

70-440-250-81

9311026 (2)

**AGENCY FOR INTERNATIONAL DEVELOPMENT**  
**PROJECT PAPER FACESHEET**  
**TO BE COMPLETED BY ORIGINATING OFFICE**

**1. TRANSACTION CODE**  
 ("X" appropriate box)  
 Original     Change  
 Add     Delete

**PP**  
**DOCUMENT CODE**  
 3 46p

**2. COUNTRY/ENTITY**  
 TA/Bureau

**3. DOCUMENT REVISION NUMBER**

**4. PROJECT NUMBER**  
 931-1026

**5. BUREAU**  
 a. Symbol: TAB    b. Code: 08

**6. ESTIMATED FY OF PROJECT COMPLETION**  
 FY | | |

**7. PROJECT TITLE - SHORT** (stay within brackets)  
 [Effects of Mechanization on Small Farms]

**8. ESTIMATED FY OF AUTHORIZATION/OBLIGATION**  
 a. INITIAL mo. yr. [9 | 7]    b. FINAL FY [7 | 9]

**9. ESTIMATED TOTAL COST (\$000 or equivalent, \$1. = )**

a. FUNDING SOURCE	FIRST YEAR FY _____			ALL YEARS		
	b. FX	c. L/C	d. Total	e. FX	f. L/C	g. Total
<b>AID APPROPRIATED TOTAL</b>	554		554	774		774
(Grant)	( )	( )	( )	( )	( )	( )
(Loan)	( )	( )	( )	( )	( )	( )
Other 1.						
U.S. 2.						
HOST GOVERNMENT						
OTHER DONOR(S)						
<b>TOTALS</b>	554		554	774		774

**10. ESTIMATED COSTS/AID APPROPRIATED FUNDS (\$000)**

a. Approp- riation (Folio Code)	b. Primary Purpose Code	c. Primary Tech. Code	FY _____		FY _____		FY _____		ALL YEARS	
			f. Grant	g. Loan	f. Grant	g. Loan	f. Grant	g. Loan	f. Grant	g. Loan
FN	189I	977	554				220			774
<b>TOTALS</b>			554				220			774

**11. ESTIMATED EXPENDITURES**

**12. PROJECT PURPOSE(S)** (stay within brackets)  Check if different from PID/PRP

[To provide a better understanding of the effects which farm mechanization has had on small farmers, and to encourage more applied research on the effect of farm mechanization and improve the capacity of Asian scientists and institutions to undertake such research]

**13. WERE CHANGES MADE IN BLOCKS 12, 13, 14, or 15 OF THE PID FACESHEET? IF YES, ATTACH CHANGED PID FACESHEET.**  
 Yes     No

**14. ORIGINATING OFFICE CLEARANCE**

Signature: *[Signature]*  
 Title: Director, TA/AGR

Date Signed: mo. day yr. 09-15-77

**15. Date Received in AID/W, or For AID/W Documents, Date of Distribution**  
 mo. day yr. | | |

AID 1330-4 (7-75)

Environmental Threshold Determination distributed along with PID in July, 1976

<b>AGENCY FOR INTERNATIONAL DEVELOPMENT PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS PART I</b>	1. TRANSACTION CODE <input type="checkbox"/> A ADD <input checked="" type="checkbox"/> C CHANGE <input type="checkbox"/> D DELETE	PAF 2. DOCUMENT CODE 5
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3. COUNTRY ENTITY DS Bureau RDA-2 A-Res	4. DOCUMENT REVISION NUMBER <div style="border: 1px solid black; width: 30px; text-align: center; margin: 0 auto;">1</div>
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5. PROJECT NUMBER (7 digits) <div style="border: 1px solid black; width: 100px; padding: 2px;">931-1026</div>	5. BUREAU/OFFICE A. SYMBOL B. CODE DS/AGR <div style="border: 1px solid black; width: 20px; text-align: center;">08</div>	7. PROJECT TITLE (Maximum 40 characters) <div style="border: 1px solid black; padding: 2px;">The Consequences of Small Farm Mechaniza.</div>
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8. PROJECT APPROVAL DECISION ACTION TAKEN <input checked="" type="checkbox"/> A APPROVED <input type="checkbox"/> B DISAPPROVED <input type="checkbox"/> C DEAUTHORIZED	9. EST. PERIOD OF IMPLEMENTATION YRS. <div style="border: 1px solid black; width: 20px; text-align: center;">02</div> QTRS <div style="border: 1px solid black; width: 20px; text-align: center;">0</div>
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10. APPROVED BUDGET AID APPROPRIATED FUNDS (\$000)									
A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE		E. 1ST FY <u>77</u>		F. 2ND FY <u>78</u>		K. 3RD FY <u>79</u>	
		C GRANT	D LOAN	F GRANT	G LOAN	I GRANT	J LOAN	L GRANT	M LOAN
(1) FN	189 I	977		554		215		0	
(2)									
(3)									
(4)									
TOTALS				554		215		0	

A. APPROPRIATION	N. 4TH FY		Q. 5TH FY		LIFE OF PROJECT		11. PROJECT FUNDING AUTHORIZED	
	O. GRANT	P. LOAN	R. GRANT	S. LOAN	T. GRANT	U. LOAN	(ENTER APPROPRIATE CODE(S)) 1 - LIFE OF PROJECT 2 - INCREMENTAL LIFE OF PROJECT	A. GRANT B. LOAN
(1)	0		0		769			1
(2)								
(3)								
(4)								
TOTALS		0		0		769		C. PROJECT FUNDING AUTHORIZED THRU FY <div style="border: 1px solid black; width: 20px; text-align: center;">89</div>

12. INITIAL PROJECT FUNDING ALLOTMENT REQUESTED (\$000)	13. FUNDS RESERVED FOR ALLOTMENT
A. APPROPRIATION B. ALLOTMENT REQUEST NO. _____ C. GRANT D. LOAN	TYPED NAME (Chief, SFR; FM; FSD) SIGNATURE DATE
(1)	
(2)	
(3)	
(4)	
TOTALS	

14. SOURCE/ORIGIN OF GOODS AND SERVICES  
 000     941     LOCAL     OTHER \_\_\_\_\_

15. FOR AMENDMENTS, NATURE OF CHANGE PROPOSED  
 A two year non-funded project extension (October 1, 1980 to September 30; 1982) has been recommended by RAC. This action will provide the contractor with the additional time needed to overcome the project implementation delays that have been encountered. The RAC also recommended that the contract be modified to indicate the deletion of Pakistan as a study site.

FOR PPC/PIAS USE ONLY	16. AUTHORIZING OFFICE SYMBOL	17. ACTION DATE MM   DD   YY	18. ACTION REFERENCE (Optional)	ACTION REFERENCE DATE MM   DD   YY
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PROJECT STATEMENT

A. PROJECT SUMMARY

PROJ 1026  
2

1. Statistics:

Project Title: Effects of Mechanization Upon Small Grain Farm Production, Income, and Employment

New or Extension: New

Duration: Three Years -- September 1, 1977 to August 31, 1980

Total Estimated Cost:		
	FY 1977	\$330.8
	FY 1978	\$222.9
	FY 1979	<u>\$216.9</u>
Total		\$768.6

Principal Investigator: International Rice Research Institute (IRRI), Agricultural Development Council, Inc., (A/D/C), and subcontractors to be selected by IRRI.

Project Manager: William C. Merrill  
Economics and Sector  
Planning Division  
TA/AGR/ESP

## 2. Abstract

Since 1965 AID has promoted the development and use of small scale farm machinery for grain production in Asia. In recent years there has been increased interest in the economic and social effects of such machinery on small farm households. The basic question is, "Does the development and promotion of small scale farm machinery truly benefit small farmers?" This project will not provide the definitive answer to this question but it will begin the process of building an increased awareness in the Asian region of the importance of the question and an increased capacity to carry out research related to the question.

Under this project coordinated case studies of the effects of farm mechanization will be carried out in four Asian countries under the direction of the International Rice Research Institute IRRI and several small independent research activities will be carried out in other Asian countries under the direction of the Agricultural Development Council (A/D/C). The coordinated case studies directed by IRRI are the major component of this project. Under this component it is proposed that a sample of small farms characterized by varying agricultural practices and levels of mechanization be selected and surveyed at various times in the crop production cycle. Farm-level data will be gathered on use and cost of inputs, yields, incomes and other variables required to better understand how the use of small scale farm machinery affects small farmers. Particular attention will be placed on the timing, amount and composition of the labor input vis-a-vis family and hired labor. The data will be analyzed to determine whether significant differences in employment, yields and other relevant variables exist among the various mechanization-technology combinations found in a particular study area. The results from these case studies, will provide micro-level data on input characteristics of several farm operations and insights for analysis of mechanization on other cropping systems in different areas or countries. Since the research project will focus on four countries with differing geographic climatic and socio-economic conditions these externalities will be greater than those from a single country study.

