties</i>	-.12
3. <i>Delays</i> in obtaining loans for fertilizers (leaders)	-.21*
4. <i>Delays</i> in obtaining loans for land improvement (leaders)	-.17
5. Leaders state promises <i>broken</i> 'sometimes'	.02

* Statistically significant at 5 per cent level.

CHARACTERISTICS OF EXTENSION PERSONNEL

Several characteristics of extension workers may affect the success or failure of change programs. Background features such as age, marital status, education, particularly agricultural training, we felt may be related to the effectiveness of the propagation of agricultural innovations. The years of experience a worker had, or how long he had been serving

28. A Guttman scale yielded a 85.7 per cent coefficient of reproducibility, with a skewed distribution, and hence an index was constructed using three-point equal weighting.

	0 None	1 Some	2 Much
Difficulty getting fertilizer
Difficulty getting pesticides
Difficulty getting seed
Difficulty getting credit
Difficulty getting implements

in the block, may affect the success or failure of the program. His competence and the quality of his work, may affect agricultural development. How much of his own initiative a worker uses, or conversely how authoritarian he is, may be related to adoption of agricultural practices.

In the framework of program administration, it is difficult to ascribe either the success or failure of the program in a village to particular extension agents because of frequent transfers. In this respect the bureaucracy is impersonal and 'irresponsible', because the extension worker does not take personal credit for success nor does he take blame for failures. Very seldom does a BDO stay long enough in a block to see the fruits of his labor in even one or two of the programs he actively initiated. In this study we stipulated that the VLW should have been in the circle for at least two years before a circle would qualify for being in the sample. We could not further stipulate this condition for the AEO or the BDO, because of sampling difficulties.

None of the personal characteristics of extension agents which we examined showed any substantial relationships with village levels of agricultural adoption. The results of our analysis are not given in detail but tended to show that: younger extension agents were working as successfully as older ones; unmarried extension agents were only slightly less successful than those married; extension agents with more formal education were only slightly more successful than those with less; and the amount of training in agriculture, the amount of in-service training, and the frequency of agents' reading of professional journals were only slightly and to some extent inconsistently related with village levels of agricultural adoption.

TABLE 15: AVERAGE YEARS OF SERVICE OF EXTENSION WORKERS AND AN INDEX OF PERSONNEL TURNOVER

Variable	Average
Years of service, BDO	4.56
Years of service, VLW	5.98
Years in block, AEO	2.17
Years in block, BDO	1.28
Years in circle, VLW	3.41
Number of agriculture extension workers serving village in past 5 years	8.13

Table 15 shows the average years of service in the career of the entire career for the BDO and the VLW, and in the sample block or circle for these two plus the AEO. The figures are higher for the VLW because we restricted our sample to circles in which the current VLW had been working for at least two years. And further, given the short history of the entire program, it should not be surprising that most workers have

not been in a given location for more than a few years. This may well explain the fact that differences among the villages in personnel turnover are not related to levels of agricultural adoption ($r = .014$). The turnover index is a simple count of the total number of BDOs, AEOs, and VLWs who had worked in the sample village in the past five years. A preliminary analysis of the length of service of the particular types of agents suggested that only lower turnover in the block for the BDO might contribute to higher adoption levels.

Next, we obtained a rating of the VLW's competence by asking the eight leaders whether they felt the VLW knew the problems of village people, knew village traditions, whether he could convince people, and whether he could demonstrate practices. All of these variables were significantly related to village levels of agricultural adoption (Table 15a). We also constructed an index of VLW competence based on the above four items plus a rating by the AEO and it was also highly correlated with adoption.²⁹

TABLE 15A: LEADERS' RATINGS OF AGENTS' COMPETENCE AND PERFORMANCE AS RELATED TO AGRICULTURAL ADOPTION

Variable	Correlation
Leaders' estimate that VLW knows problems	.26**
Leaders' estimate that VLW knows traditions	.23**
Leaders' estimate that VLW can convince	.27**
Leaders' estimate that VLW can demonstrate	.44**
<i>VLW competence index</i>	.25**
Leaders feel VLW listens to big cultivators	.39**
Leaders feel VLW listens to small cultivators	.21*
Leaders feel VLW is helpful	.39**
Leaders feel BDO is helpful	.37**
Leaders feel AEO is helpful	.44**
<i>Performance index</i>	.39**

* Statistically significant at 5 per cent level.

** Statistically significant at 1 per cent level.

Closely akin to competence is the quality of the performance of the extension workers in the eyes of the beholders. The leaders were asked three questions on the work of the VLW, and two questions to evaluate whether the BDO and AEO were working successfully. We found that the ratings of performance of the VLW, AEO and BDO were all significantly related to adoption. The rating of the AEO as being

29. Competency index:

AEO rating competent or very competent

knows problems 6 + leaders

knows traditions 6 + leaders

can convince 6 + leaders

can demonstrate 6 + leaders

helpful had the highest level of significance. We then constructed an index of all five items³⁰ and this was also highly related with adoption.

Finally, we hypothesized that workers who were less authoritarian would propagate practices better, and also that extension workers who took initiative and did things on their own would be successful in propagating agricultural practices.³¹ We attempted to construct indexes of authoritarianism and initiative, using items which we felt would elicit whether extension workers felt that their initiative permitted them to work successfully, and also whether they perceived the structure as being relatively non-authoritarian.³² The items we used did not scale satisfactorily, however, therefore we cannot draw conclusions about relationships between these variables and agricultural adoption.

CONCLUSIONS

The community development program is essentially an extension of government services — particularly the nation-building departments of agriculture, health, and education — below the district sub-division down to a block of 100 villages, and lower to the VLW circle and village panchayat, so that every village and every farm family can have access to information, advice, supplies, and services to develop his family and his community. In this study we were concerned only with whether the provision of agricultural services related with the degree to which the village had adopted new agricultural practices.

First, we found that the greater the amount of contact the village had with agricultural extension agents the greater the amount of agricultural innovation in the village. We measured contact in terms of the number of times leaders talked with extension agents and the village of agricultural innovation in terms of an index of agricultural practices related to his related

30. Performance index:

- VLW listens to big cultivators 'lot'
- VLW listens to small cultivators 'lot'
- VLW 'very helpful' 3 + leaders
- BDO 'helpful' 7 + leaders
- AEO 'helpful' 7 + leaders

31. Donald A. Pelz, *Co-ordination, Communication and Initiative*. New Delhi: Indian Institute of Public Administration.

32. For example, the authoritarian scale for the VLW has

- (1) Illiterate cultivators will not understand
- (2) Cultivators need to be pushed
- (3) Extension workers should not listen to cultivators
- (4) Extension worker should present pros and cons
- (5) VLW should work long hours

The VLW initiative scale consisted of:

- (1) VLW sometimes or frequently can act on own
- (2) BDO solves problems in his own way
- (3) AEO solves problems in his own way

with a coefficient of correlation of .52, and also an index of agents' contact with the village, which had a coefficient of correlation of .50.

Second, we found that an index of competence of the VLW was significantly related with agricultural adoption. An index of performance of the various agents correlated with a coefficient of .39 with agricultural innovation. Other characteristics we examined such as age, education, seniority, and turnover did not explain much of the differences between villages.

Third, bringing the services nearer to the villages, affected the degree of agricultural change. A proximity scale of administrative services had a correlation coefficient of .29 with agricultural innovation. Among the services, distance from the VLW headquarters ($r = .37$), and the co-operative ($r = .29$), were the most closely related to adoption. Further, the years that community development had been in operation in terms of the five-year stages of blocks ($r = .25$), the years that the panchayat had been in operation ($r = .33$), and the years the VLW headquarters had operated ($r = .22$), were the measures most closely related to agricultural adoption.

Fourth, although many agents and leaders stated that they felt community development was implemented better after panchayati raj, our measures of the extension agents' and leaders' perceptions of decentralization and delegation of power did not manifest any consistent relationship with agricultural adoption in the villages. Further, the states with the longest experience of panchayati raj were not perceived as clearly having higher levels of decentralization or delegation of powers.

More specifically, we found the role of the AEO to be closely related to agricultural development of the villages: leaders' contact with the AEO ($r = .51$), leaders' evaluation of the AEO as being helpful ($r = .44$), and AEO's visits to the village ($r = .25$), all manifested significant relationships with the level of practice adoption. Further, the role of the VLW was also closely related to agricultural innovation: leaders' contact with the VLW ($r = .44$), VLW's performance ($r = .37$), feeling that the VLW can demonstrate agricultural practices, and VLW's visits to villages ($r = .37$), all showed significant relationships with adoption of agricultural practices in the villages.

Since our measure of agricultural success for innovations introduced after independence, and our measures of administrative services were nearly all within the purview of the community development program, we can conclude that the agricultural changes that took place in villages can, to a large measure, be attributed to the community development program.

Communication and the Success or Failure of Agricultural Change Programs

THE objective of this chapter is to determine the relationship of communication between the village and the larger society to the adoption of agricultural practices. Our general proposition concerning communication variables is that greater access and exposure to the larger society will contribute to higher levels of agricultural adoption.

MEANS OF COMMUNICATION

Means of communication include transport facilities such as roads, bus services, trucks and railways; the mass media channels of radio, newspapers, and magazines; and personal contact between various agents of change and their clientele. Communication, as the transmission of messages from one person or agency to another, can be interpreted so as to subsume almost all aspects of a development program. Given capital and physical resources, development depends upon the transmission of technological, motivational, educational and other kinds of information. On the basis of this information, social and economic changes occur. Viewed broadly, communication leads to shared meanings, through which an individual learns both expected behaviors and changes in these behaviors.

It may be noted here that the object of persuasive communication in community development is precisely to make changes in behavior; that is, to generate adoption of innovations calculated to facilitate development. Traditional methods of communication are chiefly inter-personal — people talking to one another, as individuals or in small groups. These traditional

methods have recently been augmented by the use of radio, television, and print. Both the traditional means of communication and the mass media have been supplemented by improved access to transport facilities, which enables people to be exposed directly to more communication stimuli.

SITUATIONAL VARIABLES

Communication provides stimuli for or against change in village situations, which vary in pre-conditions for development. Two situational factors were considered in this context. These are geographic isolation, as measured by distance of the village from development block headquarters and means of transportation, and mental isolation, as measured by selected items referring to norms and beliefs. These situational variables, of course, are also independent variables; that is, their effect upon agricultural adoption will be considered. It was hypothesized that greater the geographic and mental isolation of the village, the less would be the adoption of agricultural practices. It was expected that communication variables, in turn, would mitigate the effect of isolation, as transport facilities, mass media, and agency contact overcame the physical and mental obstacles.

ANALYSIS

The communication variables are grouped into six categories, reflecting the major factors investigated. Comparisons have been made by means of correlation coefficients showing the relationship between the communication variable and the index of adoption of agricultural practices. Most of the coefficients are statistically significant, but only four variables, in themselves, account for more than 16 per cent of the variability in adoption among the sample villages.

As will be explained more fully in the following section, on village resources, population size of the village was used as a control variable because of its positive and significant relationship to agricultural adoption. Thus, partial correlation coefficients are shown in Table 1, which control on population size. The effect of population size on agricultural adoption was not great, but was persistent enough so that it is presented in this analysis.

Geographic and Mental Isolation

It is apparent that village isolation, in the sense of distance from block headquarters, was not a factor in agricultural adoption. The

correlation coefficients are very nearly zero. The data for distance from block headquarters was highly accurate, as it was obtained from vehicle odometer readings and interviewer diaries. Villages ranged in distance from the block headquarters from one to 39 miles. There is the question of whether distance from block headquarters can be equated with 'distance from an urban center', which is more conventionally used as a measure of isolation. However, our data on distance from the block headquarters were more reliable than distance from a city, and it is likely that this center of development activity is more relevant for our study of agricultural adoption. Schuman, in his excellent social-psychological study of the impact of an experiment in co-operation upon economic development and individual change, also found distance from town to be a negligible factor in accounting for differences under study.¹

To further assess the degree of geographic isolation, three measures of access to transport facilities were used. Distances from paved road and from bus depot were both negatively and significantly related to adoption, but distance from railroad was positive and not significant. Only two villages had railroad stops located within the village and most were more than five miles away. As one might expect, paved road and bus depot are highly inter-related, $r = .81$, and only bus depot will be considered in later multivariate analysis. All three coefficients are given here because of the potential separate importance of these items. Thus, highways and highway transportation can be seen as factors which have helped to overcome distance from urban centers as a deterrent to adoption.

We have attempted to measure mental isolation, that state of mind which cuts one off from communication stimuli, by means of an index of attitudes toward programs of change and an index of secular orientation of leaders. Both reflect norms and beliefs which the individual can adhere to and which can effectively negate incentives to change. Because of possible interest in the separate items and their relationship with adoption, coefficients for all are given in Table 16. There was a substantial degree of inter-relatedness among the items and between individual items and the index, justifying index construction. 'Breaking the *jajman* relationship', a matter of lessened dependence on occupational caste relationships in a hypothetical case of adopting a steel plow, is not a formal program like the other four, but was intercorrelated positively with them.² All of the items, and their sum in index form, relate significantly to adoption when population is controlled. This gives support to the notion that favorable attitudes and supporting norms are important for adoption.

1. H. Schuman, *Economic Development and Individual Change: A Social Psychological Study of the Comilla Experiment in Pakistan*, Occasional papers in International Affairs, Number 15, Cambridge, Massachusetts: Center for International Affairs, Harvard University, February, 1967, p. 32.
2. W. H. Wiset, *The Hindu Jajmani System*, Lucknow: Lucknow Publishing House, 1956.

The other measure of mental isolation is a secularism index. It is composed of eight items such as 'Can evil spirits cause disease', and 'If your son wanted to marry a lower caste girl would you allow it', and was also positively and significantly related to adoption. That is, villages with more secular-oriented leaders were more likely to score high on the adoption index. Responses to the eight 'yes-no' questions were simply summed for each leader and then averaged to obtain the village score used in analysis. This index has one of the highest zero-order and partial relationships with adoption of any of the communication variables, $r = .45$ and $r = .44$ respectively, but it should be noted again that it is an index of leaders' secularism only, and only an average of eight were interviewed per village. The index has been used on larger samples, however, and with similar results.³ It does appear to be a reliable measure of traditional beliefs, which could contribute to mental isolation, and serve to operate as an obstacle to change. This variable will be discussed more fully in the chapter on characteristics of leaders. For present purposes, mental isolation, as measured by these two indices of norms and beliefs, appears to be a significant factor in determining levels of agricultural adoption, enhancing the role of direct communication to the villages.

TABLE 16: RELATIONSHIPS OF COMMUNICATION VARIABLES WITH AGRICULTURAL ADOPTION

Variable	Zero-order	Partial
Geographic isolation factors		
Distance from block headquarters	.04	.05
Distance from <i>pucca</i> road	-.30**	-.26**
Distance from bus depot	-.35**	-.31**
Distance from railroad	.07	.15
Mental isolation factors (leaders)		
Favorableness toward housewife learning to read and write	.16	.18**
Favorableness toward breaking <i>jajman</i> relationship	.20**	.24**
Favorableness of leaders toward agricultural programs	.23**	.27**
Favorableness of leaders toward health programs	.16	.19**
Favorableness of leaders toward family planning programs	.46**	.44**
Index of attitudes toward programs of change (sum of codes for above five items)	.29**	.33**
Secular orientation (leaders)	.45**	.44**
Urban contact		
Index of urban contact (leaders)	.29**	.23**
Urban contact through officials residing in the village, <i>per capita</i>	.09	.11
Urban contact through males migrating, <i>per capita</i>	.16	.17**

3. The items have been principally developed and researched by Prodipto Roy. See Y. N. Junghare and Prodipto Roy, "The Relation of Health Practice Innovations to Social Background Characteristics", *Rural Sociology*, 28 (December, 1963), pp. 391-400; and Joseph E. Kivlin, "Immigrants as Change Agents", *Behavioral Sciences and Community Development*, Vol. 1, No. 2, September, 1967.

