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THIRD SIX MONTHLY PROGRESS REPORT - CONTRACT NO. AID-csd-2805

"The Impact of New Technology on Rural Employment and Income Distribution"

For the Period July 1, 1971 - January 1, 1972

John W. Mellor, Cornell University

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I. INTRODUCTION

Efforts in the third six months of the contract concentrated on:

(a) Further development of the mathematical, two-sector model which serves as the conceptual framework for the rest of the work;

(b) Further development of the simulation model which is patterned after the growth model. The model provides a basis for (1) quantifying the effect on employment and income distribution of various types of technological change in agriculture and (2) organizing the data and perspectives from the various sub-projects;

(c) Continuation of the six integrated sub-projects of the contract which provide detailed data and perspective for key elements of the simulation model; and

(d) Intensive data collection to fill out the data needs for the simulation model and to provide a comprehensive view of the relationship between new technologies in agriculture and employment and income distribution.

Progress in each of these areas will be discussed in Section II of this report. Section III will delineate the specific plans for the third year of the contract. Section IV will recapitulate the data to be collected from the various sub-projects and special data collection efforts in the context of the simulation model. Section V will indicate the status of publication and provide a general guide to the publications which have been issued so far. Appendix 1 provides more detailed information on the status of the individual sub-project. Appendix 2 is a list of publications.

II. PROGRESS TO DATE

The Two-Sector Model

The original model by Mellor and Lele, which has been reported in the earlier reports, in a seminar at AID Washington and in Occasional Paper No.

43, continues to form the basic conceptual framework for the research being undertaken under this contract. A number of improvements and modifications are being made with respect to the model. First, the agricultural production function is being reformulated to include labor supply and demand functions within the agricultural sector. It is being assumed that the supply price of labor in the agricultural sector is institutionally determined or perhaps more properly determined by the household utility function. It will be noted that this is somewhat different to the common assumption of the labor surplus model that it is the demand price for labor that is institutionally determined. Second, the relationship between average laborers income in the agricultural and non-agricultural sectors is being reformulated to allow more complex assumptions than in the original model. Third, problems in the derivation of the specific elasticities used in the model are being dealt with and that formulation improved.

Initial work has been completed on a major extension of the model so that it includes a capital market and its general equilibrium with the labor and food markets which were included in the original model. The basic statement of the new form of the model has been completed and very major amount of mathematical analysis carried on. The model appears to be consistent and stable up through the point at which all the unemployed labor in the agricultural sector is absorbed. Beyond that point, the model also has considerable interest but poses severe mathematical difficulties. Work is continuing along these lines. Expansion of employment is a function of capital as well as wages goods and intersectoral capital flows are potentially large and influenced by technological change in agriculture. Thus this is an important addition to the work. It also allows a connection between dualistic models and growth models.

The Simulation Model

A preliminary form of the simulation model has been completed and has been run with several different sets of assumptions. It will be recalled that the simulation model is a specialized model intended to examine a number of demand and employment implications of increased foodgrains production. It examines the effect of different rates of growth of foodgrains production with different initial distributions of income from that production upon (a) the demand for foodgrains, (b) the marketings of foodgrains, (c) the total employment which may be supported with the additional quantity of wages goods, (d) the increase in laboring classes incomes which may derive from that increased employment, (e) the demand effects of that increased income on the demand for other agricultural commodities and (f) the distribution of employment between foodgrains production, other agricultural commodities production, and the various non-agricultural sectors. The model has been run with several different assumptions and is giving interesting results. A publication is in process of preparation.

It is desired to make a set of improvements in the model to introduce some capital requirements, demand for non-agricultural commodities and the division of output and employment between non-agricultural consumer goods and capital goods. The model is being tested primarily against data from India. Some rough calculations consistent with it are being made for the economy of East Pakistan.

While the formulation of the simulation is being improved, substantial efforts are being made to provide actual data with respect to the Indian economy as input into the model. Much of the effort in the various integrated sub-projects and other data collection are pointed toward this objective. This will be commented upon more fully in Section IV of this report.

Integrated Sub-Projects

Data collection for the field project in Thailand (Burton) is nearing completion. A full report on the sequence of the events in that project is appended. The data from the Thailand project provides a comparison against the Indian instruction for the initial distribution of income from new technology between various income classes, the change in relative demand for various factors of production and the size of the production increase for various types of technology. It also provides detailed data on the labor supply situation. It is important to have a check on these variables under the quite different conditions of Thailand. This will facilitate building the simulation model in such a manner that it may be usable under a wide range of conditions and it will be helpful to us in drawing policy conclusions for differing situations. In addition the Thailand project is providing detailed information with respect to the cost, returns and requirements for profitability of new rice varieties under a substantial range of conditions.

The rural education project in India (Shortlidge) has passed the data collection stage and data analysis is now proceeding vigorously. A full report on that is appended, along with some preliminary conclusions from some of the data analysis. This study will add to our knowledge of labor mobility thus allowing us to handle our model in a realistic manner with respect to shifts of labor between sectors. It is clear that there are important interactions between the availability of employment and the demand for education and the supply of education. This study will give detailed information on these relationships.

The study of small industries has also passed the data collection stage and analysis is proceeding (van der Veen). A full report is appended, with a statement of some of the preliminary hypotheses which are being tested. As the simulation model tests the effect of relatively rapid rates of growth of foodgrains production and marketings, it will be important to see the relationship between employment and capital requirements and other potential retardants to the growth of employment of the non-

agricultural sector. A detailed study of small-scale industries provides scope for viewing these relationships and building the model in a more useful manner. It will also provide a basis for realistic policy recommendations from the model.

The study of small farms (Schluter) is now just entering the data collection stage. A full report is appended. We have been fortunate in being able to get data for a sufficiently long period of years which, when added to our own individual survey will provide the basis for well-considered judgments concerning risk and uncertainty problems for small farms. The total knowledge from the small farm study and the emphasis on risk and uncertainty will allow modification of our present dichotomy of land owning and laboring classes to include treatment of the small farmer and his interaction with the various processes with which we are dealing. It will also provide a basis for policy recommendations for increasing participation of small farmers in income raising innovations.

The microanalysis of employment allocation (Donovan) is just about to enter the data collecting stage. This project was considerably delayed in initiation because of substantial delays in obtaining government of India permission to carry on the research sub-project. That permission has now been received and the leader of the sub-project has now arrived in Bangalore and is undertaking the preliminary surveys preparatory to initiating the intensive field work. A full report of developments in this sub-project is appended.

The nature of the models being developed in this project places substantial emphasis on increases in demand for various commodities consequent to increases in real incomes derived from expanded agricultural production. There has been considerable enlargement of the scope of work in this part of the project. A report on that work is appended (Desai). We have carried on intensive analysis with existing consumer expenditure data in order to understand the effect of changes in the distribution of income upon consumption patterns, the demand for various commodities and the employment implications of those increased in demand. We have found substantial published data which can be analyzed in this context and we are continuing with intensive analysis of expenditure patterns on consumption items. This will be followed by a more complete look at changes in total expenditures by rural families including capital expenditures.

Considerable analysis has been carried on of capital labor ratios in large-scale industry. These data will supplement the intensive study being made of small-scale industries and will be tied to the consumer expenditure data to understand the employment effects of shifts in consumption patterns depending on increased agricultural production achieved with various types of technology and with various distributions of the income. A note is appended concerning current analysis of data which we have carried on with respect to capital labor ratios (Dabholkar). These data build on the work on capital labor ratios published in Occasional Paper No. 44.

Because of its special current importance and the fact of an aborted set of research projects being carried out in East Pakistan under USAID auspices and with the direct collaboration of the director of this project, it was thought desirable to pursue intensive secondary analysis of a certain aspect of this project with respect to the economy of East Pakistan. A note is appended concerning some work which has been done on this topic (Zaman).

Other Data Collection

The key initial assumptions in the simulation model have to do with the rates of growth of agricultural production, the technology by which that increase is achieved, and the factor shares incident to that. In applying the simulation model to India, it is particularly important that an understanding be had of the rate of growth of foodgrains production that may be expected in India over the next decade or so and the extent to which that growth may be attributed respectively to new high yielding varieties, to increased applications of inorganic fertilizers, and to increased irrigation. An intensive analysis of Indian data is being carried on with particular emphasis on fertilizer and its interactions with the other factors indicated. That analysis provides basic inputs into the simulation model. In addition, we expect to put out a report dealing specifically with growth and consumption of fertilizers in India and its interaction with growth and foodgrains output. That publication should be valuable in its own right and will represent an important complement to the fertilizer demand study published under the AID Prices Research Contract of which I was director. Much of the data and a substantial part of the preliminary analysis for the fertilizer input - foodgrain output work has been completed. A final report on this part of the data collection should be completed by mid-1972.

There is considerable current policy emphasis on expanding employment in rural areas through rural public works. In order to deal with growth in rural employment, we need to know what the labor requirements are in absolute terms and relative to other inputs for various types of rural public works constructed by various techniques. For this purpose, intensive data collection is being pursued with respect to labor and other input requirements for several types of roads, for several types of medium and small scale irrigation projects, for rural power distribution lines and for various types of housing. These data will be useful for the Donovan sub-project dealing with micro-allocations of labor, in interpreting the overall simulation model and in drawing policy conclusions. Data collection for this is just commencing and should be completed late in 1972.

Because of the substantial data being developed on capital labor ratios and small-scale and large-scale industries, opportunity was taken to pull together data on the capital labor ratios for various import and export industries. Those data have been tabulated and are now in the process of analysis. They will provide a useful supplement for interpretation of the simulation model and for the drawing of policy conclusions.

III. PLAN OF WORK FOR THE THIRD YEAR OF THE CONTRACT

The work plan for the third year will have the following parts:

(1) Completion of the mathematical model. This will include minor improvements in the initial model and expansion of the model to include introduction of a capital market. This work can proceed simultaneously with further development of the simulation model. The much increased complexity of the mathematical model and the substantial potentials it offers for contribution to thinking about economic growth results in expansion of the work done on this. It is expected that a revised version of Phase I of the model will be completed by June 1972 and a report on Phase II will be completed by December 1972.

(2) Completion of an expanded version of the simulation model which is proving more productive than had been originally expected and is lending itself to systematic organization of a high proportion of the data generated in this study. A preliminary report on the simulation model will be available, as initially stated, by October 1972. Final report on the model, however, will not be completed until near the end of the contract period in June 1973. The various other sub-projects will be completed according to the schedule reported a year ago and as indicated in the appended table. In addition to the projects scheduled in the report one year ago, the work on capital labor ratios is being incorporated into a supplementary model that has been made into a distinct sub-project under the direction of Uttam Dabholkar. It is expected that the statistical analysis on that project will be completed by February 1973 and a final report by July 1973. The sub-project listed one year ago for wages (Montgomery) is being financed by a 211(d) grant and is not reported here. That work bears a close relation to the work on this contract and close cooperation and integration is being maintained.

It is anticipated that a final report on the overall project will be completed on schedule by July 1973. The schedule will, of course, be very difficult to meet as so many different elements of the project will be drawing together at that same time.

Schedule for Sub-Project and Project Completion

Sub-project Director	Project	Date work started	Date field work ended	Date sta- tistical analysis completed	Date of completion of report
1. J. W. Mellor	The conceptualizing Phase I	7/70			4/71
	Revised Phase I	10/71			6/72
	Phase II	5/71			12/72
2. J. W. Mellor	Simulation model	9/71			10/72
	Preliminary report				
	Final report	--			6/73
3. Jan van der Veen	Employment potential in small industries Gujarat State	10/70	10/71	8/72	10/72
4. William R. Furton	A comparative study of agricultural innovations with respect to productivity and the distribution of economic returns	12/70	12/71	9/72	12/72
5. Richard L. Shortlidge	Cost benefit analysis of education of rural people in Uttar Pradesh	2/71	9/71	5/72	9/72
6. Michael G. Schluter	Raising incomes on small farms - Bardoli Taluka, Surat District, India	8/71	8/72	1/73	7/73
7. Graeme Donovan	Direct and indirect employment effects within agriculture of new agricultural technologies	8/71	8/72	1/73	7/73
8. Bhupendra Desai	Consumption pattern effects Phase I - Secondary data	2/71			8/72
	Phase II - Field study	9/72	2/73	5/73	7/73
9. Uttam Dabholiar	Capital labor ratios as they relate to employment growth	6/71		2/73	7/73
10. J. W. Mellor	Final overall report				7/73

IV. DATA INPUTS FOR THE SIMULATION MODEL

The simulation model is serving as a primary device for organizing the data and findings of this research project. The model of course is a small, partial model and therefore the final report will go beyond the model both in drawing on data and perspectives and in providing conclusions and perspectives. Nevertheless it is useful at this stage to summarize the data efforts in terms of categories of needs for the simulation model.

Production Data

The basic sources of production data to go into the simulation model will come from the field study being carried on in Thailand under the direction of Mr. Burton; the intensive analysis of growth in foodgrains production and demand for fertilizer being done on a consulting basis by Dr. G. M. Desai; and the analysis of the small farmer under the direction of Mr. Schluter. These data will provide the basis for estimation of the Indian economy future rates of growth of foodgrains production and the sources from which that growth derives. This is one of the two key initial inputs into the simulation. We will also have a check for relationships from a quite different type of economy from the Thailand study.

Factor Shares Data

A key element of the model is its ability to accommodate non-neutral technological change. Information on the effects of various technologies on the distribution of initial benefits among income classes will come from the Thailand study under Mr. Burton's direction, from the consulting work of Dr. Desai, and from Schluter's study of small farmers.

Demand Structure Data

The importance of shifting factor shares derives from the effect of demand structure and the consequent varying employment which in turn determines marketing of foodgrains and demand for non-agricultural commodities. It is these two latter factors which determine the secondary employment effects. In order to analyze this feature of the model, we need detailed consumption data by income class. These data are being derived from current secondary sources under the direction of Mr. B. Desai. We will then pursue that analysis to less readily available data and even to primary data and to an emphasis on production goods as well as consumption goods.

Problems of Labor Transfer

The model emphasizes the distribution of employment among various sectors. The model, of course, assumes no frictions in labor transfers. In interpreting the model and drawing policy conclusions, however, it requires a sense of these frictions. Information is being checked on that question by the sub-project under the direction of Mr. Shortlidge dealing with rural education.

Capital Labor Ratio Data

The model, as initially formulated, does not include a capital sector. However, even in interpreting that model and moving to policy recommendations, knowledge must be had of the extent to which capital may be limiting to the employment level suggested by the model. As a capital sector is introduced into the model, we will need more of such capital labor data. These data are being provided with respect to small-scale industries through the sub-project under the direction of Mr. van der Veen, for large-scale industries under the sub-project under the direction of Mr. Dabholkar, for rural public works projects from the consulting work with Mr. Patwardhon and for both rural public works and non-foodgrains agricultural sector from the sub-project under the direction of Mr. Donovan.

V. PUBLICATION

The basic conceptual model has been published as Occasional Paper No. 43. A popular interpretation of that model has been published as Occasional Paper No. 42 and a revised version of that published in the January 1972 issue of International Affairs. A preliminary effort at drawing together the empirical data in the framework presented by the conceptual models appears in a joint paper presented by the project director and Dr. Uma J. Lele at a conference at Stanford University December 13-18 and will soon be issued as Occasional Paper No. 50. The title of that paper is "Domestic Markets and the Growth of Farm Cash Income". A list of Occasional Papers published under this contract and its predecessor contract is appended. Papers 42, 43, 44, 45, 47, 48 and 49 report work done specifically under this contract. These various papers have been discussed at length with various researchers and officials in India and substantial correspondence has been carried on with respect to them with various officials in Nepal, Thailand, and Taiwan. There has also been an intensive interchange of information concerning this work with various scholars in the United States, with persons at AID, and with persons with other national and international agencies. It is already clear that the impact of this research on both policy and other research work has been substantial.

APPENDIX 1

Sub-Project Reports

- A. A Comparative Study of Agricultural Innovations with Respect to Productivity and the Distribution of Economic Returns
William R. Burton
- B. Capital Labor Ratios as they Relate to Employment Growth
Uttam Dabholkar
- C. Consumption Pattern Effects
Phase I - Secondary Data
Phase II - Field Study
Bhupendra Desai
- D. Direct and Indirect Employment Effects within Agriculture of New Agricultural Technologies
W. Graeme Donovan
- E. Raising Incomes on Small Farms--Bardoli Taluka, Surat District, India
Michael G. Schluter
- F. Employment Potential in Small Industries--Gujarat State
Jan van der Veen
- G. Cost Benefit Analysis of Education of Rural People in Uttar Pradesh
Richard L. Shortlidge
- H. Analysis of Employment Relations in East Pakistan
M. Raquibuz Zaman

A. A Comparative Study of Agricultural Innovations with
Respect to Productivity and the Distribution of Economic Returns

William R. Burton

Field work for the study commenced upon Mr. Burton's arrival in Thailand on December 29, 1971. Staff members of the Department of Agricultural Economics, Kasetsart University, provided letters of introduction to the National Research Council of Thailand and the Thai Government Immigration Department explaining the nature of the research planned. Approval of the research was promptly granted by the National Research Council, and the Immigration Department granted visas which allowed for a year's stay in Thailand without need of renewal.

Drs. James Hoath and Fletcher Riggs of the U.S. Agency for International Development Office in Bangkok were personally contacted by Mr. Burton shortly after his arrival.

Kasetsart University enrolled Mr. Burton as an Overseas Graduate Student and a faculty advisor was assigned. A Junior Lecturer in the Department of Agricultural Economics, Mr. Pongruay Chungtes, was selected to work with Mr. Burton on this project while simultaneously pursuing his own research on the costs and returns for producing the high yielding rice varieties (HYV).

With letters of introduction from Kasetsart University, early liaison was also made with officials in the Government of Thailand's Rice Department, Irrigation Department, Land Development Department and the Division of Agricultural Economics.

Prior to selecting the sample area for this study, several field trips were made to promising locations north and west of Bangkok in the Central Plain region. After consultation with Government, Kasetsart University and local authorities, a sample area was chosen in changwad Supan Buri about 160 kilometers northwest of Bangkok in the heart of a major rice producing region.

On March 1, 1971 Mr. and Mrs. Burton and Mr. Chungtes moved to Supan Buri to commence field interviews with rural household members. A house was rented in the provincial (changwad) capital and a motorcycle purchased for local travel.

With the aid of a letter of introduction and explanation from Kasetsart University, the Governor of Supan Buri was informed of the nature of the study. He, in turn, introduced Mr. Burton and Mr. Chungtes to provincial and district officials who had special knowledge of the sample area's agriculture. With their assistance, six villages were chosen from which a total of 150 rural households were selected at random. Two villages and approximately fifty households were located in a deep water area where the HYV could not be grown. The remaining four villages (and 100 households) were located in an area of good water control where large plantings of HYV had been observed.

All sub-district and village leaders were contacted and given letters explaining the proposed study.

From March to May, 1971 all selected households were interviewed and basic information (plantings, labor force, costs and returns, etc.) from the 1970 wet season was obtained. Each household was personally interviewed by Mr. Burton and Mr. Chungtes. Particularly valuable assistance was given by the village headmen, while the farmers themselves were very cooperative.

The period from May to September, 1971 was spent tabulating data, conducting preliminary analysis and interviewing Irrigation, Extension and Rice Department officials in the Supan Buri area. Detailed soils and irrigation maps were obtained and updated for the study region.

Early analysis from the 1970 wet season indicated that problems of water control limited the total area of HYV and mixed HYV/traditional varieties to only one-fourth of the total sample area in the villages with what was generally considered "good" water control. No HYV were grown in the deep water villages. As a rule, if sustained water depths were to exceed one-half meter, traditional rather than the short statured HYV were grown. Yields for those farmers who were able to grow HYV were an average of 30% greater than for the traditional varieties. There was a very wide range of yields for the HYV, from double the average for traditional varieties to only one-half the average of traditional varieties for those farmers growing the HYV in areas where the water was too deep. Farmers did use more fertilizers on the HYV than on traditional, but the rate of application was still less than recommended. Sufficient HYV seed was available in the area and could be purchased at about the same price as for traditional varieties. By far the most popular HYV was a variety developed in Thailand (RD-1), followed by a variety developed at the University of the Philippines (C4-63). The third most popular variety was RD-3, another Thai variety.

From September to November, 1971, a second round of interviews was conducted to gather complete information from the 1971 dry season and preliminary information from the 1971 wet season. During this period four students from Kasetsart University spent two weeks working on the project as part of a University requirement for field experience.

Information from the second round showed the popularity of HYV in the dry season (when deep water is not a problem). The dry season planted area (in the study area) was only one-fourth that of the wet season, but HYV accounted for 35% of this area.

During the period from March to November, a number of visitors came to observe the study area and discuss the research in progress. They included Prof. John W. Mellor of Cornell University, Dr. Randolph Barker and Mr. Bart Duff of the International Rice Research Institute and Dr. A. Weisblatt of the Agricultural Development Council in New Delhi. Several Kasetsart University staff members also visited the area.

In September Dr. Gampol Adulavidhya of Kasetsart University initiated a series of economic studies on HYV in an area to the west of that chosen for this study. His research will be for both Kasetsart and the International Rice Research Institute.