The small, independent research activities directed by A/D/C will provide information on the effects of mechanization which will supplement and complement that developed by the IRRI directed component of the project. The A/D/C directed research will provide scholars not included in the IRRI directed component an opportunity

to carry out small studies on the effects of agricultural mechanization and to exchange ideas, information, and results of their work with IRRI researchers.

The A/D/C component of the project will be managed in such a way as to encourage (1) research on the effects of mechanization in countries not included in the IRRI component and (2) the exchange of information and results of this research with other interested scholars in the Asian area. The exchange of information will take place, in part, through participation in regional seminars on agricultural mechanization. Some of the seminar activities will be funded by this project. Funding for additional seminar and workshop activities will be requested at a later date if necessary but, in general, would be provided by other organizations or through other AID programs.

## B. EXPANDED NARRATIVE STATEMENT

### 1. General Background

Since 1965, the International Rice Research Institute has had a program for the development and extension of small farm machinery which has been funded in part by AID. Total AID funding of these activities to date amounts to approximately \$2,200,000. Under the IRRI program prototype models are designed and field tested. Successful models are then made available to local manufacturers. IRRI provides these manufacturers technical assistance and engineering testing services for machinery of IRRI design or modifications of IRRI designs. Most of this work until recently has been conducted in the Philippines. In 1975, however, the IRRI program was broadened to include "industrial outreach" activities in Pakistan and Thailand. It is anticipated that similar work will be initiated in Indonesia in the near future.

In the early 1970's AID began to direct greater attention to the impact of its programs on small farmers. As part of this process it became increasingly interested in the effects that programs such as the IRRI small farm machinery program might have on small farmers. A thorough review of the literature on the effects of farm mechanization was undertaken by the Agency in late 1974 and a careful review of the IRRI program was completed in 1975. Following, the 1975 reviews it was decided that, in light of the industrial outreach program, it would be appropriate and timely to initiate more in-depth research on the effects of agricultural mechanization once initiated outside of the Philippines.

Funds were requested for such research in 1976 but staff time did not permit the development of a project proposal or request for such proposal at that time. In early 1977, IRRI submitted an unsolicited proposal to undertake such research in coordination with its industrial outreach project. A/D/C had previously indicated its interest in such research but felt that its style of operation and staff situation would not be consistent with accepting primary responsibility for a large scale, coordinated research effort. This project proposal is a revision of the proposal submitted by IRRI and links that proposal to the approach suggested by the A/D/C for encouraging small research projects on the effects of agricultural mechanization in Asia.

## 2. Research Purpose and Expected Products

Purpose: This project is designed to achieve two objectives. The first is to provide a better understanding of the effects which farm mechanization has had on small farmers. Emphasis will be given to determining output, income, and employment effects of small scale (IRRI-type) equipment on small grain farms, particularly rice farms. The second objective is to encourage more applied research on the effects of farm mechanization and improve the capacity of Asian scientists and institutions to undertake such research. A large proportion of the total funding for this project is devoted to achieving the second objective. The rationale for undertaking IRRI directed research activities in four countries and the proposed A/D/C research grant, in large part, stems from the importance of achieving the second objective. The first objective is a research objective. The second, in large part, an institution (or capacity) building objective.

Expected Products: (1) improved capacity of Asian scientists to use the techniques of agricultural economics and rural sociology to assess new technologies, conduct farm level studies, and to analyze policies; (2) recommendations useful to small grain farmers regarding appropriate mechanization practices based on economic, and technical studies in regions of four Asian countries; (3) analysis of alternative policies and programs for assisting small farmers to improve income and employment opportunities and the extension of this information to relevant government and parastatal agencies; (4) analysis of the optimum resource combinations and the resulting impacts of mechanization on 'typical' farms in four Asian countries; (5) additional knowledge of the factors underlying the adoption of improved practices,

new technologies and mechanization and projections of adoption rates based on this knowledge; (6) regional estimates of the effects on farm income, employment, and production of adoption of mechanization in grain production and (7) methodologies for assessing the impacts of mechanization on small farms.

Relevant Policy Questions: The information developed by this project will be relevant to program and policy questions such as:

- (1) whether or not to include a mechanization component in government agricultural projects,
- (2) the use of subsidized small equipment government operated "power/implement" pools for custom-hire work,
- (3) the use of subsidized credit for equipment purchase,
- (4) removing or improving tariffs on imported machinery, parts, and fuel,
- (5) subsidy programs for domestic producers of equipment,
- (6) commodity price and input cost subsidies which may alter the relative profitability of small-scale mechanization
- (7) land tenure arrangements which may affect size of holdings and thus effect the profitability of mechanization.

It is recognized that the priorities assigned to policy questions of this type will vary between countries. The research designs for the countries may differ somewhat as a result.

### 3. Relevance and Significance of the Proposed Project

#### a. The Development Problem

Agricultural mechanization touches on three vital issues which are important not only to AID and the "New Directions" mandate but, to basic development questions: i.e., employment creation, food production and equitable income distributions. For example, employment creation continues to be a most vexing problem for LDCs for it is apparent that employment growth within LDC manufacturing sectors has not been sufficient to absorb the increases in the labor force nor are the prospects for doing so likely to improve in the near future. Therefore the agricultural and rural sectors in LDCs, particularly those with low land/labor ratios, must generate added employment if these increases are to be absorbed in productive activity.

On the other hand, food production and productivity per worker must increase to meet the food demands stemming from population growth and the increasing urban populations. Increases in food production are a vital element of a rural income-generating mechanism that will allow self-sustaining growth. New agricultural technologies, particularly cost decreasing innovations, can be important in this strategy.

In the process of food production, initial factor endowments and the returns to those factors will determine the amount as well as the direction of income flows. It is important to determine the changes in direction and amount of flows due to new technologies and mechanization in particular.

While farm mechanization is viewed as a vital part of agricultural development, the type of mechanization, i.e., size and power and type of machine, may have a profound influence on the demand for labor, output and distribution of income. It has been argued that mechanization will result in increased output and employment by increasing the cultivated area, permitting multiple cropping, and improving cultivation practices and yields, yet, little empirical evidence exists to support this conventional wisdom.

Unfortunately such statements provide little useful information to policy makers since each type of machinery can interact differently with cropping systems and operations, resulting in different and possibly negative employment and output effects.

While the problems of assessing the effects of new technology are not simple, strong interest in these effects is expressed by LDCs and is a necessary input into AID decision making. AID is increasingly concerned about the development and use of appropriate technology given the factor endowments and the needed increases in food output. It is clear that the assessment of the effects of agricultural mechanization can be helpful to many development practitioners. The proposed research project will provide information about appropriate technology on farm sizes which make up close to 90% or more of farms in the region, viz., 0-12 hectares.

#### b. Policy Issues and the Research Focus

By nearly any measure, the amount of useable energy (man, animal, and machine) available for agricultural use in LDCs is low. One of the most important decisions facing a low income country is that of evaluating the most economically and socially desirable process of agricultural mechanization. In evaluating the process, one must consider the type of machine used, the rate of introduction, and the operations affected. For individual countries,

the lack of adequate technical expertise and farm level data makes the formulation of policy and assessment of impacts speculative at best.

Some economists point to the paradox of mechanization in labor abundant economies while other economists and most engineers equate farm mechanization with modernization; and modernization, in turn with high productivity of labor and land. The latter group seems to foster the concept of a mechanization ladder. The first group prescribes a "go slow" policy for mechanization while the second encourages rapid adoption. To some extent these groups may be talking past each other as a result of initial biases, but these divergent prescriptions may also result from different perspectives on the temporal dimensions of mechanization. Over the long run, mechanization appears to be the only viable means of significantly increasing agricultural power. As the availability and quality of land drops per capita, the food energy for men and animals will become increasingly expensive. Thus, mechanization could reduce the demand for animal feeds and increase availability of land for food production. On the other hand most studies have shown that mechanization in its early stages has little effect on crop yields. There appears to be wide agreement that the long term effect of farm machinery on agricultural employment is likely to be substantially greater than the short term changes.

The proposed project will focus on the economic costs and benefits of mechanization on small farms; viz., those associated with short and intermediate term changes in production, income, and employment.

c. Possible Side-effects of the Proposed Research

Environmental aspects of this project have been considered. The project activities are limited to an economic study of the effects of mechanizing small farms. Projects of this type normally do not require the filing of an Environmental Impact Statement (22CFR 216.2(b)). This activity is not deemed a major Federal Action (Section 1500.6, CEQ Guidelines) since the project will have no significant effects which adversely affect such aspects of the human environment as air, water, land, flora or socio-economic conditions. Therefore, it is recommended that the Threshold Decision be deemed negative, constituting a Negative Determination since the project will not result in activities affecting environment.

This project will analyze the input requirements particularly the labor used under alternative levels of mechanization. This should permit a clearer understanding of mechanization impacts on population growth, energy requirements and the role of women. For example, if mechanization reduces the drudgery of field work it may increase female labor participation as women assume other jobs. If these jobs are incompatible with the care of children at home there could be implications for fertility. Also, if the skill levels required in agriculture are increased it may motivate farmers to provide more education for their children and increase the cost of children. Therefore, the analysis of family vs. hired labor are or should yield insight into the role of women and population growth implications of mechanization. On the other hand, the analysis of input needs should also provide information on energy requirements of alternatives mechanization levels.

#### 4. Relation to Existing Knowledge

A review of the literature on farm mechanization reveals several complications involved in measuring employment, output and income impacts. First, each individual operation required for crop production can be performed with many alternative techniques. Land preparation, water control, planting, harvesting and threshing are individual operations within the farm production function. Mechanization can impact on all, one or several of these operations. Thus, in the research design proposed, the mechanical changes are disaggregated into specific changes in individual operations.

Secondly, although studies of single mechanization options (tractor hire schemes for example) are relatively easy to carry out, they are of more limited value to policy makers than those concerned with assessing the impact of mechanization options which may affect several production operations. Research in the short and medium term should emphasize the trade-offs inherent in mechanization options. The array of alternatives is wide and an all inclusive sample would be very expensive and difficult to collect. This research project will attempt to investigate only a limited range of mechanization alternatives associated with several farming operations. It is recognized that sorting out the impacts is complicated by the fact that the type of mechanization employed in one operation is seldom independent of that used in other operations. Small power tillers for example, may have little impact on production unless a pumpset is used to increase water availability. Further, it is difficult to sort out the impact of a newly mechanized operation and new technology inputs like fertilizer. Mechanization may enable more precise timing of operations and application of chemical inputs so that double cropping may take place. Thus, the study has to look not only at separate operations and the array of mechanical techniques but

also at the level of technology and the feedbacks between mechanization and other farming practices. The existing literature provides very little insight into the complexities of these relationships.

Existing data available from farm surveys provide limited information for policy analysis of mechanization. Such surveys frequently provide information on size of farms, man/land ratios, implements in use etc., but seldom show changes in output, income distribution and employment associated with changes in inputs including farm machinery. The estimates of employment requirements for particular operations vary widely from country to country. Differences in soil, weather and cultural practices account for some of the variation, but in other cases the differences are hard to explain given similar cultivation practices. Thus the collection of new farm level data is necessary to provide the information needed for this project.

During the past four years, AID has funded five small studies of the effects of new technology on small farmers.

These are:

- (1) Antonio Gayoso, The Impact of Changing Technologies Mechanization and Employment: A Preliminary Review Economic Analysis Division, Bureau of Program and Policy Coordination, U.S. Agency for International Development, Washington, D.C., 1974
- (2) William C. Merrill, The Impact on Agricultural Mechanization on Employment and Food Production, Occasional Paper No. 1, Economics and Sector Planning Division, Office of Agriculture, Technical Assistance Bureau, U.S. Agency for International Development, Washington, D.C., September 1975
- (3) A. L. Becker, W. R. Butcher, C. F. Feise, and C. A. Ulinski, Evaluation of Factors Affecting the Rate of Adoption of IRRI Small Farm Equipment, Department of Agricultural Economics, Washington State University, Pullman, Washington, November, 1975.
- (4) John Balis, Appropriate Technology for Agricultural Development, Appropriate Technology Committee, U. S. Agency for International Development, Washington, D. C., June, 1976.

- (5) Wayne A. Schutjer and Marlin G. Van Der Veen, Economic Constraints on Agricultural Technology in Developing Nations, Occasional Paper No. 5, Economics and Sector Planning Division, Office of Agriculture Technical Assistance Bureau, U.S. Agency for International Development, Washington, D.C., forthcoming, 1977.

Each of these studies represented three to six man-months of research based on existing literature and data. The conclusions of these studies were quite similar. They confirm:

- (1) That little systematic research has been carried out on the impacts of mechanization on small farmers.
- (2) That much of the existing research fails to separate out the interactions between mechanization and the adoption of other technologies and practices.
- (3) That there is very little evidence to support the contention that mechanization substantially increases yields.
- (4) That mechanization which replaces animal power usually reduces rural employment.
- (5) That tractorization may result in a gradual increase in the size of land holdings and the displacement of tenants or farm workers.
- (6) That government policies and programs to promote mechanization through subsidized interest rates, favorable import arrangements, or increased credit availability can cause a significant increase in the rate of mechanization and are likely to benefit large landholders more than others.
- (7) That the mechanization of agriculture is a continuous and inevitable process in economic development but one whose speed and direction can be altered by public policies and programs.
- (8) That agricultural mechanization should be viewed as a part of modern agricultural production systems.

Combined with new biological and chemical technologies mechanization may enable more precise timing of operations and application of chemical inputs so that the total biological, chemical, and mechanical package results in an increase in output per acre year with little, if any, reduction in total employment

Many of the studies upon which these general conclusions are based are careful analyses of specific types of mechanization in selected types of mechanization in selected regions in most of the countries included in this project. The focus of these studies, however, generally was not on small scale, IRRI-type, farm machinery. A large proportion of the research on this topic has been on medium and larger size tractors, associated equipment, and larger scale modern grain harvesting equipment. These studies will provide background and complementary information for the proposed research. Very little, if any, duplication between the proposed and past research is anticipated. IRRI has, however, carried out several small, case study surveys of the impact of small scale equipment in the Philippines. This work will provide a starting point for the proposed study in the Philippines, and illustrations of the type of information which could be collected relatively quickly in the other countries working with IRRI.

##### 5. Relation to Other AID Projects

There are no AID projects currently underway or proposed on the effects of different types of mechanization on small farms in other areas of the world. The AID Working Group on Appropriate Technology has, however, established a private corporation, Appropriate Technology International, intended to develop and promote appropriate technologies for developing countries. A.T. International may at a later date undertake projects related to the proposed project. TA/AGR/ESP is represented on the AID Working Group on A.T. and, therefore will be able to assure close coordination between the proposed project and any related work sponsored by A.T. International.

The proposed project is directly related to IRRI's industrial outreach program which is funded by AID (AID Contract csd-1208). This project will be managed by IRRI and AID so as to supplement and complement on-going industrial outreach program. It will provide useful information with which to evaluate the industrial outreach program and for re-focusing the program, if necessary, in the future. The IRRI industrial outreach network in Pakistan, Thailand, Indonesia (proposed), and the Philippines will be used to provide information on where IRRI-type equipment is being used and, where appropriate, institutional bases for the research activities.

The A/D/C - Research and Training Network (RTN) program will be particularly helpful in the dissemination of the results of the proposed project, to policy-makers and other researchers.

Current work supported by AID/TA/AGR at Michigan State University, Purdue University, and Cornell University (Poor Rural Households, Technical Change and Income Distribution in LDCs) is related to the proposed project, but differs in the degree of detail being given to the mechanization issue. The Poor Rural Households ... project will not attempt to define specific farm level packages of mechanization and then evaluate their impacts in relation to other technological advancements as does this proposal. Thus, the proposed activity focusses upon the question of the role that adoption of mechanization plays in increasing small farm income, in changing farm labor requirements, and in bringing about change in farm production.

6. Research Project Design and Methodology (IRRI Component)

a. Research Design Summary

The research design for this project will be finalized and approved prior to and during the initial start-up Phase of the project period. Nevertheless, the following discussion outlines what is presently anticipated and serves as the basis for estimating project costs. It is recognized that the needs, capabilities, and interests of each country are likely to differ and must be reflected in the final project design.

b. Preliminary Description and Justification of Project Design

Primary farm survey data supplemented by experiential data derived from agronomic and engineering studies will be utilized in this project. Cross-sectional survey data will be obtained from random samples of farms in selected regions of each of four countries viz., Pakistan, Indonesia, Thailand, and the Philippines. Farmers will be interviewed to determine the nature of their farming operation. Engineering feasibility and cost data will come from IRRI as will agronomic and other production oriented data.

The entire set of information utilized will serve as the basis for describing the production, resource use, costs and income status of typical farms in each region. From these data typical-farm programming models will be constructed and analysis carried out to identify efficient production levels, use of resources, levels of mechanization, labor utilization, costs and returns. Sensitivity analysis will be carried out to determine the impacts at the farm

level of variations in commodity prices resource constraints input prices, and other parameters which may be sensitive to government policies and programs. The effects of alternative levels of mechanization will be shown by comparison between farms where alternative sources of power and implements are the primary difference.

Aggregation of the "typical" results will be carried out to show regional implications of changes in relevant policies and programs. To the extent possible, regional estimates will in turn be aggregated to reveal the general nature of impacts at the national level. Rough estimates of adoption rates for mechanization will be approximated using information derived from the cross-sectoral surveys as well as other sources.

c. Project Activities

Project Phases: This project will be carried out in four phases. Phase I will require approximately four months. (October 1977 - January 1978). During this phase (1) sub-contracts will be negotiated with institutions in Indonesia, Thailand, Pakistan, and the Philippines, and (2) the research design for each country will be finalized and approved. Phase II will entail completion of the field survey questionnaires to be used and the selection of the sample farms for intensive study during Phase II. It is anticipated that Phase II will require approximately six months. Phase III is the data collection phase. It will require approximately one year. Phase IV is the data analysis phase which will end with the preparation of final reports at the end of year three. Workshops will be scheduled at appropriate times during each phase to coordinate the activities in each country and assure the maximum comparability of results.

