

PD-AAP-850  
ISN = 35969

XO-AAP-850A  
42

AGENCY FOR INTERNATIONAL DEVELOPMENT <b>PROJECT DATA SHEET</b>		1. TRANSACTION CODE <input checked="" type="checkbox"/> A = Add <input type="checkbox"/> C = Change <input type="checkbox"/> D = Delete	Amendment Number <u>1</u>	DOCUMENT CODE <u>3</u>
2. COUNTRY/ENTITY <u>Guyana</u>		3. PROJECT NUMBER <u>504-0072</u>		
4. BUREAU/OFFICE <u>Latin America/Caribbean</u>		5. PROJECT TITLE (maximum 40 characters) <u>Rice Modernization II</u>		
6. PROJECT ASSISTANCE COMPLETION DATE (PACD) MM DD YY <u>06/30/85</u>		7. ESTIMATED DATE OF OBLIGATION (Under "B" below, enter 1, 2, 3, or 4) A. Initial FY <u>78</u> B. Quarter <input type="checkbox"/> C. Final FY <u>83</u>		

8. COSTS (\$000 OR EQUIVALENT \$1 = )

A. FUNDING SOURCE	FIRST FY			LIFE OF PROJECT		
	B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total
AID Appropriated Total				3,603		3,603
(Grant)	( )	( )	( )	( 1,250 )	( )	( 1,250 )
(Loan)	( )	( )	( )	( 2,353 )	( )	( 2,353 )
Other U.S. 1.						
Other U.S. 2.						
Host Country					681	681
Other Donor(s)						
<b>TOTALS</b>				3,603	681	4,284

9. SCHEDULE OF AID FUNDING (\$000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) FN	170	070	010	1,250	2,353			1,250	2,353
(2)									
(3)									
(4)									
<b>TOTALS</b>				1,250	2,353			1,250	2,353

10. SECONDARY TECHNICAL CODES (maximum 5 codes of 3 positions each)	11. SECONDARY PURPOSE CODE
12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)	
A. Code	
B. Amount	
13. PROJECT PURPOSE (maximum 480 characters)	

To increase yields, reduce cost of production and improve the grading system for efficient export marketing of rice.

14. SCHEDULED EVALUATIONS	15. SOURCE/ORIGIN OF GOODS AND SERVICES
Interim MM YY MM YY Final MM YY <u>06/85</u>	<input checked="" type="checkbox"/> 000 <input checked="" type="checkbox"/> 941 <input checked="" type="checkbox"/> Local <input checked="" type="checkbox"/> Other (Specify): <u>935</u>

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a \_\_\_\_\_ page PP Amendment.)  
The Project Amendment will extend the Project Assistance Completion Date (PACD) from June 30, 1984 to June 30, 1985 with no additional obligation of AID funds. The amendment will permit the completion of those aspects of the Project that have not been completed in the Applied Research, Seed Production and Rice Grading programs.

17. APPROVED BY	Signature <u>Harry J. Robinson</u>	18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION MM DD YY <u>06/29/84</u>
	Title: <u>Acting Mission Director</u> <u>USAID/Guyana</u>	

Project No. 504-0072

PROJECT PAPER AMENDMENT

GUYANA

RICE MODERNIZATION II

PROJECT PAPER

GUYANA: RICE MODERNIZATION II

TABLE OF CONTENTS

	<u>PAGE</u>
<u>I - PROJECT SUMMARY AND RECOMMENDATIONS</u>	
A. Recommendation.....	1
B. Description of the Project.....	1
(1) Grantee.....	1
(2) Summary of Project Description.....	1
 <u>II - ORIGINAL PROJECTS CONCEPTS</u>	
A. Introduction.....	2
B. Background to Rice Modernization II.....	3
C. Background to Small Farm Development, Black Bush Region.....	6
D. Progress to Date.....	
(1) Rice Modernization II - Loan.....	7
a. Original Project Goal and Purpose.....	7
b. Output Accomplishment and Problems.....	8
(2) Small Farm Development - Loan.....	10
a. Original Project Goal and Purpose.....	10
b. Output Accomplishment and Problems.....	10
(3) Rice Modernization II & Small Farm Development; Grant Funding.....	11
a. Output Accomplishments and Problems.....	12
 <u>III - DESCRIPTION OF THE EXTENSION</u>	
A. Rationale for AID Involvement in the Rice Industry.....	21
(1) Importance of Rice Production in Guyana's economy...	21
(2) GOG's Plan for the Rice Industry.....	21
(3) Target Group.....	23
B. Project Description.....	24
(1) Project Rationale.....	24
(2) Project Goal and Purpose.....	25
(a) Goal.....	25
(b) Purpose.....	25
(c) Relationship to Mission Strategy.....	25

	<u>PAGE</u>
(3) Project Activities during the Extension Phase.....	25
(a) Applied Research.....	25
(b) Seed Production.....	28
(c) Autonomous Rice Grading Authority.....	30
C. Financial Plan.....	31
D. Implementation Plan.....	33
(1) Project Organization and Implementation.....	33
(a) Project Organization.....	33
(b) Project Implementation.....	34
E. Evaluation Plan.....	34
F. Project Issues.....	34

ANNEXES

- ANNEX 1 - Logical Framework
  
- ANNEX 2 - Quarterly Report - Applied Research
  
- ANNEX 3 - Extract from 1984 Budget Speech - New  
Institutional Framework for the Rice  
Industry
  
- ANNEX 4 - Work Plan
  - (a) Applied Research
  - (b) Seed Production
  - (c) Rice Grading
  
- ANNEX 5 - Staffing Patterns
  
- ANNEX 6 - Allocation of Field Commodities

I. PROJECT SUMMARY AND RECOMMENDATIONS

A. Recommendations:

It is recommended that the Rice Modernization II Project (hereafter referred to as the Project) described herein for an extension of PACD to June 30, 1985, to complete those aspects of the Project that have not been completed in the Applied Research, Seed Production and Rice Grading programs.

B. Description of the Project:

1. Grantee:

The Grantee will be the Government of Guyana (GOG) acting through the Ministry of Agriculture (MAG). The Project will be implemented by the Director, Coastal Research of the Agricultural Research Institute and the Director of the Rice Grading Authority.

2. Summary of Project Description:

The Project goal under this extension will remain unchanged from the original PP focusing on improving the standard of living in Guyana's rural areas by increasing small rice farmer income. However, the Project purpose has been changed to emphasize increased rice farm yields, reducing cost of production and improving the quality of the grading system for efficient export marketing of rice. The original purpose was to reduce post-harvest losses and to improve the marketing system for efficient domestic and export marketing of rice by the rehabilitation and construction of drying, storage and milling facilities and by technical assistance to upgrade operation and maintenance, financial and managerial capabilities.

During the extension period of the Project, emphasis will be placed on:

- (1) (a) The purification and multiplication of Diwani; (b) the further development of two new Diwani strains that are high yielding and have high milling yield comparable to the U.S. varieties, Starbonnet and Bluebelle; and (c) promising varieties and lines for commercial production.
- (2) On-going screen test of rice selections imported from all over the world with a view of selecting 4-5 promising varieties for regional testing.
- (3) Fertilizer trials to determine the levels of fertilizer requirements of rice varieties.

- (4) To establish a seed production and delivery system and
- (5) To establish an autonomous rice grading authority for the grading of rice.

## II. ORIGINAL PROJECT CONCEPTS

### A. Introduction:

At the time when the Rice Modernization II Project was being implemented a second and complementary Project, the Small Farm Development was also initiated. The benefits that impact on small farmers from the completion of the two Projects, the Rice Modernization II and Small Farm Development would have been:

#### (a) Rice Modernization II:

1. Reduction in post-harvest losses;
2. improved rice quality as a result of better grain handling;
3. improved marketing management; and
4. participating small farmer income increased by 40%.

The new drying and storage facilities would have been located in areas of high concentration of small farmers.

#### (b) Small Farm Development:

##### (i) Global:

1. Rice production would have been increased from 34,000 tons to an estimated 67,500 tons annually;
2. corresponding increases in food crop production; and
3. 46,600 acres of agricultural land would have been rehabilitated.

(ii) AID:

1. Design and construction of civil works;
2. Upgrading production services (land development, applied research, seed production and testing, extension, water management, farm inputs) directed towards on-farm development and efficient utilization of infrastructure improvements, all of which would increase small farmer income, increase rice production and improve the quality for export markets.

The technical assistance aspect of the Project (upgrading those production input elements and devising delivery systems to the small farmer that would bring economic rewards and help achieve full and efficient agricultural utilization of the irrigation and drainage system) was recognized from the beginning to be national in scope and would not only benefit those farmers in the Black Bush Polder Region but all rice farmers of Guyana.

B. Background to Projects:

1. Background to Rice Modernization II:

The Checchi Corporation was contracted to perform a second Guyana Rice Study. The purpose of this study was to provide the analytical framework required for developing a second Rice Modernization Project by updating and expanding the 1967 Guyana Rice Study (which was also performed by Checchi Inc.). The Study (published in March 1979) included a detailed evaluation of the first Rice Modernization Project, an update of the rice situation including technical, engineering, economic, institutional and financial requirements to determine the feasibility of a second Rice Modernization Project; and an assessment of the projected benefits to the target beneficiaries of a second Rice Modernization Project. Additionally, the Study was to form the basis for a GRB ten-year plan for the rice industry, of which the Project was to form the first portion.

Three new irrigation schemes (Tapakuma, Black Bush Polder and MMA), for the production of rice were being financed by international donors including AID. These irrigation schemes when completed, with the wide-spread use of improved varieties were to have resulted in a rapid expansion in rice production. It was determined that the increases in production must be handled by modern methods if Guyana is to hold traditional clients as well as attract new ones. An analysis of the facilities identified that an acute shortage of such facilities existed. The results were post-harvest losses

of 10% and severe reductions in quality, and an inefficient system to respond to export orders.

The Project purpose was to increase small farm incomes through the reduction of post-harvest losses (both quality and quantity) and to increase the efficiency of the marketing system. This was to be accomplished by the following Project financial activities:

- (1) The construction of five new paddy storage and drying centers;
- (2) the expansion of six existing storage and drying centers;
- (3) the construction of three 10-ton per hour multi-stage rice mills;
- (4) the rehabilitation of the Georgetown rice export center;
- (5) technical assistance and training to upgrade GRB financial and managerial capability; and
- (6) technical assistance and training to GRB personnel in the operation and maintenance of the storage, drying and milling facilities.

Conditions resulting from the completion of the Project that would benefit the small farmer were:

- (1) Reduction in post-harvest rice losses;
- (2) improved rice quality as a result of better grain handling;
- (3) improved marketing management; and
- (4) participating small farmer income increased by 40%.

On September 27, 1978 the Project was approved for a total cost of \$16,500,000 over four and a half years. The loan funds of \$15,000,000 were to finance (a) design and construction of: (i) new paddy storage and drying facilities and expansion of existing facilities, and (ii) rice mills and (b) reconstruction of the Georgetown export facility. The grant funds of \$1,500,000 were to provide technical assistance and training complimentary to the Project. Subsequently, on September 30, 1978 and December 28, 1978 the Mission signed the Project Agreements relating to the

loan and grant funding. The GOG agreed to contribute the equivalent of \$5,500,000 and \$500,000 towards the loan and grant, respectively.

NOTE:

Evaluation of Rice Modernization Project I (1968-1977):

The first Rice Modernization Project was designed to help promote a continued GDP growth rate of 7%, increased rice farmer income, and enable the GRB to compete effectively in world markets; thus optimizing the contribution of rice to export earnings. From a price value of \$8.55 million in 1970, the contribution of rice to GDP rose to \$23.3 in 1977. As measured in constant prices, the rice component of GDP expanded at an annual rate nearly double the rate of total GDP growth. This strong rate of expansion contributed to an annual GDP growth rate of 8.05%, well above the Project objective of 7%.

At least three factors have supported the expansion of rice contribution to GDP: (1) increased paddy production; (2) a large jump in the production of improved varieties; (3) the associated increase in the value of GRB rice purchases (i.e. improved quality). The total paddy production increased at an annual rate of 6.7%, while the production of improved varieties accelerated at an annual expansion rate of 84.3%. This vastly increased production of high yield/value varieties made a major contribution to the 26% annual growth rate of the value of GRG paddy intake.

The shift to improved varieties has directly affected farmer incomes. With the proportion of improved varieties produced moving from only 8% in 1970 to roughly 80% in 1977, the gain in real farmer income has been substantial.

An improved quality of paddy made possible the production of better quality, higher value rice which has resulted in higher export earnings. Rice export earnings increased since 1970 at an annual rate of 18.8% while total export earnings rose at an annual rate of 14.3%. This higher growth rate of rice exports raised the rice component of total export value from 7.2% (1970) to 10% in 1976.

On the technical level, Project objectives were oriented toward construction and preparation for the operation of a series of facilities designed to benefit the Guyana rice industry. The six storage/drying centers planned were constructed and are operating near or in excess of capacity. The milled rice storage facility in Georgetown was completed as scheduled, though a fire in 1977 damaged its handling capability. The other project facilities, the pureline seed storage unit and the rice research station at MARDS, were also completed and operational.

The strength of the Project's rice research program is indicated by the introduction of a series of improved varieties specifically suited to Guyanese environmental conditions. Varieties developed through the research program and successfully introduced include variety 'N' and the recently released Champion and Rustic varieties. Another major accomplishment was the development of a foundation seed program. Availability of this high-quality seed has promoted the increased production of improved varieties which have played a key role in the improvement of Guyana's rice industry.