TABLE 16 (contd.)

Variable	Zero-order	Partial
Mass media access and contact		
Access to radio (radios per person) .. ..	.23**	.21**
Index of access to mass media (distance from post-office, library, cinema) .. ..	.31**	.22*
Print mass media exposure (publications <i>per capita</i> received in village) .. ..	.17**	.14
How often leaders attended cinema .. ..	.43**	.36**
Agricultural agency access and contact		
Index of agency access (Distances from various agencies) .. ..	.28**	.22*
VLV Headquarters in village .. ..	.38**	.33**
Index of leaders' contact with agents .. ..	.52**	.49**
Agent's choice of media (Relates positively with use of radio, newspapers, demonstrations and meetings as compared to use of group discussions and farm visits)		
	.17**	.18**

* First-order partial correlation coefficients, population of the village held constant.

** Significant at the .05 level, one-tailed test. N varies somewhat, from 91 to 103, as a missing data program was used for analysis. For most coefficients the relevant degrees of freedom are 100, with a coefficient of .161 or larger needed for significance.

Urban Contact

Urban contact serves as a communication variable in two ways. First by bringing the individual, and through him the village, into direct contact with agencies of change whose headquarters and personnel are usually located in towns and cities. Second, by indirectly 'urbanizing' the individual and his village, making for more freedom of mobility and choice, and lessening the social pressure for conformity. Urbanization processes are highly complex and the evidence for their effect is somewhat conflicting.⁴ However, there is little reason to doubt the direct effect of urban contact as one means of communication and the indirect effect seems at least plausible.

Urban contact by leaders living in or visiting a city, city to village contact through officials (*per capita*) residing in the village, and the effect of males (*per capita*) migrating from the village were used to investigate this variable. Urban contact is considered here as a separate independent variable but it is logical to assume that it is related to other independent variables such as transport facilities and size of the village.

The first measure, an index of leaders' contact outside the village, is composed of two items, average number of times visited town or city during the previous year, and percentage of leaders in the village who had lived outside the village for one year or more. This index is positively and significantly related to adoption and the relationship is reduced somewhat when size of village population is controlled.

4. L. K. Sen, "Main Concepts in Modernization" (unpublished manuscript), p. 25.

For the other two measures of urban contact, population size was essentially controlled by putting the figures on a *per capita* basis, thus there is little difference between the zero-order and partial coefficients. City to village contact was measured by a single item, the number of appointed and elected officials *per capita* residing in the village. The relationship is positive but quite low. This is somewhat surprising as 'VLA headquarters in village,' discussed below, was highly related to adoption. The number of males migrating *per capita* is another indirect measure of urban contact, and it was barely significant (Table 16). This item implies a return of the male or communication from him which could help or hinder change. It was thought to be important because there is substantial migration in India, due to development of newly irrigated lands. Thus, there is migration both to and from villages.⁵ The failure of the two indirect measures of urban contact to relate strongly with adoption, while leaders' visits and residence in the city do relate strongly, leaves a somewhat confused picture of urban contact. It is concluded that urban contact does facilitate adoption and help to promote change, but that the larger villages are more apt to have this urban contact as a function of population size. It remains a matter of development strategy and resource allocation as to whether more and presumably costlier efforts should be made in the smaller villages.

Mass Media Access and Contact

Mass media have been widely used in agricultural extension programs in India. Radio farm forums and cinema have been used extensively. Closed circuit radio and television have been tried in the New Delhi area. We considered radio, newspapers, magazines and cinema in the present study. All but one relationship with the dependent variable was significant and all were in the expected direction. Those villages with greater access to, and contact with mass media channels of communication were more likely to score high on agricultural adoption.

Access to radios was measured by the number of radios *per capita*. Actual number of radios varied from none to 100 per village. As with all of the measures of mass media access and contact, there was some effect of population size, there being less relationship of mass media access and contact with adoption among the smaller villages. A second item measuring access to mass media combined distances from post-office, library and cinema, in an index which was substantially reduced in its relationship with adoption when population of the village was controlled. As with access to radios, however, the relationship remained significant,

5. Phase 2 of the larger study will provide data on immigration to study villages. See also J. E. Kivlin, "Immigrants. . . ." *op. cit.*

and we conclude that access to mass media is an important factor in agricultural adoption. It may be that radio and cinema, which do not depend very much upon literacy for effective communication account for most of the relationship, but it will be shown in the next chapter that literacy is apparently also an important variable in adoption.

For exposure to mass media, two measures were used. The first, an index of print mass media contact, is only weakly related to adoption, being somewhat affected by population size. This is the sum of daily newspapers, weekly newspapers and monthly magazines received in the village, *per capita*. Its relatively low relationship with adoption further suggests that publications in themselves do not yet provide important channels of communication for Indian cultivators. The second measure of mass media contact, number of times leaders attended cinema, is highly related to adoption and the relationship is also reduced when population size is controlled. It should again be remembered that only from six to ten leaders were interviewed in each village and, therefore, these 'lead-items' with high correlations should be viewed with some caution. Cinema attendance by the cultivators themselves will be reported elsewhere, and it should then be possible to evaluate more precisely the impact of cinema upon adoption.

Mass media, then, seem justified as important contributors to development as measured by adoption of agricultural practices. Like other variables we have considered, their effect is associated with population of the village.

Agricultural Agency Access and Contact

Access to agricultural agencies was measured by scores for distances from various agricultural agency offices: block headquarters, veterinary center, godown, VLW headquarters in the village, co-operative society in the village, and panchayat in the village. This same index has been described in the next chapter on program administration, and is there called 'Proximity' scale. As expected, this index was significantly related to adoption, as were all three of the access indices, at quite high levels. Although population size was somewhat, it is apparent that ease of access to these agencies is reflected in greater adoption.

This conclusion should not be taken as a conclusion that geographic isolation, as measured by block headquarters, is not an important factor in the sample area. The distance from the block headquarters was taken as a substitute for 'distance from an urban

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block headquarters is the least accessible of the six agencies; the other five are located in or nearer the village. That is, the agency has in a sense 'come to the village' suggesting that the barrier of geographic isolation has largely been overcome.

One of the items contained in the index of agency access, 'VLW headquarters in the village', was considered important enough to consider separately. The VLW is thought to be a key person in development efforts and our data bear this out. Only slightly affected by population size, the coefficients indicate that villages in which the VLW resides and in which he has his headquarters are more apt to adopt agricultural practices. There is, of course, a considerable degree of circularity here, for most of the innovations included in our dependent variable are precisely those advanced by development agents such as the VLW. However, the fact remains that there are differences in adoption, and this differential is strongly associated with agricultural agency access and contact.

Contact with agricultural agent was related positively with adoption and at the highest level of any variable considered in this chapter. This index, composed of the number of times leaders talked per year with various agricultural officials, is also used and explained in more detail in the chapter on leader characteristics.

The final item in Table 16 is an attempt to take into account the VLW's choice of media used. It was expected that there would be higher adoption in villages where the VLW used group discussions and farm visits, dissemination techniques involving more personal interaction. The relationship is in the opposite direction, however, and significantly so. It appears that the current popular demonstration technique, and not that of farm visits is more likely to communicate to potential adopters.

SUMMARY AND CONCLUSIONS

The focus of this section, like that of the other chapters, has been upon the village as the unit of analysis. Despite the complexities and difficulties of comparing these large and diverse units, most relationships between factors of communication and agricultural adoption were statistically significant and in the predicted direction.

The objective of the chapter was to determine the relationship between the use of certain communication channels that may serve agencies of change, and agricultural adoption, taken as a measure of developmental success or failure. For both individual items and for summary indexes it was found that this relationship was generally positive.

Contrary to expectation, geographic isolation from block headquarters was found to bear no relationship to adoption. This finding is striking

in itself and the suggestion is strong that, in one way or another, the barriers to communication with India's villages can be overcome with facilities presently available. Villages distant from block headquarters are as likely to adopt agricultural practices as those close by.

Social-psychological factors, however, contributing to what we have termed 'mental isolation', were disclosed to be quite important.⁶ Traditional norms and beliefs remain a strong obstacle to adoption and will likely remain a long-term problem until they are overcome. It is futile to hope that some elements of conservatism and traditionalism will not remain in every population, as new values become old and people refuse to replace them. However, as has happened to some extent already in India, general attitudes toward change may become more favorable and common while traditional beliefs in turn become less the norm.

Urban contact, when directly measured by visits to and residence in a town or city, was significantly related to adoption, but two indirect measures were not.

Almost without exception, relationships of mass media access and contact, and the more personal agricultural agency access and contact, were significantly, and positively related to adoption. The evidence is strong that contact with the larger society of any sort is important and provides one of the keys to faster adoption of agricultural innovations. In the last chapter of this report we will attempt to throw some light on which types of contact should receive priority in current developmental efforts, which we believe should be intensified.

6. Schuman found "wide and statistically reliable social-psychological differences between a sample drawn from 17 co-operative villages and a sample from villages in four control areas . . .", Schuman, "Economic Development . . .", *op. cit.*, p. 46. Sinha, however, found few differences in motivations and aspirations of villagers in developed as compared with relatively under-developed villages. See Durganand Sinha, *Villages in Transition: A Motivational Analysis* (Mimeo.) Department of Psychology, University of Allahabad, Allahabad, Uttar Pradesh, India, November, 1966.

Village Resources and the Success or Failure of Agricultural Change Programs

AN unlimited number of things may be regarded as resources for development. People, land, water, animals, machines and education are but a few. Furthermore, whether or not a given thing actually is a resource, in the sense that it contributes to development, may vary in time and place. It is obvious that one can have both too many or too few people or cattle, or too much or too little land or water for optimum economic and social development. In this chapter we shall consider selected items of resource potential. Relating them to our dependent variable will provide some indication of their importance in development and some indication of how much of the resource seems desirable.

Resources are loosely grouped into two categories, human and non-human (Table 17). Comparisons have been made by means of correlation coefficients showing the relationship between the resource variable and the index of adoption of agricultural innovations. About half of the coefficients are significant at the 5 per cent level, but only two variables, in themselves, account for as much as 16 per cent of the variability in adoption among the 108 villages.

HUMAN RESOURCES

The total number of people in a village was considered first. It is obvious from the significant relationship shown in Table 17 that size of village as measured by population is an important variable. It is one which must be taken into account when considering other variables. That is, it is necessary to determine whether a particular variable has an

effect which is independent of size of village. This has been accomplished to some extent by comparing proportions or putting figures on a *per capita* basis. In addition, partial correlation coefficients are also shown in Table 17, which control the factor of population size. Villages ranged in size from 112, for a village in West Bengal, to 7,615 for a village in Andhra Pradesh, but over 50 per cent ranged between 700 and 1,600 people. It was to be expected that the larger villages would have such advantages as better transport facilities, more attention from government agencies, and in general benefit from economies of scale.

Turning from sheer numbers of people to a more qualitative assessment, we considered literacy, education and proportion paying a relatively high level of village taxes. For both sexes, those villages with a high proportion of literates tended to score high on the measure of agricultural adoption.

TABLE 17: VILLAGE RESOURCE VARIABLES, AND THEIR RELATIONSHIPS WITH AGRICULTURAL ADOPTION

Variable	Zero-order	Partial*
Human resources		
Population of the village	.25**	—
Proportion literate, males	.39**	.35**
Proportion literate, females	.34**	.27**
Per cent males with primary education	.07	.10
Proportion of adults who have completed any of the grades from 5 to 8	.06	.07
Proportion of leaders 9th standard or higher	.15	.09
Proportion of families taxed Rs. 10 or more	.30**	.24**
Number of laborers per owner-cultivator	.30**	.32**
Non-human resources		
Number of acres sown <i>per capita</i> , 1961	.09	.03
Proportion of acres sown which were sown more than once, 1961	.01	-.08
Number of cattle <i>per capita</i> (cows, buffaloes, bullocks)	-.04	.03
Proportion of cattle which were bullocks	-.31**	-.31**
Electricity in the village	.47**	.42**
Predominant mode of transport (mechanization of transport)	.23**	.18**
Bicycles <i>per capita</i>	.03	.03
Electric pumps <i>per capita</i>	.40**	.37**
Oil engines <i>per capita</i>	.23**	.21**
Grain mills <i>per capita</i>	.15	.16
Total acres which came under irrigation, last five years	.16	.11

* First-order partial correlation coefficients, population of the village held constant.
 ** Significant at the .05 level, one-tailed test. N varies somewhat, from 90 to 103, as a missing data program was used for analysis. For most coefficients the relevant degrees of freedom are 100, with a coefficient of .164 or larger needed for significance.

It would be easy to assume that these strong associations point the way to long-term success in development, *via* literacy. While this may indeed be so, the present analysis does not permit such an unqualified

conclusion.¹ Causal relationships, always difficult to determine, would require exhaustive and repeated studies to partial out possible common factors which may account for the apparent difference that literacy makes in development. Data available in the present study permitted only limited control on such factors. First, of course, population size was controlled. The partial correlation coefficients for literacy, with village size controlled, are only somewhat smaller than the simple associations with adoption. Female literacy was more affected by population size than was male literacy. As with most 'modernization' variables, however, size of village population is significantly and positively related to literacy; that is, the larger villages have a higher percentage of literate males and females.²

Second, it may be noted in Table 18 that the two literacy measures were correlated significantly with two other important 'modernization' measures, education levels and village affluence. There are low correlations between per cent males with primary education and the literacy measures, but increasing and significant correlations of literacy with measures of successively higher educational levels: per cent adults who have completed any of the grades from five to eight, and per cent leaders with ninth standard education or higher. These measures are not directly comparable, but were selected because there were negligible amounts of missing data. Literacy also correlates strongly with per cent of families taxed Rs. 10 or more a year.

TABLE 18: INTERCORRELATIONS OF LITERACY MEASURES WITH EDUCATION AND VILLAGE AFFLUENCE MEASURES

	A	B	C	D	E	F	G
A. Population of the village ..	1.0	22	45	-11	01	28	30
B. Per cent literate, male ..		1.0	69	08	17	21	36
C. Per cent literate, female ..			1.0	07	23	53	41
D. Per cent primary education, males ..				1.0	22	09	05
E. Per cent adults completed any of the grades from 5 to 8 ..					1.0	09	03
F. Per cent leaders 9th std. or higher ..						1.0	26
G. Per cent families taxed Rs. 10 or more ..							1.0

Although literacy is thus shown to be part of a complex of 'modernization' variables associated with development, it may be questioned whether it is really literacy or associations with other independent variables which is responsible for the significant relationships of literacy with

1. For a recent discussion of the contribution of literacy to development, see F. C. Fliegel, "Literacy and Exposure to Agricultural Information: A Comparison of some Indian and Brazilian Data", *Behavioral Sciences and Community Development*, Vol. 1, No. 2, September 1967, pp. 89-99.
2. For a discussion of modernization variables, see L. K. Sen, *Modernization in Village India*, Hyderabad: National Institute of Community Development (in press).

adoption. This was tested by controlling on the education and village affluence variables in partial correlation analysis. For both males and females, per cent literacy in the village remained significantly associated with adoption.³ As one might expect, the two literacy measures are highly intercorrelated, $r = .69$. Both are positively related with adoption when the effect of each is controlled, but the relationship of female literacy with adoption becomes non-significant when male literacy is controlled. This might also be expected in that there is generally a difference in attitudes toward the education of men and women, and male literacy rates were substantially higher than female rates in the sample villages. As the partial correlations referred to indicate, however, there is substantial agreement between relationships of other variables with male literacy, and those of the same variables with female literacy.