Phase I October 1, 1977-January 31, 1978

The proposed primary contractor is the International Rice Research Institute (IRRI). During Phase I the research design and methodology for each country will be finalized, and sub-contractors for country studies will be selected.

During early meetings between AID and IRRI staff members the procedures to be followed for reaching project objectives will be finalized. Details to be agreed upon include the different types and levels of mechanization to be examined, the farm size units to be considered, the "mix" of other traditional/modern cultural practices to be included, the basis for stratification of sample data, the probable variation in

sample data, the specific sampling procedures and size required in order for the study to produce statistically reliable results and the methods of analysis to be followed in evaluating the data.

Following agreement on the study design and methodology, IRRI will identify sub-contractors to carry out three studies, one in Pakistan, one in Thailand, one in Indonesia, and will conduct a study themselves in the Philippines. Each sub-contractor will be selected on the basis of capacity to carry out the work and institutional commitment to the research. AID/TA/ACR will have final approval of the sub-contractors. While final selection of sub-contractors has not yet been made IRRI has had preliminary discussions with several institutions. The following is a synopsis of their findings:

Indonesia - Three institutions offer possibilities to assist with the project. They are the Central Research Institute for Agriculture, the Agriculture Institute (an agricultural university) both at Bogor, and the Institute of Technology, Bondung. The Agricultural Engineering Department, Ministry of Agriculture is also very much interested in mechanization studies.

Pakistan - Dr. H. Slamul Haque, Director General of the Agricultural Research Council (ARC) and R. M. Tono Quraishi, Director of Economic Research for ARC are interested in mechanization utilization research. Dr. Quraishi has experience with this type of research at the Sind University and will welcome the opportunity for additional study.

Dr. M. L. Quraeshi, Director Pakistan Institute of Development Economics (PIDE) and members of his staff also indicated an interest in mechanization use studies. Dr. Abdul Salam appeared the most interested in conducting such research. Dr. Quraeshi indicated interest in coordinating a Pakistani effort in this area.

Dr. Amir Khan IRRI/Pakistan talked with Dr. Bashir Ahmed, Joint Chief Economist - Planning and Development Department, Government of the Punjab; and staff of the Economics Department - Layallpur University. Both offices were interested in participating in mechanization use research. All Pakistani contacts indicated facilities for analysis and assessment of data and availability of survey staff. PIDE appeared to be the most capable and interested in coordinating project activity in Pakistan.

Thailand - In Thailand, interest and capability to assist with mechanization use studies were found in the Ministry of Agriculture, Agricultural Economics Division: Kasitsart University Faculty of Economics and Business Administration and at the Asian Institute of Technology (AIT). Dr. Nguen Susurak, Agricultural Marketing Chief and Dr. Nurong Chaprakab, Chief of Planning

Branch are interested staff members in the Ministry of Agriculture. At Kasitsart University, Dr. C. Boonma, Director of Agribusiness and Management Programs also indicated interest. Both the ministry and university voiced preference for a secondary role and not that of coordination. The AIT in addition to having good facilities and capabilities, was interested in contracting to coordinate project activities in Thailand. Also through their graduate training program, they see an opportunity to conduct surveys in neighboring countries with their students who are nationals of those countries.

Dr. Peter Cowell, Agricultural Engineering Chief at AIT is the principal contact for mechanization use studies.

Phase II - February 1, 1978 - July 31, 1978

Phase II begins with the selection of the study region.

Criteria for selection should include:

- (a) a high degree of specialization in grain farming;
- (b) low variation in those factors which can not be controlled in the model specification such as climate;
- (c) widespread use of mechanical, biological, and chemical technologies, and modern practices;
- (d) a high level of existing available knowledge, data, or information about farmers and farming in the area in order to facilitate specification of research hypotheses development as well as sampling design and questionnaire construction;
- (e) a high degree of cooperativeness of farmers in responding to questions, as exhibited by any previous surveys;
- (f) accessibility to facilitate senior staff participation in field work and to facilitate numeration.

Also in Phase II the questionnaire will be developed, translated into the local language and tested. Testing should be carried out on a wide range of farms using different combinations of technology and practices and of different sizes and cropping patterns. After completion of field tests, a workshop will be held in March, 1978 by the research collaborators to construct the final questionnaire and to design sampling procedures for the survey.

**Phase III - August 1, 1978 - August 31, 1979**

During Phase III basic data will be collected describing farming operations and the economic and institutional environment in which sample farmers exist. As indicated above, these data pertain to farm size, enterprise combinations, access to and use of resources including land, labor, non-farm produced inputs, capital, water, machinery and work animals, cultural practices, input costs and output prices. These data will be used to delineate farming systems prevalent in the regions of interest and the timing and level of inputs utilized. Upon completion of the survey, initial analysis will be undertaken to stratify the sample by farming characteristics. The basis of the stratifications cannot be specified a priori, but it will include relationships such as size of holding, use of mechanical, biological, and chemical technology employed, other cultural practices, and enterprise combinations. Whole-farm calendars of operations and budgets will be the fundamental framework for preparing typical farm accounts. Among the strata will be the traditional farm operation not characterized by mechanization or use of other modern practices.

Following completion of field work the data will be processed for verification and storage for later analysis (i.e. Phase IV). Preliminary examination of the data will be carried out to identify missing segments or gaps, and complementary experimental data added to the data file.

At the end of Phase III a workshop will be carried out in order for the country research teams to share experiences and knowledge gained, and to review programming for Phase IV.

**Phase IV - September 1, 1979 - September 30, 1980**

Once data has been collected and made ready for analysis Phase IV begins. In this Phase the activities to be carried out involve, first, the design of programming models which adequately characterize typical farming operations within each region studied. It is expected that for each region there will be several typical farming systems, each one reflecting different levels of mechanization and other cultural and resource base differences. For each type of system there will be a economic programming model designed to simulate basic production and resource use behavior of that type of farm. More than likely these models will be based upon linear programming activity analysis, however the "lumpy" nature of mechanization inputs may mean another approach such as integer programming will be a more realistic tool of analysis. In any event, the appropriate modelling technique to be utilized will be decided upon later by the researchers involved in consultation with AID/TA/AGR staff.

Analysis of the impacts of mechanization upon farm production, income,

and resource use, and the interactions which are likely to show up between mechanization and other cultural practices will be carried out by first testing initial solutions of the programming models against actual farm behavior, evaluating solutions to isolate the impacts of interest, and then carrying out parametric studies of the models. The latter activity (i.e., parametric studies) will permit the researcher to evaluate the impacts upon efficient farm operations of alternative policies and programs which affect such things as farm output prices, input costs, input-output technical relationships, and resource constraints.

Finally, attempts will be made to generalize the results of the typical farm studies to their regional and to the extent possible, national implications. Future research needs will be identified, the methodology followed will be evaluated, a final workshop will be carried out and project completion reports will be prepared and distributed.

d. Independent Research Activities: A/D/C Component

The proposed \$115,000 research grant to the A/D/C is intended to encourage and facilitate small, independent studies on the effects of agricultural mechanization in Asia. These studies will not be coordinated with those carried out by IRRI but opportunities will be provided for persons working under A/D/C grants to meet with the IRRI directed researchers to compare results and exchange information and data. The A/D/C research grants will be used primarily to fund research by Asian Scholars who are working with A/D/C associates on full time appointments in Asia. The A/D/C will assign one of its associates as the project manager for the A/D/C mechanization research grants component. The project manager responsibilities will be:

- (1) to keep other A/D/C associates informed of the research grants program,
- (2) to assist in the final selection of small research activities to receive grant support,
- (3) to keep in touch with the coordinated research projects directed by IRRI, and
- (4) to assure that, where appropriate, researchers funded by A/D/C grants participate in the seminar and workshop activities carried out under the IRRI directed component of this proposal.

The basic philosophy of the Agricultural Development Council and style of operation in Asia precludes the identification and specification, at this

time, of the research activities to be grant funded. The A/D/C's primary objectives are to facilitate the training of Asian scholars and the exchange of information on the problems of agricultural development. The A/D/C component of this project is designed to be consistent with the broad A/D/C objectives while at the same time encouraging research on the economic and social effects of agricultural mechanization in Asia. The A/D/C, through its associates, will assist in the design and will monitor (or assist in) the implementation of the research. Grants will be made only when there is reasonable assurance that the proposed research is feasible and the work will meet the high professional standards of the A/D/C. The principle criteria specified by AID selection of activities to be grant funded is that the research must be concerned with the economic and/or social effects of small scale mechanization on small grain farmers in Asia.

#### 7. Contribution to Institution Building

Institution building is one of the principal objectives of this project. This will be achieved in two ways under the IRRI directed component. First, by facilitating close working relationships between IRRI personnel and national institutions concerned about the effects of agricultural mechanization. This, in a sense, is building capacity through "on-the-job" training and experience. Second, by hopefully establishing long term professional relationships with scientists in neighboring countries who are undertaking similar work and contributing to international recognition of the interests and capabilities of the institutions selected to participate in the project.

The A/D/C directed research grants will also improve national capacity to undertake research on agricultural mechanization. Again the mechanism is to providing opportunities (1) to undertake research in this area, and (2) to exchange information data, and research results with other Asian scientists through seminar and workshop activities.

To a large extent, this project attempts to build individual and institutional capacity primarily through investments in human capital. Only a small percentage of the funds will be invested in physical capital such as automobiles, calculators, and books.

#### 8. Facilitate Utilization of Research Results

This project has been developed with the assistance of TA/AGR's Food Crop Production Division which manages an AID-funded project carried out by IRRI to develop small scale agricultural machinery (AID Contract csd-1208). That project focuses on engineering/technical constraints and problems in

the design of machine prototypes to be manufactured in the LDCs. This project focuses on the impacts of adopting similar machinery types and other mechanization forms by small farmers and thus will be of direct value to the evaluation and redesign of future IRRI programs to promote agricultural mechanization. In addition, results will be of interest to four audiences: farmers, LDC machinery manufacturers, LDC government policy and program planners, and the international community of development practitioners and scholars. The results will be released to farmers and manufacturers through IRRI's Industrial Liason groups. These groups provide technical advisory services to manufacturers of farm machinery and through them to farmers. In addition, IRRI has excellent relationships with the Ministry of Agriculture in each of the countries. Publications summarizing the results of this study will be made available to the Extension Services of these Ministries. Similarly agricultural sector planners will receive publications. IRRI will also publish the results in one of their regular research publication series for distribution to the international community.

#### 9. Researcher Competence and Resources

IRRI has had twelve years of experience in working on agricultural mechanization programs in the Philippines. Since 1970 it has undertaken several small studies on the effects of IRRI designed machines. As part of its industrial outreach program it has established contacts with institutions interested in agricultural mechanization throughout Asia. IRRI has an international reputation for high quality research and the strongest agricultural economics division of any of the international research institutions.

The A/D/C also has an international reputation of excellence in any job which it elects to undertake. Its staff is widely known and respected in Asia and has developed close working relationships with Asian universities and scholars in both government and private institutions. Although the A/D/C staff does not have long term experience in research related to agricultural mechanization, it has had substantial experience in the design and implementation of small research activities.

Both the A/D/C and IRRI have capacity to rapidly respond to any problems which may arise in carrying out the proposed research. This is in part because both already have staff members in most of the countries involved in this project and, in part, because this project is highly complementary to their existing programs.

Project funding consists of two components:

(1) A research grant of \$115,000 (includes 15% for overhead) to the Agricultural Development Council to undertake independent research in selected countries.

(2) A centrally funded research contract between the Agency for International Development (TA/AGR/ESP) and the International Rice Research Institute. Funding of this contract for the three years of operations will be \$653,600. Major budgetary items will be for research programs in three countries as shown in the work plan, a project coordination and research program in the Philippines at IRRI and funding for consultants to advise and assist in the planning and implementation of data assembly and in analysis.

Budget Components

<u>Item</u>	<u>Year</u>			<u>Total</u>
	<u>1</u>	<u>2</u> ( <u>\$000</u> )	<u>3</u>	
Three Country Projects	\$147.9	\$132.9	\$126.9	\$407.7
Philippine Project	53.9	64.5	62.5	180.9
Consultants*	14.0	25.5	25.5	65.0
<b>Total</b>	<u>\$215.8</u>	<u>\$222.9</u>	<u>\$214.9</u>	<u>\$653.6</u>
ADC Grant	115.0	--	--	115.0
	<u>\$330.8</u>	<u>\$222.9</u>	<u>\$216.9</u>	<u>\$768.6</u>

\* Includes salary, per diem and travel :

A. IRRI - Individual Country Research Component

<u>Item</u>	<u>Year</u>			<u>Total</u>
	<u>1</u>	<u>2</u> (\$000)	<u>3</u>	
Salaries <sup>1/</sup>	\$15.0	\$15.0	\$15.0	\$45.0
Fringe Benefits <sup>2/</sup>	5.3	5.3	5.3	15.9
Overhead <sup>3/</sup>	3.0	3.0	3.0	9.0
Domestic Travel & Survey Costs	10.0	10.0	10.0	30.0
Vehicle (including Operating Cost) <sup>4/</sup>	8.0	2.0	2.0	12.0
Materials & Supplies	3.0	4.0	2.0	9.0
International Travel (workshop & conferences)	4.0	4.0	4.0	12.0
Contingency	<u>1.0</u>	<u>1.0</u>	<u>1.0</u>	<u>3.0</u>
Total	\$49.3	\$44.3	\$42.3	\$135.9
<u>For three countries</u>	<u>\$147.9</u>	<u>\$132.9</u>	<u>\$126.9</u>	<u>\$407.7</u>

<sup>1/</sup> Includes salary supplement for one Senior Research Associate and salaries for four Research Assistants and one Secretary.

<sup>2/</sup> Fringe benefits calculated as 35 percent of base salaries.

<sup>3/</sup> Overhead for country projects calculated at 15 percent of base salaries.

<sup>4/</sup> Locally procured vehicle. Estimated cost is \$6,000.

B. IRRI - Philippine Component

<u>Item</u>	<u>Year</u>			<u>Total</u>
	<u>1</u>	<u>2</u> ( <u>\$000</u> )	<u>3</u>	
Salaries <sup>1/</sup>	\$16.0	\$17.0	\$17.0	\$50.0
Benefits <sup>2/</sup>	5.6	6.0	6.0	17.6
Overhead <sup>3/</sup>	3.3	3.5	3.5	10.3
Travel and Transportation <sup>4/</sup>	15.0	15.0	10.0	40.0
Materials & Supplies <sup>5/</sup>	6.0	8.0	10.0	24.0
Workshops & Conferences <sup>6/</sup>	8.0	15.0	16.0	39.0
<b>Total</b>	<b>\$53.9</b>	<b>\$64.5</b>	<b>\$62.5</b>	<b>\$180.9</b>

<sup>1/</sup> Includes salary component for IRRI project manager plus support for three Research Assistants.

<sup>2/</sup> Fringe benefits are calculated as 35 percent of project employee salaries.

<sup>3/</sup> Overhead is calculated as 15 percent of project salaries and benefits.

<sup>4/</sup> Includes domestic travel for country research and international travel for project coordination.

<sup>5/</sup> Includes computer analysis of data and publications.

<sup>6/</sup> Includes local support costs of workshops and conferences plus travel costs for reseaches not directly associated with the IRRI component

C. IRRI - Consultants

<u>Item</u>	<u>Year</u>			<u>Total</u>
	<u>1</u>	<u>2</u> (\$000)	<u>3</u>	
Consultant's fee	\$7.5	\$15.0	\$15.0	\$37.5
Per diem	1.5	3.0	3.0	7.5
Travel	5.0	7.5	7.5	20.0
<b>Total</b>	<b>\$14.0</b>	<b>\$25.5</b>	<b>\$25.5</b>	<b>\$65.0</b>

Summary -- Line Item Budget

<u>Item</u>	<u>Year</u>			<u>Total</u>
	<u>1</u>	<u>2</u> (\$000)	<u>3</u>	
Salaries	\$61.0	\$62.0	\$62.0	\$185.0
Consultants	7.5	15.0	15.0	37.5
Fringe Benefits	21.5	21.9	21.9	65.3
Overhead	12.3	12.5	12.5	37.3
Travel & Transportation	63.5	67.5	67.5	193.5
Vehicles*	24.0	6.0	6.0	36.0
Materials & Supplies	15.0	20.0	16.0	51.0
Workshops & Conferences	8.0	15.0	16.0	39.0
Contingency	3.0	3.0	3.0	9.0
<b>Total</b>	<b>\$215.8</b>	<b>\$222.9</b>	<b>\$219.9</b>	<b>\$653.6</b>
Grant to Agricultural Development Council				<u>\$115.0</u>
<b>Grand Total</b>				<b>768.6</b>

\* Included operating expenses for country research projects

It is recognized that some budget adjustments may be required for the IRRI directed component once specific sub-contractors have been identified and scopes of work finalized.

11. Work Plan and Contract Budget

The general work plan for the project is outlined in Section 6 and the estimated project budget presented in Section 10. The proposed project timetable is as follows:

Phase I

- (1) July 15, 1977 RAC Approval
- (2) September 30, 1977 Contracts signed with IRRI and A/D/C
- (3) November 30, 1977 IRRI sub-contractors selected and initial planning workshop held
- (4) January 31, 1978 Research design finalized

Phase II

- (5) March 31, 1978 Planning workshop held to finalize field survey questionnaires and design sampling procedures
- (6) September 30, 1978 Field testing of questionnaires completed
- (7) September 30, 1978 Survey of existing data and studies on agricultural mechanization completed
- (8) September 30, 1978 Workshop to compare results of initial field survey work and exchange information on existing research.

Phase III

- (9) August 1, 1978 Field data collection initiated
- (10) August 31, 1979 Field survey work completed
- (11) November 30, 1979 workshop held to compare initial results of field surveys and coordinate Phase IV activities
- (12) January 1, 1980 Field data processed and verified
- (13) June 30, 1980 Programming analysis of typical farms completed
- (14) July 30, 1980 Final workshop held to compare results of typical farm analyses.

(15) September 30, 1980 Final policy analysis work completed and final reports prepared.

It is recognized that there will be some overlap in the timing of the activities associated with each phase of the research. The four workshops held during each phase of the project are the principal means of coordinating the research activities in the four countries and exchanging results. Nevertheless, it is anticipated that research results will be exchanged throughout the project through publications and travels of individual researchers to other countries. Where appropriate, researchers funded under A/D/C grants will be invited to participate in the workshops and to evaluate research designs and implementation procedures.

It is not possible to make a concise allocation of funds to the two principal project objectives outlined in Section 2. TA/AGR/ESP assigns both objectives approximately equal weight. Nevertheless, most of the funds are allocated to achieving the research objective and the institution building objective is to be achieved as a by-product of the research activities

## 12. Management Considerations

No unusual management problems are expected to arise in connection with this project. TA/AGR has worked closely with both the A/D/C and IRRI on past projects. Both institutions have shown high technical capacity, efficient administration and excellent cooperation with AID's technical and contract staffs.

It is estimated that the project will require approximately 2 person months per year of TA/AGR/ESP staff time. Consultants will be utilized when necessary for major evaluations of the project.

No person will, on the grounds of sex, race, color or national origin be excluded from participation in, be denied the benefits of, or be subject to discrimination under this project. Women, who are qualified and available, will be employed as research assistants, as consultants and evaluators, and in administrative positions.

## 13. Internal and External Reviews

The project will be evaluated on a regular schedule of reviews as well as by continuing supervisions by the AID project manager. For the life of the project full-scale evaluations will be scheduled for:

Ten months after project initiation  
Twenty-two months after project initiation  
Thirty six months after project initiation

The project evaluation team will be composed of:

1-Project Manager, TA/AGR/ESP

2-Representatives of A/D/C and IRRI

3-Dr. William J. Chancellor, Agr. Eng. Dept,  
University of California, Davis (tentative)

4-Additional Members selected by AID (optional)

14. Proposing Office General Appraisal

TA/AGR/ESP, assigns this project high priority. This is, in part, due to the worldwide importance of the topic and, in part, because of potential effects of the IRRI program to develop and promote small scale farm imple-ments in Asia. Both IRRI and the A/D/C also assign high priority to the proposed research and would like to begin work on the project as early as possible.

TA/AGR/ESP has discussed alternative research designs with several ex-perienced researchers. There is general agreement that the proposed research is feasible but considerable differences in opinion exist as to the specific research design most appropriate to achieve project objectives. The essence of what is being proposed is to first define typical farms using different technology mixes and different types of mechanization in four countries. Then to analyze the effects of mechanization based on in-depth field surveys of the typical farms' operations using for example, linear programming as one of the principal analytical methodologies.

It is recognized that research results with greater statistical re-liability could be obtained by utilizing the proposed funds for research in only one or two countries. This approach, however, would limit the achievement of the institutional building capacity objective to fewer countries and would provide less information on differences between countries.

If the entire project could not be funded, TA/AGR/ESP would give highest priority to the IRRI directed component of the project. Further reductions in funding would require reducing the number of countries included in the IRRI component.

Because of the number of host country institutions that will be involved in implementing this project and the possibilities of raising false expec-tations TA/AGR/ESP is reluctant to involve these institutions in detailed dis-cussions of the project's design until RAC has reviewed the project. Never-

theless, TA/AGR/ESP is of the opinion that the final project design can not be finalized until Phase I is completed.

Of the various recommendations which RAC could make on this project; the one preferred by TA/AGR/ESP would be:

- (1) RAC provide recommendations for improving the research design.
- (2) RAC approve the project subject to (a) a RAC member (or designated consultant) participating in preliminary discussions with IRRRI sub-contractors and the finalization of the project design during Phase I of the project, and (b) review of the final research design at the first RAC meeting following completion of Phase I. The RAC participant in Phase I would have authority to recommend (a) termination of the project at the end of Phase I, (b) delay of initiation of Phase II, or (c) initiation of Phase II activities with suggested changes in project design to be reviewed by RAC prior to final approval.

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William C. Merrill  
Project Manager

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Leon F. Hesser  
Director, TA/AGR

AGENCY FOR INTERNATIONAL DEVELOPMENT <b>PROJECT AUTHORIZATION AND REQUEST          FOR ALLOTMENT OF FUNDS PART I</b>		1. TRANSACTION CODE <input type="checkbox"/> A ADD <input checked="" type="checkbox"/> B CHANGE <input type="checkbox"/> C DELETE	PAF 2. DOCUMENT CODE 5
3. COUNTRY ENTITY TA/AGR RDA #2 A		4. DOCUMENT REVISION NUMBER <input type="checkbox"/>	
5. PROJECT NUMBER (7 digits) <input type="checkbox"/> 931-1026		6. BUREAU/OFFICE A. SYMBOL: TAB      B. CODE: <input type="checkbox"/> 08	
8. PROJECT APPROVAL DECISION <input type="checkbox"/> A APPROVED <input type="checkbox"/> D DISAPPROVED <input type="checkbox"/> DE DEAUTHORIZED		7. PROJECT TITLE (Maximum 40 characters) <input type="checkbox"/> Effects of Mechanization on Small Farms	
		9. EST. PERIOD OF IMPLEMENTATION YRS. <input type="checkbox"/> 0 <input checked="" type="checkbox"/> 3      QTRS <input type="checkbox"/> 0 <input checked="" type="checkbox"/> 4	

10. APPROVED BUDGET AID APPROPRIATED FUNDS (\$000)									
A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE		E. 1ST FY <u>77</u>		H. 2ND FY <u>79</u>		K. 3RD FY _____	
		C. GRANT	D. LOAN	F. GRANT	G. LOAN	I. GRANT	J. LOAN	L. GRANT	M. LOAN
(1) FN	189 I	977		554		215			
(2)									
(3)									
(4)									
TOTALS				554		215			

A. APPROPRIATION	N. 4TH FY _____		O. 5TH FY _____		LIFE OF PROJECT		11. PROJECT FUNDING AUTHORIZED		A. GRANT	B. LOAN
	O. GRANT	P. LOAN	R. GRANT	S. LOAN	T. GRANT	U. LOAN	ENTER APPROPRIATE CODE(S) 1 - LIFE OF PROJECT 2 - INCREMENTAL LIFE OF PROJECT		1	
(1)					769					
(2)										
(3)										
(4)										
TOTALS					769		C. PROJECT FUNDING AUTHORIZED THRU		FY <input type="checkbox"/> 8 <input checked="" type="checkbox"/> 0	

12. INITIAL PROJECT FUNDING ALLOTMENT REQUESTED (\$000)				13. FUNDS RESERVED FOR ALLOTMENT			
A. APPROPRIATION	B. ALLOTMENT REQUEST NO. _____			TYPED NAME (Chief, SER: FM: FSD)  SIGNATURE _____  DATE _____			
	C. GRANT	D. LOAN					
(1)							
(2)							
(3)							
(4)							
TOTALS							

14. SOURCE/ORIGIN OF GOODS AND SERVICES     
 000     
 941     
 LOCAL     
 OTHER \_\_\_\_\_

15. FOR AMENDMENTS, NATURE OF CHANGE PROPOSED

FOR PPC/PIAS USE ONLY	16. AUTHORIZING OFFICE SYMBOL	17. ACTION DATE			18. ACTION REFERENCE (Optional)	ACTION REFERENCE DATE		
	TA/AGR	MM	DD	YY		MM	DD	YY
		07	20	77				

PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS

PART II

ENTITY : TA/Bureau  
PROJECT : Effects of Mechanization on Small Farms  
PROJECT NUMBER: 931-1026.01

I hereby authorize grant funds not to exceed \$768,600 to the International Rice Research Institute (IRRI) in the Philippines (\$653,600) and to the Agricultural Development Council (A/D/C) of New York City (\$115,000). Research will be undertaken by IRRI in four Asian countries to study farm size, resources, income, operating costs, power sources and farming practices. This data will be analyzed to determine the effect of various factors on the farms studied.

A companion effort will be directed by the Agricultural Development Council (A/D/C) to involve Asian scientists in a similar study on the effects of agricultural mechanization. These scientists will be working with A/D/C associates who are full time appointments in Asia.

As the major implementation agency, IRRI will coordinate and counsel the A/D/C efforts to provide compatible data for the IRRI work, and will combine all data into the final summary of the project. Funding is for a three year period through FY 1980. This is contingent upon a review by RAC no later than six months after project commencement of the research design of the project to include both segments. After review of the research design, RAC will then recommend on the remaining parts of the project proposal.

*MS Belcher for C Farrar*  
Curtis Farrar  
Assistant Administrator  
for Technical Assistance

Date: Aug 31, 77

Clearance:

TA/AGR/ESP:WCMerrill *W. Craft* 7/20/77  
TA/AGR:DClark *du KB* 7/26/77  
TA/AGR:LHesser *Smith* 7/20/77  
TA/RES:MRehcigl *W. Craft* 7/25/77  
ASIA/TD:CMartin *Smith* 7/25/77  
TA/PPU:KMilow *Smith* 8/29/77

MEMORANDUM

TO : Mr. Curtis Farrar, AA/TA

DATE: 30 AUG 1977

FROM : Ken Milow, <sup>LM</sup>TA/PPU

SUBJECT: Approval of PAF Part II for "Effects of Mechanization on Small Farms" project

REF : Discussion Long, Day, Merrill, and Erickson dated August 24, 1977

Problem: Should A.I.D. approve PAF Part II for the full 3 year funding of subject project when RAC recommended funding only for the first phase which consists of developing a project design?

Discussion: TA/AGR submitted a proposal to RAC for a 3 year research project on the Effects of Mechanization on Small Farms in the amount of \$771,000. The committee recommended that funds be provided only for the development of a project design costing approximately \$50,000. This design should be submitted to RAC for its review within six months and at that time a decision will be made whether funds will be provided for the other phases of the proposal.

Because of our budgetting system, it is difficult to adhere to the RAC recommendation to the letter. Our funds for FY 78 are tight and have already been planned for specific activities.

To satisfy the RAC recommendation and at the same time meet our budgetting requirements, the following course of action is recommended.

1. Approve PAF Part II which authorizes funds for life of Project (3 years)
2. The follow-on PIOTs will provide the normal 2 year funding for new projects with the following proviso:

"The contractor will only spend \$50,000 for the development of the project design which is to be submitted to A.I.D. within 6 months of signing of the contract. No other expenditures will be incurred until after the contractor is formally advised by A.I.D. that the project design is acceptable and to proceed with its implementation. If the project design is not acceptable, the project will be terminated and funds deobligated."

Recommendation: That you indicate your approval of the course of action reflected above by signing the attached PAF Part II.

Attachment: a/s

Clearance:

TA/RES:JERickson (phone) *elm* Date 8/25/77

*LM*  
TA/PPU:OMolfetto:ac:8/30/77

*P.P.A.*  
*Trimmings*  
*Malfetto*  
*Hilborn*  
*Hedman*

921-07

DEPARTMENT OF STATE  
AGENCY FOR INTERNATIONAL DEVELOPMENT  
WASHINGTON, D.C. 20523

September 26, 1977

NOTE FOR: TA/AGR, Dr. Hesser

SUBJECT : IRRI Small Farm Machinery Project

REF. : Your Note of September 21, 1977

For the time being we should go ahead planning a new project to provide core support to the IRRI small machinery effort on the assumption that Regional Bureaus and Missions will finance their use of IRRI services. Keep Regional Bureaus closely involved.

I think it entirely possible that the project will become Asian regional, with funds transferred from the TAB 78 budget and some arrangement for project management but this depends in large part on real interest and demand from missions outside Asia.

Marjorie S. Belcher  
Acting AA/TA

*Note.*

cc:  
DA/AID:RHNooter  
DAA/ASIA:MHBadler  
DAA/TA:CDMcGraw  
TA/PPU:RSimpson

~~Copies: [unclear]~~  
~~[unclear]~~  
Melfella

September 21, 1977

What do you  
recommend?

NOTE TO: Acting AA/TA, Marjorie S. Belcher

SUBJECT: IRRI Small Farm Machinery Project

This is a case in which appropriate technology has resulted from research and is being introduced through the subject project. The project ends June 30, 1978. Considerable demand is building, but at best a hiatus will exist between June 30, 1978 and large numbers of Mission funded projects. Almost certainly, introduction of small scale machinery will lag without some kind of "core support." Brady is concerned that his technical people will start jumping ship without some security of expectations soon.

We need your guidance on whether to work with the Regional Bureaus to put together a project extension that will assure some minimum response capability from IRRI or whether to let it drop.

*Leon F. Hesser*  
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Leon F. Hesser  
TA/AGR

Attachment:  
Memo - Byergo/Hesser, dtd. Sept. 19, 1977

5-9-81-12

Copy to:  
TA/PPU, R.Simpson (w/att.)  
TA/AGR, D.Peterson (w/o att.)  
K.Byergo (w/o att.)

Distated but not read.

UNITED STATES GOVERNMENT

# Memorandum

TO : TA/AGR, Dr. Leon F. Hesser  
THRU : TA/AGR, Dr. Dean Peterson *D.P.*  
FROM : TA/AGR/CP, Keith M. Byergo *KMB*

DATE: September 19, 1977

SUBJECT: Meeting with Dr. Brady and Asia Bureau Representatives on the Small Farm Machinery Project, IRRI

Attendants: Nyle Brady, Director-General, Marcus Vega, Deputy Director-General, IRRI; T. C. Clark, Director ASIA/TECH Resources; Gleason Rohlf, ASIA/TR; Felicia Morrow, ASIA/PD; Don Melville, Indonesia Desk and Keith Byergo, TA/AGR.

The meeting was opened with a discussion of the project history and potential for continuation. Dr. Brady then discussed specifically the proposal for Indonesia. T.C. Clark indicated Asia Bureau's interest but stated that funding, if not already in the budgeting cycle, was difficult if not impossible. General discussion then revolved around mission interest and possibility for their funding the project. Asia Bureau will query the mission by telegram on their interest and ability to provide funding.

Dr. Brady then indicated his concern about basic project funding beyond June 1978. His ability to backstop an Indonesian project would be impaired, though not impossible, if the basic project was not continued. To respond to Latin American, African and Near East request for assistance would require the continuance of the basic project. Concern was also expressed over the amount of extra work involved if it was necessary to contract with each mission as opposed to one central contract to provide technical services.

Options appear to be as follows:

1. TAB fund the basic contract to June 30, 1978, the end of the current approval period, and terminate the project.
2. Request Asia Bureau to take over management and funding of the project. Asia Bureau indicates no funds are available and services would likely be limited to Asia.
3. Develop a centrally funded new project providing technical assistance on a worldwide basis for small farm machinery. This is generally the recommendation of the March 1977 review team. Funding from July 1, 1978 would be required.



Discussion on Options (not necessarily part of the meeting):

As funds requested for FY 79 funding were not approved, we have the problem of a technical service in considerable demand worldwide and even though there is the capability via IRRI to service the demand, no funds have been budgeted for the project. If a new project seems a viable option then a meeting to determine regional bureau interest should be held in the near future.

Given the general interest worldwide in the project as evidenced by the numerous requests received by IRRI and TAB for information and the project's success to date, it would seem that we would be remiss in dropping the project. The Agricultural Economics Division is developing a mechanization assessment project which will provide further policy direction to LDCs in their mechanization efforts. However technical assistance on the methodology of mechanization is also necessary. All evidence indicates that LDCs are going to mechanize in some fashion. How they do this will determine success or failure and how equally social and economic benefits and costs are distributed.

IRRI has the knowledge and experience to greatly assist in these mechanization efforts provided a way can be found to fund the appropriate project.

Various reports and studies\* indicate that multiple cropping (two or three crops per year), necessary to meet growing food demands cannot be accomplished without increased power per unit of land. As Dr. Brady reported in his Centers Week presentation and as Billings and Singh have reported in India, mechanization when combined with improved cropping practices and multiple cropping need not decrease labor demand per unit of land. Production efficiency is increased and more food per unit of land and labor is produced and seasonal labor peaks are evened out but total labor required when worked through the system of production, handling, processing and servicing is increased.

To assess the actual demand for small farm machinery technical assistance, it is suggested that an airgram be sent to all missions outlining potential technical services available and requesting missions to indicate the work months of service that might be required over a three year period. Also at the small farm machinery workshop to be held at IRRI in November a similar assessment of demand will be made from attendants.

Your comments and guidance will be much appreciated on this issue.

\*Giles, Wallace, President Science Advisory Report, 1967 and subsequent expanded reports by the same author.

SMALL FARM MECHANIZATION TECHNICAL SERVICES

PID

I. Summary of the Problem and Proposed Responses.

Problem: The new technologies required to increase food crop yields are generally more labor intensive and have a higher energy requirement per area farmed than traditional cultivation methods. The need for increased food production is well documented. This automatically imposes ever increasing energy requirements on agriculture. Numerous authors have pointed out that human power alone cannot meet these power needs. Even in Mainland China, where manpower use is maximized, they are rapidly converting to mechanical power in the time critical elements of production such as land preparation, seeding and harvest. The Chinese model rice transplanter is being used as a prototype in several mechanization development programs.

Some farmers in the Philippines and Thailand have indicated the elimination of the bullock and water buffalo as the prime reason for investing in the power tillers and tractors. Low efficiency, labor and time costs are given as the reason for changing to mechanization power.

Finally in improving the welfare and standard of living of rural communities mechanization is seen as a way to improve productivity.

Human or animal powered agriculture has traditionally provided a low or bare subsistence level of living. The drudgery and hard work often falls heaviest on the woman and children of the family with able bodied men seeking more remunerative occupations away from the farm. We have numerous examples such as Japan, Taiwan and parts of the Philippines, Thailand and Turkey where mechanization in conjunction with improved agronomic technology

have greatly increased food production and improved living standards.

**A: Proposed Solution**

This project would provide technical assistance, formal and informal training to countries wishing to establish mechanization programs. This assistance would cover not only the technical aspects but the socioeconomic, policy determination and industrial management issues.

Assistance in local manufacture, prototype procurement, testing and adaptation would also be elements of the project.

A separately funded ongoing research and development program of the contractor would provide updated and relevant new inputs into the technical knowledge base of the project.

One local institution subproject would be established in Africa, Latin America and the Near East/North Africa using local staff and facilities contributed by the host country or mission to the extent possible. This would serve as the region demonstration model with any additional mechanization programs in a particular region being mission or host country funded. Additional Asia Region assistance would be mission or host country funded. Project staff would be based at the contractor headquarters providing assistance on a reimbursable basis as far as travel and per diem are concerned except to designated regional demonstration subprojects.

Subject matter areas of speciality required for the project would be as follows:

1. Design and production engineer
2. Economist
3. Industrial Management
4. Production engineer, training

**B. State-of-the-Art:**

A previous TAB project has established a small farm mechanization research and development capability which is now a part of the core budget of the contractor. A second project has established a methodology for disseminating the research information to interested countries and institutions. This project would build on this established capability to provide small farm mechanization assistance on a world wide basis. Nine institutions in eight east and south Asian countries have formal linkages with the previous project contractor provided by the Small Farm Machinery Industrial Extension Project. It is envisioned that this cooperative model could be adapted to Latin America, Africa and the Near East.

Another TAB project is currently being implemented on the assessment of the socioeconomic effects of small farm mechanization. This will provide additional policy guidance to the herein proposed project.

A project review held in March 1977 commended the Industrial Extension Project for its progress and recommended the extension of its activities on a world wide basis. An international small farm machinery workshop being held the first of November 1977 will assess the demand, interest resources and capabilities in small farm machinery. This will be another valuable input into a new project.

**C. Goal & Purpose:**

1. This project would contribute directly to developing mechanization programs in LDCs and indirectly to the goal of increased food production and improved rural living by improving the timeliness of the application of improved agronomic practices and reducing the drudgery and workload imposed on farm families. The Washington State - George Washington University

analysis of the IRRI Mechanization Program in the Philippines indicated that the family labor was the first to be released with the adaption of mechanized agriculture allowing children to attend schools and other family members to pursue more remunerative pursuits. Hired labor is made more productive with mechanization and consequently can demand a higher wage.

## 2. Purpose

- a. To assist in the establishment of mechanization programs in LDCs.
- b. To provide LDC staff training in the formal & informal technology, policy requirement socioeconomic aspects and small industry establishment and management pertaining to small farm mechanization.
- c. Assist in the establishment of a local small farm machinery industry in the LDC private sector.
- d. Assist in small machine prototype development, testing, adaption and dissemination.
- e. Conduct workshops, seminars machinery displays and other appropriate activities designed to disseminate information on mechanization development.
- f. Publish and disseminate books, seminar, workshop & bulletins, meeting reports and other such materials for interested countries institutions.
- g. Subcontract with appropriate institutions and organizations to assist with any of the above purposes.

## D. Expected Output:

1. Three regional small farm mechanization demonstration subprojects project funded. Africa, Latin America & Near East.
2. Additional regional subprojects mission or host country funded.
3. Small farm machinery manufacturing capability established and cooperating with subproject staff in each country with a subproject.
4. Three subproject staff & 3 manufacturers trained in small farm mechanization in countries with subprojects.

5. A basic set of power, land preparation, seeding and harvesting machines tested and adapted to each subproject area.

6. Annual seminar/workshops held in each region for subproject staff and manufacturers.

7. One masters degree participant from each region in training in small farm mechanization, project funded.

8. Annual seminar/workshop reports and a quarterly newsletter published in each region.

#### E. Technical & Physical Resources Required

1. Four staff members with aforementioned technical qualifications.
2. Access to prototypes available in the world.
3. Access to host country workshops and testing equipment.

#### F. Expected Disbursement Period

Three years starting April 1, 1978. It should be assumed that an additional three years of service would be requested if the project is successful.

#### G. Major Assumptions

1. That agricultural mechanization will occur in some fashion regardless of AID interventions, however, with training and assistance social costs can be reduced, more equitable division of benefits can result and the small farmer interests can be better protected. Many examples of failed large scale mechanization are available, however some models of successful small farm mechanization are available as models.

2. There is a demand for mechanization assistance and host countries will be receptive to the small farm mechanization approach.

#### H. Alternatives

1. Allow missions and host countries to develop uncoordinated local programs.

2. Depend on other donors to provide assistance. None are currently active internationally.

3. Allow the private sector "Laissez Faire".

#### I. Beneficiaries

Small farmers and small local manufacturers directly, all food consumers indirectly.

#### J. Environmental Problems

No physical environmental problems are foreseen. Effects on the social environment will be positive if correct policies are established and precautions are taken pertaining to labor demand.

#### II. Financial Requirements and Plans

Annual cost of \$280,000 per year for a total of \$840,000. The first year would be from FY 78 funds and the last two years from FY 79 funds.

#### III. Project Development

A. Information needed for project development is available. Preliminary discussion with regional bureaus indicate interest in the project.

B. A well qualified prospective contractor has indicated interest.

C. A PP can be ready by December 1977. Regular TAB staff and consultants are available to accomplish project development. TA/AGR/CP will have the major responsibility for project development.

#### IV. Outstanding Issues

Project management by regional bureaus, the appropriate technology institute or TA/AGR needs to be resolved. Given the worldwide scope of the project it would appear central funding and management are required.

#### V. Project Evaluation

Regular evaluation will take place after 12 months from start up with expected outputs being main target of review.

#### Small Farm Machinery Budget Breakdown

Salaries	120,000
Overhead	60,000
Fringe Benefits	20,000
Per diem, travel and transportation	30,000
Equip. & Supplies	20,000
Misc.	30,000
<u>TOTAL</u>	<u>280,000</u>
TOTAL for 3 years	\$840,000

**ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR FOR TECHNICAL ASSISTANCE BUREAU**

**FROM :** TA/AGR, Leon F. Hesser *L.F.H.*

**SUBJECT:** Approval for Project Implementation, "Effect of Mechanization on Small Farms"

**Problem:** At the RAC meeting of July 15, 1977 approval was passed to proceed with the research project 931-1026 "Effect of Mechanization on Small Farms." Authorization for funding is needed.

**Discussion:** This project has been developed over the past year under the original title of Agriculture Mechanization. This project has been approved by R&DC and now by RAC.

Implementation is planned under a two pronged approach. The major effort will be by the International Rice Research Institute (IRRI) which will involve LDC institutions in four Asian countries. Concurrently the Agricultural Development Council (A/D/C) of New York City will involve individual Asian scholars in comparable studies in other areas which will be guided by A/D/C associates stationed in Asia. IRRI will combine all the findings into the final analysis of the study.

The study will cover the impacts of mechanization upon farm production, income, and resource use to determine interactions that show up between mechanization and cultural practices.

The recommendation from RAC limited approval to the research design development portion of the project. A subsequent recommendation will be made on the implementation after the research design has been reported to RAC.

**Recommendation:** That you approve the implementation of this project by signing the attached PAF for funding for IRRI and A/D/C.

**Attachment:**

1. PAF

**Clearances:**

TA/AGR/ESP:WCMerrill <i>draft</i>	Date <u>7/20/77</u>
TA/AGR:DClark <i>by WCB</i>	Date <u>7/26/77</u>
TA/RES:MRechcigl <i>MS. for note</i>	Date <u>7/24/77</u>
ASIA/TD:CMartin <i>Grant</i>	Date <u>7/28/77</u>
TA/PPU:KMilow <i>Rm</i>	Date <u>8/29/77</u>

TA/AGR/ESP:KPBrundage:mmb:7/20/77