On the organizational level, the primary Project objective was the merger of the Guyana Rice Marketing Board and the Guyana Rice Development Corporation with a related goal of training personnel in various aspects of management, research, maintenance, and rice processing technology. Consolidation of the two entities was achieved by the formation of a single organization called the Guyana Rice Board. Coordination of government operations related to rice, from assisting production efforts to final marketing, was to have been improved by this merger. Training of GRB personnel to handle their expanded managerial and technical responsibilities was carried out.

## 2. Background to Small Farm Development, Black Bush Region:

Under a previous (July 1971) AID-financed host country contract, Harza Engineering Company of Chicago, in conjunction with Aubrey Barker Associates of Georgetown, Guyana, conducted a feasibility study (published in November, 1975), of the East Berbice Region of Guyana to determine the potential of the area for further agricultural production and marketing development. The areas studied in this report was the Black Bush Backlands and the Manarabisi Cattle Pasture, a gross area of 51,000 acres, to determine its potential for rice and sugar production. In addition, the study included an analysis of the Black Bush Polder Frontlands to determine whether adequate water was available to satisfy irrigation requirements.

While the development proposed in this study was found to be technically and economically feasible, it was considered too costly to finance under the prevailing conditions. As a result, the feasibility of developing the Black Bush Polder, Black Bush Frontlands and Block III was analyzed by Harza (a report published March 1977). The World Bank found the proposal to be technically and economically feasible and recommended that the Project be financed.

The Government of Guyana (GOG) requested AID assistance to participate with other donors (World Bank, IFAD, IDB and CIDA), in financing the Project for the rehabilitation and improvement of irrigation and drainage systems and other agricultural improvements for rice production on about 46,000 acres of presently cultivated land in the East Berbice Region of Guyana.

The Project was part of a comprehensive plan being undertaken by the GOG to rehabilitate existing irrigation and drainage systems, including feeder roads and on-farm development, and improve agricultural supporting services for about 700,000 acres of lands suitable for rice and sugar cane production. The main objectives of this program were to provide flood protection, a dependable water supply for double-cropping, adequate drainage, all-weather roads, on-farm development (land levelling) and improved agricultural support services, all of which would have increased small farmer income, increased rice production and improved the quality of export markets.

AID-financed components were designed to ensure the existence of an adequate system of production support (land development, applied research, seed production and testing, extension, water management, farm inputs) and marketing services (e.g. drying and storage), thereby enabling small farmers to increase rice and other food production with the increased availability of irrigation water.

On July 17, 1978 the Project was approved providing \$7,500,000 (Loan) and \$1,400,000 (Grant) to finance agricultural equipment, technical assistance, training, construction and engineering consultant services for a program to increase the production of rice and food crops in the Black Bush Region. These activities were complimentary to the civil works financed by other donors. Subsequently, on August 3, 1978 and September 30, 1978 the Mission signed the Project Agreement for the loan and grant funds respectively. The GOG was to provide \$4,000,000 as its contribution towards the loan and \$983,000 to the grant on an "in-kind" basis.

C. Progress to Date:

(1) Rice Modernization II - Loan

a. Original Project Goal and Purpose:

(i) Project Goal:-

The Project goal was to improve the standard of living in the rural areas of Guyana by increasing small rice farmer income.

(ii) Project Purpose:

The Project purpose was to reduce post-harvest losses and to improve the rice marketing system for the efficient, domestic and export marketing of rice. Achievement of the Project purpose would require:

1. The construction of five new paddy storage and drying facilities;

2. the expansion of six existing storage and drying facilities;
3. the construction of three 10-ton per hour multi-stage rice mills;
4. the rehabilitation of the Georgetown rice export facility;
5. technical assistance and training to upgrade GRB financial and managerial capability; and
6. technical assistance and training to GRB personnel in the operation and maintenance of the storage, drying and milling facilities.

b. Output Accomplishment and Problems:

The original Project cost estimates made by Checchi and Company for the PP prove to be outdated. The cost estimates completed by the Project's design engineers (Jarvis International) and approved by the Guyana Rice Board (GRB) indicated substantially higher costs than originally estimated by Checchi. Costs related to transporting construction materials and equipment to Guyana were underestimated. In addition, the Checchi design called for horizontal slip-form concrete silos which were not feasible under the current conditions in Guyana, and the design did not include provisions for receiving bagged rice, ancillary paving or additional test, and personnel buildings. Thus, the updated cost estimates inclusive of additional facilities, and a doubling of the rate of inflation from the original 15% estimate necessitated a redesign of the physical scope of the Project.

Utilizing the Project component priorities suggested in the PP, the design engineers left intact the expansion of the six existing rice facilities and the rehabilitation of the Georgetown Export Center. However, because of the higher costs associated with these components, it was necessary to scale back the construction of new storage facilities from five to one and reduce the number of rice mills from three to one.

The redesign of the Project resulted in the following changes in the Project Budget:

	(\$000)
(1) Reconstruction of the Georgetown Export Center	3,188
(2) Expansion of the six existing storage centers	5,267
(3) Construction of the new storage and drying facilities, and a rice mill	<u>6,545</u>
TOTAL LOAN	<u>\$15,000</u>

Jarvis completed final designs and contract documents as required by the revised scope of work on July 10, 1981. While the home office prepared the documents, the field office attempted to prequalify general contractors. There was a limited response to the Commerce Business Daily advertisement and those responding were found unacceptable to GRB. Special efforts were then made, without success, by AID in an attempt to identify potential contractors.

Following AID's efforts, GRB requested a waiver from AID for Jarvis to construct the facilities on a turnkey basis. This request was denied and instead, AID suggested a waiver to open prequalification to Geographic Code 935 Country Contractors but only to contractors then present in Guyana considered to have a predominant capability. The suggestion was accepted by GRB.

While the prequalification procedures were in progress the design contract documents and estimates were being reviewed. Jarvis submitted the final revised set of documents to GRB on September 3, 1982 for tender. Four international contractors with local operations were prequalified and prepared to tender. At this stage the Project was suspended for three reasons:

1. Execution of the design would have required extension of the Project PACD and hence a new 611e certification. It was determined that under the existing circumstances a 611e certification could not be made.
2. The GOG and the Mission jointly agreed that as a result of changes in circumstances, the planned capital activities under the Project were no longer the most appropriate ones.
3. AID, and other donors, had concerns about the appropriateness of the current policy environment under which the rice industry was operating and its possible impact on achievement of Project objectives.

At this stage, the Project was suspended due to the economic situation in Guyana, AID's requirements for local matching funds, AID's conditions for continuation of the Project (620Q restriction) and GRB's change in construction priorities.

Suspension of the Project continued while the GOG, AID and GRB reviewed and discussed conditions for continuation of the Project. Finally, on February 28, 1983, time ran out on the Contract for Engineering Services and the services were discontinued.

On September 30, 1983 the residual of the loan funds of the Rice Modernization II Project was deobligated and the unliquidated obligations of \$644,000 under the grant remained available for use.

(2) Small Farm Development - Loan

a. Original Project Goal and Purpose:

(i) Project Goal:

The sector goal toward which the Project was directed was the improvement of the standard of living in rural areas of Guyana. The sub-goal to which the Project was specifically related was to increase small farmer income, productivity, and quality of life.

(ii) Project Purpose:

The purpose of the global multi-donor financed Project was to increase the production of rice and other food crops by 6,000 small farm families in the Black Bush Region.

The conditions that would indicate that this overall Project purpose has been achieved were: (1) rice production in the Project area would have been increased from 34,000 tons a year to an estimated 67,500 tons annually, and corresponding increases would have occurred in food crop production; and (2) 46,600 acres of agricultural land would have been rehabilitated and improved.

(iii) AID Project Purpose: . . . .

The purpose of the AID-financed component was to provide a package of services, complimentary to the other donor-financed civil works, which included: (1) A&E services for the design and supervision of the construction phase of Global Project works and (2) services which would maximize the production potential and benefits of the irrigation infrastructure to area farmers. . . .

Conditions that would indicate that the AID Project purpose have been achieved were: (1) completion of design and construction of civil works; and (2) an operating system of services directed towards on-farm development and efficient utilization of infrastructure improvements. .

b. Output Accomplishment and Problems:

Since the approval of agreements with lending agencies in 1978 and the contracting consultants (PRC Engineering Consultants, Inc.) in 1980, this Project suffered from enormous cost escalation due to delays in implementation and inflation. Consequently, a Project originally estimated to cost US\$46.0 million was estimated to cost no less than US\$75.0 M.

Numerous alternatives were examined with a view of reducing the Project's scope of work and bringing it's cost within the available financing. These efforts were largely unsuccessful since, though they reduced the benefits under the Project and would have, therefore, prejudiced the economic viability of the Project, the cost over-runs were still likely to be substantial. In view of the absence of additional external financing and the heavy burden which Project implementation would have exacted on Guyana's financial resources, the Government of Guyana had no option but to agree to the cancellation of the Project according to it's original scope of work.

Consequently, on June 21, 1982, the Government of Guyana gave notice of termination of the PRC Engineering Consultants, Inc. contract with the Ministry of Agriculture with effect from September 1, 1982. The consultants completed the first phase of the Project, the design phase and submitted all drawings etc. to the GOG as required in the scopes of work.

Circumstances in the Andes resulted in the deobligation of the remaining loan funds to meet requirements in those countries as the future of the Black Bush Project, as originally designed, was highly uncertain. Prior to AID deobligation, IFAD has cancelled its commitment. IBRD subsequently reprogrammed it's planned contribution for another Project. At the present time, IDB is still considering a small rehabilitative activity in the Black Bush area.

(3) Rice Modernization II and Small Farm Development, Grant Funding:

The GOG undertook the Projects aimed at the construction of the infrastructure necessary to provide irrigation and drainage of the frontlands of the Black Bush Polder Region and to expand the GRB storage, drying and milling facilities. Part of the Projects involved a package of technical services to strengthen the capabilities of GRB and MAG to deliver services to the farmers in the Black Bush Polder Region as well as technical assistance in improving the overall management of GRB. On April 23, 1980 a Contract Agreement was entered into between the GOG and IRI Research Institute, Inc. to perform the following services in order to achieve the above objectives:

1. Water management
2. Applied research
3. Facility management
4. Machinery services
5. Extension services
6. Seed production
7. Financial management

Very little progress was made in some phases of the Project. None-the-less there are phases that have worked well. It is our purpose at this point to continue these successful areas through June, 1985.

As a result of the cancellation of the engineering and construction phases and the uncertain future of the Black Bush Polder Project the GOG agreed to terminate the services of the Water Management, Agricultural Engineer and Extension specialists with effect from December 15, 1982. The Farm Management Specialist completed his assignment and departed Post on September 9, 1982, while the Facility Management Specialist whose contract was extended by six months completed his assignment and departed on June 2, 1983. The Financial Specialist was relieved of his duties with effect from April 3, 1984.

During the implementation of the technical activities of the Projects, it was evident that these activities would be of benefit to all rice farmers of Guyana and not limited to those of the Black Bush Polder Region. When the GOG agreed to terminate the activities as outlined above it was decided that the applied research and seed production activities should be broadened to encompass all regions of Guyana. It should have been recognized from the beginning that such an undertaking would have to be national in scope to be successful.

a. - Output Accomplishments and Problems:

(i) Water Management:

Objectives:

- (1) Evaluate water management practices in the Project area and develop improved practices through applied research.
- (2) Demonstrate on farmers' fields improved water management practices.

Achievements:

- (1) Developed a package of recommended practices to improve water utilization at the farmers' (plot) level.
- (2) Thirty-five demonstration tests were conducted on farmers plots.

- (3) Seventeen specific recommendations were developed which can be implemented by the farmers. These practices will reduce waste, lower costs, improve yield and extend present water supplied.

Problems:

Lack of water remains one of the major constraints to increased paddy production. However, it was felt that additional research on water usage and practices would not be profitable. Instead of water management research, efforts should be directed to encourage farmers through extension agents to utilize those recommended practices for maximum utilization. However, even with the best of farmer practices, the present irrigation facilities cannot deliver enough water to satisfy demand. This situation has occurred as a result of prolonged neglect.

(ii) Farm Management:

Objectives:

- (1) Evaluate and analyze production activities; . .
- (2) Develop a plan for the improvement of rice and vegetable . . . .  
crop production.
- (3) Implement the most economical package of improved cultural practices.
- (4) Promote the use of farm plans and budgets.

Achievements:

- (1) A producer "profile" was devised that categorized producers into five groups based on their level of production and availability of financing and inputs. Detailed cost studies were developed for each group.
- (2) The extension program began to make intensive use of the tool of "Partial Budgeting", unfortunately the program stopped with the departure of the Extension Specialist.

(iii) Machinery Services and Agricultural Engineering:

Objectives:

- (1) Reorganization and upgrading of the general administration of the machinery pool.
- (2) Develop regular maintenance and work schedule for the proper maintenance of the equipment fleet;
- (3) Restore as far as possible equipment owned by GRB.
- (4) Conduct training programs for mechanics and machinery operators.
- (5) Investigate the machinery needs related for improved methods for land preparation and harvesting.