Turning from literacy to education directly, Table 17 indicates a generally low correlation with agricultural adoption, and none of the three measures is significant when population is controlled. These results are surprising, as simple associations of education levels with agricultural adoption are usually significant, and literacy and education have already been shown to be positively correlated. Additionally, formal education is for most people the principal route to literacy.

The next assessment of human resources was the proportion of families paying Rs. 10 or more in village property taxes, already discussed as a measure of 'affluence'. This measure should serve as a rough guide not only to tax revenue and family affluence as village resources, but also to the ability of villages to tax themselves. With limited state and federal resources, this ability may be crucial for successful development. This measure is positively and significantly related to adoption. There is

3. For this and the following discussions of partial correlation analyses, the following are given.

Where: "1" is agricultural adoption

"2" is per cent males literate

"3" is per cent females literate

"4" is per cent adults completed grades 5th to 8th

"5" is per cent leaders 9th standard or higher

"6" is per cent families taxed Rs. 10 or more

$r_{12.3} = .23$ (Read: the relationship of per cent males literate with agricultural adoption, controlling on per cent females literate)

$r_{13.2} = .11$

$r_{12.4} = .39$

$r_{12.5} = .38$

$r_{12.6} = .32$

$r_{13.4} = .34$

$r_{13.5} = .31$

$r_{13.6} = .24$

$r_{16.2} = .18$

$r_{16.3} = .18$

$r_{16.4} = .50$

$r_{16.5} = .28$

some reduction in the correlation coefficient when size of village population is controlled. Villages scoring high on adoption were also apt to have a higher proportion of families with Rs. 10 or more tax payments. As in the case of the literacy variables, the effect of this measure was also found to be independent of other measures significantly related to adoption, as disclosed by partial correlation analysis (see foot-note 3).

The final assessment of human resources in the village is one of available human labor. Our data have shown inputs of human labor to be very high and perhaps not very efficient. This is supported by some other studies as well as by casual observation.⁴ Nevertheless, our measure of available human labor, number of agricultural laborers per owner-cultivator, is significantly and positively related to agricultural adoption. The association is very little affected when population size is controlled. It is likely that most improved agricultural practices, such as fertilizer and pesticide applications, intensify the need for human labor and that adoption is to some extent dependent upon its availability. As water, fertilizer and other presently scarce resources become more readily available, and as off-farm migration increases, it may be speculated that shortages of agricultural labor will occur in some areas. As a consequence, it is likely the present low adoption rates for agricultural implements will increase.⁵

NON-HUMAN RESOURCES

Several measures are given for non-human resources. Two concern land and land use. There are two related measures of cattle as a resource. Additionally, seven measures of energy, transport, and machine resources are given in order to fully utilize the data which were available. It should be understood that considerable circularity may be involved with these variables. That is, they may unduly reflect aspects of the dependent variable, agricultural adoption.

Turning first to land and land use, there are very low relationship between number of acres sown *per capita* and village agricultural adoptions.

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4. See, for example, John H. Foster, *The Economics of the Moldboard Plow and three-time Cultivators in Two Districts of Uttar Pradesh* (Mimeo.), Department of Agricultural Economics, Allahabad Agricultural Institute, Allahabad, U.P. Villagers are shown by Foster to use as many as 23 plowings for the preparation of a single crop of wheat. Preliminary analyses of our Phase 2 sample of 630 cultivators have disclosed that about 60 per cent used more than the required productive man work units, as estimated in various studies by agricultural economists. For a contrary view, see T. W. Schultz, *Transforming Traditional Agriculture*, New Haven: Yale University Press, 1964, especially chapters 3 and 4.
 5. It will be recalled from chapter 2 that only three items of adoption of improved agricultural implements were included in the dependent variable 17-item index, and the adoption of these was at very low levels.

It had been expected that acres sown *per capita* would be positively and strongly related, on the general grounds that adoption is usually related to farm size. Similarly, it had been expected that multiple cropping, as measured by the proportion of acres sown which were sown more than once, would also be positively and strongly associated with adoption, because of the importance of crop production.

As this measure of multiple cropping includes both irrigable land and land which may bear a dry crop such as tobacco, it may not discriminate among villages as well as a specific index of irrigation. There are many villages in the sample which have large amounts of irrigated land. Such an irrigation index could not be derived from the present data, because the amount of land under irrigation was not given in village records.

The next two measures in Table 17 concern cattle, currently a subject of much debate.⁶ As is well known, there are almost half as many cattle as people in India, somewhat over 230 million. Most of the debate centers on the functionality of these cattle for development; there is little question of the cultural importance of the cow. The evidence reported here suggests that cattle presently are dysfunctional for agricultural development. For cattle *per capita* (cows, buffaloes and bullocks) there are very low relationships with adoption, while for per cent of cattle which are bullocks, both the zero-order and partial coefficients are significant and negative.

The first association, between adoption and all cattle, was expected to be negative. Indian cattle are notoriously unproductive of both meat and milk. Dung and hides are important by-products but can hardly compensate for the expense of maintaining such very large numbers of cattle. Because of the importance of bullocks as a major source of draft-energy, however, it was expected that the higher the percentage of cattle which were bullocks, the higher would be the adoption of agricultural practices. That this is not so is especially surprising in that there was wide variation among villages in percentage of bullocks. Villages ranged from 9 to 81 per cent on this factor. A possible explanation, to fit the association obtained, is that there may be an unsuspectedly large number of old and useless bullocks which are kept for religious or sentimental reasons and which swell this category of cattle without adding to village productivity. Data obtained in the second phase of this study should provide some clues as to the validity of this hypothesis.

The remaining measures of village resources, as has been pointed out, come close to being measures of development. That is, electricity,

6. For a provocative and timely discussion of the 'cow problem', see *Seminar*, May, 1967, especially Pradipto Roy, "Social Background", pp. 17-23.

machines, and irrigation measures might reasonably be used as part of the dependent variable. They were not used for this purpose, and are cited here for the sake of completeness in data presentation and because it is quite possible to consider them as factors in continuing development.

The presence or absence of electricity in the village is the most highly related of any variable considered in this chapter, and its effect is not much altered by control on population size. The larger villages are more apt to have electricity, however, $r = .35$. Predominant mode of transport, whether by human, ox-cart, or lorry, is also significantly associated with adoption, and it is also the larger villages which have the more mechanized transport. Bicycles *per capita*, however, were not related to agricultural adoption, despite their importance in both rural and urban areas.

The numbers *per capita* of three agricultural-related machines in the village were also positively related to adoption, and it is likely that these will increase as agriculture becomes more commercialized. They are an obvious adjunct to development. Electric pumps and oil engines were significantly related, while the number of grain mills was not. The final measure, total acres which came under irrigation in the last five years, was also positively but not significantly related to adoption.

SUMMARY AND CONCLUSIONS

This chapter has considered various measures of human and non-human resources in the village. Population size of the village was positively and significantly associated with agricultural adoption and was used as a control variable. The qualitative assessments of literacy, education, village affluence in property, and available human labor were also shown to be positively related.

Land sown *per capita*, multiple cropping, and number of cattle *per capita* were only weakly related to adoption, but the proportion of cattle which were bullocks was negatively and strongly related.

All measures of energy and machine resources were positively related, with the presence or absence of electricity in the village being most highly related.

It is concluded that the differences in basic resources which were found among the 108 sample villages are important considerations for the study of adoption of agricultural practices.

Although control on population size did not very much affect zero-order relationships of other independent variables with adoption, it is likely that population size of the village should be considered in future research so as to provide possible answers to basic questions of allocation of scarce resources. Other factors are undoubtedly more important, but some minimum population size is probably necessary in order to

benefit from economies of scale. Overshadowing the question of optimum size of village are the national problems of population growth, unemployment and food production.

What seems to be the 'mix' of village resources which favors adoption of agricultural practices, and by implication, development? Adequate numbers of people and/or laborers to get the job done, a literacy level presumably high enough to keep informed on how and when to apply new practices, that *sine qua non*, money, cattle and bullocks in numbers which are not disfunctional, and the complex of electrification and mechanization which is generally associated with development. The problem of confusion of variables such as electrification with the dependent variable need not concern us unduly here. That development usually follows electrification is well known.⁷ Our evidence is by way of confirmation for this time and these places. Electrification should proceed apace.

Similarly, that village affluence is related to adoption does not necessarily indicate direction of effect. However, it is reasonable to suppose that there is at least a reciprocal effect and that *any* increase in levels of living will provide more opportunity to adopt practices which may require substantial initial investment or risk-taking. It may be that what is at issue here are the general pricing policies which result in 'ceiling prices' rather than 'price floors' for most agricultural crops, with consequent lack of incentive for cultivators.

The importance of land use and the amount of land available *per capita* is a matter which deserves more attention. In particular, a sensitive and accurate measure of the amount of irrigated land is needed in order to assess the importance of this costly input, and to evaluate the extent to which it is associated with adoption. Similarly, the associations of literacy and education with adoption deserve the closest attention, for these are also costly societal inputs and their effect is interwoven with that of associated variables.

Although we do not conclude unreservedly that large numbers of cattle in India are disfunctional, the evidence in this direction is quite suggestive. It seems highly likely that an orderly and culturally acceptable reduction in cattle numbers, and in expenditure of other resources upon them, will facilitate agricultural development.⁸

7. See, for example, Andrew J. Sofranko, Michael F. Nolan, and Robert C. Bealer, "The Definition of Modernization as a Power Continuum and Some Concomitant Structural Differentiations", paper presented at the annual meeting of the Rural Sociological Society, San Francisco, August, 1967.

8. Villagers, however, are more interested in *increasing* cattle numbers. The desirability of such an increase was constantly expressed in a large sample of villagers in both developed and relatively underdeveloped villages studied by Durganand Sinha. See *His Villages In Transition: A Motivational Analysis*, Department of Psychology, University of Allahabad, Allahabad, Uttar Pradesh, India, November, 1965, p. 59 and elsewhere.

Village Structure and the Success or Failure of Agricultural Change Programs

THE dominant idea to be pursued in this part of the analysis is that any community, whatever its location and whatever its resources, is structured in such a way as to effect the dissemination of ideas and practices within its boundaries.¹ If information about modern agricultural practices cannot reach all levels and segments of the community, in all cases an agricultural village, then the likelihood of success of the agricultural change program decreases.

Fundamental to the above line of thought is the analogy of the organism. It is assumed that there are substantial linkages among the constituent parts of the community and, therefore, there is some kind of organic unity in the community as a whole. The assumption of organic unity is reflected in the tactics of much development work. Specifically, development workers are often constrained to work through selected individuals and groups, on grounds that their primary contacts will influence others and thereby maximize impact on the aggregate. Some of the practical implications of such tactical choices will be examined in the following chapter in which the role of village leaders in change program success is the main focus. Whether change efforts are channelled through leaders or through other types of individuals, the aggregate effect of such efforts on a village will depend in part on the structure of social relationships in that village, which is our topic here.

1. Compare A. W. van den Ban, "Locality Group Differences in the Adoption of New Farm Practices", *Rural Sociology*, 25 (September, 1960), pp. 398-320; van den Ban calls attention to the need for this type of analysis and citing several earlier studies which have a bearing on the problem area. Almost no earlier studies have included a sufficiently large number of communities, however, to permit testing of hypotheses about community structure and adoption of innovations with an even modest degree of rigor.

DIMENSIONS OF VILLAGE STRUCTURE

The constituent parts of a village are, in an ultimate sense, individual people. It is the actions of individuals which differentiate them from one another or bring into being a certain degree of articulation which affects the dissemination of ideas. We will not deal directly with individuals in this analysis, however. We are dealing with categories of individuals, say an occupational category, and with organized groups. For our purposes, then, the constituent parts of the community are categories and groups of people, and we are interested in comparing villages which differ in the way these constituent parts are organized. We will assume that individual actions correspond to the categorical differences in this analysis, and will make inferences to an even higher level of abstraction, the village community.

Differences in village social structure can be said to have two major dimensions, vertical and horizontal. The vertical dimension refers to the rank ordering which is characteristic of social organization. For present purposes, we started with the idea that the less the disparities in rank order, the more likely it would be that a given new idea would penetrate to all members of a particular social system. We should make it clear at this point that this is not a hypothesis for our later analysis but an attempt to set the stage for that analysis. Our measures permit us to make certain inferences about intra-village disparities in rank order but were intended for comparisons among villages, i.e., they describe gross structural characteristics of the village as a unit.

The horizontal dimension of structure refers both to the effective ties which are again characteristic of social organization, and to disparities among individuals in interests, neither of which has a necessary association with rank order. The general idea we are pursuing here is that the less the hostility (negative effect), or the less the disparities in ties between groups or categories of individuals of comparable rank, the more likely it is that a given new idea will penetrate to all members, or only one or a few segments of a particular social system.

We are not here interested in all types of differences among people but are attempting to restrict the discussion to types of differences which may have some substantial influence on social interaction. Differences among people can result in specific patterns of relationships which are fairly stable and, therefore, having predictable behavioral consequences. The landlord-tenant relationship would be an example. The positions in such relationships such as land ownership determine positions from which people act, and the aggregate of these positions we refer to as structure.

INDICATORS OF STRUCTURAL DIFFERENCES

We have obtained data on 14 indicators of structural differences for the sample of 108 villages. Some of these indicators refer explicitly to either vertical or horizontal differences, others involve elements of both. We have, therefore, chosen to group the indicators into six fairly concrete categories, and will refer to the broader dimensions only for purpose of summarization. Further, although the variables selected tend to emphasize structural cleavages which we hypothesize to be dysfunctional to the dissemination of new ideas and practices, this does not apply equally to all variables. We expect voluntary organizations, for example, to favor dissemination of ideas, even though they might tend to isolate the set of individuals from another.

Three variables are used to assess differences among villages in agrarian structure. Since we are primarily concerned with agriculture, it is quite appropriate to focus on social stratification in terms of the agricultural economy. Agrarian structure was assessed, first, via a crude index of land tenure differences. This index, based on census records, arrays the 108 villages in terms of the average number of agricultural laborers for each self-employed cultivator. Villages with high scores are those with highest proportions of landless laborers, and are hypothesized to rank low in adoption of farm practices. The second indicator of agrarian structure is the ratio of people to cultivated land in the village. Since we used total population for this measure the few sample villages which are not dominated by agriculture are probably misclassified, i.e., they are classified as having many people per acre but in fact some of the people are not dependent on agriculture. This point will be expanded later. Land which was cropped twice in a year was counted twice in order to put villages with varying amounts of double-cropped land on a common footing. The hypothesis is that population pressure on land will be negatively associated with agricultural adoption. And third, we obtained a measure of the proportion of village land owned by the biggest landowners. The 108 villages could thus be arrayed from extreme concentration of dominance by a few landlords to the other extreme of an egalitarian distribution of ownership with the hypothesis being the latter dominance would be associated with low adoption of farm practices.

Sample villages are not exclusively oriented to agriculture as was mentioned earlier. Almost one-third of the villages have 50 percent or more of the labor force in agriculture, but at the other extreme 10 percent of the sample have less than half in agriculture, and 10 percent of self-employed are farm laborers. For this reason, several of the indicators of community economic differences which we have used are agricultural. One variable, which we have called *level of agricultural*

of sample villages on the proportion of families which paid Rs. 10 or more in village taxes in the preceding year. The base for this tax excludes farm property and consists of dwellings, house plots and personal property. The use of tax data involves certain hazards.² Among these are variability from one jurisdiction to another in both assessment procedures and in tax rates. Nevertheless, the availability of these data in village records has tempted us to use them to devise a crude measure of differences among villages in level of living. The difficulties involved in using tax data were minimized by basing the measure on the minority of tax payers in the top brackets. Our hypothesis is that villages with higher proportions of their populations at a high level of living will also have the higher levels of farm practice adoption.

Two other variables related to the economy we have called indicators of *occupational diversification*. The first is a simple statement of the proportion of the village labor force engaged in agriculture, either as self-employed cultivators or as agricultural laborers. We referred to this measure earlier for descriptive purposes. The second is a related but more complex measure of occupational diversification. Data from each village on the proportion of the labor force in each of the six census categories for non-farm occupations were compared with the all-India village distributions.³ If a village exceeded the national average in all six categories it received a score of six. If it exceeded the national average in five categories it received a score of five, and so on. For both measures of occupational diversification we hypothesized that the predominance of agriculture would be associated with relatively high levels of adoption of farm practices.⁴

Two variables refer to *caste structure*, without question an important aspect of traditional social structure in Indian villages.⁵ Since caste to some extent also denotes occupation these variables are at least implicitly related to the occupational diversification measures.⁶ We determined, first, the extent to which a single caste is numerically dominant in a given village. Village records on voter registration were used to calculate the percentage of voters in the most numerous caste for each village. We hypothesized that villages dominated by a single caste would rank high

2. See F. C. Fliegel, "Farm Income and Adoption of Farm Practices," *Rural Sociology*, 22 (June, 1957), pp. 159-162, a study based on income-tax records.

3. Government of India, *Census of India, 1961, Vol. I, General Economic Tables*, Delhi: Manager of Publications, 1965, for the national totals, and the relevant District Census Handbooks for the village figures.

4. The two diversification measures are related but not identical, $r = -.75$.

5. See M. N. Srinivas, *Caste in Modern India and Other Essays*, Bombay: Asia Publishing House, 1962.

6. The proportion of village voters in the numerically dominant caste is related to proportion employed in agriculture ($r = .36$), and to the occupational diversification index ($r = .52$). This lends some support to the contention made later that numerically dominant castes tend to be agricultural castes.

in adoption of farm practices. The rationale for this hypothesis hinges in part on the fact that dominant castes tend to be agricultural castes in agricultural villages, and that this should maximize skill inputs into agriculture and the importance attached to agriculture.⁷ Another aspect of the rationale is that numerical importance of several different castes would tend to impede dissemination of new ideas because different castes do not interact freely. The second variable concerning caste is a ranking of the ritual status of the most numerous caste. These rankings are based on the judgments of the research team and, to repeat, refer only to the status of the numerically dominant caste.⁸ The second measure, therefore, combined numerical and status dominance. Our hypothesis is that villages with numerically dominant castes of high status will be high in adoption of farm practices.

The single variable which most explicitly measures horizontal differentiation in village structure is a rating of the severity of *village faction disputes*. Our first attempts to ask respondents directly about the existence of factions and the seriousness of disputes were only partially successful. Respondents were understandably hesitant about discussing factions with strangers.⁹ Because we felt that factions could have a substantial effect on the success of village change programs the interviewing teams were asked, after field work had started, to continue to ask the prepared questions about factions, to supplement these with informal questions, and at the end of their stay in a given village, to pool their information and assign a single faction score to the village. These scores were based on a seven-point scale with the several points described, ranging from no existing factions to faction disputes involving the use of physical violence. We hypothesized that factionalism, as measured by the above rating scale, would be negatively associated with adoption.

Our last group of independent variables consists of four measures of numerical proliferation of *formal organizations* and one measure of religious diversity. Referring first to traditional formal organizations, we made a simple count of the number of caste panchayats. This measure is of course related to the measure of numerical dominance by a single caste ($r = -.30$), since only multi-caste villages could be expected to have many caste panchayats. Further, since the caste panchayat is among other things an arbiter of disputes, this variable is related to the measure of factionalism ($r = -.21$). We also made a count, for each village, of

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7. With reference to the positive effects of maximizing caste skill inputs, see S. P. Bose, *Eadpur: A West Bengal Village*, Calcutta: Department of Agriculture, Government of West Bengal, 1963, pp. 38-40.
 8. The following broad categories were used: upper caste Hindu, lower caste Hindu, Muslim, Christian, Scheduled Tribe, and Scheduled Caste.
 9. Compare, "The Study of Disputes in an Indian Village", in Srinivas, *op. cit.*, pp. 112-119.

the number of religious structures. In this case the existence of a structure is taken as an index of the existence of a formally organized religious group. Finally, we took into account differences in religious persuasions with a count of the different religions represented by structures in the village. If a village had a temple, mosque, and church it received the maximum score of three. If it had a religious structure of any kind its score was one, and so on.¹⁰

Two measures have reference to modern formal organizations. The first is a count of the different political parties which had some formal party organization functioning in the village.¹¹ The second is a count of the number of voluntary organizations present in the village. In the latter case we have reference to other than religious and political organizations, e.g., youth clubs and theatrical groups.

For the four measures referring to numbers of formal organizations, whether traditional or modern, we hypothesized that more organizations would be associated with more village adoption of agricultural practices. This in part represents an extrapolation from the fact that formal participation contributes to rapid acceptance of innovations for the individual.¹² Differential presence of such organizations in agricultural villages should then also contribute positively to adoption measured at the village level. Also, however, in spite of the fact that formal organizations represent formalized divisions among the people of a village, they serve to bring those who belong to them into contact with one another. They may also, as in the case of the caste panchayat, at least regulate if not arbitrate disputes between groups of people, thus facilitating dissemination of ideas for the village as a whole. In any case, we hypothesized that the net effect of the proliferation of formal organizations should be positive with reference to adoption of agricultural practices. Religious diversity, on the other hand, we hypothesized would be negatively associated with adoption of agricultural practices, on grounds that different religious communities may not interact freely with each other.

10. Fifty villages had temples only, seven had mosques only, two had a combination of temples, mosques and/or churches, while the remaining 16 had no religious structure of any kind, which illustrates a considerable variation within the sample.

11. Forty-two villages had no formal political party representation, 30 had two, and eight had three parties represented.

12. Compare, H. F. Lionberger, *Adoption of New Ideas and Practices*, Iowa State University Press, 1960, pp. 82-84.

13. Duncan and Kreitlow compared communities dominated by one religion with communities in which several different Christian denominations were represented and concluded that greater heterogeneity contributed to faster adoption rates. We have hypothesized a negative effect because we are dealing with different religious communities, i.e., Hindu, Muslim, and Christian. See Kreitlow, "Selected Cultural Characteristics and the Adoption of Agricultural Programs and Practices," *Rural Sociology*, 19 (December 1954), p. 357.

STRUCTURAL DIFFERENCES AND ADOPTION

Results of the analysis are shown in Table 19, in which the independent variables are listed in the order in which we have discussed them. Simple relationships with the dependent variable are reported and, in each case, the same relationship with size of village taken into account is also given. Population size was controlled because of the extent to which our independent variables, such as number of organizations of various kinds, are a function of village size.¹⁴

TABLE 19: RELATIONSHIPS BETWEEN INDICATORS OF VILLAGE STRUCTURE AND ADOPTION OF AGRICULTURAL PRACTICES FOR 108 INDIAN VILLAGES

RELATIONSHIPS WITH THE DEPENDENT VARIABLE, ADOPTION OF AGRICULTURAL PRACTICES		POPULATION SIZE*
Independent variables	Zero-order	Population controlled
<i>Agrarian structure</i>		
1. No. of farm laborers per self-employed cultivator ..	.30	.27
2. No. of people per cultivated acre ..	.60	.03
3. Per cent of village land owned by 10 biggest land-owners ..	.01	.06
<i>Level of living</i>		
4. Per cent of families paying Rs. 10 or more annual village tax ..	.30	.24
<i>Occupational diversification</i>		
5. Per cent of labor force working in agriculture ..	-.164	-.08
6. Index of diversification ..	.14	.04
<i>Caste structure</i>		
7. Per cent of voters in most numerous caste ..	-.33	.09
8. Ritual status of most numerous caste ..	.15	
<i>Faction disputes</i>		
9. Rating on severity of faction disputes ..	-.1	
<i>Formal organizations (Traditional)</i>		
10. No. of caste panchayats ..	.0	
11. No. of religious structures ..	.3	
12. Diversity of religious traditions represented in the village ..	.0	
<i>(Modern)</i>		
13. No. of political parties represented in the village ..		
14. No. of voluntary organizations (other than political parties) ..		

* N varies slightly because of missing data but is over 100 for all variables. Degrees of freedom r values of .164 and .230 are required for significance levels, respectively, for one-tailed tests. If two-tailed tests are used, r values are .195 and .251.

14. Village size and level of adoption are not significantly related.

Hypotheses regarding the influence of agrarian structure on adoption of farm practices are clearly not supported by the data from this sample. We had expected villages with many farm laborers in proportion to self-employed cultivators to rank low in adoption. The relationship, shown in Table 19, is positive rather than negative and is statistically significant. Neither population pressure on available land nor the extent of dominance in land ownership by a few landlords are related to the adoption index. The very low correlations are not even in the expected, negative direction. From these data we would infer that it is not the amount of land *per capita*, or control over the land, but the amount of labor available which is critical in fostering acceptance of modern agricultural practices.¹⁵

Villages which are relatively high in level of living are also high in adoption of practices, as expected (Table 19). The data support our hypothesis. Hypotheses regarding occupational diversification are not supported, however. The zero-order coefficients for these variables indicate a modest tendency for greater occupational diversification to be associated with higher rather than lower levels of adoption of farm practices. In other words, the dominance of employment in agriculture tends to have a negative effect on adoption of farm practices. These relationships almost disappear, however, when population size is taken into account.

Hypotheses regarding caste structure are also not supported. We had expected numerical dominance by a single caste to be positively associated with adoption, but the coefficient is negative and statistically significant.¹⁶ The relationship between ritual status of the numerically dominant caste and the dependent variable is close to zero, but in the expected, positive direction.¹⁷ And similarly, the hypothesis regarding faction disputes was not supported. Both the zero-order and partial coefficients are negative, indicating that villages with more faction disputes tend to be somewhat lower in adoption, but the relationships are not statistically significant.

Finally, hypotheses concerned with numbers of formal organizations are substantially supported. Dealing first with the traditional organizations, the sheer number of religious structures is positively associated with agricultural practice adoption. The relationship between the dependent variable and number of caste panchayats in the village is

15. Bose compared owners and share-croppers and concludes that tenure alone makes little difference in adoption of practices. See S. P. Bose, *The Adopters*, Calcutta: Department of Agriculture and Community Development, Government of West Bengal, 1964, p. 12.

16. Compare, M. N. Srinivas, "Dominant Caste in Rampura", *American Anthropologist*, 61 (February, 1959).

17. In a comparison of individual cultivators Bose found non-scheduled caste members to be higher in adoption than members of scheduled castes, see Bose, *The Adopters*, *op. cit.*, p. 13.

significant at the zero-order level but not when population size is controlled. Both coefficients are positive, as expected. Religious diversity is not associated with village adoption scores, however. We had expected such diversity to have a negative effect on adoption but the relationship is very low and is positive. Then, for what we have called modern organizations, both hypotheses are supported at the zero-order level and also with population size controlled. The more the political parties represented in the village and the more the other voluntary organizations, the higher the level of adoption of agricultural practices.

SUMMARY AND CONCLUSIONS

The analysis was focussed on the extent to which 14 aspects of village social structure were associated with level of adoption of practices. In general, our research hypotheses focussed on a blandness of structure, an absence of cleavages and differences among people as a permissive factor, favoring higher levels of adoption of modern practices.¹⁸

We cannot conclude from these data that an absence of cleavages, as such, is associated with higher levels of adoption of agricultural practices. Dominance by a few landlords is not associated with village adoption level. Numerical dominance by a single caste, on the other hand, is negatively associated with adoption. But a diversity of religious traditions in the village, emphasizing intra-village separateness of discrete groups, is not associated with level of adoption. Predominance of agricultural employment in the village has no appreciable effect, one way or the other, on adoption of farm practices. And a division of the village into hostile factions is not associated with adoption level. Neither intra-village homogeneity nor heterogeneity, in structural terms, has an unambiguous impact on level of adoption.¹⁹

Two general conclusions can be stated with some degree of assurance. First, several aspects of the economic structure have a significant influence on level of adoption of farm practices. These data indicate that labor, but not land, is a limiting factor in agricultural adoption. This may not seem reasonable at first glance in view of concerted national efforts to bring more land into production, limit size of holdings, and reduce unemployment or under-employment among the landless. One must take into account, however, that Indian agriculture is not highly

18. Some hypotheses assume some degree of control over resources in addition to absence of cleavages. For example, a village in which no one qualifies for other than minimum payment of property tax is relatively devoid of cleavages based on economic status, but would not be expected to rank high in adoption of farm practices because of lack of resources.

19. Duncan and Kreitlow, *op. cit.*

mechanized, and that in fact a number of the modern inputs being disseminated, in absence of mechanization, require additional inputs of labor. Fertilizers and insecticides must be applied to the land and the crop, to give only two examples. In addition, modern agricultural inputs require cash investments. Villages with relatively high levels of living have the economic resources, either in the hands of the farmer or available from local people in the form of loans, to invest in modern inputs.

And second, we can conclude from these data that a proliferation of formal organizations in the village contributes to higher levels of adoption of modern farm practices. We cannot infer from the data what causal mechanisms are involved in the relationships between formal organization variables and adoption. We may speculate that formal organizations provide a ready channel for dissemination of ideas to their members. It may also be that formal organizations serve as mechanisms to link together disparate elements in the village and thus less directly foster the dissemination of ideas. These are speculations, however. To add still one more speculative comment, it may be that formal organizations provide links with the larger society. This is to say that any causal link between proliferation of formal organizations and average village adoption of farm practices may be a function of extra-village ties rather than intra-village communication or arbitration of differences.

Some points of more general sociological relevance concerning the relationship between formal organizations and village adoption level might be mentioned in conclusion. It is of interest to note that it is not in the large villages only that formal organizations seem to play a facilitating role in adoption. Villages in our sample range from 231 to 7,615 in population size, or from roughly 50 families to about 1,500 families.²⁰ One might expect that if formal organizations facilitate the dissemination of new ideas, the facilitating role would really only be relevant in the larger villages, where it would be impossible for a villager to know his many neighbors at all well. The larger villages do have more formal organizations.²¹ But except for the number of caste panchayats, the relationships between numbers of organizations and practice adoption are not appreciably reduced when village size is controlled. This adds some weight to our speculation that formal organizations may facilitate the dissemination of new ideas by providing links between the village and the larger society.

And finally, still with regard to formal organizations, it is of interest to note that both the more traditional and the more modern organizations

20. Reference is here again to the census of 1961, *op. cit.*

21. Following are the correlations between village size and: number of voluntary organizations ($r = .40$), number of caste panchayats ($r = .19$), number of political parties ($r = .42$), and number of religious structure ($r = .35$).

are related in the same way to agricultural adoption. To a limited extent the different types of organizations are substitutes for one another. The village with more caste panchayats has slightly fewer political parties ($r = -.11$). In general, however, this is not the case. More of one type of organization is associated with more of other types, and higher numbers of either traditional or modern organizations are associated with higher levels of practice adoption. This touches on the much broader theme that economic development may involve a rather complex blending of traditional and modern elements.²²

22. See J. R. Gusfield, "Tradition and Modernity: Misplaced Polarities in the Study of Social Change", *American Journal of Sociology*, 72 (January, 1967), pp. 351-362.