In mid-November Mr. and Mrs. Burton and Mr. Pongruay Changtes returned to Bangkok to live. Field work in Thailand, including return trips to Supan Buri for a third cycle of interviews, will continue until the end of February, 1972. The final interviews will focus on credit and sources of non-farm income, as well as final harvest data for the 1971 wet season.

During the year monthly progress reports were sent to Prof. John W. Mellor at Cornell, Mr. Arb Nakajud, head of the Department of Agricultural Economics at Kasetsart and Mr. Boobert Klyprayong, head of the Supan Buri Rice Experiment Station. A paper presenting preliminary cost and return calculations and observations on production of the HYV will be presented this winter at the Annual Meeting of the Agricultural Economics Society of Thailand. Additional reports will be published by Kasetsart University prior to Mr. Burton's departure in February, 1972. Summary tables of the data collected will also be published and distributed by February.

Mr. Burton will return to Cornell in the spring of 1972 to complete the analysis on this research. The analysis will focus on those economic and agronomic conditions which limit or promote the profitability of HYV in Thailand. Particular emphasis will be placed on the favorable and unfavorable aspects of accelerated use of HYV and other new technologies from the point of view of growth in production and the distribution of benefits among regions and socio-economic groups.

This analysis will be presented in Mr. Burton's Ph.D. thesis which is to be completed by September, 1972.

B. Capital Labor Ratios as they Relate to Employment Growth

Uttam Dabholkar

Object of the Study

1. To ascertain the change in the composition of output in large scale industry in India since development planning was initiated in the country.
2. To ascertain factor proportions and capital coefficients obtaining in individual Indian manufacturing industries.
3. To characterize the choice of sectors within industry in the process of development planning in India by juxtaposing the quantitative information obtained under (1) and (2).

Data

(a) Source: Sample Surveys of Manufacturing Industries and Annual Surveys of Industry, Central Statistical Organisation, Cabinet Secretariat, Government of India.

(b) Years: 1951, 1957, 1960 and 1964.

Computations

The following were the principal computations carried out:

1. Capital-labour ratio for each industrial activity at the maximum level of disaggregation consistent with data availability.

Different concepts of capital and of labour were used:

for capital: (i) all productive (fixed and working) capital

(ii) fixed capital

(iii) plant, machinery and tools

for labour: (i) all employee's

(ii) all workers (i.e. employees excluding supervisory staff)

2. Capital-net value added ratio for each industry to reflect capital requirement per unit of output or inverted average productivity of capital.

3. Average wage rate for workers and nonworkers in each industry.

4. Aggregation of industries into sectors on the basis of likeness of productive activity.

Adjustment (e.g. addition, deletion or combining of industries) between time periods so as to obtain statistical comparability of composition of output and composition of capital between time periods.

5. (a) Relative, sectorwise composition of total productive capital for 1951, 1957, 1960 and 1964.

(b) Relative change in the relative share of each sector on the total productive capital for 1957, 1960 and 1964.

6. (a) Relative, industrywise and sectorwise composition of total net value added for 1951, 1957, 1960 and 1964.

(b) Relative change in the relative share of each sector in the total value added for 1957, 1960 and 1964.

7. (a) Classification of all industries on groups on the basis of factor proportions.

(b) Comparison of the classes made with respect to relative share in value added (i) in 1960 and (ii) in 1964.

Conclusions:

1. Definite empirical evidence was realized as to the extent to which the structure of manufacturing output shifted in favour of relatively capital-intensive industries, even under the assumption of unchanged factor proportions within each industry.

2. Valuable statistics were obtained e.g. sectoral wage rates, sectoral factor proportions and capital coefficients, that can be employed realistically in (a) multi-sectoral models of development planning and (b) characterization of production functions on specific industries.

C.

Consumption Pattern Effects

Phase I - Secondary Data

Phase II - Field Study

Bhupendra Desai

The report covers the work done during June and December 1971. The three topics of Indian economy were studied. They are:

- (1) Patterns of consumption expenditure
- (2) Factor shares under new agricultural technology
- (3) Seasonal pattern of employment in agriculture.

The work on the first two topics is completed except for finalization of a paper on topic (1). The work on topic (3) is under progress.

(1) Patterns of Consumption Expenditure

The previous studies, e.g. Rudra, NCAER, on this topic have mainly dealt with estimating mean expenditure elasticities and demand projection for various commodities. For our purpose this was inadequate. Further, there is a considerable lack of agreement in these estimates. Our work was, therefore, focused on three objectives; (1) to fill the gap in knowledge about the consumption behaviour of different income classes, (2) to search for explanation in the lack of agreement of various estimates, and (3) to make use of estimates of expenditure elasticities for different commodities to find out the budget shares of incremental income of various income classes.

To study these objectives data from National Sample Survey (NSS), No. 142, 1963-64 and "All-India Consumer Expenditure Survey of 1964," by NCAER were used. There were the latest years for which the data were available here.

To fulfill the objectives of our study specifications in a regression model was the crucial question. The following functional form answered this question the best.

log-log-inverse function:

$$\text{Log } E_{ij} = a + \frac{b}{x} + c \log X_j$$

where E_{ij} = per capita monthly expenditure on i^{th} commodity in j^{th} expenditure class

X_j = per capita monthly total expenditure in j^{th} expenditure class.

This function provided the varying instead of constant (which is, incidentally, the most common result implied by the regression models specified by other studies) expenditure elasticities for various income groups. Further when this function was fitted to the two sources of data viz., NSS (which was used by Rudra) and NCAER, gave us very close estimates of expenditure elasticities for food grains and milk and milk products. Thus, the lack of agreement between consumption estimates of Rudra and NCAER can be traced in part to misspecifications in the models used.

As regards the third objective, besides the earlier referred NCAER data on consumption expenditure, NSS data on land holding distribution for 1961-62 were used. These data were used to identify various income classes by land holdings. The budget share of an equal amount of an incremental income of all the income groups were estimated for food grains, other nonfoodgrain agricultural commodities like milk, milk products, edible oils, sweeteners, etc., and nonagricultural commodities like textiles, footwear, durables, etc. The results revealed the role of different income classes in generating demand-oriented growth in foodgrain, nonfoodgrain agriculture and nonagriculture sectors of the economy.

(2) Factor Shares Under New Agricultural Technology

The topic was studied using data from the High-Yielding Varieties studies conducted by various Agro-Economic Research Centres, Planning and

Evaluation Organization, and other private individuals. Two important findings are (a) the new technology invariably increased the share of land and capital much more than that of labor, both in total and incremental returns. (b) Increase in employment due to new technology seems divided between the family labor and hired labor.

(3) Seasonal Distribution of Employment in Agriculture

The work on this topic is most handicapped due to nonavailability of data on monthwise distribution of demand for and supply of labor for both farm operators and landless laborers. Consequently, after making several assumptions regarding labor supply, unemployment, employment in various activities, some preliminary analysis is under progress for the state of Punjab. A note on this analysis will be shortly completed. This note would help us decide whether we may extend similar analyses to other states in India. This note will attempt to make rough estimates of extent of unemployment and overemployment in different months and the extent of labor force that can be released for the full year by reducing the labor requirements during the peak periods of employment for the Punjab State. For this purpose data from Farm Management Survey and National Sample Survey, 1956-57 will be used.

D. Direct and Indirect Employment Effects within
Agriculture of New Agricultural Technologies

W. Graeme Donovan

A. In this period I have done the following:

2. Developed a linear programming model which will form the theoretical framework for data collection in Mysore State, India, and tested various aspects of the model on a computer. Characteristics of the model are as follows:

- (a) It maximizes net income to farmers for a specified region, in which aggregation is achieved by using "representative" farms in the programming matrix.
- (b) It allows for allocation within each representative farm of scarce resources particular to that farm type, and for allocation among farms in the region of resources for which representative farms "compete," such as irrigation water and supplies of hired labor.
- (c) By incorporating savings, investment and taxpaying activities, it allocates capital among various uses on farms and in government activities affecting farms, such as road construction, electricity reticulation, tubewell boring, and soil conservation works.

The model will be used to construct normative demand schedules for labor in the farming region. The effects on these demand schedules of changing wage levels, degree of mechanization of farm and government activities, product prices, taxation levels, saving propensities, and land distribution will be explored, along with effects of altering constraints on credit, government capital, and availability of administrative manpower.

3. Developed a model to analyze supply of labor on the part of laboring families.

4. Prepared preliminary drafts of questionnaires for field surveys of farmers, landless laborers, and government departments, and studied possible sampling methods for these surveys.

5. Made estimates of feasible employment increases for the whole of India, to be realized by increasing the area under fruits and vegetables, and by extending the commercial dairy industry. Using plausible projections of increased consumption of milk, fruits and vegetables from 1971 to 1976, it is estimated that an additional 3.3 million labor units might be absorbed in dairying, and 2.5 million in production of additional fruits and vegetables, during the five year period, given certain underlying assumptions.

B. The next phase of my work will be to carry out surveys of farmers, landless laborers and government departments for a selected small region of Mysore State, to which the programming model is to be applied. In addition, as much secondary data as possible relating to the subject will be collected. The objective of this work will be to explore the possibilities for labor absorption in the rural sector and government policies relevant to this end, as well as analyzing the kinds of income distribution and growth patterns resulting from an employment-oriented development strategy.

E. Raising Incomes on Small Farms--Bardoli Taluka, Surat District, India

Michael G. Schluter

The Area Selected for Study

The District

Surat District in Gujarat State was the area selected for this study (See Map 1). The primary criterion in making the choice was the availability of time series data for yields, prices and inputs by crop. Surat was the only district for which such data were available. These data related to 1964/65 and the period 1966/67 to 1970/71. Our survey was conducted in 1971/72, giving a total of seven years time series data within an eight year span. Since a primary aim of the study was to examine the possibilities of increasing the commercialization of small farms, a second criterion in choosing the district was acreage under commercial crops. Map 2 shows that Surat was a particularly suitable choice for satisfying this criterion.

Next, we examine the place of Surat District in the farming condition of Gujarat State. The Agro-Economic Research Centre at Vallabh Vidyanagar has divided Gujarat State into five major zones on the basis of soil type, rainfall and cropping pattern. This classification is shown in Table 1.

**Table 1: Classification of Districts in Gujarat
into Five Major Zones**

<u>No.</u>	<u>Soil Type</u>	<u>District</u>
I	Sandy	Kutch, Banaskantha, Mehsana
II	Medium Black	Jamnagar, Junagadh, Rajkot, Amreli, Bhavnagar, Surendranagar, Panchmahals, Sabarkantha
III	Sandy Loan	Ahmedabad, Kaira, Gandhinagar
IV	Deep Black	Baroda, Broach, <u>Surat</u> , Bulsar, Dangs

<u>No.</u>	<u>Rainfall</u>	<u>District</u>
I	Low Up to 500 mm	Kutch, Jamnagar, Surendranagar, Mehsana
II	Medium 501-750 mm	Amreli, Bhavnagar, Rajkot, Ahmedabad, Kaira, Banaskantha, Sabarkantha, Panchmahals, Baroda
III	Heavy 751-1250 mm	Junagadh, Broach, <u>Surat</u>
IV	V. Heavy 1251 + mm	Bulsar + Dangs

<u>No.</u>	<u>Crops</u>	<u>District</u>
I	Millet zone (Bajra-Jowar)	Kutch, Banaskantha, Mehsana, Gandhinagar
II	Groundnuts-Millet	Amreli, Jamnagar, Junagadh, Rajkot, Bhavnagar
III	Cotton-Millet	
	1) Alluvials (440-675mm)	Kaira, Ahmedabad, Surendranagar
	2) Deep Black (725-1230mm)	Baroda, Broach, <u>Surat</u>
IV	Groundnuts, Maize	Sabarkantha, Panchmahals
V	Paddy, fodder	Bulsar, Dangs

Surat has deep black soil, heavy rainfall and falls in this Cotton-Millet Zone. It may be added that although the coefficient of variability of annual rainfall for the district (30%) is classified as "Slightly low" in the Census Atlas (1961), it is nevertheless high relative to the rest of the State (See Map 3). In the context of this study, this is unfortunate since uncertainty due to yield variability, resulting from uncertain rainfall is less in Surat than elsewhere in the State. However, if uncertainty is found to be a major factor influencing the behaviour of small farmers in this district, where one major source of uncertainty is at the minimum it is very likely that this factor plays an even greater role elsewhere in the State.

Since there is such diversity in the farming conditions of Gujarat State, as shown already in Table 1, detailed findings from this study cannot be interpolated even to the State level. However, we may expect that the most general findings will have some general applicability beyond the particular district selected.

The Taluka

A taluka is a sub-district in Gujarat. From the 12 talukas in Surat District, Bardoli taluka was selected for this study. Bardoli, the main town in the taluka, is just 20 miles due West of Surat.

There were four main reasons for this choice:

1) Availability of secondary data, Bardoli was the only taluka for which data were available prior to 1966/67, and had been studied relatively intensively in the period 1966/67 to 1970/71.

2) Acreage under cash crops, Bardoli is relatively well irrigated, and has a relatively high proportion of acreage under fruits and sugarcane. Table 2 shows the considerable degree of diversity in the cropping pattern, an important characteristic for testing hypothesis relating to uncertainty.

Table 2: Proportion of Acreage Under Major Crops in Bardoli Taluka, Gujarat State, in 1967-68

<u>Crop</u>	<u>Proportion of Gross Cropped Acreage</u>
Rice	21.50
Wheat	2.66
Jowar	14.28
Pulses	18.04
Sugarcane	7.36
Cotton	26.24
Bananas + Mangoes	3.33
Groundnut	4.25
Vegetables	0.72
Others	1.61
TOTAL:	<u>100.00</u>

3) The acreage under wheat and cotton is significant, making it possible to analyse factors affecting the introduction of high-yielding seed varieties. For wheat these were introduced in 1965/66 and for cotton in 1969/70.

4) Within the taluka, there was considerable diversity in farming conditions. Thus, it was possible to select both prosperous and backward villages from this taluka.

To place Bardoli within a broader framework, we have selected certain economic and social indicators for comparison with Surat District, Gujarat State and India as a whole. These are shown in Table 3.

Table 3: Selected Economic and Social Indicators for Bardoli Taluka, Surat District, Gujarat State and India as a whole

<u>Characteristic</u>	<u>Bardoli</u>	<u>Surat</u>	<u>Gujarat</u>	<u>India</u>
% cultivating households with less than 5 acres	37	55	33	57
% gross cropped acreage under foodgrains	55 ¹	58 ²	48 ¹	N.A.
% gross cropped acreage irrigated	29	4	8	N.A.
% literate ³	36	41	36	24
% living in urban areas	11-20	23	26	N.A.
% scheduled tribes to total population	50	75	13	7
Population density ⁴	691	461	290	358

1. Refers to 1967/8; 2. Refers to 1970/1; 3. Excludes those in the age-group 0-4; 4. Number of people per square mile.

Sources: Gujarat State Agricultural Statistical Office, Ahmedabad
 Surat District Census Hand book, 1961
 Gujarat State Census Atlas, 1961
 Census of India, 1961, Vol. I, Part II-A(1), p.69
 Part II-C(1), Table C-III
 Part III(1), Table B-X
 Gujarat State Agricultural Atlas, 1968.

From this table, the picture that emerges of Bardoli is one of high degree of irrigation availability, but still a high proportion acreage under foodgrains and a medium to low density of small farms. Bardoli has a high literacy rate despite the low degree of urbanization, a very high population density (curious in view of the relatively large average farm size and low degree of urbanization) and a high proportion of the population in the lower social strata.

The Villages

From the 88 villages of the taluka, 3 were selected to reflect diversity of farming conditions. The characteristics of the three were as follows:

1. Balda: Situated 12 miles from Bardoli town to the North-East (See Map A), this is considered a very backward village. It has a very low proportion of land irrigated, as there is no canal irrigation. A very high proportion of the population is from the scheduled tribes.

2. Dhamrod-Lumbha: Situated two miles East of Bardoli town, this is considered one of the most progressive villages in the taluka by the Taluka Development Officer. A high

proportion of the land is canal irrigated, and it is well served by a local sugarcane factory and co-operative societies. Sugarcane and bananas are two of the main cash crops, neither of which is grown in Balda.

3. Kamai: Situated four miles South of Bardoli, Kamai falls between the other two villages in terms of irrigation availability and degree of progressiveness. There is some canal irrigation, but less than in Dhamrod-Lumbha, and a lower proportion of tribals than in Balda.

The Cultivators

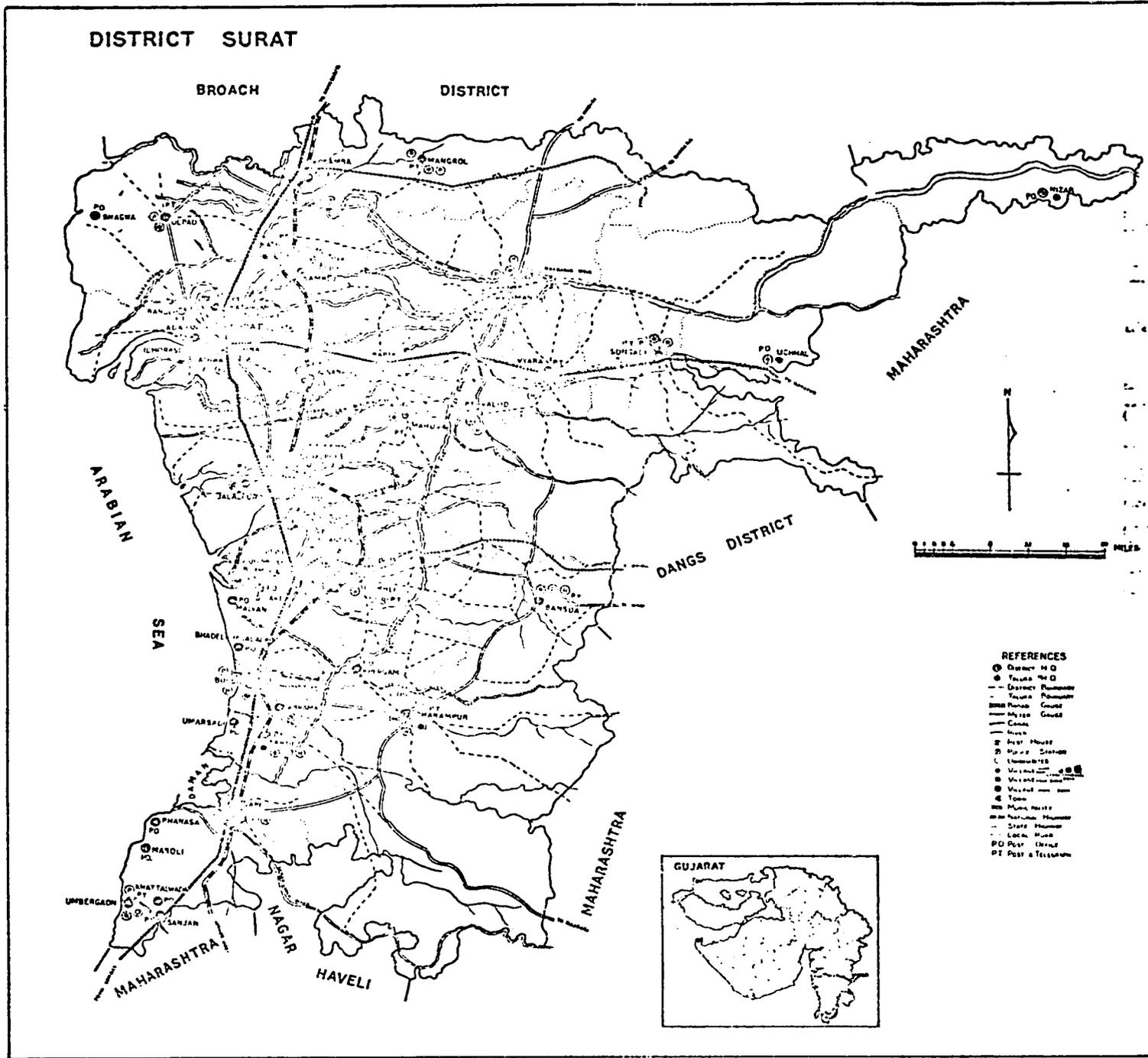
A stratified random sample of farmers will be used to select the individual households. Forty households will be taken from each of the three villages. A random sample would give the following breakdown by size of farm on the basis of the 1961 census for Bardoli taluka (Surat District Census Hand Book, Table B-X).

Acres:	<2.5	25
	2.5-5	18
	5-10	24
	> 10	53
	TOTAL:	<u>120</u>

The small farmers group defined in terms of both dependence on cultivation for income, and nevertheless having a relatively low income, may be roughly approximated by the 2-5 acre group of farms.¹ Those with less than two acres probably do not depend primarily on cultivation as a source of income and those with more than five acres may be expected to have a level of income too high to be associated into a 'small farmers'. A random sample would probably give only 20 farmers, one sixth of the total sample, in the small farmers group. Thus, it was necessary to stratify, to give the following numbers in each group.

Acres:	42	25
	2-5	50
	5-15	25
	Over 10	20
	TOTAL:	<u>120</u>

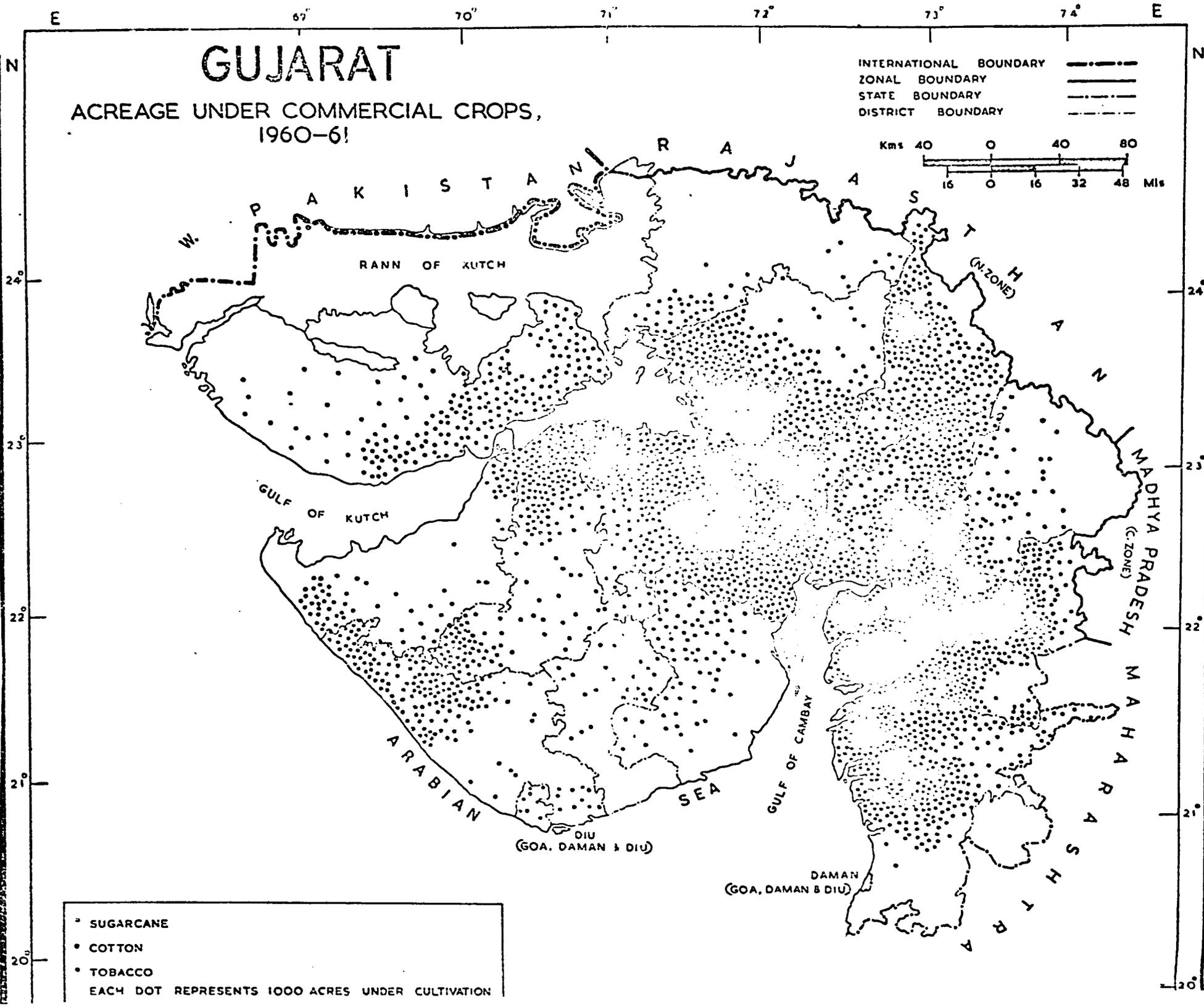
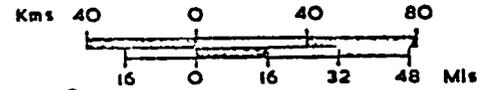
¹2-5 acres is the working deposition used by the Small Farmers Development agency in Surat for work in Bardoli Taluka.



GUJARAT

ACREAGE UNDER COMMERCIAL CROPS,
1960-61

INTERNATIONAL BOUNDARY 
ZONAL BOUNDARY 
STATE BOUNDARY 
DISTRICT BOUNDARY 

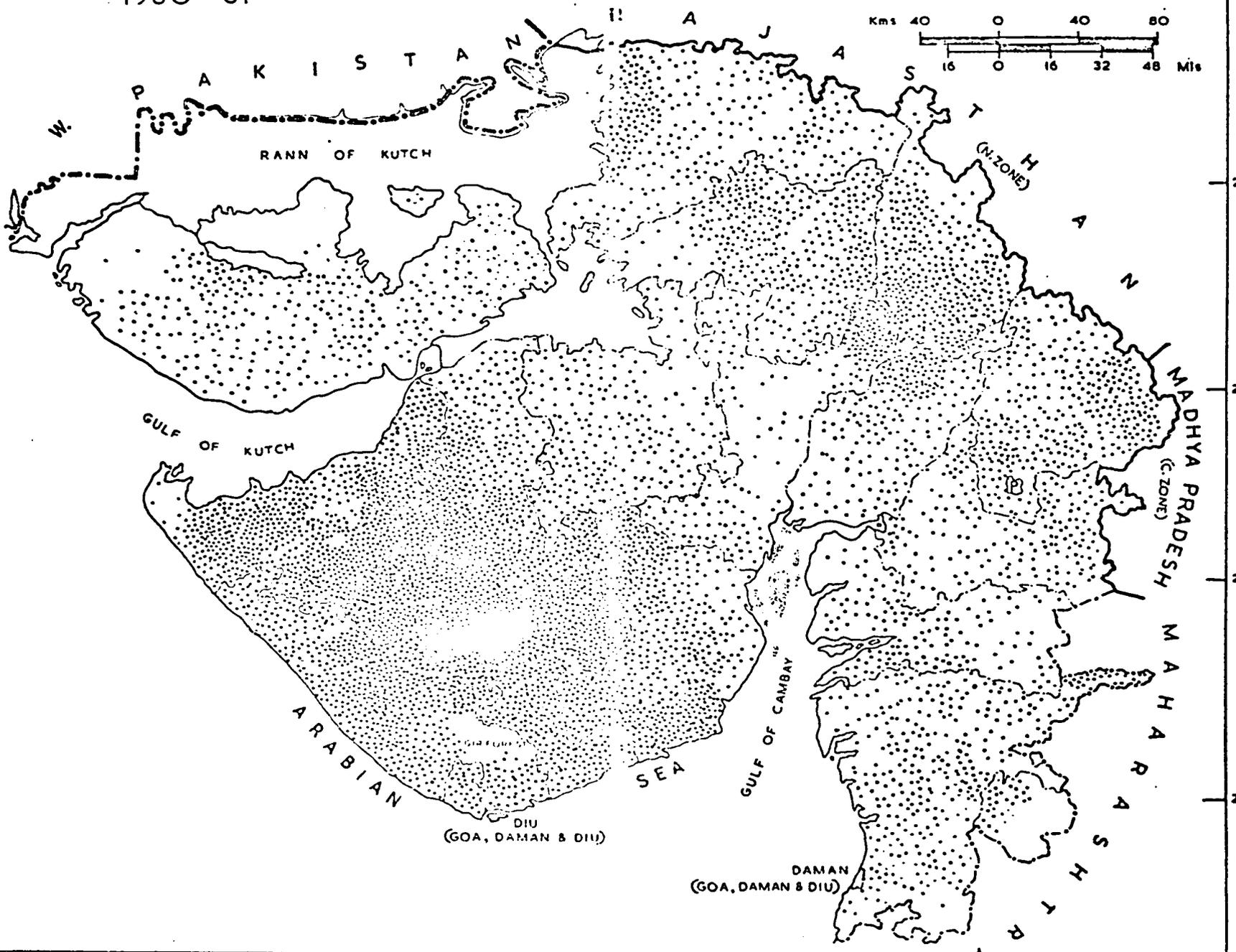
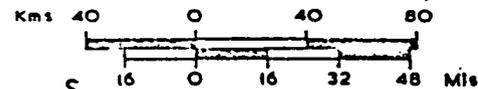


- SUGARCANE
 - COTTON
 - TOBACCO
- EACH DOT REPRESENTS 1000 ACRES UNDER CULTIVATION

GUJARAT

ACREAGE UNDER PULSES AND OILSEEDS.
1960-61

INTERNATIONAL BOUNDARY
ZONAL BOUNDARY
STATE BOUNDARY
DISTRICT BOUNDARY

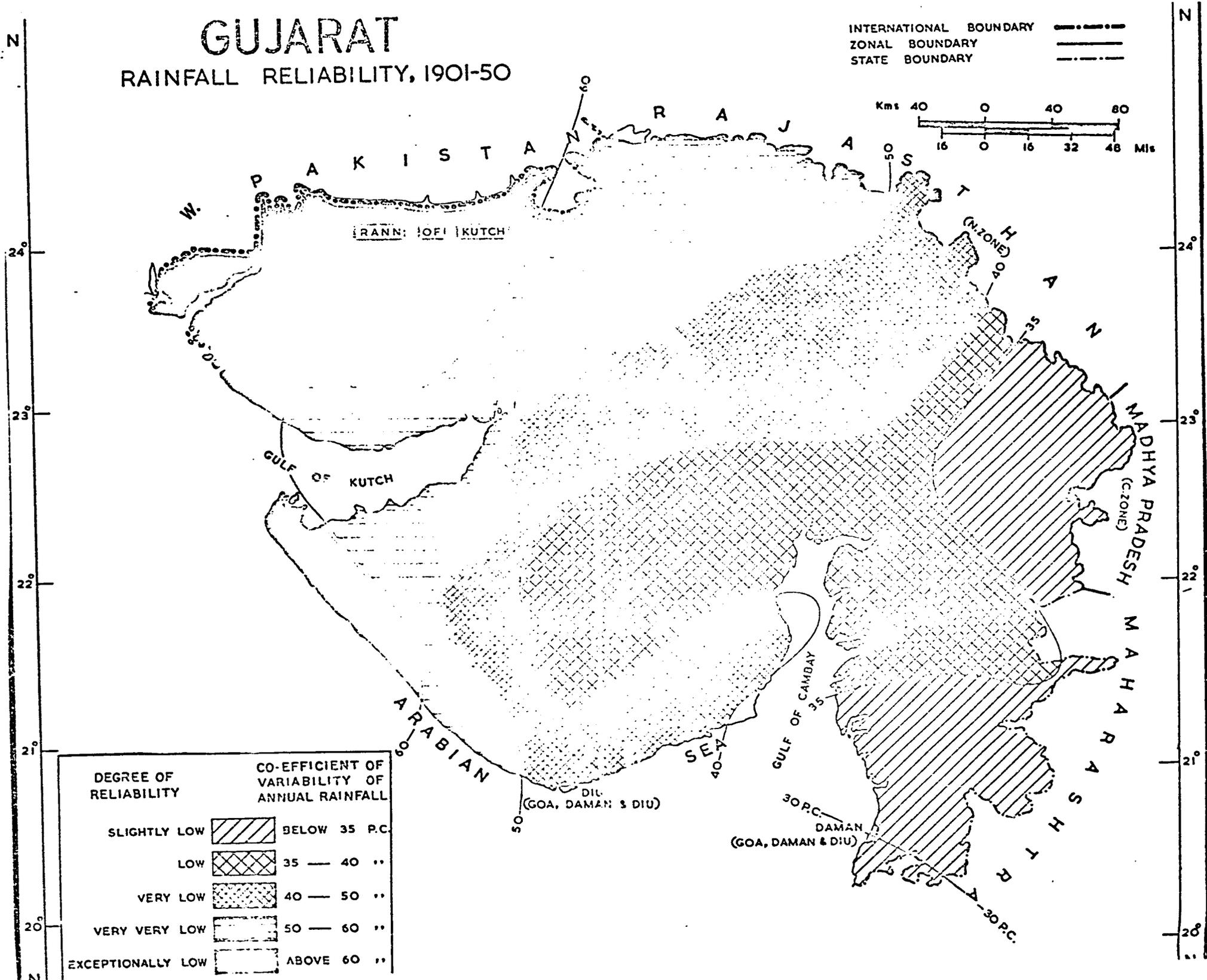
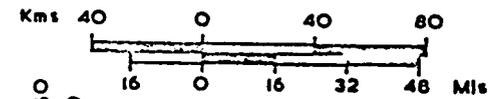


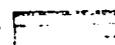
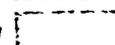
EACH DOT REPRESENTS 1,000 ACRES UNDER CULTIVATION
• PULSES

GUJARAT

RAINFALL RELIABILITY, 1901-50

INTERNATIONAL BOUNDARY 
 ZONAL BOUNDARY 
 STATE BOUNDARY 

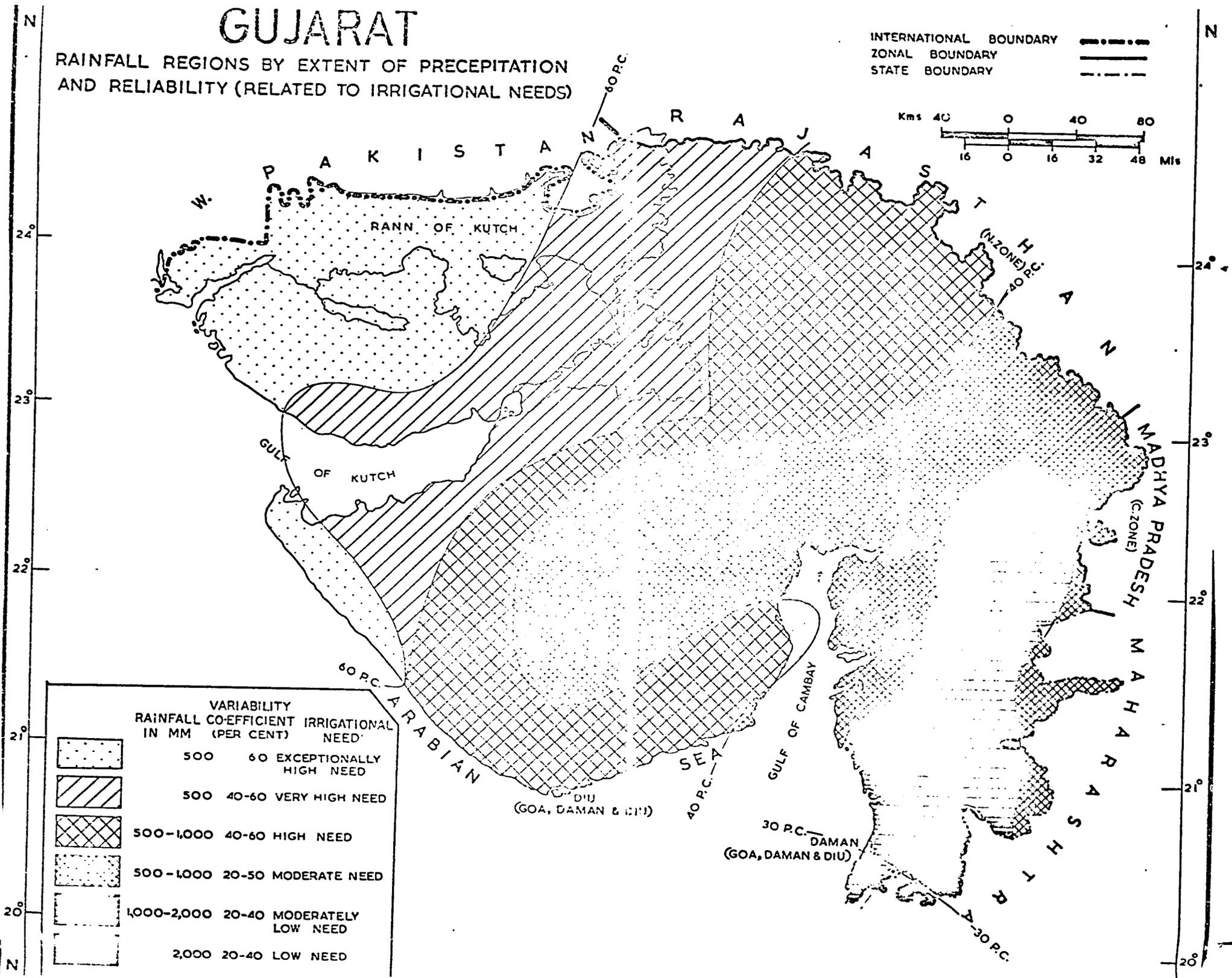
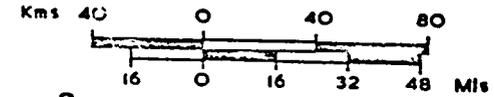


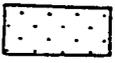
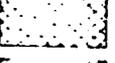
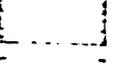
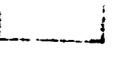
DEGREE OF RELIABILITY	CO-EFFICIENT OF VARIABILITY OF ANNUAL RAINFALL
SLIGHTLY LOW 	BELOW 35 P.C.
LOW 	35 — 40 "
VERY LOW 	40 — 50 "
VERY VERY LOW 	50 — 60 "
EXCEPTIONALLY LOW 	ABOVE 60 "

GUJARAT

RAINFALL REGIONS BY EXTENT OF PRECIPITATION
AND RELIABILITY (RELATED TO IRRIGATIONAL NEEDS)

INTERNATIONAL BOUNDARY 
ZONAL BOUNDARY 
STATE BOUNDARY 



VARIABILITY		
RAINFALL IN MM	CO-EFFICIENT (PER CENT)	IRRIGATIONAL NEED
	500	60 EXCEPTIONALLY HIGH NEED
	500	40-60 VERY HIGH NEED
	500-1,000	40-60 HIGH NEED
	500-1,000	20-50 MODERATE NEED
	1,000-2,000	20-40 MODERATELY LOW NEED
	2,000	20-40 LOW NEED

F.

Employment Potential in Small Industries--Gujarat State

Jan van der Veen

The data collection phase of this project has been completed. Field data on a sample of small industrial units in Gujarat State have been collected. These data key on variables relating to employment, capital and other industrial inputs; on variables relating to output; and on variables relating to competitive and complementary relationships between industries.

The analysis phase of this project has only just been initiated. At this point no meaningful results have been obtained.

It is anticipated that the analysis phase of this project will last until the end of April. The final version of the project report should be completed before the end of August.

Several tentative impressions based on first hand observation are noted below. These impressions are in the form of general hypotheses which will have to be tested against the data which was collected in the field.

The first impression relates to the profitability of very small industrial units. It was expected that profit rates in very small industrial units would be relatively high. This does not appear to be the case. A rough, quick estimate suggests that the profit rate on total capital lies, on average, near 14%. In other words the profit incentives to expansion -- both within a specific firm and with regard to entry from outside the industry -- are still relatively weak. Granting that motivation of individual entrepreneurial behavior is an important function of the state in India, it would appear that policies aimed at enhancing profit rates in the small industries sector possess considerable potential for encouraging further expansion.

The second impression -- again, in the form of a general hypothesis to be tested against the data -- relates to the structure of the sector embracing very small industries in India. These industries appear to be less closely related to agricultural pursuits than had been expected. Very small industries may be more closely related to the industrial base than many analysts anticipate. If true, this may have considerable bearing on the contribution of very small industries to final consumer demand. This may, in turn, have some impact on the application of a revitalized wages-goods argument to the small industries sector.

In general, it is clear that very small industrial units do offer considerable room for employing greater amounts of labor. But -- this is, again, only an impression -- it appears that very small units do not compete directly with medium and large units; that is, they do not, in general, produce roughly similar products using different techniques of production to take advantage of different economic conditions. Instead the very small units largely compliment the medium and larger units. Thus any substantial shift augmenting the relative importance of very small units in Indian industry would not be a result of the replacement of larger capital intensive units by very small relatively labor intensive units. This being true, it would follow that any significant attempt to increase the importance of smaller, labor intensive industrial units would meet with considerable resistance unless the structure of Indian industry as a whole is, itself, significantly recast.

To repeat, the above comments are merely impressions; they will be tested against the data collected in the field.

G. Cost Benefit Analysis of Education of Rural People in Uttar Pradesh

Richard L. Shortlidge

I. Period June to August 1971:

During this period the field research was completed in India. The data collected is summarized in Tables 1, 2 and 3. The study of factors effecting the supply of rural educated individuals to the labor market included a study of 12 villages in Badaun District and 2 villages in Nainital District. There were 248 households surveyed in Badaun, and 47 in Nainital. The sample proportion in Badaun was 15 percent of the households in the 12 villages stratified according to the five household categories (see Table 1). The sample proportion in Nainital had to be increased to 33 percent due to the small number of households in categories II - IV. In Nainital District, particularly the area in the Tarai, is peculiar in the sense that the majority of the landholding groups have more than 15 acres of land. This resulted from the fairly late date when the land was cleared and settled. The traditional village structure of most of U.P. does not exist in the Tarai. There were a large number of sizeable farms which have attracted agricultural laborers from other parts of Uttar Pradesh particularly the Eastern Districts. This means that the vast majority of the households in our survey are in Classes I and V (85.1 percent). Rather than have a disproportional sample it was decided to take an increased percentage of all households (33 percent was selected).

To gain information on the quality of education available and its location vis-a-vis the villages studied, the schools in the area were surveyed, (see Table 2). Twenty-nine schools were surveyed in Badaun, and 8 in Nainital. As part of the survey, information was collected from 157 teachers working in the 29 schools in Badaun and 61 teachers working in the 8 schools in Nainital. It was necessary to include high schools (up through class 10) and intermediate colleges (class 11-12) located in the block headquarters, since most of the schools with grades above 8 are located in urban communities not villages. These urban areas selected were the closest to the villages surveyed and

represented the most likely institutions that rural families in the area would send their children to for education beyond middle school.

The conditions of the market-demand for educated labor of all types was provided by a survey of firms in the ~~area~~ adjoining urban centers. All the businesses and manufacturing enterprises in Badaun, Bisauli, ^{Waringanj} ~~Waringanj~~, and Rudrapur were enumerated and classified into 15 categories according to the product produced, product sold, and service performed. A sample ~~performed~~ of 20 percent of the firms in each category was selected for surveying. This included 93 businesses in Badaun, 34 in Bisauli, 20 in ^{Waringanj} ~~Waringanj~~, and 79 in Rudrapur. Excluded from the survey were government administration offices. All schools were enumerated ^{and} ~~with~~ a list of staff size was obtained. Therefore, with the information on schools plus the surveyed firms, it is possible to gain substantial information about the demand structure for educated labor in the area. Since there is limited labor mobility (including less than college educated labor), it was felt that the surveyed industries and businesses would cover the majority of employment opportunities available to educated individuals from the villages concerned.

In addition to the survey of villages and firms, data was collected for a benefit-cost analysis of all degrees awarded by U.P. Agriculture University. The benefit information was obtained from a mailed questionnaire to 1,536 graduates from the University as of March 1971. The University had awarded 1,876 degrees between 1963 and March 1971. The 1,536 graduates represented all graduates from the University (1) after removing graduates for whom no mailing address was available, (2) after removing graduates from countries other than India and Nepal, and (3) after taking into consideration individuals who had received more than ^{one} ~~the~~ degree from the University. 606 questionnaires

were returned by July 1971. This represented a response rate of 39.5 percent. However, only 584 of the 606 questionnaires could be used in the sample due to errors in 22 questionnaires which required removing them. The 584 questionnaires represented 694 degrees awarded by the University. This was 37 percent of all degrees awarded by the University by March 1971.

~~Cost~~^{Cost} information on the 584 returned questionnaires was collected from the comptroller's office. This included actual payments of fees and tuition, hostel, and food charges. Scholarship information including amount and type of scholarship was provided by the Dean of Student Welfare. The only significant private costs omitted were the (1) the cost of books and (2) the opportunity cost to the individual by staying in school. First, the cost of books will be estimated on the basis of a survey of 40 final year students in all colleges conducted during May 1971. This information will be compared with information contained in the Education Commission's Report in 1966. Second, the opportunity cost will be estimated on the basis of three ~~services~~^{SOURCES}: (1) data collected from schools on teacher salaries and firms which were a part of the village survey work in Badaun and Nainital, (2) Mark Blaug, et. al., The Causes of Graduate Unemployment in India, and (3) Richard L. Shortlidge, The Profitability of Educational Investments in India.

The information on the social cost or total cost (nonprivate) which includes all recurring cost not covered by fees and tuition, and capital cost of the University were obtained with the assistance of the Comptroller and engineer^s working in the Department of Works and Plants. This included the actual expenditures by the University since 1963 on all salaries, equipment, and construction of buildings.

II. September - December 1971:

The emphasis of the research shifted to the stage of analysis. U.P. Agriculture University was extremely interested in having the preliminary draft of the Benefit-Cost analysis as soon as possible. Therefore, the major task since returning to Cornell has been toward meeting this obligation.

Some problems were encountered in the initial coding of the employment questionnaires. Many graduates who returned their questionnaires failed to mention that they had taken more than one degree from the University. Therefore, it was necessary to check all the questionnaires received against the cost data to determine which degree category the student belonged to (a student's I.D. number remains the same no matter how many degrees he obtains from the University). This resulted in a sample size of 694 degrees.

The next stage of the analysis involved a check for sample bias. The check was run by means of a regression equation consisting of six independent variables and one zero-one dependent variable representing whether the graduate had responded or not^{to the questionnaire}. The regression was run using the 1,536 graduates who had been sent questionnaires. The result of the sample bias check revealed that three variables had effected significantly the ^{rate} ~~rate~~ of response. (1) The graduates who had come to the University as V.L.W. responded at a rate significantly higher than nonV.L.W.'s, (2) Graduates who had taken more than one degree from the University responde^d significantly higher than those obtaining one degree. (3) ~~Third~~, there was a significant inverse relationship between overall grade point average and the rate of response. To handle the first bias a subsample of V.L.W. was created. This was necessary for two reasons. First, V.L.W.'s ^{Come} ~~Came~~ to the University under a special program in which the B.Sc. (Ag.) is awarded in two years rather than three. Second, V.L.W.'s return to their same

jobs after graduation. To retain this special case in the sample would have been prejudicial to the results of the analysis for the College of Agriculture.

The bias in terms of graduates with more than one degree from the University should in no way affect the results. This would be correct for two reasons. First, the analysis is concerned only with the highest degree received from the University. Second, if it can be shown that there is no relationship between salaries in the first job after graduation and grade point average, the fact that students with higher grade point averages have a greater tendency to go on for an advanced degree thus removing them from the sample of bachelor's degrees should not bias the data for the remaining B.Sc. holders ~~downward~~.

To check this latter ^{condition} ~~qualification~~ it was necessary to resolve the problem of the third bias. It was found that no correlation existed between the student's overall graduate point average and his initial salary. This check effectively eliminated the need to take into account the biases resulting from (1) higher proportion of graduates with more than one degree responding and (2) the inverse relationship between grade point average and response rate.

After the sample bias had been eliminated or resolved the sample was divided into groups according to year of graduation. The employment and cost data were likewise matched by year of graduation. Salary profiles ~~and~~, lengths of employment, and length^s of unemployment have been computed for developing the age-earnings profiles for all colleges and degrees at the University. In addition, the average payments for fees and tuition, hostel, and food plus the average scholarships received have been estimated for the cost side of the analysis.

The per student social cost was estimated as follows. First, for the recurring cost which are composed mainly of staff salaries, it was necessary

to take into account the different functional areas (research, teaching, and extension). The proportion of the staff's time devoted to teaching was used to estimate the recurring expenditures that should be allocated to students as a cost. Second, the per student rental cost of the University's fixed capital investment was estimated by taking the total cost of the buildings for each college, depreciating them at a straight line rate over a span of 60 years. Since the buildings are also used for other functions, the proportion of staff time devoted to teaching was used as a proxy for the facilities used in teaching. Included in this estimation of the rental value per student was a capital charge for the administration block and library facilities.

Since only that part of the expenditure on food over and above the alternative cost of eating at home can be included as an educational cost, it was necessary to estimate the cost of eating at home. This cost was derived from three rounds of the National Sample Survey and the family income information collected on the 40 final year students at UPAU. The student's monthly family income was estimated and divided by the average family size to obtain a per capita income figure. To get a per capita consumer expenditure amount it was assumed the family would save 10 percent of its income. The resulting per capita expenditure on consumption corresponded to the last consumer expenditure class in the NSS. Since data was not available after 1964 from the NSS and the proportion of the consumer expenditure going to food had remained fairly constant over the period 1958 to 1964, it was assumed that the proportion in 1971 of expenditures on food would have increased at the nominal rate of the 1958 to 1964 period over the 1964 to 1971 period. Using this proportion an estimation of the food cost in 1971 was derived. The cost for each year from 1960 to 1971 was computed using the NSS growth rate in per capita expenditure from 1958 to

1964 and the growth rate in per capita expenditure from 1964 to 1971 based on the generated cost figure for 1971. The resulting annual per capita expenditure on food corresponds to the cost of eating at home. This method of approximating the cost appears to be reasonable based on my own experience in India.

This brings the analysis up to date. Before the rates of return can be calculated the age-earning profiles must be developed. This should be completed around the beginning of the year. The preliminary draft of the UPAU study should be available by mid-January.

The following are some tentative results from the UPAU survey:

1. The initial salary received by graduates after graduation is inversely related to the length of initial unemployment. The longer the student remains unemployed the more willing he is to settle for a job with a lower salary.

2. The strong preference for public sector employment seems to be related to the occupation of the student's father. The majority of the students attending UPAU came from families in which the head of the household works in a government job. Students from civil service families show preference for civil service jobs, students from private business families prefer private business, and students from farming families (most UPAU farm families have fairly large holdings) prefer farming. This may explain part of the lack of mobility in the labor market which has often been explained in terms of ~~scarcity~~^{security} of civil service jobs and conditions of employment.

3. The cost of an education at UPAU has increased dramatically since 1967 when the University underwent major administrative changes. ^{For example,} The cost of food more than doubled with the change from common mess facilities to cafeteria-style service.

4. The labor market for B.V.Sc.'s is confined mainly to supply the needs of the state of Uttar Pradesh for Veterinary Assistant Surgeon^s. So far, few have gone into private practice. The outlook for future employment possibilities depends a great deal on increasing the number of graduates going into private practice. The narrowness of the current market for graduates from the Veterinary College has been reflected in a cut in the number of annual admissions to the college.

5. The salary differentials between a B.Sc. in Ag. and a M.Sc. in Ag. plus the growing length of initial unemployment for graduates with a B.Sc. is reflected in larger proportions of graduates continuing beyond the B.Sc.

6. The program for V.L.W.'s will probably turn out to be one of the most successful ones offered by the University. It also meets a crucial need for trained agriculturists at the level of administration dealing with rural areas.

7. The ranking of rates of return from highest to lowest will probably be along the following lines:

1. M.Sc. Agriculture
2. B.Sc. Agriculture
3. B. Tech. (Engineering)
4. B. Veterinary Medicine
5. M. Veterinary Medicine

Table 1: Number of Households in the Village Surveys of Badaun and Nainital Districts According to Landholding Class

Class Number and Description	Badaun District ¹		Nainital District ²	
	Number of Households in Sample	Percent	Number of Households in Sample	Percent
1..No Land	41	16.5	23	48.9
2..Less than 2.5 Acres of land	92	37.1	1	2.1
3. @2.5 acres to 7.5 acres of land	79	31.9	4	8.5
4. 7.5 acres to 15 acres of land	22	8.9	2	4.3
5. More than 15 Acres of Land	14	5.6	17	36.2
Totals	248	100.0	47	100.0

Footnotes:

1. There were 12 villages in Badaun district from Bisauli and Wazirganj blocks.
2. There were 2 villages in Nainital district from Rudrapur Block.

**Table 2: Survey of Schools and Teachers in Badaun and Nainital Districts.
Number included in Sample by level of Education.**

Level of School	Badaun District		Nainital District	
	Number of Schools	Number of Teachers	No. of schools	no. of teach
Primary (1-5)	18	65	2	3
Middle (6-8)	8	43	2	8
High School(9-10)	1	12	2	24
Intermediate(11-12)	2	37	2	26
Totals	29	157	8	61

Table 3: The Sample of Businesses included in the Survey of the Demand for Educated Labor in Badaun, Bisauli, Wazirganj, and Rudrapur According to Category of Product Sold, Manufactured, or Service Performed

Category	Towns			
	Baduan ¹	Bisauli ²	Wazirganj ³	Rudrapur ⁴
1. Farm Equipment Sales	9	1	0	7
2. Farm Equipment Repair and Service	13	6	1	7
3. General Stores	5	2	2	6
4. Cloth and Ready-Made Clothes	14	3	3	8
5. Leather Goods (Shoes)	4	1	1	3
6. Grain Merchants and Commission Agents	6	1	2	11
7. Staple Goods (Kirana) Stores	10	5	2	10
8. Flour Mills, Rice Mills, and Cold Storage	1	3	2	4
9. Hotels and Restaurants	1	3	1	2
10. Sawmills	1	1	1	0
11. Rope and Bamboo Merchants	1	0	0	1
12. Consumer Goods (Cycles, Radios, Petrol Pumps, Fans, etc.) ⁵	22	6	1	15
13. Medical Stores	1	1	2	3
14. Bookstores	3		1	1
15. Iron Shops	2	1	1	1
Totals	93	34	20	79

Footnotes: 1. The total number of firms in Badaun were 437. Sample size 20 percent. 2. The total number of firms in Bisauli was 180. Sample size 20 percent. 3. Total number of firms in Wazirganj was 95. Sample size 20 percent. 4. Total number of firms in Rudrapur was 385. Sample size 20 percent.

Footnotes Continued :

5. This category includes some firms which are engaged in manufacturing consumer items. For example, included in this category is a plastic bag factory and an ink factory in Badaun city.

H. Analysis of Employment Relations in East Pakistan

M. Raquibuz Zaman

Research Work Completed Since May, 1971

Research Notes:

1. "Population, Labor Force and Growth in Agriculture in East Pakistan: 1970-1980," August, 1971.
2. "Irrigation in East Pakistan," August, 1971.
3. "Surplus Labor in Rural East Pakistan," September, 1971.
4. "Effects of Irrigation and Intensive Agriculture on Gross Farm Income and on Factor Shares," September, 1971.
5. "Distribution of Incremental Income in Consumption Expenditures in Rural East Pakistan," September, 1971.
6. "Implications of Tubewell Irrigation on Rice Production and Employment in East Pakistan," August, 1971. Revised in September, 1971.

Research Papers:

1. "A Comparative Study of Causes and Patterns of Growth in Exports from India, Pakistan, Taiwan, South Korea and Japan During the Decades of the 1950's and 1960's," June, 1971.
2. "Foreign Aid and Economic Growth: A Comparative Study of the Economics of India, Pakistan, Taiwan and Korea in the Period Between 1952 and 1970," October, 1971.
3. "Generating Employment in Bangla Desh: Some Special Problems and Their Possible Solutions," December, 1971.

APPENDIX 2

PUBLICATIONS LIST

Cornell University - USAID

Prices, Employment and Income Distribution Research Projects.

Department of Agricultural Economics

Cornell University

<u>Paper No.</u>	<u>Date</u>	<u>Title</u>	<u>Author</u>
1.	Oct. 1967	"Change in Relative Prices of Agricultural Commodities, India, 1952-53 to 1964-65"	John W. Mellor and Ashok Dar
2.	Oct. 1967	"Notes on Foodgrains Prices, India, 1967-68 to 1968-69"	John W. Mellor
3.	Dec. 1967	"Determinants and Development Implications of Foodgrains Prices, India, 1949-50 to 1963-64" (Published in <u>The American Journal of Agricultural Economics</u> , Vol. 50, No. 4, Nov. 1968)	John W. Mellor and Ashok Dar
4.	Nov. 1967	"Domestic Terms of Trade and Economic Development in India, 1952-53 to 1964-65" (Cornell International Agricultural Development Bulletin No. 12)	Ashok Dar
5.	Jan. 1968	"Note on Agricultural Price Policy - 1968 Indian Wheat Price Support"	John W. Mellor
6.	Jan.- March 1968	"The Functions of Agricultural Prices in Economic Development" (Published in the <u>Indian Journal of Agricultural Economics</u> , Vol. XXIII, No. 1, Jan.-March, 1968)	John W. Mellor
7.	Jan. 1968 Revised July 1969	"Three Reviews of Indian Agriculture: a) agricultural production trends b) marketing c) village studies"	John W. Mellor
8.	Jan. 1968	"Farm Management Extension in a Modernizing Agriculture" (Published in <u>Netherlands Journal of Agricultural Science</u> , 16, No. 4, 1968)	John W. Mellor

<u>Paper No.</u>	<u>Date</u>	<u>Title</u>	<u>Author</u>
9.	Apr. 1968	"Opportunities and Problems Associated with Wheat Production, Marketing and Pricing in the Kathmandu Valley"	John W. Mellor
10.	Apr. 1968	"Wheat Production and Utilization as a Leading Edge for Development in the Kathmandu Valley"	John W. Mellor
11.	Sept. 1968	"Statistical Tables, Methodology, Data Sources and Conclusions regarding Intersectoral Capital Flows in the Economic Development of Taiwan, 1895-1960"	Teng-hui Lee
12.	Dec. 1968	"Working of Grain Markets in Selected States, India, 1955-56 to 1964-65" (out of print)	Uma J. Lele
13.	June 1968	"A Study of Movement in Prices of Selected Items of Foodgrains and Industrial Raw Materials in India, 1939 to 1967-68" (out of print)	M. B. Mathur
14.	Jan. 1969	"Increasing Fertilizer Use in Indian Agriculture"	Gunvant M. Desai
15.	Jan. 1969	"A Note on the Distribution Effects of Chilean Agricultural Price Policies"	Roberto Echeverria
16.	Jan. 1969	"Economic Analysis of Well Irrigation, Aligarh District, India"	T. V. Moorti
17.	Apr. 1969	"The Modernization Decision in Indian Urban Fluid Milk Markets" (Cornell International Agricultural Development Bulletin No. 15)	Ray W. Nightingale
18. thru 23.	Mar. 1969	Summary Tables for Study of Diffusion of Innovation, Central Plains, Thailand (out of print, see Paper No. 41)	Brook A. Greene & Jerachone Sriswasdilek
24.	July 1969	"Growth of Fertilizer Use in Indian Agriculture" (Cornell International Agricultural Development Bulletin No. 18)	Gunvant M. Desai
25.	Aug. 1969	"The Relationship Between Agricultural Production and Industrial Capital Formation in India, 1951-52 to 1964-65" (Cornell International Agricultural Development Bulletin No. 17)	U. S. Bawa

<u>Paper No.</u>	<u>Date</u>	<u>Title</u>	<u>Author</u>
26.	Oct. 1969	"An Economic Analysis of Resource Use in Farming, Jabalpur District, Madhya Pradesh, India, 1967-68"	V. P. Shukla
27.	Aug. 1969	"Agricultural Price Policy in the Context of Economic Development" (Published in <u>The American Journal of Agricultural Economics</u> , Proceedings Issue, Vol. 51, No. 5, December, 1969)	John W. Mellor
28.	Sept. 1969	"Stability for Primary Products: Means to What Ends?"	W. G. Tomek
29.	March 1970	"A Comparative Study of Well Irrigation in Aligarh District, India" (Cornell International Agricultural Bulletin No. 19)	T. V. Moorti
30.	June 1970	"The Effect of Agricultural Price Policies on Intersectoral Income Transfers"	Roberto Echeverria
31.	June 1970	"The Structure and Performance of the Rice Marketing System in East Pakistan"	M. O. Farruk
32.	June 1970	"The Impact of the Sonauli-Pokhara Highway on the Regional Income and Agricultural Production of Pokhara Valley, Nepal" (Cornell International Agricultural Bulletin No. 14)	Mark J. W. Schroeder & Daniel G. Sisler
33.	June 1970	"Agricultural Resource Transfers and Agricultural Development: A Brief Review of Experience in Japan, England, and France"	Uma J. Lele
34.	June 1970	"Technological Change in Agriculture and Intersectoral Resource Flows"	John W. Mellor
35.	May 1970	"A Brief Bibliographical Sketch on Intersectoral Capital Transfers in Japan"	Shigemochi Hirashima
36.	June 1970	"Fertilizer Adoption and Use in Amphoe Manorom, Thailand, 1967-69"	Brook Greene
37.	June 1970	"An Analysis of Modernization of the Rice Milling Industry in India"	Uma J. Lele
38.	June 1970	"Elements of a Food Marketing Policy for Low Income Countries" (Published in <u>The Marketing Challenge: Distributing Increased Production in Developing Nations</u> , Foreign Economic Development Report 7, December, 1970)	John W. Mellor

<u>Paper No.</u>	<u>Date</u>	<u>Title</u>	<u>Author</u>
39.	June 1970	"Agricultural Prices in Economic Development - Their Role, Function and Operation"	J. W. Mellor
40.	July 1970	"Modernization of the Rice Milling Industry" (Published in <u>Economic & Political Weekly</u> , Vol. V, No. 28, July 11, 1970)	Uma J. Lele
41.	Nov. 1970	"Rate of Adoption of New Farm Practices in the Central Plains, Thailand"	Brook Greene
42.	June 1971	"The Political Economy of Employment Oriented Development"	Uma J. Lele and John W. Mellor
43.	June 1971	"A Labor Supply Theory of Economic Development"	John W. Mellor and Uma J. Lele
44.	Feb. 1971	"Capital-Labor Ratios, Capital-Output Ratios, and Rates of Profit in Indian Industry"	Grace Horowitz
45.	June 1971	"A Note on Dualistic Models"	Uma J. Lele
46.	June 1971	"Dilemma of State Tube Wells" (Published in <u>Economic & Political Weekly</u> , Vol. VI, No. 13, March 27, 1971.)	John W. Mellor & T. V. Moorti
47.	Aug. 1971	"Differential Rates of Adoption of the New Seed Varieties in India; The Problem of the Small Farm"	Michael Schluter
48.	Sept. 1971	"The Green Revolution: Income Distribution and Nutrition"	Uma Lele
49.	Nov. 1971	"A Case Study in Agricultural Marketing"	Uma J. Lele
50	Jan. 1972	"Domestic Markets and The Growth of Farm Cash Income"	John W. Mellor and Uma J. Lele