ARL-1

AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523
BIBLIOGRAPHIC INPUT SHEET

FOR AID USE ONLY
Batch 73

1. SUBJECT CLASSIFICATION
A. PRIMARY: Food production and nutrition — AA00-0000-0000
B. SECONDARY: General

2. TITLE AND SUBTITLE
Approach and hypotheses for the village level studies of the International Crops Research Institute for the Semi-Arid Tropics

3. AUTHOR(S)
Binswanger,H.P.; Jodha,N.S.; Ryan,J.G.; Von Oppen,M.K.

4. DOCUMENT DATE	5. NUMBER OF PAGES	6. ARC NUMBER
1977	829.29 P	ARC

7. REFERENCE ORGANIZATION NAME AND ADDRESS

ICRISAT

8. SUPPLEMENTARY NOTES (Sponsoring Organization, Publishers, Availability)
(In Occasional paper no.15)
(In Village Level Studies ser. 1.1)

9. ABSTRACT
This report contains anthropological and economic discussions of conditions for the promotion and maintenance of group action among farmers whose improved use of agricultural resources depends upon collective measures. The purpose is to demonstrate principles of social organization which help promote the increased welfare of agricultural communities by coordinating and improving use of the natural resources exploited by their members. Disregard of the long term ecological consequences of traditional farming systems is a principal reason for instability and stagnation of agriculture in semi-arid tropical regions. Coordination or group action are necessary since many agricultural development problems affect not only individual holdings but also larger environmental units. Cases are compared from different areas of India. Topics included are (1) the need for watershed-based systems of farming; (2) implications of the fragmentation of watersheds; (3) conditions for group action; (4) group action for credit and marketing; (5) group action for local irrigation control; and (6) group action for irrigation development and for land shaping. The main conclusion is that in the absence of expensive, centralized administrative control, local group action can only be based on rules which establish a society of reciprocity rather than redistribution with respect to the resource or activity involved. Willing participation can only arise if the resource in question works in the same way for all its users and if each has the right and opportunity to protect his interests.

10. CONTROL NUMBER
PN-AAF-050

11. PRICE OF DOCUMENT

12. DESCRIPTORS
Farm management
ICRISAT
Semiarid land
Surveys
Villages

13. PROJECT NUMBER

14. CONTRACT NUMBER
AID/ta-G-1073 GTS

15. TYPE OF DOCUMENT

AID 590-1 (4-74)

APPROACH AND HYPOTHESES FOR THE VILLAGE LEVEL STUDIES OF THE INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS

Hans P. Binswanger
N. S. Jodha
James G. Ryan
M. von Oppen

ICRISAT

Occasional Paper 15
(Village Level Studies Series 1.1)

ECONOMICS PROGRAM
INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS
1-11-256 Begumpet, Hyderabad-500 016, (A.P.) India

May, 1977

Approach and Hypotheses for the Village Level Studies of the INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS*

Hans P. Binswanger
N.S. Jodha
James G. Ryan
M. von Oppen

INTRODUCTION

The low and unstable crop production of the semi-arid tropics (SAT) stems largely from three conditions. First is the inherent deficiencies of the natural resource base, such as low and erratic rainfall. Second is the insufficient and sometimes ineffective investment in improvements of the natural resource base--such as irrigation, soil improvements, and agricultural research. The third is the inefficient utilization of existing or potential resources of the SAT because of social and institutional structure and insufficient diffusion of knowledge among farmers.

---

* Village Level Studies Series 1-1.

This paper is a revised and combined version of two earlier papers: N.S. Jodha, *An Approach to Study of Traditional Farming Systems in the Semi-Arid Tropical Regions of India,(Mimeo.,* 1974) and Hans P. Binswanger, James G. Ryan, Matthias von Oppen and Associates, *Hypotheses and Priorities for the Village Level Studies in the Semi-Arid Tropics of India,* Economics Program, ICRISAT, December, 1974, Mimeo.

The first problem obviously cannot be eliminated. However, the second condition constitutes the core problem for a research institution such as ICRISAT. To solve the technical problems of investment, to improve the natural resource base, and to guide agricultural research effectively, however, requires knowledge about the socio-institutional problems of agricultural resource management and production. Attainment of such knowledge constitutes an important part of the research programme of the Agricultural Economics Program of ICRISAT.

To effectively determine research priorities and approaches and investment strategies and to understand the socio-institutional problems requires a thorough understanding not only of the scientific basis of agricultural production and of the opportunities for improvement, but also of existing farming systems and their biological and socio-economic determinants. Put otherwise, we must know and understand the constraints which limit agricultural production to existing levels.

For example, adoption of new varieties may be constraint because of several reasons each of which require a different policy or research response. If the varieties are not biologically adapted to a target region, a larger breeding effort is required. If, on the other hand, farmers cannot use the varieties due to credit constraints, ignorance, or unavailability of fertilizers, additional research will achieve little until the credit institutions, the extension service, or the input distribution system are improved.

Practically all projects of the Agricultural Economics Program are, in one way or another, designed to identify and quantify the relative importance of different constraints to increases in agricultural production. These projects use a variety of data bases--secondary stati-

stics on production, yields and factor endowments in various regions of the semi-arid tropics; experimental data generated by ICRISAT and other research organizations; market data collected by marketing authorities; consumption data of rural and urban households collected by official agencies; or agricultural farm-level data collected by agricultural universities or other research organizations. It became however, quickly apparent that many of these projects would also need additional village-level survey data which could not be obtained from secondary sources or from micro-level data collected by other organizations. Economics and other units of ICRISAT required a set of locations at which they could regularly monitor traditional farming practices and take non-experimental biological observations in addition to performing a modest amount of on-farm experimentation. The VLS (Village Level Studies) were thus set up, using a multidisciplinary approach, as an organized way of gathering original microlevel data to satisfy many of the needs of different researchers in ICRISAT.

In particular, the village-level studies were to provide the data base for the following types of analyses:

- Hypothetical and actual tests of new practices against the existing farming system via cost-benefit analysis and other checks of how the new technologies could fit into or supersede existing practices.
- Examination of proposed research projects for their likely contribution to alleviating existing constraints.
- Search of existing practices of farmers for components which might be incorporated into new technologies or improved by research.
- Identification of formal or informal institutional arrangements evolved in the past to facilitate agricultural production and identification of institutional changes required to make adoption of new knowledges or investment packages feasible.

In determining the data needs for these specific objectives, it became clear that we required accurate data on cultivation practices and inputs and outputs for all fields operated by farmers. A continuous effort was therefore inevitable. Second, we required data on incomes and expenditures and on labour use by all members of the family. Finally, detailed data on all physical assets were also required. This type of data set are also gathered in India by the Cost of C-ltivation Scheme of the Ministry of Agriculture and earlier in the Farm Management studies and the Village studies of India's Agro-Economic Research Centres. We nevertheless needed to collect new data because we needed to combine the basic economic data with technical and biological observations, with additional soil data, with data from labour households owning no land, and with specific ad hoc questionnaires and investigations on nutrition, risk attitudes and opinion surveys; data on formal and informal collaborative arrangements etc. Dependence on data from other organizations usually means waiting two or three years after completion of the field investigation; matching agrobiological data and ad hoc surveys with the existing economic data then becomes impossible.

Another feature which distinguished the ICRISAT VLS from other agro-economic studies was their immediate purpose of communicating knowledge of the existing farming system to ICRISAT researchers, which could then be compared with new systems or components thereof on which work was intended or in progress. When such information was communicated, it often resulted in new or clarificatory questions which required the addition of more questions to the routine questionnaires or to the design of specific special-purpose surveys to verify, document, or quantify. The opportunity to clarify, at the field level, questions thrown up in this manner during data analysis was extremely valuable.

Due to the combination of agro-biological and many ad hoc enquiries with the basic data-gathering effort, we believe that the VLS have been a very economical way of generating data. Whenever scientists within ICRISAT or from the outside become interested in a particular problem requiring village-level data, we already have all the necessary demographic, economic, and agro-climatic background data so that a particular question can be addressed by analyzing the existing data or by complementing it with a one-shot special-purpose survey or by adding a few questions to the routine questionnaires. In addition, by concentrating all micro-data gathering efforts in a few villages, we already have, when new questions arise firsthand knowledge based on complementary analyses of the same situation--thus we are not facing entirely new situations. We also continue to hold open the studies for researchers inside and outside the Institute by providing data and opportunities for special-purpose surveys on the same households. For these reasons, we quickly realized that the data-gathering effort would be rather wide in scope. To avoid needlessly complicated data-gathering, however, we set up a number of hypotheses in a specific priority ordering. These are reported in a later section of this paper.

GEOGRAPHIC AND TEMPORAL SCOPE

To serve ICRISAT objectives it was necessary to carry out the studies in different agro-climatic zones. We decided to limit the study to three zones and selected Sholapur, Akola and Mahbubnagar districts. The rationale and procedures for the selection of the areas and villages are given in Jodha, 1977. Next, we wanted to set up the study such that we could ourselves train and supervise the investigators and in the process

become personally familiar with the villages and farmers involved. This precluded a rigorous stratified sampling approach over a whole district or taluk, but required concentration in a few villages and subsequent selection of "typical villages."

Since we were not interested in generating statistical estimates of yield or other production parameters for a district, we felt that the gains from concentrating on few villages outweighed the potential losses in statistical purity. However, as a safeguard we decided to study two villages located fairly close to each other; unless we are able to show a particular phenomenon in both villages of an area, we have to assume that special village effects are important. Furthermore, studying two villages in each region has been useful in testing the data for accuracy and consistency. Finally, we decided to make the effort continuous and thus posted resident investigators in each of the villages. The investigators have rural backgrounds and a basic agriculture degree, along with M.Sc., degrees in agricultural economics, which enables them to collect both economic and biological data. The detailed data gathering procedures are discussed in Jodha, 1977.

HYPOTHESES AND PRIORITIES

This section is a slightly revised version of the original paper setting the economic hypotheses to be tested in the village-level studies, (Binswanger, et. al., 1975) and continues to reflect our thinking at the planning stage of the studies. The revisions have been mainly editorial, except for the section on risk where the originally proposed approach was found to be infeasible; other approaches are employed.

The hypotheses are grouped into eight areas listed in order of priority and urgency with respect to the VLS (and not with respect to the overall goals of biological, social, or economic research at ICRISAT). These priorities are determined by how urgently answers are needed for other researchers in ICRISAT; by how well the VLS are suited to answer the question; to what extent data collection with respect to a hypothesis is tied to the cropping season; and by how much work or data collection with respect to the hypotheses is going on outside of ICRISAT.

The hypotheses can be classified into eight categories :

1. Economic and environmental causes of present cultivation practices;
2. Seasonal pattern of resource availabilities and bottlenecks (labour, power, water);
3. Consumption and nutritional status of the low income population groups;
4. Impact of risk and uncertainty on farmers' behaviour and adoption of new techniques;
5. Marketing and consumer-acceptance problems;
6. Group-action problems;
7. Income distribution and distribution of benefits from technology;
8. Speed of diffusion of new technology.

These question areas are highly inter-related and frequently the answer to a question in one area will depend on what we know about another area. However, we need to isolate the problems into manageable sub-problems without neglecting the interdependencies.

To answer many of the questions outlined above, technical information will be absolutely necessary. Initially, we planned to backup the economic investigators by an agronomist and a soil and water scientist in every area. However, this has not been feasible and technical

information has been gathered by the economic investigators under guidance from biological scientists.

The basic hypothesis which underlies the approach of the Economics Program is a simple rationality hypothesis which will not be tested. It is assumed that the farmer in his production and consumption decisions attemps to maximise his satisfaction level (i.e. utility) within the constraints of the natural conditions, his individual factor endowment, his attitude towards risk, and his social obligations. This is almost tautological. It does not exclude that farmers are ill-informed or make mistakes. It only means that their observed behaviour is a rational adjustment to their environment and capacities. Without such an assumption it would be useless to observe a farmer's behaviour in an attempt to understand why he farms the way he does and to identify the most limiting constraints within which he operates. His behaviour would not reflect the constraints so much as an irrational and unsystematic response to various factors with no consequences for policy.

DETAILS OF HYPOTHESES

1. Economic and Environmental Causes of Present Cultivation Practices :

This complex of hypotheses is of a very practical nature and poses no great theoretical difficulties. Answers to these questions are important for various biological-technical programs of ICRISAT, AICRPDA, etc., and for broader investment decisions by agencies concerned with dryland agriculture.

1.1 Kharif Fallow :

Among the three districts this practice is used in the Sholapur area. We would like to test which of the following factors are most important in this practice:

- Unpredictable nature of rainfall in early monsoon
- Plant disease problems in kharif
- Difficulty of working in black soils when wet
- Desire to consume varieties which grow best in Rabi season.

Implications : Knowledge of which factor is most important should help farming systems researchers and plant breeders find the best way to overcome this undesirable practice by research.

Research Approach : Attitude questionnaires; comparison of areas with Kharif fallow and without kharif fallow but with similar soils (Sholapur - Akola comparison). Observation of disease incidence in kharif crops where possible; results of agronomic experiments with cropping in kharif.

Related Areas : 2, 4

1.2 Mixed and Intercropping :

Hypotheses : Benefits from mixed or intercropping exceed those from sole cropping because it either

- ensures better utilization of available labour and land
- or reduces incidence of diseases
- or leads to better use of available water over the cropping season
- reduces risk.

We will try to identify the most important causative factor.

Implications : For guiding biological research and extension.

Research Approach: Inter-regional comparisons, farmers' attitudes, observation on water use and pest incidence, work timing studies, agronomic experiments.

Related Areas : 2, 4

1.3 Evaluation of Traditional Tank System : In existing tank systems most water is used for paddy cultivation. This practice is often decried as a waste of water which could instead be spread on a wider area for other crops. The Economics Program is carrying out a historical and economic study on tank irrigation independently of the village-level study; the historical study will be coordinated with studies of the Farming Systems group. To the extent that the villages have tanks, questions will also be asked in this context.

Hypotheses : One of tank irrigation for paddy is primarily due to one of the following factors :

- high economic payoffs of rice cultivation
- extreme preference of cultivators for rice
- institutional factors. The ownership pattern of land in the command area, the rate structure for water, and other administrative disincentives prevent the distribution of the water on a wider basis. Private gains from rice cultivation are high despite low social gains from this practice
- lack of knowledge about effective alternative patterns
- paddy cultivation is a status symbol.

Implications : If the practice occure because of high private benefits from rice cultivation with no divergence between private and social benefits, then no change in water distribution should be recommended. However, if divergence of private benefits from social benefits is the cause of this pattern, institutions for managing the water and water rate structures need to be studied.

Research Approach : In the VLS, benefits from using the water for rice or other purposes need to be measured, if necessary in agronomic experiments. The institutional structure of water management will be studied and farmers' attitudes sampled.

Related Areas : 5, 6, 7

1.4 Bunding, Contour plowing; Ridges and Furrows :

Hypotheses :
- economic benefits of bunding are nil
- contour plowing and ridges and furrows have a high economic payoff.

Implications : Replacing the traditional bunding system by more effective soil and water management practices is one of the key objectives of ICRISAT's Farming System Programme. We do need a close understanding of the benefits and disadvantages of the traditional and advanced system in village situations.

Research Approach : Measure yield close to bunds and far away from bunds. Agronomic experiments and analysis thereof, with contour plowing bunding, and ridges and furrows.

Related Areas : 2

1.5 Comparative Study of Barriers To Acceptance of High-yielding Sorghum and Pearl Millet :

Hypotheses : Higher acceptance of hybrid pearl millet than hybrid sorghum is due primarily to

- disease incidence
- differential fertilizer response in farmers' fields
- consumer preferences for traditional varieties resulting in low price of hybrids
- lack of fertilizers, pesticides, and capital
- lack of extension services and education

Implications of accepting any of the various sub-hypotheses are clear. This question cannot be answered with VLS alone. Results from All India Coordinated Sorghum Improvement Project (AICSIP), All India Coordinated Maize Improvement Project and All India Coordinated Research Project for Dry Land Agriculture research will be important input into this effort.

Research Approach :
- observation of disease incidence
- study of consumer attitudes
- case studies on extension and input and credit availability.

Related Area : 8

2. Seasonal Availability of Resources - Bottlenecks and Surpluses :

It is generally agreed that investment programmes in agriculture--such as for minor irrigation, road building, and other infrastructural projects--should use as much as possible, and whenever it is economically efficient, the local resources already available. It could be expected

that this approach should reduce external financing requirements and lead to high local income generation. A careful assessment of both the quantity of locally available resources and of their opportunity cost (i.e. their value in their next best alternative use) is essential if local resources are to be used.

2.1 Water : We need to find out the water balance--such as rainfall and its distribution, loss from runoff, gain from outside, loss to ground water and storage capacity of soils--in each village. This knowledge is necessary to assess the potential benefits from cooperative public or private water harvesting and soil conservation.[1/]

Research Approach : Examination of rainfall records to construct probability distribution of water availability under various alternative water-storage schemes. Crop-water response relationships also need to be investigated, but this is most efficiently done under controlled experimental conditions.

Related Areas : 1, 4

2.2 Labour :

Hypothesis : Labour surplus in the SAT is not generalized. Instead it is a seasonal phenomenon which co-exists with very tight labour bottlenecks in other seasons. The cropping pattern and off-season activities of the farmer are to a large extent planned in response to the seasonal fluctuation of labour demand in agriculture. Furthermore, farmers may

---

1/ It has not been feasible to carry out physical water-balance studies in the ICRISAT villages as initially planned. Most of this work has instead been taken up at experiment stations, with model building as a major objective. Models of water balance must obviously be complemented with agro-economic micro data for cost-benefit analysis.

sometimes not be able to adopt otherwise profitable practices such as hand weeding because these practices conflict with other peak labour demands. The extent of surplus and its seasonal occurrence must be measured.

Implications : If seasonality of labour demand is very much pronounced, then innovations which either break labour peaks or which use labour in slack periods have a high chance of acceptance. Seasonal labour availability lies at the heart of a number of important policy questions. What is the scope and optimal timing of rural work programmes for land consolidation and investments in irrigation, roads, etc? What is an optimal mechanization pattern? To what extent can a capital-intensive innovation be justified because it breaks a labour peak and permits more intensive cropping during the remainder of the year, and perhaps more overall employment?

Research Approach : A detailed study of the agricultural and non-agricultural work performed by farmers, farm families and landless labourers is needed. Seasonal variations of wage rates for various classes of labour will be recorded. Labour surplus cannot be measured just by seeing who is idle and for what period of time. Rural works programmes will attract labour from all activities for which the opportunity cost is less than the wage rate. The procedures to measure opportunity costs of labour have to be worked out; they present difficult problems. Our section is consulting with other economists on this issue.

Related Areas : 1, 7, 8.

2.3 Bullock Labour : The considerations regarding human labour also apply to bullock labour. Both 2.2 and 2.3 are, to some extent part, of a broader ICRISAT study designed to determine the optimal power source for SAT agriculture.

3. Nutrition :

An assessment of the nutritional status of the low income groups of society in semi-arid areas is of high priority in ICRISAT's research effort. The policy implications reach beyond our research programme. The VLS opportunity can be used to assess the nutritional status of the rural poor. For the nutritional status of the urban poor, ICRISAT economists will have to rely on work done at other research centers. Knowing the extent of deficiencies in specific nutrients is essential if nutritional quality is to be improved by plant breeding. In addition to studying the nutritional intake of the rural population in relation to providing guidelines for the genetic improvement of ICRISAT's crops, we want to obtain more precise measurements in the following areas.

- the cyclical pattern over seasons of food consumption of the rural population
- the extent to which the rural population (especially small farmers and labourers) derive a part of their nutrition from the dietary items normally excluded from the official enumeration system, such as seasonal vegetables and wild fruits
- the extent to which self-provisioning type of farming (where a farmer grows large proportion of his dietary requirements on his own farm) ensures better nutrition.

Implications (In addition to implications for plant breeding strategy) :

Better knowledge of secondary sources of nutrition--such as fruits and vegetables--can help us identify minor components of the farming system, which, if improved, would have a large impact in bridging specific nutri-

tional deficiencies. If self-provisioning farming improves nutrition substantially, pushing the farmers into cash crops may be nutritionally detrimental.

Research Approach : A sub-sample of farmers and landless labourers in the lower parts of the income distribution will be taken from the total sample of farmers and labourers; their diets will be recorded.[1/] In addition, samples of the food used by the farmers will be analyzed in the laboratory whenever necessary. The study will done in close collaboration with the Home Science College, Hyderabad, and the National Institute of Nutrition (NIN), Hyderabad.

4. Impact of Risk and Uncertainty on Farmers' Behaviour and the Adoption of New Technology :

The overall goal of the Economic Program's risk study is to determine to which extent risk aversion by SAT farmers leads to general underinvestment by these farmers, and to what extent it retards the adoption of modern technologies--such as high yielding varieties and fertilizers. Knowledge in these areas is urgently required in technology development in order to determine the weight to be given to stability of technologies as against expected returns.

These aspects will be investigated in the risk studies :

1) What is the tradeoff between stability and expected returns in potential technologies? If that tradeoff is not large, little attention needs to be given to the risk problem in technology development.[2/] This question will not be addres-

---

1/ Actually, ICRISAT, Andhra Pradesh Agricultural University and NIN subsequently decided to survey the entire sample.

2/ For example if HYV's (High yielding Varieties) are both higher yielding and more stable than traditional varieties, risk aversion cannot retard adoption--adoption will actually be speeded up.

sed with VLS data; instead it will be carried out with different data.

2) What is the extent of risk aversion of farmers? Are small farmers and labourers more risk-averse than large farmers? What are the other determinants of risk aversion? In VLS this question will be addressed by questionnaire methods and by observing real choices of the farmers in agricultural and nonagricultural decisions.

3) What mechanisms do farmers and labourers now use to adjust to and ensure themselves against risk, and how can these mechanisms be made more effective?

Implications : If risk aversion is found to be strong and the traditional adjustment and self-insurance mechanisms are weak, planned development efforts must give much more weight to risk reduction and risk insurance if they are to generate higher rates of private investment and technology adoption in the SAT. If risks cannot be substantially be reduced by general development efforts and insurance schemes, and if the technological tradeoffs between stability and expected returns are large, technology development must be oriented more heavily to generate more stable, although lower-yielding, technologies.

Research Approaches :

1) Measurement of risk attitudes of farmers via interview techniques and observation of real choice behaviour under risk.

2) Studying present production behaviour, such as crop mixes, intercropping, bunding and wind breaks, water management, etc., in relation to risk.

3) Study present adjustment and self-insurance mechanisms such as storage of output, part-time farming, borrowing behaviour and preferential relationships with landlords, money lenders, and relatives.

Related Areas : 1, 2, 8.

5. Marketing and Consumer Acceptance :

5.1 Consumer Acceptance of Different varieties :

The marketing section of the Economics Program has separate projects in this area. The goals are to put an economic value on characteristics of different varieties such as seed size, colour, flavour, processing quality, etc., so that the plant breeder may have accurate information upon which to establish priorities. It is hoped that many of the characteristics can be tied to visible seed characteristics so as to facilitate screening. This area of research presents some problems in economic theory, because the price differential of varieties reflects both demand and supply conditions, whose separate effects are difficult to quantify.

Within VLS, price differentials, cost differentials of different varieties, and rural consumer attitudes can be tested and information gathered on what they are consuming and how the food is prepared. Also consumer panels can be formed from the respondents to test quality preferences of rural consumers.

5.2 Marketable Surplus and Subsistence Farmers Response to Price Incentives

In subsistence farming in SAT regions, production and consumption decisions are integrated. This fact should be taken into account when studying farmer's behaviour.

Hypotheses :

- small subsistence farmers in SAT are responsive to market incentives. This response may not in total be reflected in actual market transactions; it may also appear as changes in intra-village barter transactions and in adjustments in cropping patterns.

- market participation and responsiveness of marketed surplus of SAT farmers declines with a reduction in land-holding size.
- extent of marketed surplus declines as "transactions costs" rise. Transaction costs are measured as the spread between the price at which farmers can sell a commodity and the price at which he can buy it (or grow it) at his home location. It therefore includes transportation cost to and from market (including opportunity cost of owned resources used to transport), wholesale and retail margins, risk of adulteration, etc.
- farmers who participate extensively in markets are more likely to adopt new practices.

Implications : For investment policies into marketing facilities and roads, and for market regulation. If market participation per se speeds up adoption and if participation rises rapidly with reduced transaction costs, then anything that brings down transaction costs contribute to the spread of new technology.

Research Approach : Comparison of the marketing behaviour of different classes of producers and relating the behaviour to farm size, transaction cost, etc. Different elements of transaction costs will have to be measured. This will require a full description of marketing channels. In fact, plans are to select in each region one village accessible by a good road and one village which is fairly inaccessible so as to generate differences in transaction costs.[1/]

Related Areas : 1, 8

1/ This was not achieved in the actual selection of the villages. A study with only six villages is not well suited to investigate the impact of transport costs, but must concentrate on elements of transaction costs which vary among farmers in a given locality.

6. Organization and Group-action Problems :

Watershed-based soil and water management, intensively studied by the Farming Systems program, will require some organized group-action to consolidate land, level it, utilize it as per the technical requirements of the watershed, and distribute collected runoff water. On a broader scale, many other rural-development efforts require such group action--cooperatives, communal storage, and rural services such as roads, drinking water and public health activities.

It is therefore important to understand the factors which facilitate or retard group action, in order to gear the technology developed in such a way that it does not present barriers to group action. It is also necessary to understand what type of institutions will be required if this technology is to be adopted. This problem area goes far beyond the VLS and must be analyzed by other means, such as by case studies.

Economists, and probably sociologists as well, have in their analysis often taken institutions as given and examined the workings of the economic and social forces within the existing institutional framework. For example, economic theory can handle the problem of designing efficient water allocation rules for an existing irrigation system and administrative setup. The prescription is generally to equate the private and social costs of water. (This type of question will be dealt with under area 1.3 and 2.1). Sociology has concentrated on the internal dynamics of a group which tries to achieve a given goal, without too much attention as to how the goal itself affects these dynamics.

In recent years a new economics of public choice has emerged which tries to go beyond the traditional economic questions to analyze forces which guide the formation of groups and the development of institutions. For a survey of this literature see Dennis and Mueller, 1976.

The framework for analyzing group action problems which comes out of this stream of analysis can be briefly sketched here :

A latent group of persons is defined as any group of persons who could benefit from common action. A latent group might be the farmers who could benefit from a marketing cooperative or the land owners who would benefit from the construction of a road or the workers in a firm who could benefit from forming a labour union. In organizing itself, the latent group has to overcome the free-rider problem and the problem of transaction costs.

The Free-Rider Problem : If my neighbours build a road, I can benefit as much as they can without bearing any of the costs. A worker can benefit from a wage rise negotiated by the union without being a member and paying dues or joining in a strike, etc. Groups and institutions have developed many schemes to overcome the free-rider problem. Labour unions try to get closed-shop laws, land consolidation is often compulsory, public undertakings are paid for by taxes or special assessments, political-pressure groups such as trade associations provde members with information or other services which they can receive only if they contribute to the expenses of the groups.

Transaction costs : These are costs sustained by members of the latent groups in achieveing a consensus on how to achieve the common goal, and how to distribute the benefits of the common action among the members. These costs include time spent in bargaining and general administrative activity. Transaction costs are increased :

- the larger the group
- the less the benefits and costs are measurable and obvious (soil conservation is a good example)
- the more the common action depends on the consent of every individual member. Joint purchasing of a machine by a voluntary group of farmers or cooperative is easier to achieve than voluntary land consolidation in a village because, for the former,

consent of all villagers is not necessary while it is likely to be for the latter.

Hypothesis : The larger the benefits accruing to individual members of a group and the easier the group can perceive them, the more likely will be the formation of a group (for given transactions costs). In designing institutions for common action, such as watershed-based farming, it is necessary to keep the following questions in mind :

- How can the free-rider problem be avoided?
- Which type of projects and public actions require a legal framework capable of coercing farmers into participation?
- How can transaction costs be minimized?
- How can the visibility of benefits to each participant be enhanced?
- How can one improve the measurability of benefits?
- What is the optimal group size?

ICRISAT also wants to test the following hypothesis :

In the economic sphere, farmers are not subject to village pressures and sanctions as they are in the social sphere of village life. Economic incentives and penalties are therefore necessary to induce him to enter into group action. Social incentives and penalties will not help.

In VLS, we want to confront these ideas with existing successful and unsuccessful cooperative ventures on a case-study basis. Additional case studies will be undertaken on other areas.

It is in this area that social scientists other than economists can make a contribution. The economic approach outlined above cannot capture all relevant group-action problems. Caste barriers or caste

solidarity may either hinder or enhance group action, depending on whether groups need to be formed across caste lines or within castes or tribes. (Caste barriers may of course be considered as factors which increase negotiation and transaction costs in group formation across caste.) It will be necessary to fully integrate the analytical approaches of economists and other social scientists. A sociologist, anthropologist or political scientist who works on these questions should therefore have some interest in economic theory as well.[1/]

Related Areas : 1, 2, 7, 8.

7. Income Distribution and Distribution of Benefits from Technology :

In the socio-economic area, income distribution stands next to growth of income as the most important problem confronting societies today. Within VLS, it will, however,receive low priority for the following three reasons.

ICRISAT works by its charter for some of the poorest countries of the world and some of the poorest regions within these. It works on crops cultivated by poor farmers, for consumption by poor consumers. It also has a commitment to labour-intensive technology and bullock-

---

1/ Since the original drafting of the hypothesis, anthropologist V.S. Doherty has joined ICRISAT VLS effort. His participation is probably the best example of the opportunities to integrate additional sets of questions into ongoing routine enquiries. His study of traditional cooperative behaviour among farmers required only the addition to the transaction schedule of new codes to identify transaction partners more precisely and the inclusion of previously unrecorded transactions, such as reciprocal exchanges, etc. In most other respects, data collected were almost anthropological in detail anyway. The previously neglected kinship information and additional demographic observations were collected by adding specific one-time schedules.

drawn equipment. Success of the scientists in these areas will therefore help the income distribution problem in its international and inter-regional dimensions, will not create additional employment problems for landless labourers and small cultivators, and will contribute to holding down prices of foodstuffs consumed by the poorest groups in society. Furthermore, many other researchers are engaged in studying the distributional impact of the green revolution and we can rely on their work to increase knowledge in this area.

Finally, the village-level studies at this stage, when little new technology exists for dryland agriculture, offers only limited opportunities for studying this question.

In VLS, we will, of course, make a full assessment of income distribution, including traders and landless labourers. This will become a benchmark study for future income-distribution studies if and when the villages begin to participate in new technology.

Related Areas : 2, 3, 6, 8.

8. Speed of Diffusion of New Technology :

This is an area in which economists and sociologists have worked extensively. Economists have primarily used profitability or relative advantage of an innovation as the explanatory variable of the speed with which innovations are adopted. Sociologists have concentrated more on other attributes of innovations, but the primary focus of their work has been on the dynamics of the innovation process: which farmers can be expected to be the early adopters and which ones the late adopters? How do innovators become aware of innovations and make their decisions to adopt? Sociology is therefore extremely relevant when it comes to extension problems.

Initially, the ICRISAT VLS programme is not a good laboratory for testing hypotheses relative to diffusion, because of the lack of new dryland technology. Besides, these questions are among the most popular research topics in India and in the developed countries. Nevertheless, we will, on a case study basis, look for more confirmation of the following hypotheses regarding desirable characteristics of innovations, taking it for granted that profitability or relative advantage is the sine qua non of adoption.

Given an equal expected payoff, an innovation is more easily acceptable to the SAT farmer if it :

- involves small changes in production methods and management practices
- involves use of owned or locally available inputs such as seasonal surplus labour and bullock power or local construction material, and does not substantially increase farmer's dependence on external inputs and institutional factors
- involves a sequential process of investment, i.e. can be adopted component by component
- involves (in the case of a long-term investment type of innovation) a shorter rather than a longer cost recoupment period. (For this we need to measure the rate of time preference of farmers.)

The hypotheses have clear implications for technology to be evolved for SAT farmers, as the payoff, investment cost and its spread, gestation period, extent of out-of-pocket costs, etc., are basic considerations influencing farmers' response to new technology.

It is clear that smallness, use of owned inputs, and short recoupment periods are all desirable characteristics. What we would like to know is quantitatively how much the speed of adoption is reduced if one of the above considerations cannot be met, as may frequently be the case with new technology.

The hypotheses will be tested by collecting details in the form of case histories of any innovations which have been tried and accepted or tried and rejected by the farmers in the area of study.

HPB:KMS
28-5-'77

REFERENCES

Hans P. Binswanger, James G. Ryan and Matthias von Oppen and Associates, *" Hypotheses and Priorities for the Village Level Studies in the Semi-Arid Tropics of India"*, ICRISAT, Agricultural Economics Department, December 1974, Mimeo.

N.S. Jodha, *An Approach to Study of Traditional Farming Systems in the Semi-Arid Tropical Regions of India*, ICRISAT, Agricultural Economics Department, December, 1974, Mimeo.

N.S. Jodha, M. Asokan and James G. Ryan, *"ICRISAT Village Level Studies: Sampling procedures, data coverage and resource endowments of the study areas"*, ICRISAT, Agricultural Economics Department, Occasional Paper 16, June, 1977.

Dennis C. Mueller, *"Public Choice : A Survey"*, Journal of Economic Literature, Vol.14, No.2, June, 1976.

OCCASIONAL PAPERS are informal reports of research or thoughts of ICRISAT staff members which are designed to stimulate thinking and comments of professional colleagues within and outside the Institute. These reports are not to be considered as formal publications bearing the endorsement of the Institute.