Achievements:

Almost immediately after IRI began work on the Contract, GRB divested itself of the machinery pool. Consequently, the Specialist was instructed to emphasize his duties in Agricultural Engineering. These included:

- (1) The development and use of work orders and the use of time and cost records to determine when a specific piece of machinery has reached the end of its useful life.
- (2) Surveyed all items of machinery to determine status as (a) operating (b) non-operating and repairable and (c) non-operating and non-repairable.
- (3) Identified the equipment and shop tools to improve workshop operation and facilitate machinery repairs.
- (4) Three training courses were held for equipment operators.

(iv) Management:

Objectives:

- (1) To evaluate the functions and structures of the GRB, and its management and decision making processes with special emphasis on long range planning.

- (2) Development of improved management process.

Achievements:

None. A decision was made to delay the arrival of the Management Specialist until planned "reorganization" of the GRB would have been completed. An attempt at providing management assistance was made by the Training Specialist.

(v) Training:

Objectives:

Responsible for the in-country training and off-shore training programs in respect of seed technology, adaptive research, extension, management finance, and marketing.

Achievements:

- (1) One counterpart to IRI Extension Specialist participated in a seven-week course in "Agricultural Communication and Media Strategies" at the University of Iowa.
- (2) Training programs were developed for drying, storage, and milling facilities maintenance and operations on three levels to include management, supervisors and operators.
- (3) Two training programs of four weeks duration were conducted on drying, storage and milling facilities, maintenance and operation. Fourteen employees participated.

Problems:

Off-shore training program was not fully utilized due to the inability to identify qualified candidates. In some instances candidates who had been identified for specific courses left the Project before preparations could be completed.

(VI) International Marketing:

Objectives:

The development of an international marketing strategy capable of handling the increased production.

Achievements:

None. A decision was made to delay the arrival of the Specialist until the latter part of the Contract.

(VII) Inventory Control:

Objectives:

The development of an inventory management and control system so that there would be timely inventory reports available to management.

Achievements:

None. There was never a consensus of opinion whether this Specialist would concentrate on rice stocks or spare parts inventories or both. Also the general lack of organizational stability within GRB was a factor in not sending a Specialist.

(VIII) Extension Services:

Objectives:

The development of programs for extension workers.

Achievements:

- (1) Four training courses were completed. Participants were extension personnel assigned to the Project and personnel from Hydraulics Division and Land Development.
- (2) Two field days were held for Black Bush Polder farmers to view water management, variety and fertilizer trials.

- (3) Two extension counterparts were trained on how to write effective agricultural column.
- (4) A technological package of thirty-six yield improving cost effective recommendations that were implementable by the farmers at the plot level were developed. The recommendations emphasized improving farm management practices rather than increased material inputs. The IRI staff was unsuccessful in getting the package seriously discussed or approved by GRB.
- (5) The participation of thirty-three out of thirty-four farmers in block planting of one hundred and eighty acres. The farmers achieved increased yields of 24% and reduced costs by coordinating their planting and harvesting.

Problem:

The progress of the program was severely hampered by the lack of trained counterparts. The original PP envisioned as many as twenty-six extension agents. After the first complete year, five agents were assigned and in July 1982, six agents had been recruited when the services of the Extension Specialist was terminated.---

(IX) Financial Management:

Objectives:

- (1) To design and implement budgetary and cost control and financial-reporting system for GRB. - . . .
- (2) To train GRB personnel in the day-to-day maintenance of the accounting and reporting system.

Achievements:

- (1) Documents prepared and issued to GRB.
  - (a) Cost ascertainment and cost control within GRB;
  - (b) An examination of the system of Paddy Purchasing Farmers Credit Services and Paddy and Rice Inventory Reporting with recommendations thereon;
  - (c) Manual of Procedures and Responsibilities;
  - (d) Manual of Procedures (2nd Part)
    - Head Office and Inter Company Accounting
    - Purchase Office Procedures
    - Store Procedures
    - Paddy Inventory
    - Farmers Accounts
    - Mill Production and Inventory Control
    - Mechanical Workshops Accounting
    - Fixed Assets Control
- (2) Printing of forms prescribed by the Accounting Procedures Manual.
- (3) Distribution of adding machines and calculators to various locations.
- (4) Training of GRB personnel in basic accounting and book-keeping functions as well as periodic sessions on the theory of Accounting and Financial Management reporting.
- (5) Distribution of Accounting Procedures Manuals to GRB regional accounting offices. The following procedures became operative during 1982 or as of January 1, 1983:
  - (a) Paddy inventory
  - (b) Paddy purchasing and scale house procedures
  - (c) Farmers accounts
  - (d) Agri. bonds
  - (e) Mechanical workshops accounting
  - (f) Stores procedures

- (6) The IBM input terminal was put into service.
- (7) Training of five GRB accounting personnel to operate the IBM 3742 completed.

Problems:

The major constraint of implementing the recommended program was the lack of management commitment and support.

(X) Applied Research:

Objective:

- (1) To develop and promote an improved package of production technology for farmers.

Achievements:

- (1) Confirmation of high yielding capacity and wide adaptation of Diwani throughout Guyana. Diwani screened from more than 260 high yielding varieties has been found to give the highest yield in seven variety-yield test trials over four consecutive crops. The conditions under which Diwani was tested include:

1. fertile and very favorable microclimate conditions;
2. areas very conducive to incidence of blast and/or brown leaf spots;
3. salty soils;
4. high land without irrigation;
5. culture without fertilizer inputs;
6. water shortage;
7. poor water management and weed control;

Diwani performed well under these conditions and is regarded as a variety of wide adaptation in Guyana. This variety is to be officially released for commercial production in the Autumn crop 1984.

- (2) A break-through in improving head rice milling return of Diwani by the identification of two new strains of Diwani. Two new strains of Diwani out of more than 1,000 lines were identified. These two new strains have grain quality comparable to or better than U.S. long grain rices such as Starbonnet and Bluebelle. Their yielding capacity is as long or even better than standard extra long Diwani. They are long grained and out yielded Diwani in head rice milling return by 10 to 20%. These new strains, because of high milling return can further boost the income of the Guyana rice industry. It is expected that at least two more crops will be needed to develop these new strains for commercial production.
- (3) The setting up of regional research plots in Essequibo, Mon Repos, MARDS and Black Bush Polder. These plots replicate all research work on a regional basis.
- (4) The identification of a number of high yielding varieties which were imported from all over the world. On going screening and further testing needs to be done.

(XI) Seed Multiplication:

Objective:

- (1) To upgrade the quality of seed produced.

Achievements:

There was some delay in the recruitment of the Seed Production Specialist who came on board on February 5, 1984. It is expected that by June 1984 the following would have been achieved:

- (1) Evaluated existing seed delivery systems (completed).
- (2) Procedures for the production of breeder, foundation and certified seeds.
- (3) Procedures for proper storage.
- (4) Procedures for quality control.
- (5) Training manual for field inspectors and seed processors.

- (6) Rehabilitating the seed processing facilities and seed laboratories.

Problems:

- (1) No counterpart staff allocated to Seed Specialist.

III. DESCRIPTION OF THE EXTENSION

A. Rationale for AID Involvement in the Rice Industry:

(1) Importance of Rice Production in Guyana Economy:

Although rice ranks behind sugar in terms of contribution to GDP and in the generation of export earnings, it employs more people than sugar and is the mainstay in the Guyanese diet. Rice producers, unlike sugar producers, are small independent farmers, 88% operate farms of fifteen (15) acres or less, operating either on a free-hold, government lease basis or rental from land owners. There are about 45,000 rice farming families engaged directly in the rice industry while thousands of others find employment in transportation, milling, and marketing of rice. It is estimated that approximately 315,000 persons are earning a living directly or indirectly from the rice industry.

Rice is also the major ingredient in the diet of both rural and urban sectors, and its importance has increased since GOG instituted import restrictions on wheat flour.

As well as forming the only food staple grown domestically, rice is an important foreign exchange earner for Guyana. In 1983, rice contributed US\$21.60 million to Guyana's total export earnings.

(2) GOG's Plan for the Rice Industry:

In May 1982, the GOG announced several changes to improve the efficiency of GRB. The most important of these were:

(a) Regional Boards:

The GOG agreed to decentralize the GRB and to establish five regional boards which would be better able to manage the rice industry in the regions. According to the implementing legislation, Regional Board members are chosen by the Regional Administrations with final approval vested in the Ministry of Agriculture. The Chairman of each Regional Board is a

member of the central GRB. The Regional Boards are expected to be financially viable entities with the freedom to manage the rice facilities within their respective jurisdictions. These Boards have been established and are not functioning in the best interest of the rice industry. The Regional Board members are political appointees with little or no interest in the industry and knowledge about rice.

(b) Transfer of Farm Input Supply Functions from GRB to Commercial Importers and Distributors:

Responsibility for distribution and sale of fertilizer, agro-chemicals has been transferred to GNIC, a public sector agency. GNIC established or designated a number of private retail outlets throughout the rice growing areas which worked well and satisfied the needs of the farmers. However, in late 1982 GNIC was instructed to hand over the distribution to the Regional Administrations. The Regional Administrations have at their disposal few main distribution points which makes it more costly and difficult for farmers to obtain the inputs.

(c) Transfer of Credit Functions from GRB to GAIBANK:

GAIBANK took over the credit functions from GRB and has been providing production credit to farmers. GAIBANK has decentralized its operations and established branch offices throughout the rice areas with the objective of speeding up loan processing and making timely credit available.

(d) Transfer of Rice Extension to the Ministry of Agriculture:

The Ministry of Agriculture and the Regional Administrations have been given full responsibility for extension work. The extension activities are seriously affected by the lack of trained extension agents.

(e) Selling of Small GRB Mills to Private Sector or Regional Organizations:

Five small rice mills have been handed to the Regional Administrations for reorganization and operation. The GOG considers that the sale to the Regional Administrations is only temporary and that the mills will eventually be sold to farmers' cooperatives.

(f) Divestment of Farm Machinery and Equipment:

Most of the machinery has been sold to the Regional Administrations. Some has been sold to Private Farmers.

(g) Decentralizing GRB sales to Local Millers and Farmers:

Rice millers and farmers have been selling directly to consumers and retail outlets.

On January 30, 1984, the Minister of Finance and Economic Planning in his Budget Speech announced the new institutional framework for the rice industry which is being established this year. The draft legislation will call for the dissolution of the GRB and transfer of its assets and liabilities as follows:

- (a) The drying, milling and storing responsibilities will be transformed into the Guyana Rice Export Board (GREB).
- (b) The rice drying milling and storage activities will be transferred to a new specialized institution, the Guyana Rice Milling Corporation (GRMC).
- (c) A functionally autonomous Grading Authority to maintain technical standards, consistent with international classification for grading paddy and rice.
- (d) The establishment of an Agricultural Research Institute.
- (e) The Planning Department of the Ministry of Agriculture will be responsible for the annual review of prices.

(3) Target Group:

Participation by AID in the applied research, seed multiplication and rice grading is justified on the basis of the impact on small rice farmers throughout the rice growing area of Guyana (i.e. increased rice production and increased income, creation of additional off-farm employment, as well as its beneficial impact on the Guyanese economy as a whole).

The principal direct beneficiaries of this Project will be the 45,000 rice farm families and the 136 rice millers in Guyana. Within this farming group, benefits are expected to be increased, primarily from (a) the development of the Diwani variety and its two strains for higher yields and higher milling yields; (b) in making pure and viable seeds available in adequate quantities; and (c) the maintaining of standards and quality.

There are other benefits, which will result from the extension of this Project. These include:

- (a) Foreign exchange earnings - increased production with higher milling yields will result in more rice being available for exports;
- (b) Foreign exchange savings - the Diwani variety and its two new strains are resistant to blast disease and does not require the use of triple super phosphate, thus reduction in cost of production of G\$11.25 per acre.

In summary, if 220,000 acres of paddies out of 246,000 acres or 89.4% can be planted to Diwani and new Diwani strains, an increase of G\$43.78 M income can be obtained - for farmers G\$26.68 M and rice millers G\$17.10 M by 1987.

B. Project Description:

(1) Project Rationale:

Very significant practical results from three years of Applied Rice Research in the varietal improvement program which has identified some outstanding high yield rice varieties and a few strains of the Diwani variety that have potential of high milling recovery are now becoming available to the Guyana Rice Industry. The impact of the new varieties and their translation into increased yield and incomes, at the farmer level, can only be achieved if they are quickly and properly disseminated. Thus, a high quality seed program is required that would control the seed multiplication process to prevent degeneration of the varieties and a drop in yield after a few years. Also, Guyana, over the years has lost some of its export markets and one of the reasons is the supply of varying quality of rice. In order to maintain standards, consistent with international classifications an autonomous grading entity is required that would in the first phase grade all export rice.

(2) Project Goal and Purpose:

(a) Goal:

The Project goal is to improve the standard of living in the rural areas of Guyana by increasing small rice farmer income and productivity.

(b) Purpose:

The Project purpose is to increase yields, reduce cost of production and improve the grading system for efficient export marketing of rice.

(c) Relationship with Mission Strategy:

USAID/Guyana's assistance strategy is directed towards the development of the rural sector through an integrated economic and social approach designed to increase food production and rural incomes while concomitantly providing selective social services to the rural population. This strategy parallels the GOG's own development objectives which are primarily aimed at "nutritional self-sufficiency; and maximization of exports of a selected set of products".

~~This extension is consistent with Mission strategy of a phase-down program which is not intended to affect disbursement of the remaining pipeline funds. These pipeline funds will be used to increase overall achievement of Project objectives (the Rural Health Project), assist that segment of the population most affected by the current crisis (the Weaning Foods Project) and reinforce the efforts of those who have made progress in achieving positive policy changes under this Project. While much has been accomplished under the current PACD of 6-30-84, the twelve month extension is important to the complete success of this program. The phase-down program with continued disbursement of the remaining pipeline cannot be effected without extension of some PACD's.~~

(3) Project Activities during the Extension Phase:

During the extension phase (July 1984 - June 1985) the following activities are expected to be achieved:

(a) Applied Research:

The Project will provide for the continuation of Applied Research activities by the Research Specialist, Dr. Jeff Wang in:

(i) Development of new Diwani strains of high milling returns for commercial production. This involves:

- determination of yield capacity, milling and other performance;
- determination of segregation;
- purification and multiplication of seed of Diwani strains;
- quality determination.

A breakthrough to improve the head rice milling yield of Diwani has been made during the second crop of 1983. Two new strains of Diwani were identified out of more than 1,000 lines. These two new strains of Diwani have grain quality comparable to or better than the U.S. long grain rice such as Starbonnet and Bluebelle. Their yielding capacity is as good or even better than standard extra long Diwani. They are long grained and outyielding Diwani in head rice milling return by 10 to 20%. It is expected that at least two more crops will be needed to develop the new strains for commercial production.

By June 30, 1985, it will be possible to determine what further tests are needed before the two new strains can be released for commercial production, as the two strains have been found to be segregating in the spring crop of 1984. Should further tests be needed, the Guyanese plant breeder and three field supervisors who have worked for 3 to 5 years with the Research Specialist in this project should be able to carry on the tests and other necessary work (purification and multiplication) to realize the commercialization of the strains.

(ii) Improvement on some drawbacks of Diwani variety.

During the initial trials of Diwani cultivated under commercial scale, two drawbacks have been observed: 1) need substantial longer time from commencement of flowering to reach full flowering than the present commercial varieties, and 2) longer maturation (10 to 14 days) than most Guyanese commercial varieties.

These two drawbacks were found to be created by presence of several Diwani lines in the Diwani seeds used for the commercial tests. Through purification by head-rows-selection method, the first drawback can be completely corrected by June 30, 1985. While the second drawback can be reduced to only a few days (3-5 days), once the two drawbacks are corrected or improved the spread of Diwani will take place more quickly.

(iii) Initial screen test of high yielding varieties/lines imported from all over the world.

It is not safe to rely on one or two major varieties which have the same or similar genetic sources. To stabilize the paddy yield, there is need to have several major varieties of more diversified genetic sources. To this end, every year 200-400 of promising rice selections from all over the world are introduced and tested for this purpose.

This is on-going work, and experience suggests it is possible to hit one good variety adapted to the local conditions out of every 200-400 selections introduced. Before this can be determined, it is expected that 10 to 20 promising selections be identified from the selections introduced and tested in 1984/1985 by June 30, 1985. A group of the local counterparts mentioned in section (i) will continue this program.

(iv) Refining the screen tests for the promising varieties/lines identified earlier.

The promising varieties/lines identified in the initial screen tests or earlier tests will be tested under a number of conditions such as different seasons, different inputs, different soil types, etc. to select the most promising and stable yielders finally for commercial tests. By June 30, 1985, two to four promising varieties/lines may be identified from this on-going program.

(v) Regional tests for the most promising varieties/lines.

The most promising varieties/lines selected above will be subjected to commercial scale tests in various regions of Guyana. If successful, these new varieties/lines will be recommended to be released officially. It is expected that four promising varieties/lines will be tested in various regions under commercial scale production in 1984/1985. By June 30, 1985 it is hoped that one or two varieties/lines be recommended for commercial production to broaden the genetic-sources.

(vi) Varietal multiplications and Breeders Seed Production.

In this program the genetic purity will be maintained through headrow methods. Depending on the man-power supply and the need, enough quantities of breeder seed of several commercial varieties and promising lines are to be produced every crop for further test and germ-plasm conservation. The target quantities are:

<u>Diwani</u>	<u>Bags</u>
Diwani	50
Rustic	45
N	20
Starbonnet	15
Promising varieties/lines	5

(vii) Soils and fertilization studies.

The main purpose of the studies in this program is to:  
(i) identify the varieties which do not require high fertilizers input;  
(ii) increase the efficiency of fertilizer; (iii) identify the varieties which are tolerant to salt and some other adverse conditions.

To this end, the activities involve:

- collection of soil samples and analysis;
- pot trials and fertilization trials in field.

BY June 30, 1985, the expected outcomes are:

1. Enough information on whether or not phosphorus application may be eliminated for Diwani as the practice recommended in Suriname.
2. Two to three varieties / lines which have tolerance for salinity and low fertilizer input may be identified.

The local Agronomist and/or plant breeder should be able to carry on this program continuously after June 30, 1985.

(viii) Training counterpart staff.

In-country training is an on-going program. Counterparts are exposed to all activities in the applied research programs. The plant breeder will be sent on an intensive rice breeding program to the International Rice Research Institute (IRRI) or Centro Internacional de Agricultura Tropical (CIAT) for two to three months by June 30, 1985.

(b) Seed Production:

To maximize the impact of the Applied Research program it is essential to improve the seed delivery system. The varieties must be pure, viable and readily available to the farmer in adequate quantities. The seed production activities will be concentrated in the following areas:

- (i) Improving existing methods and establishing new procedures for the multiplication of system to ensure varietal purity, and the delivery of high quality seed to the farmer.

Attention will be given to the production of: 1) foundation seeds at MARDS and Essequibo; 2) registered seed on state farms and farmers' plots in Essequibo, Black Bush Polder and Cane Grove. Also attention will be paid in maintaining high levels of quality at all steps of seed delivery system, with emphasis given to post harvest threshing, drying, cleaning, quality control, storage and package. The production of seed during the extension phase would be as follows:

Second crop 1984 - Foundation seed - 10 acres Diwani; 3 acres 1R22  
First crop 1985 - Foundation seed - 18 acres Diwani;  
Registered seed - 250 acres Diwani; 75 acres 1R22  
Second crop 1985 - Foundation seed - 30 acres Diwani; 5 acres of new  
Diwani strains  
Registered seed - 450 acres Diwani;

(ii) An intensive training program for the seed delivery personnel involved in seed production.

Three courses of two weeks duration will be conducted, one at each of the following locations, Essequeibo, Black Bush Polder, and MARDS to train up to thirteen seed delivery personnel.

Training will be focussed on (a) seed production, involving land preparation, nursery development, transplanting, weed control, pest and disease control, fertilizing, water management, rogueing, harvesting and certification of the seed; (b) drying will involve training in proper drying of the seed by both the mechanical and sun-drying methods; (c) seed testing, emphasis on varietal purity and germination and (d) seed processing and storage, involving operation and maintenance of seed processing equipment, the proper labelling and storage on pallets, the control of storage pests and rodents, and proper record-keeping.

As part of the training, a seed delivery training manual will be produced. Also, during the Project, intensive on the job training will be a continuous activity. The Seed Production Officer will be sent on an intensive seed training course sponsored by AID and USDA at the Mississippi State University.

(iii) Assisting in improving and minor rehabilitation of seed processing facilities at MARDS, Black Bush Polder and Essequeibo.

The rehabilitation of the existing seed processing equipment at these locations will involve the replacement of worn out parts and the acquisition of spares such as screens, brushes, V-belts, etc. For the improvement of the MARDS Research Station seed facility, there is need for a cleaner specifically to handle breeder seed only in order to maintain a genetically pure seed (see Attachment I for details).

(iv) Establishing seed testing laboratories at Black Bush Polder and MARDS and to improve the existing laboratory at Essequeibo.

The seed testing laboratories at MARDS (which were financed under the RMI Project) and Black Bush Polder require the replacement of a

number of basic and important equipment in order to make them functional. The laboratory at Essequibo (financed under the Tapakuma Project) is functioning but requires some supplies and minor equipment (see Attachment I for details).

By the end of the project at June 1985, the foundation of the seed production program will be established to handle the seed production. The seed specialist's counterpart (Seed Production Officer) would have received training overseas and will be involved in country training to continue the seed production program with the twelve local trained technical staff.

(c) Rice Grading:

There are to be four distinct areas which require external technical assistance to the GOG in order to implement and manage the functions of the proposed Rice Grading Authority.

(i) Development and Implementation Assistance.

Development and implementation assistance are required to manage the necessary linkages and assemble resources until local personnel have been selected, hired and trained for their tasks. Preparation of the Guyana Grain Inspection Act (GIA) and regulations under the act is required. For this activity nine months of technical assistance would be required. The activities under the technical assistance is outlined in the Floyd F. Niernberger's report of April 1983.

(ii) Training:

A training component is necessary, consisting of brief, refresher-type training in the United States for two technically-experienced Guyanese in grain grading operations and instruction. In-country training should also be provided by personnel from the United States in the areas of inspection and operation for supervisors and grading officers. It is expected that thirty persons will be trained in two distinct courses. Continued in-country training of newly hired inspection personnel is advisable, to be conducted by Guyanese using training materials from the preceding instruction.

(iii) Information Gathering:

Information and reference material should be developed for the major regulation needs in an inspection program of the type proposed. These would consist of standards, certification and licensing. Information is required for standardized procedures; equipment testing; rice and products; packaging; and sanitation. Requirements and issuance and distribution regulations for certificates are needed. Regulations on licence requirements, applications, examination, issuance, and cancellation will need to be drafted.

(iv) Operations and Management:

In-country assistance in administration and operations will be required initially to familiarize staff with the principles which guide the Federal Grain Inspection Service in the United States. Design and preparation of documents, operating guidelines, fee determinations, billing and paying procedures, and data reporting methods will also necessitate assistance.

C. Financial Plan:

The total financing package amounts to US\$795,000 to be disbursed over the period July 1984 to June 1985. The total AID commitment to the Project extension is US\$530,000 grant funds. The GOG contribution to the Project extension is projected at US\$265,000. The following table itemizes the major Project components and showing AID and GOG contribution.

1. USAID

(US \$000)

		<u>Research</u>	<u>Seed Multiplication</u>	<u>Rice Grading</u>	<u>Total</u>
Consultants		143	62	108	313
Spares and Supplies		5	25	-	30
Training		5	5	15	25
Equipment		-	100*	7	107
Other Expenses		9	9	-	18
Evaluation	10	-	-	-	10
Contingencies		9	10	8	27
<b>TOTAL</b>	<b>10</b>	<b>171</b>	<b>211</b>	<b>138</b>	<b>530</b>

\*1 Rice Combine

2. GOG

(US \$000)

		<u>Research</u>	<u>Seed Multiplication</u>	<u>Rice Grading</u>	<u>Total</u>
Personnel		62	46	47*	155
Office Expenses		15	15	-	30
Housing		12	10	-	22
Vehicles - fuel & maintenance		3	3	-	6
Travelling & subsistence		6	4	-	10
Training		2	2	14	18
Inputs		8	-	-	8
Other Expenses		2	2	-	4
Contingencies		5	4	3	12
<b>TOTAL</b>		<b>115</b>	<b>86</b>	<b>64</b>	<b>265</b>

\*Includes facilities

D. Implementation Plan:

1. Project Organization and Implementation:

(a) Project Organization:

The Ministry of Agriculture (MAG) will be the executing agency for the extension of this Project and will have the responsibility for all the principal Project activities.

The Project components for which MAG through the Agricultural Research Institute and the Grading Authority will be responsible are as follows:

(i) Agricultural Research Institute:

This Division of the MAG will have as one of its responsibilities Applied Research and Seed Production of rice. At present the Applied Research and Seed Production activities are with the GRB and with effect from 1st July, 1984 these activities are to be transferred to the new Agricultural Research Institute, a central government funded organization. The Applied Research of rice is basically concerned with rice research, and seed production with the production of rice seeds that are genetically pure, have a low moisture content, high level of germination and free from weed seeds and other impurities. ~~At present the Applied Research has a plant breeder, four Technical Field Officers, two Junior Field Officers and ten laborers. However, with the re-organization of GRB, the Project would~~ require the following additional staff: one Agronomist, four Technical Field Officers and twenty laborers. (Note: Previously Applied Research used staff from state farms).

The Seed Production Specialist at present does not have any counterparts. With the transfer of this activity to MAG a separate unit is to be created to deal specifically with seed production of rice. (It should be noted that the seed production unit that is presently in operation at Mon Repos will continue to handle seed production of other crops, except rice). It is envisaged that in the first year of development the rice seed production units located at Black Bush Polder, MARDS, and Essequibo will each have a Seed Production Officer, three Assistant Seed Production Officers, three Seed Production Assistants (SPA), three Seed Technicians (ST), three Seed Certification Inspectors (SCI), three Operators (casual labor will be employed only during the harvesting periods to clean the seeds). When fully developed the technical staff, that is the SPAs, STs, and SCIs will be doubled at each location.

(ii) Rice Grading Authority:

The Rice Grading Authority when created is to be an autonomous organization, and under the supervision of the Ministry of Agriculture. The activities of the Rice Grading Authority under this Project will include: grading and certifying all paddy arriving at the mills; grading and certifying all rice milled for sale both locally and overseas; provide relevant data on grading and quality control; train and certify and license graders and license mills and inspect their operations with a view to facilitating improvement in their quality control and other operations.

(b) Project Implementation:

The IRI Research Institute Inc., was contracted under the previous Project to provide the required technical assistance for Applied Research and Seed Production. For the extension phase, IRI will be re-contracted to provide the technical assistance in Applied Research, Seed Production and Rice Grading.

The team leader from IRI will coordinate the activities of the Project - Applied Research, Seed Production, and Rice Grading with MAG.

E. Evaluation Plan:

An ex-post facto evaluation will be held within ninety days of the PACD to determine the extent to which the Project's purposes and objectives were achieved. The evaluation will be conducted through a contractual arrangement with a consultative firm. Funding to conduct this evaluation is included in the grant component of the Project.

The Contract consultant will, in collaboration with MAG and the Mission, identify and quantify (where applicable) all benefits resulting from the Project as well as benefits anticipated but not achieved. Non-quantifiable benefits will also be discussed and evaluated to the extent possible.

F. Project Issues:

The overall intent of the AID financed production services components of the Small Farm Development Project, as outlined in the original PP, was to upgrade those production input elements which were efficient and devise delivery systems to the small farmers that bring prompt economic rewards

while keeping the risks at an acceptable level. This objective was to be achieved by "the integrated package approach". The high level of rice production must be based upon ready availability of high producing seed, proper land preparation, correct and timely management of irrigation water, adequate seed and pesticide control and timely harvesting.

In order to achieve the objective of the original PP, the GOG was to have assigned forty-eight professional and sub-professional staff to the Project. During the Project only fourteen were assigned.

The Project's most recent experience is with the Seed Production Specialist who came on-board at the request of GRB, in February 1984 and no counterpart has yet been assigned.

The issue foreseen, for the Project extension based on the past experience with the original Project, would be GOG's ability to assign the necessary counterpart staff.

Another major issue that may arise is the ability of GOG to provide the level of counterpart funding for the Project extension. The Minister of Finance and Economic Planning in his 1984 Budget Speech highlighted the new institutional framework for the rice industry. Included were (a) the establishment of an Agricultural Research Institute to which the Applied Research and Seed Production activities would be attached. This new institute would be Central Government funded. However, no allocation or token amount has been made by the GOG in the 1984 Estimates of Expenditure. (b) - The creation of an autonomous Grading Authority for which no mention was made on the source of funding. The extension of the Project would be dependent on the GOG meeting its counterpart funding. During the start-up of the Grading Authority extensive financial support must be obtained to provide facilities and administrative support.

PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

ANNEX I

Life of Project:  
From FY July 1984 to FY June 1985  
Total U. S. Funding \$530,000  
Date Prepared:

Project Title: Rice Modernization II - Extension

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS																																		
<p>Program or Sector Goal: The broader objective to which this project contributes:</p> <p><u>Sector Goal:</u></p> <p>To improve the standard of living in the rural areas of Guyana.</p> <p><u>Subgoal:</u></p> <p>To increase small rice farmer income and productivity.</p>	<p>Measures of Goal Achievement:</p> <p><u>Sector Goal:</u></p> <p>1. Increase in production yields.</p> <p><u>Subgoal:</u></p> <p>1. Participating rice farmers increase income by at least 30%.</p>	<p>1. MAG production statistics.</p> <p>2. Regional Administration statistics.</p> <p>3. Bank of Guyana and Ministry of Finance and Economic Planning reports.</p>	<p>Assumptions for achieving goal targets:</p> <p>1. Small rice farmers are willing to participate.</p> <p>2. GOG to pursue consistent rural development strategy.</p> <p>3. Inputs and spares and credit available.</p> <p>4. Weather conditions remain favourable.</p>																																		
<p>Project Purpose:</p> <p>To increase yields, reduce cost of production and to improve the grading system for efficient export marketing of rice.</p>	<p>Conditions that will indicate purpose has been achieved: End of project status.</p> <p>1. Diwani planted to 65,000 acres in first crop 1985 and 75,000 acres in Autumn crop 1985.</p> <p>2. Efficient grading system for export marketing of rice.</p> <p>3. Efficient seed delivery system.</p> <p>4. 8% reduction in cost of production.</p>	<p>1. MAG Reports.</p> <p>2. Guyana Rice Export Board Reports.</p>	<p>Assumptions for achieving purpose:</p> <p>1. Sufficient GOG personnel available to serve as Project counterparts.</p>																																		
<p>Outputs:</p> <p>1. Purification of new Diwani strains.</p> <p>2. Selection of new promising varieties/lines.</p> <p>3. Improved seed delivery system in rice growing areas.</p> <p>4. Rehabilitation of seed production and testing facilities</p> <p>5. Establishment of seed testing facilities.</p> <p>6. Agricultural Research Institute and Grading Authority personnel trained:</p> <p>(a) Off-shore</p> <p>(b) On-shore</p> <p>7. Improved system for the grading of export rice.</p>	<p>Magnitude of Outputs:</p> <p>1. 2</p> <p>2. 4</p> <p>3. 3</p> <p>4. 3:1</p> <p>5. 2</p> <p>6.</p> <p>(a) 4</p> <p>(b) 36</p>	<p>1. Consultants and Contractor Reports</p> <p>2. Agricultural Research Institute and Grading Authority Reports.</p> <p>3. On site inspections.</p>	<p>Assumptions for providing outputs:</p> <p>1. Adequate staff available for training.</p> <p>2. Suitable candidates available for training.</p>																																		
<p>Inputs:</p> <p><u>USG:</u></p> <p>1. Consultants</p> <p>2. Spares &amp; Supplies</p> <p>3. Training</p> <p>4. Equipment</p> <p>5. Evaluation</p> <p>6. Other Expenses</p> <p>7. Contingencies</p> <p><u>GOG:</u></p> <p>1. Personnel</p> <p>2. Office expenses</p> <p>3. Housing</p> <p>4. Fuel &amp; maintenance of vehicles</p> <p>5. Travelling &amp; subsistence</p> <p>6. Training</p> <p>7. Inputs</p> <p>8. Other Expenses</p> <p>9. Contingencies</p>	<p>Implementation Target (Type and Quantity) (In US \$000)</p> <p>July 1984 - June 1985</p> <table> <tbody> <tr><td>1.</td><td>313</td></tr> <tr><td>2.</td><td>30</td></tr> <tr><td>3.</td><td>25</td></tr> <tr><td>4.</td><td>107</td></tr> <tr><td>5.</td><td>18</td></tr> <tr><td>6.</td><td>10</td></tr> <tr><td>7.</td><td>27</td></tr> <tr><td></td><td><u>530</u></td></tr> <tr><td>1.</td><td>155</td></tr> <tr><td>2.</td><td>30</td></tr> <tr><td>3.</td><td>22</td></tr> <tr><td>4.</td><td>6</td></tr> <tr><td>5.</td><td>10</td></tr> <tr><td>6.</td><td>18</td></tr> <tr><td>7.</td><td>8</td></tr> <tr><td>8.</td><td>4</td></tr> <tr><td>9.</td><td><u>12</u></td></tr> </tbody> </table>	1.	313	2.	30	3.	25	4.	107	5.	18	6.	10	7.	27		<u>530</u>	1.	155	2.	30	3.	22	4.	6	5.	10	6.	18	7.	8	8.	4	9.	<u>12</u>	<p>1. Consultants and Contractor Reports.</p> <p>2. GOG Annual Budget.</p> <p>3. AID disbursement records.</p>	<p>Assumptions for providing inputs:</p> <p>1. All financing in place.</p> <p>2. AID &amp; GOG funds become available on schedule.</p> <p>3. Personnel available.</p> <p>4. Commodities under previous IRI Contract are available for use in the Project activities.</p>
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APPLIED RESEARCH  
QUARTERLY REPORT NO. 13  
NOVEMBER 1983

IRI RESEARCH INSTITUTE, INC.  
CONSULTANTS TO GUYANA RICE BOARD

## APPLIED RESEARCH

### I. SUMMARY

#### A. HIGHLIGHT

Diwani may increase Guyanese farmers' income by 26.7 million dollars (US\$8.9M) and newly identified Diwani strain may further increase Guyana Rice Mills' income by 17.1 million dollars (US\$5.7M) annually!

Diwani, screened from more than 260 high yielding varieties, was found to be always the highest or occasionally second highest yielding at research plots in 7 tests over the past four consecutive crops (spring crop 1982 through autumn crop 1983). Its high yielding capacity, wide adaptation throughout Guyana and resistance against the major diseases have been confirmed also in the past two crops in regional tests under the commercial production scale. On the average, Diwani outyielded Rustic or other Guyanese varieties by 10 bags/acre in regional tests.

A decision was made by GRB to plant 1,000 acres of Diwani for seed production in this coming spring crop 1984. We expect that Diwani will occupy 50 to 60% of Guyana paddies a year from now, and this eventually will reach 80 to 90% a few years after. The increase in income for Guyana rice industry because of the yield increase may reach 26.7 million dollars (G\$). The major beneficiaries are farmers.

More important, we have made a breakthrough to improve the head rice milling yield of Diwani. We have identified two new strains of Diwani out of more than 1,000 lines examined. These two new strains have grain quality comparable to or

better than US long grain rices such as Starbonnet and Bluebelle. Their yielding capacity is as good as or even better than standard extra long Diwani. They are long grained and outyielded Diwani in head rice milling return by 10 to 20%. These new strains, because of high milling return, may further boost the income of Guyana rice industry by 17.1 million dollars annually. The major beneficiaries will be Guyana Rice Board and private mills. We expect that at least 3 more crops will be needed to develop the new strains for commercial production.

B. MAJOR ACTIVITIES

1. Carried out routine maintenance of the field trials laid out for autumn crop 1983 at 3 locations - Black Bush Polder, HARDS and Guyana School of Agriculture in Mon Repos. The last harvest will be completed by the middle of January next year.
2. Monitored and collected the results of regional tests on determination of Diwani's adaptation under a variety of conditions throughout Guyana.
3. Made a study on the anticipated nation wide yield increase and income increase of farmers in the next four years, because of new variety Diwani.
4. Made a breakthrough research to improve the head rice milling return of diwani --- identification of two new strains of Diwani which have milling return better than Starbonnet. These two new Diwani strains

also out yielded standard Diwani by 15% in paddy yield in a preliminary test.

5. Made a study on the anticipated income increase for Guyana Rice Industry because of substantially higher milling return of new Diwani strain.
6. Imported more than 300 promising high yielding rice selections collected from all over the world through CIAT, Columbia to keep up the varietal improvement research.
7. The specialist was on leave from the project between August 14 and September 24 to attend the annual meeting of American Society of Agronomy in Washington DC and for a home-leave.

## II. OUTSTANDING ACHIEVEMENTS

Several outstanding achievements were obtained in this report period. They are as follows:

- A. Confirmation of High Yield Capacity and Wide Adaptation of Diwani Throughout Guyana,
- B. Diwani May Boost Guyanese Farmers' Income by 26.7 Million Dollars,
- C. A Breakthrough in Improving Head Rice Milling Return of Diwani -- "Identification of New Strains of Diwani", and
- D. New Diwani Strain May Further Boost Guyana Rice Board and Private Mills' Income by 17.1 Million Dollars.

A. CONFIRMATION OF HIGH YIELD CAPACITY AND WIDE  
ADAPTATION OF DIWANI THROUGHOUT GUYANA

Diwani, screened from more than 260 high yielding rice varieties tested at Black Bush Polder, has been found to be the highest or occasionally second highest yielding in 7 variety yield tests over 2 years of 4 consecutive seasons (spring crop 1981 through autumn crop 1983). Table 1 gives the results of these seven tests. Because of its high yield capacity and high resistance to the major diseases, it was recommended to replace a Guyanese variety Rustic, also an extra long rice, in August 1982 (IRI Quarterly Progress Report No. 8, August 1982).

The test to determine Diwani performance under commercial production scale was first conducted at Black Bush Polder State Farm in autumn crop 1982. Table 2 gives the results. In this test Diwani (1.5 acre size) produced 6.30 t/ha (40 bag/acre) whereas the control varieties Rustic and Starbonnet, respectively, produced 4.25 t/ha (27 bag/acre) and 3.77 t/ha (24 bag/acre). Diwani outyielded the local varieties by 48 up to 67%.

In spring crop 1983, such commercial production test was expanded to East Denerara (Bel Field) and Essequibo State Farms. The plot sizes of Diwani were 5 acres up to 12 acres. Table 3 gives the results. Diwani produced 5.19 to 6.60 t/ha (33 to 42 bag/acre) depending on locations whereas Rustic produced 4.09 to 4.56 t/ha (26 to 29 bag/acre). Diwani outyielded Rustic by 27 up to 45%.

In autumn crop this year, the commercial production tests were greatly expanded to a number of locations throughout the whole of Guyana. The size of plots varied from 3.75 acre up to more than 100 acres, which, indeed, covered small farms and large farms commonly

Table 1.

Yields of Diwani Compared with Rustic, Starbonnet and Others in Seven Variety Yield Tests at Research Plots of Black Bush Polder and Mon Repos, Guyana, Spring Crop 1982 Through Autumn Crop 1983.

1982			1982			1982			1983			1983			1983			1983		
Spring Crop -(BBP)-			Autumn Crop -(BBP)-			Late Autumn Crop -(BBP)-			Spring Crop -(BBP)-			Late Spring Crop -(BBP)-			Autumn Crop -(BBP)-			Autumn Crop -(Mon Repos)-		
Yield			Yield			Yield			Yield			Yield			Yield			Yield		
Variety	t/ha	% <sup>a</sup>	Variety	t/ha	% <sup>a</sup>	Variety	t/ha	% <sup>a</sup>	Variety	t/ha	% <sup>a</sup>	Variety	t/ha	% <sup>a</sup>	Variety	t/ha	% <sup>a</sup>	Variety	t/ha	% <sup>a</sup>
Diwani	9.28	136.4	CICA 8	7.29		Diwani	7.01	106.5	Diwani	8.59	103.5	Diwani	7.38	107.7	Diwani	9.02	137.7	J367	4.91	
CICA 4	9.20		Diwani	7.24	106.0	J386	6.80		Rustic	8.30	100.0	Rustic	6.85	100.0	J358	8.70		Diwani	4.89	100.4
Eloni	8.63		CICA 4	7.16		J229	6.54		Champion	7.80		Viral-T#13 <sup>b</sup>	6.41		J229	8.45		Rustic	4.66	100.0
CICA 8	8.55		N	6.87		Rustic	6.58	100.0	CICA 8	7.67		CICA 9	6.00		IR22	7.31		J229	4.63	
CICA 6	8.44		Rustic	6.83	100.0	Eloni	6.51		N	7.64		Viral-T#20 <sup>b</sup>	5.74		J367	7.24		J369	4.53	
75490	8.34		75490	6.75		J367	6.26		IR22	7.56		Viral-T#30 <sup>b</sup>	5.59		J383	7.07		J358	4.37	
N	8.00		IR22	6.70		J351	6.19		Eloni	7.43		" #9 <sup>b</sup>	5.47		J369	6.83		IR22	4.27	
75406	8.00		Eloni	6.61		J369	5.93		CICA 9	6.93		" #24 <sup>b</sup>	5.37		Rustic	6.55	100.0	S/B	4.25	91.2
J266	7.82		CICA 6	6.61		CICA 8	5.55		S/B	4.70	56.6	" #3 <sup>b</sup>	5.19		CICA 9	6.45		CICA 9	4.11	
CICA 9	7.19		J266	6.59		J258	5.51		S/B	3.89		" #19 <sup>b</sup>	5.16		J386	5.61		J383	3.93	
GR277-2	7.00		CICA 9	6.27		J383	5.51		Belleum			" #8 <sup>b</sup>	5.15		S/B	5.15	78.6	J385	3.21	
84426	6.87		75406	6.20		IR22	5.42					" #19 <sup>b</sup>	5.15		J386	5.15		J385	3.12	
Champion	6.84		Champion	6.05		J384	5.11					" #19 <sup>b</sup>	5.15		S/B	4.20		J386	3.12	
Rustic	6.80	100.0	GR277-2	6.01		J311	5.02													
S/B	6.72	98.8	S/B	4.85	71.0	S/B	4.72	71.7												

a: The yield of Rustic is used as the base (100.0%) to indicate the relative yield % of Diwani and Starbonnet (S/B).

b: The medium maturation rice selections imported from CIAT, Colombia. Only eight out of 30 selections showing good head rice yields are listed here.

## 6.

Table 2.

Yields of Diwani and Control Varieties - Rustic and Starbonnet Under Commercial Scale Production, Autumn Crop 1982, Black Bush Polder.

<u>Variety</u>	Plot Size -Acres-	Yield (14% moisture)		
		-t/ha-	-Bag/acre-	-%
Diwani	1.5	6.3	40	140.1
Rustic	-	4.25	27	100.0
Starbonnet	-	3.77	24	88.9

Table 3.

Yields of Diwani and Control Varieties - Rustic, N and Starbonnet Under Commercial Scale Production in Three Regions, Spring Crop 1983.

<u>Region</u>	Plot Size of Diwani Ha (Acre)	<u>Varieties</u>							
		<u>Diwani</u>		<u>Rustic</u>		<u>N</u>		<u>Star- bonnet</u>	
		t/ha	Bag/ acre	t/ha	Bag/ acre	t/ha	Bag/ acre	t/ha	Bag/acr
Black Bush Polder	4.86(12)	5.97	38	4.40	28				
East Benerara	2.23(5.5)	5.66	36	4.09	26				
Essequibo Coast	3.24(8)	6.60	42	4.56	29	4.40	28	3.77	24
Average		6.11	38.9	4.35	27.7	4.40	28	3.77	24
*			140.4		100.0				88

\* The yield of control variety Rustic is used as the base (100.0%)

## 7.

seen in Guyana. In most cases, Rustic was used as the control variety, but in a few cases other varieties, Starbonnet, N, T or BG-79, were also used as the control. Diwani and the control variety were grown side by side or within a very short distance. The influence of variation in microclimatic and soils conditions was minimized.

The conditions under which Diwani was tested included:

1. fertile and very favourable microclimatic conditions for rice culture,
2. areas very conducive to the incidence of blast and/or brown leaf spots,
3. salty soil,
4. high land without adequate irrigation,
5. culture without fertilizer inputs,
6. water shortage, and
7. poor water management and weed control.

Indeed, should Diwani perform well under such a variety of conditions, it should be regarded a variety of wide adaptation in Guyana.

The results of the tests are given in Table 4. As can be seen from the results, Diwani produced 3.12 t/ha (19.8 bag/acre) up to 6.04 t/ha (38.4 bag/acre) whereas the control variety Rustic produced between 1.57 t/ha (10 bag/acre) and 4.84 t/ha (30.8 bag/acre). Thus, Diwani outyielded the local varieties by 11.3 up to more than 100%. On the average, Diwani outyielded Rustic by 48.5% or 1.56 t/ha (10 bag/acre) almost incredible!

Diwani outyielded Rustic more obviously at the locations where some adverse conditions exist such as conducive to disease incidence, water shortage or salty.

Table 4.

Yields of Diwani and Control Varieties - Rustic, N, Starbonnet, T  
and BG-79 Under Commercial Scale Production Throughout Guyana, Autumn  
Crop 1983

Locations	Conditions	Plot Size of Diwani Ha	Paddy Yield <sup>a</sup>					
			Diwani	Rustic	t/ha (Bag/acre)		S/B	BG-79
Essequibo State Farm	Blast & leaf brown spot often serious	27.92 (69)	4.43 (28.2)	2.35 (15)	1.89 (12)	T	2.31 (14.7)	
E/bo Private Farm	Water shortage in early stage, but no disease constraints	3.24 (8)	3.24 (20.6)	1.57 (10)				
E/bo Cooperative Farm	Water management and weed control less ideal	8.90 (22)	3.11 (19.8)				1.89 (12)	
West Demerara	Notorious for blast incidence	17.00 (42)	6.04 (38.4)		4.47 (28.4)			
East Demerara	Salty conditions	1.52 (3.75)	5.46 (34.7)	4.84 (30.3)		3.93 (25)		
East Demerara	Blast sometimes serious	14.57 (36)	5.46 (34.7)	3.55 (22.6)				
Cane Grove	Blast sometimes serious	4.05 (10)	5.03 (32)	3.77 (24)				
Frontland, B'ce	Highland, no fertilizer in- put and ideal irrigation not maintained	2.43 (6)	3.54 (22.5)					2.72 (17.3)
Black Bush Polder	Blast sometimes serious	4.43 (6)	4.52 (28.8)				3.14 (20)	
Average t/ha (Bag/acre)			4.78 <sup>c</sup> (30.41)	3.22 <sup>d</sup> (20.43)				
% <sup>b</sup>			148.5	100.0				

a: The yield data were supplied by the cooperating farmers in combine bag per acre, and one combine bag weighed between 150 and 180 pounds. However, in our calculation, all of the bags are assumed to weigh 140 pounds per bag, so that inflated data are avoided.

b: The yield of control variety, Rustic is used the base (100%).

c: Average yield calculated from the sum of total acreage.

d: Average yield calculated from the five figures listed in this table.

The yield difference becomes less significant where the conditions are more ideal. Under the ideal condition we assume the maximum yield capacity is expressed. This suggests that Rustic is more sensitive to the environmental conditions than Diwani and explains why Rustic is not stable.

At Essequibo State Farm where in autumn crop seasons rice often suffers from serious blast and brown leaf spot diseases damages, Diwani produced 4.43 t/ha (28.2 bag/acre) whereas Rustic produced 2.35 t/ha (15 bag/acre). The low yield of Rustic was caused by the serious damages of neck rot (blast) and brown leaf spots. Diwani in this crop also suffered from some fungus diseases (brown spots) on the leaves, however, the diseases became obvious after the grains were filled.

At a private farm close to the coast in Essequibo, Diwani produced 3.24 t/ha (20.6 bag/acre) whereas Rustic produced 1.57 t/ha (10 bag/acre). At this location diseases were not constraints, but the field had water shortage until 42 days after seeding. For this reason, both Diwani and Rustic were stunted at harvesting time. The big yield difference suggests that Rustic is more prone to water shortage than Diwani. This is supported by significantly deeper root development of diwani than Rustic, which was observed by the State Farm Manager, GRB, Essequibo.

At a co-operative farm in Essequibo, Diwani produced 436 bags of Diwani paddy on 22 acres of new field (19.8 bag/acre) whereas a nearby farm yielded 12 bag/acre of Starbonnet paddy. The cooperative farm was new to rice cultivation, and for this reason, their water management and weed control was not maintained at satisfactory conditions. Under such less than ideal management conditions Diwani out-yielded Starbonnet by more than 65% indicating the former can tolerate adverse management conditions more than the

latter. Berbice farmers claim that the same is true with IR22 over Starbonnet. They have learned of this from their experience over a number of years. Because of this, IR22 has over taken Starbonnet and become the most prevalent variety (75%) in Berbice. IR22 has never been released officially.

At a private farm in West Demerara, Diwani produced 6.0 t/ha (33.4 bag/acre) whereas N produced 4.47 t/ha (23.4 bag/acre). The area is notorious for blast disease incidence. Its geographic location is similar to Caledonia where GMB used to carry out the blast tests because of very heavy incidence of the diseases. The cooperating farmer claimed that if he had planted Rustic, he probably could not get more than 2.35 t/ha (15 bag/acre). His experience suggested that Rustic is more susceptible to the blast diseases than N. For this reason N was used. The N rice still suffered from obvious blast disease and received fungicide spray whereas Diwani did not.

At a location by the coast (Bel field) where the soils often become salty, Diwani produced 5.46 t/ha (34.7 bag/acre) whereas Rustic also produced fairly well 4.34 t/ha (30.3 bag/acre). Nevertheless, Diwani outyielded Rustic by 11.3%. At this location disease incidence was not observed. Under the conditions (at our research plot) in which disease incidence was not observed, Diwani out-yields Rustic by 4 up to 8%. Apparently, the salty soil has widen the yield difference by 3.3 up to 7.3%. This would suggest Rustic is more sensitive to salt or in other words, Diwani is more salt tolerant. The salt tolerant Guyanese variety T produced 3.93 t/ha (25 bag/acre) at this particular location.

At a location approximately 2 to 3 miles from the coast in East Demerara (Bel Field), Diwani produced 5.46 t/ha (34.7 bag/acre) whereas Rustic at the nearby location produced 3.55 t/ha (22.6 bag/acre). At this location incidence of blast diseases sometimes may occur in autumn crop seasons.

At a location approximately 5 to 6 miles from the coast in Cane Grove, Diwani produced 5.03 t/ha (32 bag/acre) whereas Rustic produced 5.03 t/ha (24 bag/acre). Because of blast disease incidence the cooperating farmer sprayed fungicide for Rustic and other local varieties (N and IR22) but not for Diwani. Diwani did not suffer from the blast disease attack. The cost of the fungicide spray was approximately \$10.00 per acre.

At a location in Frontland of Berbice where the field is situated in highland area, and for this reason proper irrigation was not maintained, Diwani produced 3.54 t/ha (22.5 bag/acre) without any fertilizer inputs. Under the same condition, BG-79 produced 2.72 t/ha (17.3 bag/acre). Many farmers plant BG-79 on the land of less ideal condition. They claim that this traditional variety does not need high inputs and can stand adverse conditions better than improved high yielding varieties. The results of this test may clarify the incorrect belief of many farmers, agronomists, and government officials, that all of high yielding varieties produced well only under the ideal conditions and high inputs.

Suriname and Guyana have very similar climate and soils. However, Suriname does not recommend TSP for their varieties including Diwani. Whereas most Guyanese farmers strongly insist that half bag per acre of TSP be needed, although GRB has recommended that TSP be applied every

other crop, most farmers do not seem to follow such recommendation. Their strong belief in TSP effect has probably come from their experience with Starbonnet. The fact that Suriname farmers outyielded Guyanese farmers by 40% (9 bag/acre) without TSP would suggest that Suriname's varieties (including Diwani) may exploit the native soil phosphorous more effectively than Guyanese varieties. Our fertilizer tests over the past two years in Black Bush Polder also demonstrate that the rice yield in most farms can be maintained without TSP. In view of these results, when Diwani is recommended for commercial production, we may reduce TSP by half from half bag per acre to a quarter bag per acre. This recommendation applies to most farms where TSP has been already applied each crop for a number of years. For some particular soils or area where TSP plays a critical role to maintain the yield, such a recommendation may not apply. Either extension workers or local farmers may locate such specific areas by their experience and/or soil tests. However, such areas occupy only a small fraction.

B. DIWANI MAY BOOST GUYANESE RICE FARMERS' INCOME BY

26.7 MILLION DOLLARS ANNUALLY

In a recent meeting of GRB on seed production for 1984 (1983-11-25), a decision was made to sow 1,000 acres at the three State Farms of GRB to produce the seed of Diwani in this coming spring crop 1984. The seed produced from this can be used to sow 20,000 to 30,000 acres of Diwani in autumn crop of 1984. In 1985 we expect that between 140,000 acres (two crops combined together) will be planted to Diwani as shown in Table 5. This projection is made based on the trend in which N and Rustic spread in the whole Guyana and IR22 in Berbice region. Table 5 also shows the projection up to 1987.

Table 5  
Increase in Net Income due to Replacement of Guyanese Commercial Varieties  
with Diwani and New Diwani Strain

Crop Year	Acreage of Paddies in Whole Guyana <sup>f</sup>			Increase in Net Income due to Diwa- ni and New Diwani Strain <sup>a</sup> -M dollars (G\$)-	Increase in Net Income due to New Diwani Strain <sup>b</sup> -M dollars (G\$)-	Total Increase in Income Annually -M dollars (G\$)-
	Total <sup>d</sup>	Diwani <sup>c</sup>	New Diwani Strain <sup>e</sup>			
	-----Acres-----					
Spring 1984	113 000	3 000	-	0.36	-	-
Autumn 1984	133 000	31 500	4	3.62	-	-
Total 1984	246 000	34 500	4	4.18	-	4.18
Spring 1985	113 000	65 000	120	7.68	-	-
Autumn 1985	133 000	75 000	3 600	9.09	-	-
Total 1985	246 000	140 000	3 720	16.97	-	16.97
Spring 1986	113 000	30 000	70 000	12.13 <sup>c</sup>	5.99	-
Autumn 1986	133 000	10 000	90 000	12.13 <sup>c</sup>	7.70	-
Total 1986	246 000	40 000	160 000	24.26 <sup>c</sup>	13.69	37.95
Spring 1987	113 000	10 000	100 000	13.34 <sup>c</sup>	8.55	-
Autumn 1987	133 000	10 000	100 000	13.34 <sup>c</sup>	8.55	-
Total 1987	246 000	20 000	200 000	26.68 <sup>c</sup>	17.10	43.78

- a. Increase in net income due to Diwani over the previous year in which no Diwani was planted, assuming Diwani will outyield by 5 bag per acre. The major beneficiaries are farmers.
- b. Increase in net income due to New Diwani Strain because of higher milling return of this strain, assuming New Diwani Strain produces as well as Diwani. The major beneficiaries are GRB and private mills.
- c. The figure includes those due to Diwani and New Diwani Strain because of yield increase over Rustic. It is assumed that Diwani produces as well as New Diwani Strain.
- d. Based on the target acreage projected by Guyana Rice Board.
- e. Based on Jeff C. H. Wang (IRI Research Specialist's) estimation with which L.G. Small (Manager, Production, Research and Extension, GRB) has concurred.
- f. Based on Jeff C. H. Wang's estimation.

From the presentation in the previous section it is quite conservative to expect that a yield increase of 5 bags per acre can be obtained. As was mentioned earlier Surinam farmers outyielded Guyanese farmers by approximately 9 bag/acre of paddy. In the specialist's opinion, at least 4 to 5 bag/acre may be attributed to varietal difference while the balance is attributed to the difference in the culture practices and husbandry between the two neighbouring countries. Our test results indicate that a yield increase of 6.34 bag/acre in test plots and that of more than 10 bag/acre in regional tests were obtained. This would support that anticipation of an increase of 5 bag/acre is quite conservative.

Based on this assumption, it is estimated that the increase in net income be \$121.25 per acre. The calculation is based on that :

- (1) One bag paddy sells \$30,
- (2) The harvesting costs are \$8.00 per bag,
- (3) Half of the total savings due to reduction of TSP from half bag to a quarter bag per acre (\$12.50) and omitting of one fungicide spray (\$10) is accounted for the cost reduction.

Thus the calculation is as follows:

5 bag x \$30/bag	=	\$150 00
-5 bag x \$8/bag	=	\$ 40 00
<u>+½ (\$12 50 + \$10)</u>	=	<u>\$ 11 25</u>
Net increase	=	\$121 25/acre

In figuring out the cost reduction, half of the total savings (TSP and fungicide spray) is used because fungicide spray is not a very common practice for many small farmers and many farmers may not be willing to reduce the TSP to a quarter bag per acre initially.

Translating the above figure into the national scale we project that in the next two years we can boost the rice farmers' income by 21.158M dollars. Once Diwani starts to occupy approximately 57%, the increase in income will be 17M dollars (US\$5.67M) annually in 1985. This figure will reach \$26.7M (US\$8.9M) annually if 90% of Guyanese paddies are occupied by Diwani. Thus the total expenses of IRI operation (\$8.1M) over more than 3 years in the past can be paid off within a very short period of time.

C. A BREAKTHROUGH IN IMPROVING HEAD RICE MILLING RETURN OF DIWANI - IDENTIFICATION OF NEW STRAINS OF DIWANI

Extra long rices like Diwani and Rustic, though attractive in shape, do not produce good milling return. In Suriname, selection of extra long rice is traditionally required, but recent reports from there indicate this does not pay economically. As was pointed out by the specialist in an earlier report, in order to improve the head rice milling, selection of extra long rices should be avoided.

Having confirmed high and stable yield capacity of Diwani and its wide adaptation in Guyana, ideally we would like to have a Diwani which retains Diwani's yield capacity, wide adaptation and disease resistance but which are long grained and has substantially higher head rice milling return. In reality, we have identified a few such strains from a multiplication plot in Black Bush Polder. The plot was laid out according to head-rows method and involved more than 1,000 head rows.

These strains may have been developed from:

- (1) Segregation
- (2) Natural crosses with other varieties
- (3) Mutation and
- (4) Contamination of other off-type varieties

Morphologically they are very similar to the standard

Table 6

Agronomic characteristics of Standard Extra Long Diwani and  
Several New Diwani Strains Autumn Crop 1963, Black Bush Polder

Diwani Type	Height -cm-	Maturation		Panicle # %/hill	Pubescent or Glabrous	Yield	
		Flowering -days-	Harvest -days-			-t/ha-	(Bag/acre)
Standard Diwani	112.2	90	130	9.3	G	6.50	(41.3)
IDS#33	101.3	84	128	10.0	P	4.88	(31.0)
IDS#66	109.3	80	120	12.0	P	5.49	(34.9)
IDS#404	100.3	83	123	7.0	P	4.85	(30.8)
IDS#551	118.7	86	126	10.0	P & G <sup>a</sup>	7.77	(49.4)
IDS#569	101.3	87	127	10.0	P & G <sup>a</sup>	7.28	(46.3)
IDS#622	106.1	84	124	10.0	P	6.24	(39.7)

a: Mixture of both pubescent and glabrous grains were found in the same head row, resulting from segregation.

Table 7.

Rice Qualities of Standard Extra Long Diwani, New Diwani Strains and Two Control Varieties Rustic, Starbonnet and Bluebelle

Variety	Grain Type	Amylose %	Grain		Length White mm	Hilling Yield		Chalkiness %
			Paddy mm	Cargo mm		TL %	HR %	
Starbonnet	L.	24-26 <sup>a</sup>	9.2 <sup>a</sup>	7.2 <sup>a</sup>	6.7 <sup>a</sup>	71	62	8.5
Bluebelle	L.	24-26 <sup>a</sup>	9.6 <sup>a</sup>	7.5 <sup>a</sup>	6.9 <sup>a</sup>	70 <sup>a</sup>	60 <sup>a</sup>	-
Rustic	E.L.	28	11.3	9.0	8.0	71	45-55	2.4
Standard Diwani	E.L.	23-26	11.0	8.5	8.0	70	45-58	8.18
NDS#33 (P)	L.	-	8.8	6.7	6.4	72	70	4.3
NDS#66 (P)	L.	-	8.9	6.7	6.4	70	68	4.3
NDS#404 (P)	L.	-	8.9	6.6	6.4	70	68	2.8
NDS#551 (P)	L.	-	9.4	7.1	-	-	-	-
					7.1 <sup>b</sup>	72 <sup>b</sup>	68 <sup>b</sup>	3.4 <sup>b</sup>
NDS#551 (G)	L.	-	9.8	7.4	-	-	-	-
NDS#589 (P)	E.L./L.	-	10.1	7.8	7.2	72	65	6.8
NDS#589 (G)	L.	-	9.3	6.9	-	-	-	-
NDS#822 (P)	L.	-	9.0	6.7	6.3	70	69	0.8

a: Data from USDA Handbook No. 289 "Rice in the United States: Varieties and Production". June 1973.

b: Data obtained from the mixture of Pubscent and glabrous NDS#551.

extra long Diwani. The major differences of these strains from the standard Diwani, apparently, are in their grain length and milling qualities. It is very likely that they have been developed from the segregation though the other mechanisms cannot be excluded. Tables 6 and 7, respectively, give their agronomic characteristics and the qualities.

As can be seen from Table 6, these strains all have 3 up to 10 days shorter maturation than the standard Diwani. This shortening of maturation, when compared with standard Diwani, is desirable for Guyanese farmers since the standard Diwani has a few days longer maturation than Starbonnet. Their tillering capacity is nearly the same as the standard Diwani. In this preliminary test, two strains (IDS #551 and IDS #589) appeared to have higher yielding capacity while the other four strains (IDS #3, #66, #404 and #622) had slightly lower to moderately lower yielding capacities. The standard Diwani are glabrous. It was, however, interesting to find out that the grains from the four lower yielding strains are all pubescent while approximately 80% of the grains from the two higher yielding strains (#551 and #589) are pubescent. Obviously, the two higher yielding strains are still in segregation stage with respect to glabrousness. Since glabrousness is controlled by a single recessive gene, the glabrous strains of #551 and 589 will not segregate further while the pubescent ones may do so.

The most existing finding was that these new strains have substantially higher head rice milling return (65 up to 69%) than the standard extra long Diwani (45-58%). Obviously the increase in head rice milling return resulted from the reduction in kernel's length from 6.5mm (brown rice or cargo rice in Guyanese) in the standard Diwani to 6.6 - 7.6mm in the new strains. The two higher yielding strains (#551 and #589) have

the length comparable or slightly longer than that of Bluebelle, one of its ancestors. While the kernels of the four lower yielding strains (6.7 mm) are approximately 15% shorter than those of Bluebelle (7.5m). Nevertheless, these four strains can be classified as long grain rice.

It was also interesting to note that the chalkiness in these strains reduced drastically to 0.8 - 6.8% from 6 - 18% of that in the standard Diwani. Thus the improvement was not only obtained in milling return but also in reduction of chalkiness, an important parameter to downgrade the rice quality in the market.

The amylose content, the most important parameter which controls the cooking quality, of these strains remains to be analysed. From the parentage of Diwani, we expect they should be in the range between 23 and 25%. Should rice have an amylose in this range it is dry and fluffy after cooked.

The qualities (head rice, chalkiness and color) of these strains are comparable to or better than Starbonnot (Table 7). Identification of these strains may be claimed as a breakthrough in breeding of tropical high yielding varieties which have as high qualities as do US long grain rices. This was supported by one of the most authoritative rice breeders (founder of the miracle rice IR8) in the world, Dr. Peter R. Jennings. He reported that so far no tropical high yielding varieties which can compete with US long grain rices in qualities have been developed. He made such a report in a seminar when he visited Guyana in May 1983.

It is expected that these new Diwani strains retain all the other properties of the standard Diwani such as yield capacity, disease resistance, wide adaptation

and cooking quality. This may be especially so for the two higher yielding glabrous strains #551 and #582. Thus, the chance to find out such strains was 2 in 1,000.

The specialist experience with Diwani tests over the past two years would indicate that at least 3 more crop /will time (a year and half)/be needed to develop the new Diwani strain for commercial production. Should we follow the most conventional method (crossing) to attain the same improvement, at least 5 years are needed. It took, in fact, 10 years and 8 years to release Rustic and Diwani, respectively, from the initial crosses. How lucky we are! We must take the full advantage of this finding to develop them to commercial varieties because the length of time required is only one fifth of the conventional method.

D. NEW DIWANI STRAIN MAY BOOST GUYANA RICE BOARD AND PRIVATE MILL'S INCOME BY 17.1 MILLION DOLLARS ANNUALLY

The specialist was the first to point out that the poor milling return of N and Rustic might be one of the attributing factors making GRB operation not profitable (IRI Quarterly Progress Report No. 3, May 1981).

Using the data obtained from the experiment plot at Black Bush Polder, the specialist figured out GRB might lose 2M dollars because of poor milling quality of Rustic and suggested GRB management to review the problem.

The specialist recommended Diwani to replace Rustic because of the former's high and stable yield. The milling yield of Diwani is only slightly better than Rustic. It is interesting to study the magnitude of the profits which may arise from the high milling rice, new Diwani strain, for GRB and the private mills.

In this study four rice varieties harvested from the

research plot - Starbonnet, Rustic, Diwani and New Diwani Strains #551 and #582 were used as the materials.

The laboratory mill set up at Black Bush Polder was used to determine the milling yields (total white rice, head rice and broken rice). The results are shown in Table 8. Using these results we can calculate the prices of total finished products (head rice and broken rice) of the four rice varieties after one bag of paddy is processed. Table 9 gives the results.

As can be seen from Table 9, when one bag of paddy is milled, Starbonnet, Rustic, Diwani and New Diwani Strain, respectively, produce \$37.44, 34.87, 35.01 and 38.43 dollars of finished products. Here, it is assumed that one bag (180 pound) of head rice sells \$70.60 (current price of White B rice) while one bag broken rice sells \$44.80. The results thus indicate one bag of new Diwani strain will generate \$38.43 - 35.01 = \$3.42 more than standard extra long Diwani. Standard extra long Diwani out-produces Rustic by \$0.14, while new Diwani strain out-produces Starbonnet by \$0.99.

Since an increase of 5 bag/acre is assumed, we can safely estimate that an average yield of 25 bag/acre be obtained in the nationwide scale. Therefore, the increase in the income for GRB and private mills due to higher milling new Diwani strain will be:

$$\$3.42 \times 25 = \$85.50 \text{ per acre.}$$

Using this figure, we can calculate the increase due to new Diwani strain in 1986 will be:

$$\$85.50/\text{acre} \times 160,000 \text{ acres} = 13.68 \text{ million dollars.}$$

Here it is assumed that 160,000 acres (2 crops combined together) be planted to New Diwani Strains.

The income increase may reach \$17 M if 200,000 acres (2 crops combines) or 81.3% of Guyana's paddies are planted to new Diwani strain (Table 5).

Table 8

## Laboratory Milling Yields of Four Rice Varieties from Autumn Crop 1983

<u>Variety</u>	<u>Total rice</u>	<u>Milling Yield</u>		<u>Total head rice equivalent*</u>
		<u>Head rice</u>	<u>Broken rice</u>	
Starbonnet	71.4	64.5	6.9	68.9
Rustic	71.3	50.5	20.8	63.5
Divani	70.2	53.5	16.7	64.1
New Divani Strain	71.8	66.8	5.0	70.0

\* Sum of head rice and broken rice in which broken rice is converted to head rice equivalent according to the market price. In Guyana the price of broken rice is somewhere between 63.6 and 67.7% of white rice's. In this particular case we have used 63.6%.

Table 9.

Total Prices of Finished Products (Head Rice and Broken Rice) of  
Four Rice Varieties after Milling of One Bag (140 Pound) of Paddy

Variety	Bag of Paddy Processed	Head	Rice	Broken	Rice	Total Price of Head Rice & Bkn. Rice
		Bag (180 lb)	G\$*	Bag (180 lb)	G\$*	G\$
Starbonnet	One	0.502	35.44	0.054	2.40	37.82
Rustic	One	0.393	27.75	0.159	7.12	34.87
Divani	One	0.416	29.37	0.126	5.64	35.01
How Divani Strain	One	0.520	36.71	0.033	1.72	38.43

\*Based on the assumption that one bag (180 pound) of Head rice sells G\$70.60 (current price for white rice B), while the broken rice is assumed to sell G\$44.00 per bag (180 pound).

In summary, if 220,000 acres of paddies out of 246,000 acres or 89.4% can be planted to Diwani and New Diwani strains, an increase of \$43.78M income can be obtained for Guyanese farmers (\$26.68M) and Guyana rice mills (\$17.10M) in 1987 (Table 5). This fully demonstrates how important rice research is to Guyana rice industry. Indeed, the rice research expenses are very humble when compared with the return from the research work.

### III. RESULTS OR RICE RESEARCH IN 1983

As was reported earlier, in 1983 the research programmes have been expanded to the whole Guyana from Black Bush Polder. The research plots which could meet the requirement of the level of the international standard were laid out at Black Bush Polder, MARDS, Rice Research Station and Lion Repos Guyana School of Agriculture, while the plots of applied research type (in large plot size and without replication) were laid out at the State Farm of Essequibo.

At the time when this report was being prepared, one of the variety yield trials which involved 24 promising rice selections screened from 200 selections imported in 1982/1983 was not completed. The harvest of this trial will be completed by the middle of January 1984.

Several outstanding research completed in this report period was presented in the previous section, while the results which cover the whole year of 1983 (spring crop and autumn crop) will be compiled in a separated report sometime in January 1984.

### IV. TEMTATIVE PLAN OF RICE RESEARCH IN SPRING CROP 1984

#### A VARIETAL IMPROVEMENTS

1. Development of New Diwani Strain of High Milling Return for Commercial Production.

2. First Screening of High Yielding Varieties from Germplasms Newly Imported from All Over the World.
3. Refining the Screening of High Yielding Varieties.
4. Regional Tests of Promising Varieties.
5. Multiplication of Promising Varieties through Head-Rows Selection Method.

B. SOILS AND FERTILITY MANAGEMENT

1. A Study of Improving Nitrogen Fertilizer Efficiency.
2. Soil Phosphorous Fertility Survey and Varietal Difference in Phosphorous Fertilizer Requirements.

EXTRACT FROM 1984 BUDGET SPEECH

NEW INSTITUTIONAL FRAMEWORK FOR THE RICE INDUSTRY:

The new institutional framework which is being established this year includes the following:

1. A rationalisation of the management activities of the Guyana Rice Board (GRB) by clearly separating into different institutions the two principal activities, milling and marketing.

- (a) The Guyana Rice Board, divested of its drying, milling and storing responsibilities will be transformed into the Guyana Rice Export Board (GREB) with basis responsibilities for:

- (i) Negotiating and entering into Government to Government and Government to non-Government contracts. GREB will be a principal in these contracts.

- (ii) Fulfilling these contracts: GREB will procure its rice for export by way of Suppliers' Contracts, where necessary.

- (iii) Monitoring and guiding the development of the domestic rice sector in response to trends and changes in the export markets for rice and rice products.

(iv) Advising the Government and the Industry in general on marketing prospects. It will be involved on an on-going basis in marketing research and analysis, establishing trends and preferences in export markets with a view to developing an information base adequate for strategic planning of production and exports of rice and rice products.

(v) Certifying exporters wishing to enter into contracts for the export of rice as well as advising on all matters pertaining to these arrangements. Private exporters will be permitted to export rice that is surplus to the requirements of the CARICOM market and other markets subject to Government to Government contracts.

(vi) Certifying the export quality of rice.

The export Storage facilities will be operated under the supervision of the GREB. Responsibility for overseeing the storage and preparation of rice for export, especially to those markets for which GREB is the exporter will be with the GREB.

Private exporters, who have negotiated their own markets will be paid the full price negotiated less the agency fee charged by the GREB. These exporters will have to pay for the services provided by the GREB.

The GREB will finance its operating costs by these fees which will be based on a percentage of the value of the export contracts. Its buying and selling operations will be managed through a separate trading account on behalf of the Government.

- (b) The rice drying/milling/storage activities will be transferred to a new specialised institution, the Guyana Rice Milling Corporation (GRMC), responsible for conducting such activities on a commercially viable basis.

This new Corporation, in addition to providing rice to the GREB for export, will be the sole body responsible for marketing rice on the domestic market. In discharging this responsibility, the GRMC could nominate individual private millers and other appropriate entities as agents responsible for supplying rice to particular local areas. It will also have the authority to procure rice from millers under Suppliers' Contracts.

- 2. A functionally autonomous Grading Authority will be created to maintain technical standards, consistent with international classifications, for grading paddy and rice. This Authority will be the sole entity for certifying grades of paddy and rice. The basic functions of the Grading authority will be:

- (a) To grade and certify all paddy arriving at the mills;
- (b) To grade and certify all rice milled for sale both locally and overseas;

- (c) To assemble and disseminate to the Industry all relevant data on grading and quality control;
- (d) To train, certify and license graders; and
- (e) To license mills, and to inspect their operations with a view to facilitating improvement in their quality control and other operations.

In addition, steps will be taken to rationalise the industry's research and extension facilities. An Agricultural Research Institute will be established. Due attention will be paid to all aspects of rice production, including the development of improved varieties and the establishment of an effective extension service.

Research and extension activities will be the responsibility of the Central Government.

The revenue from rice exports in excess of operating costs including the agency fee, will be used by the Central Government to assist in financing development.

#### The Price Determination Mechanism

The Planning Department of the Ministry of Agriculture will be responsible for the annual review of these prices. These reviews will take place before the second rice crop and the new prices will be announced before the end of August of the same year.

The cost of production will be based on the actual costs obtaining at the end of the first crop and the estimated costs for the second crop.

The new formula for determining the price of paddy will ensure compensation of small farmers for those costs of production over which they have no control. It is recognised that farmers owning machinery will benefit more since the rates at which they hire out their machines are higher than the economic costs of these services. Their approach, however, safeguards small farmers against the unavoidable rental rates which they have to pay to machinery owners. Also to the extent that small farmers improve on those elements of the cost of production over which they have control (i.e. increase their production efficiencies) their overall revenue earnings will be greater. The formula also has the added advantage for farmers in that the yield is based on the actual average for the previous year and therefore any improvement in yield which the present level of technology permits will entail additional income to farmers for the current year.

The price of rice will be determined by adding to the price of paddy an adequate margin for the costs of milling and other associated conversion costs. The domestic retail price of rice will be determined by ensuring adequate retail margins for retailers.

The policies and the pricing mechanism outlined above will be, of course, subject to periodic review in order to assess their efficacy and to serve as a basis for necessary improvement.

## RICE RESEARCH WORK PLAN

1984 JULY - 1985 JUNE

ACTIVITIES	1984						1985					
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
1. VARIETAL IMPROVEMENTS DEVELOPMENT OF NEW DIWANI STRAINS												
- SELECTION	-----					-----					-----	
- PERFORMANCE TEST	-----					-----					-----	
-QUALITY ANALYSIS				-----						-----		
-MULTIPLICATION	-----					-----					-----	
2. INITIAL SCREEN TESTS FOR NEW RICE SELECTIONS INTRODUCED FROM OUTSIDE OF THE COUNTRY	-----											
3. REFINING THE SCREEN TESTS FOR THE PROMISING VARIETIES/LINES IDENTIFIED EARLIER	-----											
4. REGIONAL TESTS FOR THE MOST PROMISING VARIETIES/LINES	-----					-----					-----	
5. VARIETAL MULTIPLICATION												
-DIWANI	-----					-----					-----	
-OTHER PROMISING VARIETIES/LINES	-----					-----					-----	
6. SOILS & FERTILIZATION STUDIES												
-COLLECTION OF SOIL SAMPLES AND SOIL ANALYSIS				-----					-----			
-POT TRIALS FOR SOIL PHOSPHORUS VARIETIES/LINE	-----					-----					-----	
-FERTILIZER TRIALS	-----					-----					-----	
7. TRAINING OF COUNTERPART STAFF	-----											
8. VISITING FARMERS & FARMS ROUTINELY TO COLLECT AND ANALYZE THE INFOR- MATION ON THE YIELD CONSTRAINTS WHICH CAN BE SOLVED BY AGRONO. RES.	-----											

SEED PRODUCTION - WORK PLAN1984 JULY - 1985 JUNE

ACTIVITIES	1984					1985							
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	
1. Implement procedures for the production of breeder and foundation seed	-----												
2. Implement procedures for the production of registered seed	-----												
3. Implement system of quality control		-----							-----				
4. On the job training of seed delivery personnel	-----												
5. Establishing seed testing laboratories		-----											
6. Revitalizing seed processing of facilities	-----												

RICE GRADING

ANNEX 4 (c)

PLAN OF IMPLEMENTATION TASKS

DATE:

Month:	Day:	Development/Implementation 1/	Training 2/	Specific Regulations 3/	Administration/Operations 4/
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1984

8	1	Draft OIA completed by GOC and forwarded to appropriate authorities as determined by GOC. Estimated date unknown, but assume 60 to 120 days.			Evaluate possible facilities at Georgetown and Corriverton for export inspection, weighing, training, final appeals, and administration.
		Begin drafting general regulations, format and content.			
8	13	Select and order inspection, weighing and training equipment required for phase 2. Arrange training programs in the U.S. Develop operating budgets. Review facility proposals.	Select two people to be sent to U.S. for training.		Draft job descriptions, performance standards, pay scales, and hiring procedure. Develop operating budget estimates, fee schedules, record-keeping procedure.
9	1	Arrange training program for Guyana.		<u>Standards</u> Begin developing standards for inspection and weighing equipment and procedure; packaging standards; proposed revision of rice standards.	Design accounting, legal, and operating documents. Evaluate staff requirements and guidelines and submit list of recommendations/applicants.
9	5	Coordinate U.S. training, monitor progress. Complete equipment shipments and training items. Review personnel needs.	Training for two persons; one for three weeks in Kansas City; the other for three weeks in New Orleans, La.		Develop employment package for presentation at training session.
9	26	Coordinate in-country training, review operating budget.	Training ends and return to Guyana. Set up in-country training. Select personnel for training.	Complete standards work (24 days TA)	Develop record system for statistics on shipments, samples, inspections, weights, sanitation.

DATE:

Month:	Day:	Development/Implementation	Training	Specific Regulations	Administration/Operations
10	15	Approve draft standards and send to QOC for final review. Review staff requirements and list of applicants.		<u>Certifications</u> Design inspection certificate, develop operating program to include legal, accountability and security aspects. Complete certification program (10 days TA)	
10	6	Coordinate standards implementation. Approve draft certification regulations.	Expatriate training team of two people arrives to begin two sessions of one week each. Total time in-country eighteen days. (60 days TA)		
10	27	In-country assessment of phase 2.			
11	1	Implementation of GIA and start of GIS for export inspection ; domestic appeals.			
11	7	Assessment report and draft work plans for phase 3.			
		<u>Start Phase</u>			
11	31	Develop domestic supervision/monitoring inspection program.	Develop training materials for GIS licensing of grain graders.	<u>Licensing</u> