AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

BIBLIOGRAPHIC INPUT SHEET

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Batch #22

1. SUBJECT CLASSIFICATION

A. PRIMARY: Serials — Y-AE10-0000-0000

B. SECONDARY: Agriculture--Agricultural economics

2. TITLE AND SUBTITLE

Impact of new technology on rural employment and income; six monthly progress report,July-Dec.1970

3. AUTHOR(S)

(101) Cornell Univ. Dept.of Agr.Economics

4. DOCUMENT DATE	5. NUMBER OF PAGES	6. ARC NUMBER
1971	11p.	ARC

7. REFERENCE ORGANIZATION NAME AND ADDRESS

Cornell

8. SUPPLEMENTARY NOTES *(Sponsoring Organization, Publishers, Availability)*

(Research summary)

9. ABSTRACT

10. CONTROL NUMBER	11. PRICE OF DOCUMENT
PN-RAB-385 PN-RAD	
12. DESCRIPTORS	**13. PROJECT NUMBER**
Employment Technological change	**14. CONTRACT NUMBER** CSD-2805 Res.
	15. TYPE OF DOCUMENT

AID 590-1 (4-74)

FIRST SIX MONTHLY PROGRESS REPORT - CONTRACT NO. AID/csd-2805

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

For the Period July 1, 1970 - January 1, 1971

John W. Mellor, Cornell University

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Progress to Date

During the first six months of the contract the work fell in three categories. First, developing a conceptual model. Second, delineating initial empirically based sub-projects. Third, initiating the sub-projects.

A major effort was put into developing a conceptual model. This model not only forms the basis for conceptualizing, organizing and presenting our information from the various sub-projects but we believe also represents a major step forward in conceptualizing an approach to meeting the employment problems of low income countries.

Presentation of the model takes two forms. First, we have drafted a technical paper presenting a mathematical growth model which emphasizes labor and consumer goods in contrast to the usual growth models which place their emphasis on capital and investment goods. Our approach gives prime place to creation of employment and the incident distribution of income. A draft of that technical paper is enclosed as Appendix I. A number of refinements to the model are still being developed. Second, policy implications of the model are spelled out in an ancillary more popular paper. This paper clarifies the major step forward in conceptualization with respect to employment problems which our model provides. That paper is appended as Appendix II. It too is being revised.

The second effort has been that of delineating the various sub-projects to be undertaken during the first and second years of the contract. Four of these sub-projects have been worked out in detail and actual work on three of them has commenced. The fourth one is due to commence within a month or so. All four will be well underway before the end of the first fiscal year. Preliminary progress has been made in delineating three additional sub-projects and it is expected that work will get underway on those near the end of this year or early in the second year of the project.

Major progress has been made with respect to analysis of data dealing with the problems of cultivators with small holdings. Appendix III to this report is the first draft of our report on that initial stage of the sub-project. Also appended to this report as Appendix IV are a set of statistical data dealing with capital-labor ratios which will enter into some of our other analysis in a substantial manner.

In keeping with our conceptual model the field oriented sub-projects fall into four categories. It is clear from our model that it is unproductive to look at the question of employment and income distribution effects of the new agricultural technologies only with respect to their direct effects or even to their indirect effects within agriculture. The effects of technological change in agriculture are substantial and pervasive throughout the economy. Various direct effects within agriculture may rule out various indirect effects in other sectors and conversely. Therefore at least some studies of this question must look at them in their totality and with their interactions among sectors. Thus we break our sub-projects into four parts to look at these various direct and indirect effects and their interactions.

The first category of studies is concerned with the direct effects of the new technologies on net yields and hence on returns to the wealthier classes of land owners and on employment and hence returns to lower income people in agriculture. In a technical sense we are concerned with the measurement of the nonneutrality of bias of returns to factors of production by various forms of technological change and innovation within agriculture. We have three sub-projects in this area. The first of these sub-projects is already underway in Thailand. An intensive study is being made of the varying affect of particular new technologies on yields, demand for labor and relative incomes of various classes in the agricultural sector under varying physical conditions. An outline of that project is appended as Appendix V. We are concerned particularly with the interaction between high yielding varieties of rice in an area of better than average water control and another area with worse than average water control and the interaction of these matters with mechanization. From this we will have an understanding of the direct effects, first round indirect effects and a basis for looking at second round indirect effects. (1)

The second sub-project in this part is planned to be undertaken in India. We are still drafting the final formulation of the sub-project. In this sub-project we are concerned with looking at some first round effects of the new technologies and a set of second round effects within the agricultural sector. At the moment we are planning to look particularly carefully at the increased costs and returns and factor utilizations, employment effects and income distribution effects of rural public works particularly including roads as they interact with the new agricultural technologies. We are also considering looking carefully at other major labor using innovations such as increased production of fruits and vegetables and livestock products as they interact with the new agricultural technologies on both the supply side, the demand side and the factor utilization side. Discussions will be undertaken with USAID personnel in India prior to final formulation of this sub-project. (2)

The third sub-project in this part deals with the special problems of small cultivators. Appendix III provides a report on our initial analysis in this area. There has been a substantial amount of study of diffusion of innovation by size of farm, particularly in India. We have (3)

reviewed this literature intensively and from that have formulated a number of hypotheses concerning the nature of lags in acceptance of technologies by small cultivators, the kind of policies which might accelerate their acceptance and the implication of various rates of diffusion to the distribution of incomes between larger and smaller cultivators. We see the problem of small cultivators as s special case of diffusion of returns to landowning classes and of returns to laboring classes. A project statement of the field work which we intend for more intensive look at this problem is being formulated.

Part II of our empirical studies is concerned with labor absorption in the nonagricultural sector as it relates to events in the agricultural sector. We are pursuing some intensive analysis of capital-labor ratios by various industries and will thereby have some indication of the extent to which labor absorption in the industrial sector can be increased. This has obvious and substantial implications to the kinds of policies followed in the agricultural sector with respect to various technological changes. The work which we plan generally on capital-labor ratios will be drawn largely from secondary materials.

Because we believe that there is particularly intense interaction of small scale industry with technological change in agriculture, we are instituting a micro oriented intensive field study of small scale # industry in Gujarat, India. The project statement for that project is appended as Appendix VI. That study is now underway. Appendix VII includes a report on specifics of modification in the project made in response to suggestions from various cooperating agencies in India where the field study is being carried on. It is our belief that rapid technological change in agriculture encourages small-scale industries by (1) increasing the demand for some of the final consumer goods produced by small-scale industries, (2) increasing the demand for certain producer goods from small-scale industries, and (3) increasing the availability of labor to small-scale industries. We want in particular to see what the problems are in taking advantage of these changes in environment for small-scale industries, what difficulties they have in expanding, what kinds of policies might encourage them more, how these policies may be modified in view of the interaction with the agricultural sector and what are the relative problems and merits of small-scale industries which are directly associated with agriculture compared to those more indirectly associated.

The third set of studies which we envisage are concerned with the institutional blocks to movement of labor to various direct and indirect opportunities. We at the moment plan only one sub-project in this area since we think that this area is so crucial that we would like to enlarge our knowledge here before defining other projects. The project we have commenced is with respect to education in rural areas as it relates to employment and employability. The project statement for that is appended as Appendix VIII. The field work for that sub-project is expected to get underway in February of 1971.

The fourth set of sub-projects are concerned with the direct and indirect effects of changes in agricultural technology on the distribution of income and then the effect of those changes in distribution in income on consumption patterns and hence on the structuring of industry and the demand for labor. Most macro models of development have taken consumption patterns and income distribution as given. Thus there is little discussion of changes in the structure of the economy as a means of increasing the employment content of growth. We know that certain industries use much more labor relative to capital. Thus in a world in which capital is a restraint on growth of employment we must be concerned with the possibility of changing the structure of industry in such ways as to increase the employment content. We hypothesize that the new agricultural technologies will result in direct and indirect redistributions of income, a consequent restructuring and enlargement of effective demand, which will call for a restructuring of industry which will create more employment. A number of policies may be needed so as to gain these potential advantages. Our study will direct us in the right directions for this.

Concentration on distribution of income and consumption patterns assumes a closed economy. We also wish to explore the potentials of restructuring of demand through international trade. We have one sub-project now being outlined in this area which has substantial potential. Again we must emphasize the very sharp interactions of changes in trade policies with technological change in agriculture. A project statement will be sent for comment as soon as it is available.

February 1, 1971

REVISED EXPECTATIONS FOR FIRST YEAR BUDGET,

July 1, 1970 - July 1, 1971

			Expected Expenditure 7/70 - 7/71
	Staff Salaries		
1.	Project Director		$ 6,500.00
2.	Senior Investigators		15,000.00
3.	Research Associate		0
4.	Graduate Research Assistants		20,000.00
5.	Computer Programmer		0
6.	Administrative Aid and clerks		16,000.00
	Sub-Total Staff Salaries		$57,500.00
	On Campus	$52,500.00	
	Off Campus	5,000.00	
	Other Direct Costs		
	Domestic Travel		1,000.00
7.	Travel to field & return for Project Director & Senior Investigators.		2,000.00
8.	Travel to field & return for Research Assistants		3,400.00
9.	Travel to field & return for family of field-based Research Assistants		2,200.00
10.	Housing Allowance for field-based investigators		2,400.00
11.	Field Research Expenses		6,000.00
	Salaries (off campus)	$3,000.00	
	Non Salaries	3,000.00	
12.	Consultant's and advisory committee's fees		3,000.00
13.	Office supplies and mimeographing		2,000.00
14.	Communications		1,700.00
15.	Computing		500.00
16.	Publication		500.00
	Sub-Total other direct costs		$24,700.00
	Indirect Costs		
	43% of salaries on home		$22,575.00
	17% of salaries on field		1,360.00
	Sub-Total individual costs		$23,935.00
	GRAND TOTAL		$106,135.00

NOTES TO REVISED FIRST YEAR BUDGET

We expect total expenditure in the first year of the project to be only $106,135.00 rather than the $147,151.00 which was budgeted. There are two prime reasons for this underspending. First there was some delay in getting various field projects going and hence the expenses for those projects will fall more into the next year than into this year. In other words, we have simply postponed some expenditures from the original schedule set. The second reason for underexpenditure is that some items which relate directly to the contract and produce contract work are being paid for from other funds thereby saving AID this expenditure. This represents no diminution in the total work to be done or delay in timing of the work but simply a shifting of expense to other sources. I will comment on some of these items as follows:

1. Although the Project Director is spending a full half-time on the project, only one quarter of his salary is being charged to the project because of the availability of other funds for covering that. We have also been able to cover a substantial proportion of field supervision by senior staff from other funds.

3. Delay in getting the field work going and some delay in formulation of the conceptual model has made it necessary to delay hiring a research associate to work on the project. Hence there has been no expenditure for this this year. There will be a research associate next year and his time will be used effectively.

5. With respect to the computer programmer, again delay in getting field projects going and some delay in the conceptual model has made it unnecessary to have the amount of computer programmer work which would justify a full or even a half-time person. Some computer programming has been used but it has been paid for on an hourly basis.

6. We are spending considerably more than expected on administrative aids and clerks. The prime reason for this is the discovery that a good deal of secondary data is useful for our project. We have been able to use statistical clerks for pulling some of this together thereby saving money for the project totally.

8. We are underspending on travel to the field for research assistants, first because one of our major research projects is being supervised by Jan van der Veen who has been able to cover a substantial proportion of his costs in the field with a Fulbright grant. We feel that this is desirable for Mr. van der Veen, it in no way affects the delineation of the project and it saves project funds. In addition the movement to the field of Messrs. Burton and Shortlidge was delayed sufficiently so that we have only paid out of this fiscal year their travel to the field and will cover travel for their return out of the next fiscal year's budget.

11. Expenditure on field research expenses will be about half of what we anticipated because of the delay in getting people into the field.

Other expenditures are lower more or less in proportion to those above and for those reasons.

February 1, 1971

EXPECTED EXPENDITURE, BY CATEGORY FOR SECOND YEAR,
July 1, 1971 - July 1, 1972
BUDGET

	Staff Salaries	Second Year Budget
1.	Project Director	$14,000.00
2.	Senior Investigators	17,700.00
3.	Research Associate	13,500.00
4.	Graduate Research Assistants	28,500.00
5.	Computer Programmer	6,000.00
6.	Administrative aid and clerks	19,000.00
	Sub-Total Staff Salaries	$98,700.00
	On Campus $79,700	
	Off Campus 19,000	
	Other Direct Costs	
	Domestic Travel	2,000.00
7.	Travel to field & return for Project Director & Senior Investigators	4,600.00
8.	Travel to field & return for Research Assistants	10,000.00
9.	Travel to field & return for family of field-based Research Assistants	3,300.00
10.	Housing allowance for field-based investigators	7,200.00
11.	Field Research Expenses	30,100.00
	Salaries (off campus) $21,100.00	
	Non salaries 9,000.00	
12.	Consultant's and advisory committee's fees	3,000.00
13.	Office supplies and mimeographing	3,000.00
14.	Communications	2,000.00
15.	Computing	3,000.00
16.	Publication	5,000.00
	Sub-Total other direct costs	$73,200.00
	Indirect Costs	
	43% of salaries on home	34,271.00
	17% of salaries on field	6,409.00
	Sub-Total individual costs	$40,680.00
	GRAND TOTAL	$212,580.00

NOTES TO REVISED SECOND YEAR BUDGET

The revised second year budget is for the same total amount as in the original contract. A few changes have been made within the budget. We are now budgeting for only half-time of a computer programmer instead of full-time. For reasons pointed out in the notes to the revised first year budget we will make additional expenditure for administrative aids and clerks. Domestic travel has increased substantially in recognition of the consultations which must be done in Washington and elsewhere. Research assistants field travel is reduced primarily because of the time slippage explained in the body of the report. Field research expenses are increased somewhat now that we have seen more clearly what is involved in the field research.

PLAN OF WORK FOR THE SECOND FISCAL YEAR OF THE CONTRACT

The work planned for the second fiscal year will have the following parts.

1. Further development of the model including incorporation of a capital sector in the model particularly emphasizing inter-sectoral capital transfers and then subjection of the model to simulation.

2. Studies underway in the field will be continued to completion of data collection and through much of the analysis of data. This will include the Burton sub-project in Thailand entitled, " A Comparative Study of Two Agricultural Innovations with Respect to Productivity and the Distribution of Economic Returns", the van der Veen sub-project in India entitled, "The New Agricultural Technologies and the Emerging Industrial Structure in India," and the Shortlidge sub-project in India entitled, "Cost Benefit Analysis of Education of Rural People in Uttar Pradesh."

3. Additional sub-projects will move into their field stages. This includes the field work on the Schluter sub-project on small cultivators in India, the Donovan sub-project on direct and indirect effects of new technologies on agriculture, the Desai sub-project on the effect of the new technologies on income distribution and consumption patterns and then the final effects of that on employment and the Montgomery sub-project on the effect of the new agricultural technologies on trade and hence on employment potentials. The schedules for each of these sub-projects are as in the following table.

Sub-Project Director		Date field work started	Date field work ended	Date statistical analysis completed	Date of Completion of Report
1. J. W. Mellor and U. J. Lele	The conceptualizing				
	Phase I.	7/70			4/71
	Phase II.	5/71			1/72
2. J. W. Mellor	Simulation model	9/71			10/72
3. Jan van der Veen	The New Agricultural Technologies and the Emerging Industrial Structure in India	10/70	10/71	8/72	10/72
4. William R. Burton	A Comparative Study of Two 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	Differential Rates of Adoption of the New Seed Varieties in India, the Problem of the Small Farm				
	Analysis of secondary data	0	0	12/70	3/71
	Field Study	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. Roger Montgomery	Trade and Employment Effects of New Technologies	9/71	9/72	2/73	7/73