Leadership Characteristics and the Success or Failure of Agricultural Change Programs

IN this chapter, we have studied the role of village leadership in the adoption of improved agricultural practices by the village as a whole. Eight hundred and fifty-six leaders in the 108 villages of Andhra Pradesh, Maharashtra and West Bengal were interviewed to obtain information for the analysis. The main objective of the chapter is to study the relationships between selected characteristics of leaders and village-level adoption of agricultural innovations. We have also analyzed, in the last part of the chapter, the relationships between the degree of integration of leadership, measured by leader consensus on a few issues, opinion leadership concentration, and power concentration, and adoption of agricultural innovations.

SELECTION OF LEADERS

For this study, five formal leaders who held official positions in the village were selected. These leaders were then asked to respond to a socio-metric question, 'If you need information on cultivation, or if you want to check on new information received from the VLV or other sources, whom would you contact?' The three people who received the highest socio-metric scores in each village were then interviewed. This method produced a constant number of eight leaders in each village, five formal plus three informal leaders. During actual field work, however, the number varied slightly within a range of six to ten. This was because in a few villages there were either less or more than five formal leaders, and

sometimes the nominations were less than three. The average number of leaders for the 108 villages was eight. The following chart shows the nature of the positions held by the selected leaders in each village.

<i>Position</i>	<i>No. of leaders</i>
Panchayat president (or vice-president when the former was not available)	1
President of village co-operative (or secretary when the former was not available)	1
Village school head-master (or senior teacher if former was not available)	1
Priest (temple), Imam (mosque) or Minister (church) or a trustee of these establishments	1
President or secretary of a voluntary organization (e.g., youth club)	1
Non-officials nominated by formal leaders	3
	8

LEADER CHARACTERISTICS

We have used 14 leadership characteristics, to be treated as independent variables, for our analysis. Brief discussions of the meanings of these characteristics, and their operationalization are presented below. Our dependent variable is adoption of agricultural innovations at the village level.

1. *Caste*. Traditionally, leadership in Indian villages has been monopolized by upper castes. This has been shown in a number of village studies.¹ A recent nation-wide survey has shown that upper castes still dominate the village.² In order to study the precise relationship between the caste position of leaders and village-level adoption of agricultural innovations, a village-level index of leaders' caste status was developed.

For indexing village-level caste scores, we have calculated percentages of leaders in five hierarchical categories and labelled each village as having 'mainly upper caste leadership' or 'mainly scheduled caste leadership', and so on.

1. See, for example, Oscar Lewis, *Village Life in Northern India*, Urbana: University of Illinois Press, 1958, pp. 143-149; and H. S. Dhillon, *Leadership and Groups in a South Indian Village*, New Delhi: Programme Evaluation Organization, Planning Commission, Government of India, 1955, pp. 112-126.
2. Lalit K. Sen and Prodyoto Roy, *Awareness of Community Development in Village India* Hyderabad: National Institute of Community Development, 1965, p. 43.

2. *Age.* Youth is generally associated with receptivity to change. For purposes of this chapter, we are interested in knowing whether villages with a higher proportion of younger leaders adopt more improved agricultural practices than villages with a higher proportion of older leaders. The modal age for the sample leaders was 42, with a range of 34 to 60. The village-level index of leaders' age was calculated by averaging the ages of the selected leaders in each village.

3. *Level of living.* Level of living has been measured by the ownership or non-ownership of the following items, which are usually associated with a higher level of living: radio, chairs or tables, porcelain or plastic dishes, shirts and trousers, and tooth-brushes and tooth-paste. The scoring was done by giving one point for ownership of each item, and then adding them up for a total score for each leader. For a village-level index, the scores were averaged for each village.

4. *Urban occupational pull.* We have used this variable as a subjective index of urbanization. It refers to the psychic pull cities have over the leaders and was measured by the question, 'If you were offered a job in a city which would give you about double the income you now receive, would you move to that city?'³ A 'yes' answer to this question reflects that the respondent looks toward the city as his destination and main reference group. A 'no' answer shows that the respondent considers the village as his permanent residence and would reflect his village orientation. The village-level index for this variable was developed by calculating percent ages of leaders who said 'yes' to the question in each village.

5. *Urban contact.* A composite index was developed for urban contact by averaging, for each village, the number of trips made by the leaders to cities, and the duration of their stay. The average number of trips and the average period of stay were added to obtain the index.

6. *Literacy.* All mass media help the individual to be in touch with systems other than his own. Literacy provides access to other systems through the print media. In order to obtain information about leaders' literacy, they were asked whether they could read newspapers or not. The percentage of those who said 'yes' was calculated, and was used as the village-level index of leaders' literacy.

7. *Education.* While literacy provides one with the basic skill to receive ideas *via* print media, formal education as a conditioning process over a much longer period of time helps to develop attitudes. Education, in this sense, is an important element of socialization during which the individual internalizes values which form the content of education. For

3. See Prodipto Roy "Factors Related to Leaving Farming", *Journal of Farm Economics*, 43: 654-674, and also Frederick C. Fiegl, "Aspirations of Low-income Farmers and their Performance and Potential for Change", *Rural Sociology*, 24, 205-214, September, 1959.

our village-level index of leaders' educational attainment, the percentage of leaders who had ninth grade education and above was calculated for each village.

8. *Extension agency contact.* For a village-level index of leaders' contact with extension agents, the number of contacts of each leader with the following agents during the past year were added: VLW (male), VLW (female), mid-wife, sanitary inspector, block doctor, BDO, block extension officer (Ag.), block extension officer (Co-op.), block extension officer (Panch), and block veterinarian.

As a next step, the number of total contacts per village was averaged by dividing the total number of contacts by the number of leaders in each village.

9. *Fatalism.* It is generally assumed that fatalism is an important determinant of behavior in traditional societies. Theoretically speaking, a belief in fate reduces initiative and innovativeness. Conversely, self-reliance should increase one's initiative and innovativeness. For testing whether the self-reliance or fatalism of the leaders has any effect on village adoption of agricultural innovations, the leaders were asked the following question: 'How much of your future depends on you yourself? Out of a rupee, would you say 16 annas, 12 annas, 8 annas, 4 annas, or none?'

The answers were then converted into a five-point scale and the scores were averaged for each village.

10. *Opinion of extension programs on agriculture, health and family planning.* Leaders' opinions of extension programs were expressed in response to questions in the following form: 'What is your opinion of . . . practices and the programs to promote them?' The answers were then categorized into a five-point scale of favorableness of opinion and the scores were averaged for the village.

11. *Empathy.* Empathy is defined as the ability to take other roles. The concept has been used as an index of individual modernity and is considered to be a prerequisite for adopting new ideas and practices.⁴ For this study empathy has been measured by questions in the following form: 'If you were . . . , what would you do to . . . ?' The roles that were suggested to the respondents were that of (a) the BDO, (b) president of the panchayat, and (c) average cultivator. The percentage of leaders who could take these roles and suggest meaningful steps to solve specified problems was calculated for each village and provided the village-level index of leaders' empathy.

12. *Secular orientation.* The secular (rational, non-traditional) orientation scores for leaders were obtained through the following questions.

4. Daniel Leiner, *The Passing of Traditional Society*, New York: The Free Press of Glencoe, 1961, p. 49.

(1) Can evil spirits cause disease? (2) Have you made sacrifices to prevent sickness? (3) Should Harijans (untouchables) be allowed to draw water from all wells in the village? (4) Should Harijans and other children take meals together in school? (5) If your son wanted to marry a lower caste girl, would you allow it? (6) Do you think Harijans should be allowed to worship in all temples in the village? (7) In your opinion, is an illiterate village Brahmin superior to a lower caste B.A., or M.A.?

The answers to these questions were dichotomised and a 'yes' answer was scored one point while a 'no' was scored zero. These scores were added up for each village and averaged.

13. *Land-oriented conservatism.* It has been pointed out in some studies that Indian farmers associate special values with land even when it is unproductive. Ownership of land is an important source of prestige in the village community.⁵ As a result, farmers are reluctant to sell a piece of land to raise capital for productive ventures.⁶ Land-oriented conservatism of the village leaders was measured by the question: 'Sometime ago I met a cultivator who saw good possibilities to increase his income by establishing a fruit orchard. In order to do this he needed more capital. The only way to get this capital was to sell an acre of land that he had rented to somebody else. This he did. Did he do right or wrong?' The village-level index of land-oriented conservatism of leaders was determined by calculating percentages of leaders who said 'no'.

14. *Credit-risk orientation.* Willingness to borrow money for investment in productive enterprises is an indication of one's orientation to commercialization. To what extent this orientation among village leaders affects village-level adoption of agricultural innovations was tested. The question asked was: 'Suppose it is profitable for a cultivator to start a dairy operation. Should a cultivator who would have to borrow most of the money start such an operation?' The village-level index of leaders' credit-risk orientation was determined by calculating the percentage of leaders who said 'yes'.

Data Analysis

As we have described above, village-level indices were constructed for each of the 14 characteristics of leaders. Each village was given a score reflecting the degree of presence of a certain characteristic among its leaders.

Table 20 presents (1) zero-order correlations between the 14 leader-characteristics and village-level adoption of agricultural innovations,

5. Richard D. Lambert, "The Social and Psychological Determinants of Savings and Investments in Developing Societies", in Bert F. Hoselitz and Wilbert E. Moore (eds.), *Industrialization and Society*, Paris: UNESCO, 1966, pp. 110-115.

6. *Ibid.*

and (2) partial correlations controlling on one characteristic, caste. Since caste is considered an important determinant of socio-economic status and possibly attitudes, it was considered necessary to remove the influence of caste on the association between other characteristics and village adoption.

TABLE 20: DIFFERENCES AMONG VILLAGES IN CHARACTERISTICS OF VILLAGE LEADERS AND ADOPTION OF AGRICULTURAL INNOVATIONS

				Zero-order correlation	Partial correlation, controlling caste
1.	Caste	..	..	.37*	—
2.	Age	..	..	-.02	-.10
3.	Level of living	..	..	.25*	.19**
4.	Urban pull	..	..	-.01	-.01
5.	Urban contact	..	..	.29*	.25*
6.	Literacy	..	..	.31*	.24*
7.	Education	..	..	.15	.12
8.	Index of leaders' contact with agents	..	..	.52*	.48*
9.	Fatalism	..	..	-.08	-.07
10.	Opinion of extension programs	..	..	.29*	.14
11.	Empathy	..	..	.29*	.12
12.	Secular orientation	..	..	.45*	.33*
13.	Land-oriented conservatism	..	..	.09	.07
14.	Credit-risk orientation	..	..	.20**	.19**

* Significant at 1 per cent level according to one-tailed test of r .

** Significant at 5 per cent level according to one-tailed test of r .

It can be seen from the above Table that among the variables we have considered here, extension agency contact of the leaders is the most influential variable in village-level adoption of improved agricultural practices. This is confirmed when the influence of caste is removed. Both the zero-order and the first-order partial correlations show substantial relationships, which are positive and significant. This in essence shows the effectiveness of the policy followed by extension agencies of working through village leaders.⁷ Inter-correlations among independent variables show that extension agency contact of leaders is related to credit-risk orientation ($r = .25$), urban contact ($r = .36$) and level of living ($r = .23$).⁸ All of these relations are statistically significant. These several variables can be easily understood as related aspects of leaders' linkage with other systems, and it is most likely that those with resources will be at an advantage in maintaining these links. It is also likely that those with resources will be willing to take risks and contact with

7. It has been an accepted policy of the extension workers employed by the community development administration in India to work in the villages through the leaders ever since the community development program was initiated. Since the introduction of the panchayati raj in 1959, elected leaders of the village communities were officially recognized as co-workers of extension agents.

8. Throughout this analysis, the one-tailed significance test of r was used. $N = 119$ and $r = .230$ and $.164$ for 1 and 5 per cent levels of significance, respectively.

extension agents, who provide information about new practices and often provide credit to invest in them, naturally accentuates this risk orientation.

Next in order of importance is the caste of the leaders. Our data show that the higher the caste of the leaders, the higher is the village-level adoption of agricultural innovations. The inter-correlations between caste and other leader characteristics show that caste is significantly related to most of the characteristics which influence village-level adoption. For example, caste is significantly related to level of living ($r = .23$), urban contact ($r = .13$), secular orientation ($r = .48$) and extension agency contact ($r = .22$). The only variable which relates with village-level adoption but not with caste is credit-risk orientation ($r = .05$). Caste does not relate to the characteristics which are not significantly associated with village-level adoption, such as education ($r = .10$), fatalism ($r = .03$), land-oriented conservatism ($r = .08$), and urban pull ($r = .01$).

The importance of leaders' caste position in the adoption of improved agricultural practices can also be seen in the partial correlations. A control on caste showed effects on the correlations between most of the variables and village-level adoption. The effect of caste was most telling on leaders' empathy and their opinion of extension programs. Empathy and a favorable opinion of extension programs are generally considered to be 'modern' characteristics and, when possessed by leaders, they should relate to village-level adoption. They did show significant relationships with village-level adoption at the zero-order level, but once the influence of caste was removed in the partial correlations, these relationships disappeared. This indicates, for our sample, that the effect of empathy and favorable opinion of extension programs on adoption are mainly functions of caste status. The association between caste, which refers to a traditional ranking system, and these 'modern' variables shows that tradition is not always contradictory to modernity.

Secular orientation of the leaders is positively and significantly related to village-level adoption. It also shows positive and significant relationships with caste ($r = .49$), level of living ($r = .1$), and urban contact ($r = .18$). However, it does not show any relationship with extension agency contact ($r = .13$), and credit-risk orientation ($r = .04$). What is most revealing here is the high correlation between leaders' caste position and secularity. Our data show that the higher the caste position of the leaders, the more secularly oriented they are. Caste position is an ascribed status based on the traditional hierarchical system, yet high caste leaders are less tradition-bound than other leaders. A discussion of the meaning of this will be provided later.

Leaders' literacy, urban contact, credit-risk orientation, and level of living are all positively and significantly related to village-level adoption.

These characteristics are also related to most of the other characteristics that relate to village level adoption.

On the whole, therefore, we find that the above leader characteristics (arranged in terms of high to low correlations with village-level adoption) are not only significantly related to village-level adoption, but the inter-correlations among them are also fairly high. This indicates a more or less definite configuration of leadership characteristics that influence village-level adoption of agricultural innovations.

Variables which do not relate to village-level adoption of agricultural innovations, even at the zero-order level, are: age, urban pull, fatalism, land-oriented conservatism and education.

Our data indicate that leaders who influence village-level adoption come from all age-groups. Urban pull, it may be recalled, was measured by the respondent's willingness to leave the village if an attractive opportunity arose. According to our correlation analysis, urban pull experienced by the leaders does not influence village adoption in either direction. We have already seen that urban contact of leaders, measured by the number of trips made to cities during the past year, is significantly related ($r = .247$) to village level adoption. It becomes obvious, therefore, that being in contact with cities is quite different from experiencing urban pull. The former is the characteristic of a cosmopolite who is very much a part of the village system and yet is receptive to the urban world and ideas. The latter is the characteristic of a would-be occupational migrant, who does not accept agriculture as his permanent occupation and would leave whenever opportunities arise.

The notion that fatalism is a traditional characteristic and that it destroys a person's initiative originates from Max Weber's explanation that other-worldly religious values inhibit economic development.⁹ This line of thought has been followed by numerous scholars who have assumed this instead of testing it.¹⁰ It is possible, and some evidence has been cited to substantiate it, that fatalism is more a method of rationalizing past failures than a determinant of behaviour.¹¹ Our data show that leader's fatalism does not influence others' adoption behavior. Fatalism is also unrelated to those leader-characteristics which show significant relationships with village level adoption.

Leaders' land-oriented conservatism again does not show any significant relationship with the adoption behavior of others. This is understandable in the context of the recent land reforms implemented by

9. Max Weber, *The Religion of India*, translated by Hans Gerth and C. Wright Mills, New York: Free Press of Glencoe, 1960.

10. A good review of this type of scholarship can be seen in Amer K. Singh, "Hindu Culture and Economic Development in India", *Conceptus* No. 1 (1967), pp. 9-32.

11. Arthur Niehoff, "Discussion of Fatalism in Asia: Old Myths and New Realities", *Anthropological Quarterly*, 39 (1967), pp. 244-253.

all the states in India. A ceiling has been placed on individual landholding which prohibits owning more than 30 acres. Land has thus been officially made a scarce commodity, and owning land, regardless of how unproductive it is, is important to the farmer.

One should not be surprised at the insignificant relationship between education and village-level adoption. In the past, the type of education that was available in the rural areas was not geared to agriculture. The result of this type of education has been a steady migration of educated people to the cities.¹² Where adequate jobs were not available or resources did not permit, educated villagers remained in the village with no interest in agriculture or in any occupation that required manual work. We have to be careful, however, in trying to interpret our data in terms of these ideas, as education does not show a negative relationship with adoption of improved agricultural practices. Our correlations only show that the presence or absence of educated leaders does not make any difference so far as village-level adoption of agricultural innovations is concerned.

A comparison of the effects of leaders' literacy on the one hand, and education on the other, on village-level adoption leads us to an interesting conclusion. Leaders' literacy relates to the dependent variable but education does not. Although educated persons are necessarily literate, our measures for the two variables were, as described previously, not identical. Literacy is a basic skill to decipher messages in written form. It enables the literate person to share symbols with a wider society. Education, on the other hand, is a long conditioning process during which the individual acquires different attitudes. We have already discussed the nature of education that was available in the past in Indian villages and its impact on the village people. Literacy, as a basic skill has quite different implications, and its significant relationship to leaders with village-level adoption is, therefore, not surprising.

An analysis of the inter-correlations among the independent variables which relate to agricultural adoption presents an interesting picture. These variables are more or less independent of each other. Literacy (r = .17), education (r = -.02), age (r = -.17), fatalism (r = -.24) and opinion of extension agent (r = -.15). On the other hand, education does not relate to village-level adoption (r = -.05), secular orientation (r = .12) and opinion of extension agent (r = .00), but relates to level of living (r = .12) and opinion of extension agent (r = .53).

In sorting out these relationships, one may conclude that the educational level of leaders is not a significant factor in the relationships between the educational level of leaders and village-level adoption of agricultural innovations.

12. M. K. Gandhi, *Basic Education*, Ashoka Education Society, Bombay, 1936.

tentatively conclude that in regard to the leadership characteristics that we have considered here, there seem to be two more or less distinct dimensions with differential effects on village-level adoption of agricultural innovations. The dimension that does influence adoption is composed of 'traditional' as well as 'modern' characteristics. The one that does not, is composed only of 'non-traditional' or 'modern' characteristics with urban overtones.

A further discussion on this point cannot be attempted here because our data are limited and such discussions have been presented elsewhere.¹⁴ We would like to point out, however, that modernization in Indian villages (agricultural modernization in this specific case) cannot be explained only by the presence of the so-called 'modern' characteristics of the leaders. Our data indicate that a configuration of 'traditional' and 'modern' characteristics of the leaders, are influential in helping the community to adopt improved agricultural practices.

LEADERSHIP INTEGRATION

Villages differ in terms of the patterns of leadership that evolve over a period of time. The leadership pattern is a product of a conglomeration of factors and, generally speaking, is an index of the way the community has organized itself to solve some of its internal problems, and also problems arising out of links with other systems. For this study, we selected three measures of leadership patterns, all of which refer to the degree of leadership integration in a village. Our general hypothesis for this section is that higher integration of the leadership pattern in a village will lead to higher adoption of agricultural innovations.

Leader Consensus

Our first measure was leader consensus on a few subjects which were considered important for the community. The main objective here was to find out the extent of agreement or disagreement among the leaders in locating the vital problems of the village, or in interpreting a problem when such a problem was presented to all of them. Our hypothesis here is that the higher the consensus among the leaders, the greater will be the community-wide adoption of agricultural innovations. The logic behind this hypothesis is that a higher consensus among leaders will reflect a greater integration of leadership and consequently a greater integration of the village as a whole, as leaders are spokesmen for their groups.

14. Everett M. Rogers, Arthur Niehoff and Lalit K. Sen, "Overview", in Gerald Hursh (ed.), *Survey Research Methods in Developing Nations*, (in press); Lalit K. Sen, *Modernization in Village India*, Hyderabad: National Institute of Community Development (in press), also Joseph R. Gusfield, "Tradition and Modernity: Merged Polarities in the Study of Social Change", *American Journal of Sociology*, 72 (January, 1967), pp. 351-362.

The construction of the leader consensus index was based on five items: (1) the most urgent problem of the village; (2) opinion of improved agricultural practices introduced in the village; (3) evaluation of the effects of chemical fertilizers on agricultural production; (4) the most important job of the village level worker; and (5) evaluation of the role of panchayati raj in the implementation of community development programs.

The number of agreements which each leader had on these five items with other leaders was totalled and divided by the total possible agreements (e.g., village A had eight leaders and the total possible agreements were $8 \times 5 = 40$; the number of agreements leader No. 1 had on the five items with other leaders was: 3, 1, 4, 1, 4. Thus leader No. 1 had an agreement score of $\frac{3 + 1 + 4 + 1 + 4}{40} = .325$). This procedure was followed for

each leader and the agreement scores were averaged for the village. The zero-order correlation between village-level leader consensus and village-level adoption of agricultural innovations produced a coefficient of .150, which was statistically significant at the 10 per cent level only. Although strictly speaking our hypothesis was rejected, a modest relationship is indicated.

Opinion Leadership Concentration

Our second measure of leadership integration was the degree of concentration of opinion leadership. Opinion leaders in a community are not necessarily identical with formal leaders. While formal leadership represents the power relations between various interest groups in the community, opinion leaders are those who are sought by the individual villagers for advice and information on various matters. Even where formal leadership cuts across opinion leadership, the roles can be studied separately.

For this study, our definition of opinion leadership is rather narrow. We asked the eight selected leaders in each village to indicate to whom they went for information and advice. The number of opinion leaders thus obtained was expectedly larger than the number of leader respondents. Secondly, opinion leadership was measured on a single dimension, advice and information on agriculture. Our index of opinion leadership concentration was based on the method developed by Lorenz and Gini.¹⁵ In short, each village was scored according to its position on a continuum between two extreme points representing absolute concentration (everybody named the same person) on the one hand, and no concentration (everybody mentioned gets one nomination) on the other. We shall not go into the procedures here as they have been fully described elsewhere.

15. G. Wunderlich, "Concentration of Land Ownership", *Journal of Farm Economics*, 40 (December, 1959), pp. 137-153.

We hypothesized that villages with higher opinion leadership concentration would also have higher adoption of agricultural innovations, as a higher concentration will indicate greater integration of the village as a whole.

The correlation between the indices of opinion leadership concentration and adoption of agricultural innovations, however, was not statistically significant ($r = .11$). When population size was controlled, as population size is expected to be related to the number of leaders, the coefficient increased ($r = .14$), and was significant at the 10 per cent level only. Our conclusion, therefore, is that there is a very slight indication that opinion leadership concentration is related to village-level adoption of agricultural innovations.

Power Concentration

Our third measure of leader integration was an index of the concentration of formal positions available in the village. Since the concentration of formal positions among a few leaders may or may not indicate integration of the village we did not proceed with a directional hypothesis.

The index construction for power concentration was also done with the help of the Gini method. The zero-order correlation between the power concentration index and the index of village-level adoption of agricultural innovations was $-.11$, and the first-order partial correlation between these two indices controlling on population size was $-.09$, both statistically insignificant.

Although our data indicate that there is very little relationship between power concentration and village-level adoption of agricultural innovations, the negative direction of the relationships may indicate that concentration of formal positions in a few hands is not conducive to higher adoption. We might note here that numerical dominance by a single caste also had a negative effect on adoption levels.

SUMMARY

In this chapter we have studied the relationships between selected leader characteristics and village-level adoption of agricultural innovations. Characteristics of leaders which were found significantly related to village-level adoption were: extension agency contact, caste position, secular orientation, urban contact, credit-risk orientation and level of living. Characteristics which did not relate were: age, urban pull, literacy, education, fatalism, opinion of extension programs, empathy, and land-oriented recruitment. Leader characteristics which had significant

relationships with adoption also showed high inter-correlations among themselves, while the remaining variables were quite independent of each other except for education which related significantly with most of the variables unrelated to adoption.

Our conclusions were:

(1) Caste positions of leaders play an important role in village modernization. As a bridge between the traditional past and the new, caste still guarantees a higher social status to the leaders, which helps them to be modern (high extension agency contact, high urban contact, secular orientation and credit-risk orientation), and to influence the whole village in that direction. Some of the so-called modern characteristics, such as empathy, and favorable opinion of extension programs, were found to be dependent on caste status.

(2) The policy of extension agents to introduce new programs through the village leaders, is fully justified as shown by the high correlation between the extension agency contact of the leaders and village-level adoption of agricultural innovations. Contact with extension agents also makes the leaders credit-minded, which again was found to be related to the adoption of improved agricultural practices by the village.

(3) Leaders who are in contact with urban centers, yet consider the village as their home (cosmopolites), influence village-level adoption, in contrast to those who would wish to migrate to a city.

(4) Leaders whose impact is felt most on village-level adoption, generally come from the higher socio-economic classes.

(5) Educated leaders, who do not necessarily come from upper castes, are also more willing to migrate to cities, and do not show any effect on village-level adoption.

Our general conclusion was that leadership characteristics which influence village-level adoption of improved agricultural practices consists of a mixture of traditional and modern characteristics.

Our analysis of the pattern of leader integration, measured in terms of leader consensus, opinion leadership concentration, and power concentration, shows that these make an extremely modest contribution to village adoption. While leader consensus and opinion leadership concentration show this modest relation in a positive direction, concentration of formal positions in a few hands has a negative effect on village-level adoption of agricultural innovations.

Institutional Development and the Success or Failure of Agricultural Change Programs

THE community development program in India has put special emphasis on institutional development in the villages. Institutions, in this instance, are meant for better harnessing of community resources in order to solve problems pertaining to modern times. In this chapter, we have measured the influence of institutions on the community-wide adoption of agricultural innovations. Our main focus is on the total institutional development of our sample villages, and not on any particular kinds of institutions. We have, therefore, included all institutions in our study, regardless of their historical origins, their specialized functions, and their indigenous or exogenous nature.

The assumption here is that any specific improvement in the village society, such as an increase in agricultural production, or an improvement in health standards, or a higher participation in the political and social life of the village, is a product of an overall development of the village. This has been the main philosophy of the community development program in India since it was started in 1952. Although the general objective of the program has been to increase agricultural production, extension work has been channelled into other spheres of village life also, with the aim of bringing about a general development of the village. Thus education, health, small-scale industries, voluntary organizations, co-operatives, family planning, and many other activities received the attention of extension workers, along with agriculture. Since community development primarily concerns people who live in villages, several institutions were introduced in which the village people play an important part. Institution, can, therefore, be considered as an index of develop-

ment in particular spheres of village life. A statistical measure of total institutional development, following the same logic, will similarly measure the total development of the village.

Our main hypothesis in this chapter is that higher institutional development in a village will be positively related to a higher village-level adoption of agricultural innovations.

VILLAGE INSTITUTIONS

We started out with a list of 31 institutions that might possibly be found in the villages. Our field investigators recorded the presence (located in the village or within one mile), or absence (beyond one mile), of these institutions in the villages. In case of institutions which were located beyond one mile from the village, the distance was recorded. Table 21 presents percentages of villages located at various distances from various types of institutions.

TABLE 21: PERCENTAGES OF VILLAGES LOCATED AT VARIOUS DISTANCES FROM INSTITUTIONS

	Within village or within 1 mile	1-4.9 miles	5-9.9 miles	10 miles and over	No information	Total**
1	2	3	4	5	6	7
<i>Educational Institutions</i>						
1. Primary school ..	100.0	.0	.0	.0	.0	100
2. Middle school ..	37.0	46.3	13.0	1.9	1.9	100
3. High school ..	13.9	50.0	22.2	13.9	.0	100
<i>Health Services</i>						
4. Primary health center ..	4.6	22.2	30.6	38.9	3.7	100
5. Subsidiary health center ..	15.7	37.0	18.5	8.3	20.4	100
6. Dispensary ..	24.1	38.0	11.1	17.6	9.3	100
7. Hospital ..	.9	18.5	21.1	56.5	.0	100
<i>Communications</i>						
8. Post-office ..	52.8	39.8	5.6	1.6	.0	100
9. Telegraph office ..	3.7	25.0	31.5	39.8	.0	100
<i>Economic Institutions</i>						
10. Co-operative ..	75.9	18.5	4.6	.0	.9	100
11. Godown ..	19.4	33.3	27.8	12.0	7.4	100
12. Bank ..	.9	15.7	22.4	50.9	.0	100
13. Insurance ..	.0	11.1	16.7	71.3	.9	100
14. Wholesale market ..	2.0	27.8	38.0	31.5	.0	100
15. Retail market ..	37.0	44.4	13.0	4.6	.9	100
16. Village store ..	82.6	--	--	--	--	--

TABLE 21 (Contd.)

	1	2	3	4	5	6	7
<i>Political Institutions</i>							
17. Panchayat	89.8	6.5	2.8	.9	.0	100
18. Political parties*	..	61.1	---	---	---	---	---
<i>Voluntary Organizations</i>							
19. Youth club	65.7	12.0	3.7	.0	18.5	100
20. Community center	24.1	8.3	20.4	13.0	34.3	100
21. Library	47.2	27.8	12.0	7.4	5.6	100
<i>Extension Services</i>							
22. VLV office	48.2	41.7	8.3	1.9	.0	100
23. Block office	3.7	21.3	38.0	37.0	.0	100
24. Veterinary stockman center	..	10.2	38.9	30.6	18.5	1.9	100
<i>Administrative Offices</i>							
25. Police station	1.9	26.9	50.0	21.5	.0	100
26. Revenue office9	17.6	32.4	49.1	.0	100
27. Court0	6.5	15.7	75.0	1.9	100
<i>Religious Institutions</i>							
28. Temple, mosque, church	85.2	4.6	3.7	1.9	4.6	100
<i>Other</i>							
29. Cinema	3.7	18.5	29.6	48.2	.0	100
30. Bicycle repair	19.4	10.7	23.2	16.7	.0	100
31. Engine repair0	13.5	24.1	56.5	.9	100

* Data on distance were not collected.

** Total may not equal 100 because of rounding.

INSTITUTIONAL DEVELOPMENT SCALE

In order to develop a composite index of village institutional development, we have used the Guttman method of scaling. This method helps to select items that are unidimensional, and orders them from high to low in terms of their importance. Before applying the Guttman technique, we subjected the institutions to two screening procedures.

First, institutions which were present in less than 10 per cent or in more than 90 per cent of the villages were rejected. For example, primary schools (present in all villages), primary health centers (90.9 per cent of the villages), hospitals (.9 per cent), telegraph offices (2.8 per cent), banks (.9 per cent), insurance offices (none), wheelwrights (2.3 per cent), block offices (3.7 per cent), police stations (1.9 per cent), revenue office (.9 per cent), court (none), cinema halls (3.7 per cent), and repair shops (none), were dropped from our scale.

Secondly, institutions which are by definition present in every village were eliminated. For example, a health center serves more than one village, usually three to four, and the VLV office serves more than one village. These institutions were also dropped.

We were thus left with the following institutions for Guttman scaling: (1) middle school, (2) high school, (3) dispensary, (4) post-office, (5) co-operative, (6) godown, (7) retail market, (8) village store, (9) panchayat, (10) political parties, (11) youth club, (12) community center, (13) library, (14) temples, mosques, churches, and (15) bicycle repair shop.

The actual scaling was done on the basis of presence or absence of these institutions in the 103 villages, and not on the basis of their distances from the villages. It was assumed for this part of the analysis that the villages are more or less self-contained, and the absence of a particular institution will indicate that the village lacks development in that specific field. An institution was considered to be present in a village if it was located within the village or within one mile of the village boundary. Any institution beyond one mile of the village boundary was considered absent.

Scaling was done with the help of scaling blocks, and five institutions could not be fitted into the scale because of their erratic nature. Institutions which were rejected by the scale were: (1) middle school, (2) dispensary, (3) political parties, (4) library, and (5) community center. We were thus left with ten institutions as scale items. The arrangement of these scale items from low to high can be seen in Table 22 below.¹

TABLE 22: SCALE OF TEN VILLAGE INSTITUTIONS

Institution	Position on scale	Percentage of error
Panchayat	1	6.5
Temples, mosques, churches	2	10.2
Village store	3	13.8
Co-operative society	4	8.3
Youth club	5	12.9
Post-office	6	11.1
Retail market	7	13.8
Godown	8	10.2
Bicycle repair shop	9	9.2
High school	10	7.4
Total percentage of error		10.4

The total percentage of error was 10.4 with a scalability of 89.6. Although 90 per cent scalability is considered a minimum requirement for the soundness of a Guttman scale, the scalability in this case is so close to 90 per cent that we have treated the ten institutions as scale items and scored them in accordance with their positions on the scale. Thus a

1. Compare Frank W. and Ruth C. Young, "The Sequence and Direction of Community Growth: A Cross-Cultural Generalization", *Rural Sociology*, 27 (December, 1962), pp. 374-386; and also Frank W. Young and Isao Fujimoto, "Social Differentiation in Latin American Communities", *Economic Development and Cultural Change*, 13 (April, 1965), pp. 344-352.

village which had a high school obtained the maximum score, a village which had a bicycle repair shop but no high school got the next highest score, and so on. Villages which had only panchayats and no other institutions, received the minimum score.

DATA ANALYSIS

A zero-order correlation between village institutional development scores and scores for village-level adoption of agricultural innovation produced a coefficient of .23 which was significant at the 1 per cent level (according to the one-tailed test of t). However, a first-order partial correlation, controlling on the population size of the village reduced the coefficient to .161 which was not significant even at the 5 per cent level. Our hypothesis that village institutional development is positively related to village-level adoption of agricultural innovations was, therefore, rejected.²

We consider it necessary to add a few qualifications to the above finding. It may be recalled that the scalability of the ten scale items was slightly less than 90 per cent. This would indicate that the items included in the scale may not have been exactly unidimensional. A more elaborate procedure for determining unidimensionality, such as factor analysis, may have indicated several sub-dimensions or clusters of scale items. Due to shortage of time, this could not be done and it will be attempted in a future report. Correlations between individual scale items and village-level adoption of agricultural innovations somewhat support our suspicion. Table 23 below presents these correlations.

TABLE 23: PRESENCE OR ABSENCE OF INDIVIDUAL INSTITUTIONS AND ADOPTION OF AGRICULTURAL INNOVATIONS

Institutions	Zero-order correlation	Partial correlation controlling population size of village
Panchayat .. .. .	.14	.14
Temples, mosques, churches .. .. .	.13	.03
Village store	-.07	-.05
Co-operative society .. .. .	.39*	.26*
Youth club .. .. .	.39*	.37*
Post-office .. .. .	.24*	.17**
Retail market .. .. .	.23*	.16
Godown .. .. .	.14	.03
Bicycle repair shop .. .. .	.12	.01
High school .. .. .	.23	.15

* Significant at 1 per cent level of confidence according to the one-tailed test of t .

** Significant at 5 per cent level of confidence according to the one-tailed test of t .

2. Thus, although we and others, such as Young and Young, *op. cit.*, have been able to develop scales which measure the same general dimension, it is not yet clear that these scales have any considerable utility in data analysis.

It can be seen from the above Table that five out of ten institutions in the zero-order correlations, and three out of ten in the partial correlations, are significantly related to village-level adoption. Inter-correlations among the scale items suggest the possibility of at least two clusters of institutions, one of which is related and the other unrelated to village-level adoption. It is possible, therefore, that being in the same scale they depress the effect of the scale on village-level adoption.

Another explanation for the lack of relationship between institutional development and village adoption may lie in our assumption that villages are more or less self-contained. It may be recalled that our scaling was based on the presence or absence of institutions in the village. We considered an institution present in a village if it was located within at least one mile of the village. Institutions beyond that distance were considered absent. Our finding in this chapter may perhaps indicate that villages are connected extra-territorially through institutions.³ In other words, a measure of the institutional development of a village should take into consideration institutions which are outside of the village, and development should be measured in terms of the distance of an institution from the village rather than its presence or absence.

Correlations between the distances of institutions from villages and village level adoption of agricultural innovations give some support to this line of thought. Table 24 below presents these correlations.

TABLE 24: DISTANCE FROM THE VILLAGE OF INDIVIDUAL INSTITUTIONS AND ADOPTION OF AGRICULTURAL INNOVATIONS

				Zero-order correlation	Partial correlation controlling population of village
Panchayat (1)	..	..	..	---	---
Temples, mosques, churches (1)	..	..	..	---	---
Village store (2)	..	..	..	---	---
Co-operative society	..	..	..	.29*	.29*
Youth club ..	..	..	..	.42*	.42*
Post-office ..	..	..	..	.46*	.46*
Retail market	..	..	..	.32*	.32*
Godown ..	..	..	..	.21**	.21**
Bicycle repair shop	..	..	..	.13	.13
High school	..	..	..	.33*	.33*

(1) No correlations were run because of the extreme skewness of the data.

Table 24.

(2) Data on distance not available, see Table 21.

* Significant at 1 per cent level according to one-tailed test of significance.

** Significant at 5 per cent level according to one-tailed test of significance.

3. See also Herbert A. Aurabac, "A Guttman Scale for Migration", *Research in Transportation*, 20 (June, 1955), pp. 142-145. Aurabac uses commuting items to measure relative isolation of countries.

ation", *Res*
transportation.

It becomes clear from Table 24 that so far as institutional development is concerned, it may be more meaningful to take a territorial unit larger than the village. Out of seven institutions, six (in the zero-order analysis) and five (after controlling size of village population) are significantly related to village-level adoption, showing thereby that extra-village institutions influence village-level adoption. Our attempts to pursue this line of thought and develop an institutional distance scale did not yield acceptable results.⁴ However, we are presenting the data in Table 24 with the suggestion that further research may be useful.

SUMMARY

In this chapter, we have examined the influence of village institutional development on the adoption of agricultural innovations by the village as a whole. A Guttman scale for institutional development was constructed on the basis of the presence or absence of a number of institutions. The scale contained ten institutions. Correlation analyses failed to show a significant relationship between village institutional development scores (as indicated by the scale) and village adoption.

Our main conclusion, therefore, was that the institutional development of a village is not fully related to the presence or absence of institutions in or from the village. It is not directly related to village-level adoption of improved agricultural practices.

Further data analyses suggested hypotheses for future research. First, village institutions may be multi-dimensional and should be treated accordingly. It is possible for institutions to grow in clusters or complexes and these complexes may work against each other. Secondly, villages may not be self-contained so far as institutions are concerned. Villages may be connected extra-territorially through institutional networks. To study the effects of such patterns on village-level adoption, one needs to take an area larger than the village as one's unit of study.

4. The primary difficulty has been that scale items based on distance from the village, which have acceptable proportions of error, tend to divide the sample of villages at nearly the same cutting-point, yielding essentially a small town versus village dichotomy. Still another scale, not based on distance as such but on presence or absence of institutions within a five-mile radius of the village, looks much more promising, and a re-analysis of some of the data presented here is underway.

Multivariate Analysis of Factors Contributing to the Success or Failure of Agricultural Change Programs

IN this, the final chapter in our analysis, we will consider jointly the many different characteristics of villages which we have discussed thus far, to determine which factors seem to make the most difference in accounting for the success of agricultural change programs. To some extent we have already been working toward this end in the preceding chapters. We asked, for example, whether a proliferation of voluntary organizations really contributed to program success, or whether the apparent positive effect of voluntary organizations was only a function of the fact that larger villages have both more voluntary organizations and higher levels of adoption.

Here, however, we will carry the process of considering several variables at the same time much farther. We have again chosen to use partial correlation techniques to delete those variables with least explanatory power. Our higher order partial correlation analysis has been carried out in two stages. First, we have taken the best predictors of village-level adoption from a given chapter and have considered those jointly. In this manner, for example, we deleted two of the five independent variables which had significant zero-order correlations with village-level adoption from the chapter on program administration. And second, having deleted the weaker predictors from the group of variables pertaining to each chapter, we have then aggregated all of the remaining variables into one final partial correlation analysis.

The successive deletions of those independent variables with least predictive power has the obvious advantage of permitting us to focus our

analysis on fewer and more critical factors. This has been our intent. One must also keep in mind, however, that if we delete a variable at some point in our analysis we are not saying that it is of no consequence whatsoever.

For example, as we broaden our analysis to include the entire village spectrum, we will argue that village electrification is an important factor in the success of agricultural change programs. At that stage in the analysis the several ways in which we have assessed caste will have been dropped from the analysis. It would be both intuitively and statistically unwarranted to conclude that caste makes no difference to the success of agricultural change programs. We can argue that *from the point of view of the village as a whole*, at a given point in time, caste differences are overshadowed by other factors, including electrification. But we must also keep in mind that if we pose the problem of how a village can obtain electricity, then we will probably be concerned with the role village leaders play in such an endeavor, and it would be foolish to ignore the caste status of those leaders. In other words, we are quite deliberately shifting our analysis to the abstract, village level. But that does not mean that we ignore the complex substructure which makes the village what it is.

In the following pages we will present Tables of zero-order and highest order partial correlations which refer to the chapters on program administration, communication, village resources, village structure, and village leadership. Each of these will be briefly discussed. The institutional development chapter is not represented in this discussion because our measure of institutional development was not significantly associated with adoption. The discussion is followed by another Table and summary discussion, treating jointly the key variables from each of the chapters.

PROGRAM ADMINISTRATION

Of the many variables which were considered in the chapter on change program administration, five are retained for further consideration here (Table 25). These variables describe the distance of the change agency from the village, the agents' contact with the village and, in turn, leaders' contact with the agency, plus two measures of leaders' perceptions of the change agent and how he performs. The five variables combined explain 36 per cent of the variance in agricultural adoption.

TABLE 25: ZERO-ORDER AND FOURTH-ORDER PARTIAL CORRELATIONS OF PROGRAM ADMINISTRATION VARIABLES WITH AGRICULTURAL ADOPTION

	Zero-order correlations*	Fourth-order partial correlations*
Institutional proximity scale (distances from various agencies) ..	.28	.04
Index of agent contact with village ..	.50	.25
Index of leaders' contact with agents ..	.52	.30
VLW competence index ..	.25	-.15
Extension performance index ..	.39	.17

* For most coefficients the relevant degrees of freedom are 100, with a coefficient of .164 or larger needed for significance.

It is apparent from an examination of the partial correlation coefficients in Table 25, that the distance between change agency and village is of no consequence when reciprocal contacts between the village and the agency are considered as well. Both agents' and leaders' contacts show significant partial correlations, and this is somewhat surprising in that the two types of contact are of course related. In the last section of our analysis we will argue that leaders' contact with the agency, reflecting the initiative of local leadership, is the more critical variable in explaining success of change programs. For the moment, both types of contact remain as important factors in our analysis, however.

The partial correlation analysis suggests that leaders' perceptions of the VLW as competent or incompetent are not of major significance if they think he *and other change agents* are performing well, and if there is contact between them. Competence and performance are not independent, but the performance index refers to block as well as village-level personnel. We can, therefore, infer that team performance is of greater importance than the perceived competence of one of the team members.

COMMUNICATION

Table 26 contains the 14 variables remaining from the analysis of communication variables as related to adoption. Village size is included in the partial correlation analysis because it had been used earlier as a control variable. We may note here, however, that differences in population size are not associated with adoption when considered in conjunction with the communication variables.

The communication variables cover a wide range, including both physical and mental isolation, and also several indicators of access to and actual contact with the larger society. Considered together in a multiple

correlation analysis, these 14 variables account for 57 per cent of the variance in village-level adoption of agricultural practices.

TABLE 26: ZERO-ORDER AND THIRTEENTH-ORDER PARTIAL CORRELATIONS OF COMMUNICATION VARIABLES WITH AGRICULTURAL ADOPTION

	Zero-order correlations*	13th-order partial correlations*
Population of the village .. .. .	.25	-.04
Distance from bus depot	-.35	-.16
Index of attitudes toward programs of change .. .. .	.29	.32
Secular orientation (leaders) .. .. .	.45	.18
Index of urban contact (leaders) .. .. .	.29	-.05
Urban contact through males migrating, <i>per capita</i> .. .. .	.16	.17
Access to radio (radios per person) .. .. .	.23	-.08
Index of access to mass media (distance from post-office, library, cinema) .. .. .	.31	.18
Print mass media contact .. .. .	.17	.07
How often leaders attended cinema .. .. .	.43	.20
Index of agency access** (distances from various agencies) .. .. .	.28	.14
VLW headquarters in village .. .. .	.38	.22
Index of leaders' contact with agents .. .. .	.52	.32
Agent's choice of media (personal <i>versus</i> impersonal contact) .. .. .	.17	.32

* For the zero-order correlations the relevant degrees of freedom are 100, with a coefficient of .164 or larger needed for significance. For the partials, 90 degrees of freedom and a coefficient of .173 are more appropriate.

** Same as Institutional Proximity, Table 25.

The partial correlation analysis considerably reduces the number of communication variables which must be considered critical. One of the remaining indicators of geographic isolation, distance from bus depot, drops out of the analysis when the several variables are considered jointly. This is consistent with our inference in the previous section, where we indicated that reciprocal contact, which can be established in spite of isolation, is the more important factor. Only VLW headquarters in the village continues to show a significant, positive association with adoption.

Indexes of mental isolation, or an absence of such isolation, are not deleted by the partial correlation analysis. Favorable attitudes toward programs of change and a secular orientation among leaders show positive and significant partial correlations with change program success.

On the whole, the relationships of indicators of contact with urban areas and with the various mass media are reduced in the partial correlation analysis. In part they may cancel each other out, but the fact that direct contact between village leaders and change agents continues to be significantly associated with adoption (Table 26), suggests that the mass media probably do not have much impact on adoption of new practices

in the village. Given that the mass media are not yet extensively used for this purpose, our inference would seem reasonable. In any case, the correlations of access to radio, and contact with the print mass media drop to near zero. Leaders' attendance at cinema and the general index of access to mass media, which is a distance measure, continue to show significant correlations with adoption, but the relationships are much reduced in the partial correlation analysis.

Urban contact through males migrating from the village continues to show a modest relationship with level of adoption. The index of urban contact, however, which assesses leaders having lived in or visiting urban areas, is deleted from the analysis. The latter index is the most direct measure of urban contact we had in our analysis, and the fact that the correlation with adoption drops to near zero when other communication variables are considered, tends to rule out urban contact as a major factor in explaining success of agricultural change programs.

Finally, the relationship of agents' choice of media with adoption, the last item listed in Table 26, is substantially increased when other communication variables are considered. The major distinction which this measure makes is between direct personal contact with the client and the use of less direct techniques, especially the demonstration of the innovation. In constructing the measure we did not distinguish between the use of radio and print media, and the use of farm demonstrations. Most responses indicating the use of less personal techniques had reference to the demonstration, however. Radio and print are not yet used extensively, especially at the local level, thus our measure essentially contrasts the use of demonstrations with the use of personal visits and group sessions. Our analysis indicates that a greater use of demonstrations contributes to a higher level of adoption. And we might also infer from the relationship that as the use of other less personal teaching techniques, especially the use of the mass media, becomes more feasible, levels of adoption will be increased further.

VILLAGE RESOURCES

The zero-order and partial correlations of village resource variables are described in Table 27. These seven variables, combined in a multiple correlation analysis, account for 35 per cent of the variance in adoption of agricultural innovations at the village level. All but two of the variables are deleted from our analysis, however, when we consider the partial correlations shown in Table 27.

TABLE 27: ZERO-ORDER AND SIXTH-ORDER PARTIAL CORRELATIONS OF VILLAGE RESOURCE VARIABLES WITH AGRICULTURAL ADOPTION

	Zero-order correlations*	Sixth-order partial correlations*
Population of the village	.25	-.01
Proportion literate, males	.39	.25
Proportion of families taxed Rs. 10 or more	.30	.08
Number of laborers per owner-cultivator	.30	.15
Proportion of cattle which were bullocks	-.31	-.12
Electricity in the village	.47	.35
Predominant mode of transport (mechanization of transport)	.23	.12

* For most coefficients the relevant degrees of freedom are 100, with a coefficient of .164 or larger needed for significance.

Village size was also included in the partial correlation analysis of communication variables, and just as in that section, the effect of population size drops to near zero when other variables are considered. Sheer numbers do not seem to make a difference when one considers some of the qualitative factors which may, to some extent, go with larger numbers. The next variable listed in the Table, the proportion of village males who are literate, would be an example of the above. Larger communities typically have more highly developed school facilities, and higher literacy contributes to higher levels of adoption, at least at this level of analysis.

The several measures of personal wealth and resources are all deleted from our analysis when the resource variables are considered jointly. Differences among villages in individual wealth, measured by the proportion paying Rs.10 or more annually in village taxes, show no relationship with adoption when other differences are held constant. Similarly, the availability of a plentiful supply of labor drops in importance in this analysis.

The major village resource which seems to make a substantial difference in level of adoption is the availability of electric power. More will be said on this point later. For the moment, we will point out that the availability of mechanized transport and a plentiful supply of labor drop in importance, while the availability of electric power continues to show a positive and significant relationship with adoption.

The negative influence of a high proportion of bullocks among village cattle on levels of adoption, which had been difficult to account for in our earlier zero-order analysis, is to some extent clarified in the partial correlation analysis shown here. We had expected the greater availability of animal draught power to encourage adoption of modern practices, but this did not prove to be the case. For the partial correlation analysis, we

obtained inter-correlations among the several village resource variables, and some of these are quite relevant to the present discussion.

The evidence available suggests that bullocks may, to some extent, become redundant when villages have other sources of power available. A high proportion of bullocks is negatively associated with the measure of mechanization of transport ($r = -.17$). The bullock index is also negatively associated with village electrification ($r = -.23$). As motor transport and electric power become available, there is less need for animal power. Availability of the modern power sources, especially electric power, makes a positive contribution to village adoption levels.¹ And when the several power indices are considered jointly in a partial correlation design, the negative relationship of the bullock index drops below the level of significance.

VILLAGE STRUCTURE

Zero-order and sixth-order partial correlations with agricultural adoption are shown in Table 28 for the seven variables which had been considered under the heading of village structure. In multiple correlation terms, these seven variables together account for 56 per cent of the variance in village levels of agricultural adoption. Since several of the variables listed in Table 28 were also included in the partial correlation analyses discussed above, and were deleted, we need not repeat that discussion here. Village size, the availability of labor, and the proportion paying higher levels of village taxes do not show significant relationships with adoption levels when other village characteristics are considered.

TABLE 28: ZERO-ORDER AND SIXTH-ORDER PARTIAL CORRELATIONS OF VILLAGE STRUCTURE VARIABLES WITH AGRICULTURAL ADOPTION

	Zero-order correlations*	Sixth-order partial correlations*
Population of the village .. ..	.25	.02
Number of laborers per owner-cultivator ..	.30	.18
Proportion of families taxed Rs. 10 or more ..	.30	.17
Proportion of voters in most numerous caste ..	-.33	-.07
Number of temples, mosques, or churches ..	.33	.12
Number of political parties ..	.43	.35
Number of voluntary organizations ..	.42	.17

* For most coefficients the relevant degrees of freedom are 100, with a coefficient of .161 or larger needed for significance.

1. See Andrew J. Sofranko, Michael P. Nolan, and Robert C. Bealer, "The Definition of Modernization as a Power Continuum and Some Concomitant Structural Differentiations", paper presented at the annual meeting of the Rural Sociological Society, San Francisco, August, 1957.

Of the several indicators of organizational and associational complexity in the village, only the number of political parties continues to show a fairly strong relationship with village adoption levels. The partial correlation between number of voluntary organizations and adoption remains significant but is much lower than the zero order coefficient. This is in part a function of the fact that numbers of political parties and numbers of voluntary organizations vary together ($r = .29$). The number of political parties is also fairly strongly associated with the number of temples, mosques and churches ($r = .40$). This inter-relationship helps to account for the fact that the number of religious structures is not significantly associated with adoption when the other structural variables are considered. Specifically, we infer that the positive effect of a proliferation of religious groups is overshadowed by the effect of political parties.

In general, we can say of the organizational variables that when both traditional and modern types of organizations are considered jointly, only the more modern types of organizations make a significant difference in adoption level for the village. The more modern types of organizations are more directly concerned with village development. The critical underlying variable probably is an instrumental relationship between the village and relevant aspects of the larger society such as government, rather than the growth and development of organizations as such.²

The negative relationship between numerical dominance by a single caste and village adoption level drops to near zero when the other structural variables are considered. Caste dominance is negatively associated with most of the other structural variables, among them the number of political parties ($r = -.21$). Other, and again more modern, devices for distributing power in the village can apparently overcome the conservative influence of dominance by a single caste.³

VILLAGE LEADERSHIP

Six variables were considered in the partial correlation analysis of village leadership variables, shown in Table 29. The multiple correlation

2. See the discussion of community homogeneity and heterogeneity in J. A. Duncan and E. W. Kreidlow, "Selected Cultural Characteristics and the Acceptance of Educational Programs and Practices", *Rural Sociology*, 19 (December, 1954), pp. 349-357. The prior discussion of institutional development and its importance for change generally is also relevant. See especially, Frank W. and Ruth C. Young, "The Sequence and Direction of Community Growth: A Cross-Cultural Generalization", *Rural Sociology*, 27 (December, 1962), pp. 374-386.
3. Compare J. R. Gusfield, "Tradition and Modernity: Misplaced Polarities in the Study of Social Change", *American Journal of Sociology*, 72 (January, 1967), pp. 351-362; and M. N. Srinivas, *Caste in Modern India and Other Essays*, Bombay: Asia Publishing House, 1962.

of these six accounts for 40 per cent of the variance in adoption of agricultural practices at the village level. Several of these variables have also been considered and discussed above; therefore, the discussion can be abbreviated here.

TABLE 29: ZERO-ORDER AND FIFTH-ORDER PARTIAL CORRELATIONS OF VILLAGE LEADERSHIP VARIABLES WITH AGRICULTURAL ADOPTION

	Zero-order correlations*	Fifth-order partial correlations*
Caste .. .. .	.37	.13
Level of living .. .. .	.25	.01
Urban contact .. .. .	.29	.06
Index of leaders' contact with agents .. .. .	.52	.38
Secular orientation .. .. .	.45	.27
Credit-risk orientation .. .. .	.20	.14

* For most coefficients the relevant degrees of freedom are 100, with a coefficient of .164 or larger needed for significance.

Two variables stand out in their positive effect on increasing village adoption of modern practices. These are leaders' contact with change agents and leaders' secular orientation. Villages which have secularly oriented leaders who are able and willing to take some initiative in making contact with change agents apparently benefit from that in higher levels of use of modern practices. It is of considerable interest to note in this respect that the two measures of leaders' status, caste, and level of living, are not associated with the measure of adoption when the other variables are considered. The status of village leaders makes little direct difference in adoption levels, but they must take initiative in contacting the sources of change and they must be secularly oriented to be able to capitalize on the opportunities available.⁴

Similarly, leaders' contacts with cities and their willingness to take credit-risks drop out of the analysis when they are considered in conjunction with direct contact with change agents and the other leadership variables. At first glance it would seem likely that the more comprehensive attitudinal variable, secular orientation, would account for the deletion of leaders' credit-risk orientation. This is not the case however, the two variables are not related ($r = .04$). In fact, leaders' credit-risk orientation is not significantly related to any of the other five variables considered here, so we can give no specific reason for its deletion in the partial correlation analysis.

4. Compare I. K. Sen and P. Roy, *Awareness of Community Development in Village India*, Hyderabad: National Institute of Community Development, 1966.

SUMMARY ANALYSIS OF VILLAGE CHARACTERISTICS AND ADOPTION

Finally, in Table 30, we have combined the better predictors of village adoption levels from the preceding sections into a summary analysis. Thirteen variables remain for consideration, and the Table shows both the zero-order and twelfth-order partial correlations. When we combine these 13 variables into a multiple correlation analysis, we can account for 59 per cent of the variance in village adoption levels. The fact that we can account for a substantial proportion of the total variance in adoption levels among villages with these variables is at least encouraging. Our 108 sample villages differ in many respects, and the multiple correlation gives us assurance that some of the key differences have been isolated.

We are primarily concerned with the twelfth-order partial correlations in this discussion, however. When we combine the best predictors of agricultural adoption from the several content areas into a single analytic design, it is apparent that most of the selected variables are of relatively minor importance. Only four of the partial correlations, shown in Table 30, are statistically significant. These four variables apparently account for most of the differences among villages in adoption of modern agricultural practices.

TABLE 30: ZERO-ORDER AND TWELFTH-ORDER PARTIAL CORRELATIONS OF ALL VARIABLES REMAINING FROM THE PREVIOUS ANALYSIS WITH AGRICULTURAL ADOPTION

	Zero-order correlations*	12th-order partial correlations*	Least square fourth-order partial correlations**
Index of agent contact with village ..	.50	.11	.36
Index of leaders' contact with agents ..	.52	.19	
Extension performance index ..	.39	-.05	
Secular orientation (leaders) ..	.45	.35	.45
Urban contact through males migrating (per capita) ..	.16	.12	
Index of access to mass media (distance from post-office, library, cinema) ..	.31	-.04	
How often leaders attended cinema ..	.43	.03	
VLV headquarters in village ..	.38	.15	
Agent's choice of media (personal versus impersonal contact) ..	.17	.29	.21
Proportion literate, males ..	.35	.11	.21
Electricity in the village ..	.47	.32	.37
Number of political parties ..	.43	.13	
Number of voluntary organizations ..	.42	.10	

* For the zero-order coefficients the relevant degrees of freedom are 109, with a coefficient of .164 or larger needed for significance. For the partials, 90 degrees of freedom and a coefficient of .173 are more appropriate.

** A least square deletion computation deleting insignificant variables singly was conducted and these five variables remained. Together they explain 53 per cent of the variance, and the highest order partials are presented for the five-variable solution. The results are similar to the 12th order partials except that agent contact is substituted for leader contact and male literacy becomes more important.

Before discussing these results, however, we should probably repeat our earlier warning about simply ignoring those variables which have been deleted. All of our analysis has been oriented toward consideration of the agricultural village as a unit. A village, like an individual, is a complex entity. No two villages are precisely alike. With the present data we can compare more villages in more respects than almost any other scholar or group of scholars has been able to do before. We are on relatively safe analytic ground, then, in discussing that abstract entity, the village. And as we look at the village as a unit, we can, with present data, select a few key factors which seem to be more important than many others in explaining differences among those villages in adoption of agricultural practices. Most people concerned with change in villages, however, are more immediately concerned with a particular village or a small group of villages. In these practical situations, where one is concerned with the particular as well as the general, many of the variables which we have deleted in the present analysis may play key roles in explaining success or failure of change programs. We urge the reader, then, to keep in mind all stages of our analysis in applying these findings to particular situations.

The four factors which are of major importance in explaining differences among villages in adoption of agricultural practices are village leaders' contact with change agents, the secular orientation of village leaders, change agents' use of impersonal techniques in disseminating information — especially the demonstration — and the electrification of the village.

We can infer that physical isolation of the village is not of major importance in explaining adoption levels if villages have secularly oriented leaders who are willing to take the initiative in contacting the change agent and agency. Even the presence of VJW headquarters in the village, which certainly maximizes the opportunity for change agent contact in some villages, is not significantly associated with adoption levels when the broader spectrum of variables is considered.

More importantly, we can observe that frequency of agent contact with the village drops in importance when the spectrum of village differences is considered. There is only weak evidence in our data that increasing agent contact, say by increasing the number of agents working in a given area, or that modifying the selection and training procedures used in recruiting agents, hold the key to change program success. Our data reaffirm the old truth that the client must want the change and ask for it before an effective transfer of agricultural innovations can take place. The innovation and the change agent must be available to the

client; but the key factor seems to be the client's willingness to take some initiative in obtaining help.

The one variable having to do with techniques of information dissemination which continues to be significantly associated with adoption level in this summary analysis is the use of impersonal media by change agents, especially the demonstration. Our data confirm the wisdom of current practice, which puts considerable stress on the use of result and method demonstrations. Our data also indicate that the less direct influence of general exposure to radio, print or film media is overshadowed in importance by some of the other factors.

Both leaders' attendance at cinema and our index of access to mass media show correlations with adoption which are near zero in this summary analysis. Similarly, the indirect influence of urban contact seems to be overshadowed by other factors. The one urban contact variable which had not been deleted earlier is contact between village and city as a function of males migrating to the city. The zero-order correlation of this variable with adoption was not high, and the twelfth-order partial correlation is below the level of significance.

The organizational complexity of the village and the level of male literacy in the village are also deleted in the partial correlation analysis. The village resource which seems to be most important in explaining differences in adoption levels is village electrification.

Earlier, we had expressed some concern about the fact that electrification could, in some senses, also be treated as part of our dependent variable, and that our reasoning here might be circular. Electrification is certainly an adjunct of modern agriculture, especially in the present context in which power for pumping irrigation water is vital. Village electrification represents much more than a productive resource, however. Electrification has enormous implications for all aspects of living, and probably represents a key step in linking the farmer with the commercial-industrial complex of the larger society. Electricity opens many doors to the farmer as consumer. The farmer uses it in the home as well as on the farm. Expenditures for lights, fans, radios, and so on, depend on a cash income. More cash, in turn, depends on more production. It may well be that the attractiveness of consumer goods and services plays an important role in stimulating productivity.

In summary, we can say that the agricultural village which has an important resource, electric power, and has a secularly oriented leadership which is willing to go to the change agency for information and supplies, and is served by change agents who are willing to demonstrate modern practices, is most likely to have a successful agricultural change program. It should be remembered, however, that the other variables we have considered, which were deleted at some point in our analysis, may well

be important for program success in a particular village. We feel confident that if all of the factors we have considered are taken into account, in the degree that seems appropriate for a particular setting, then a major part of the solution to India's food problem will be found.

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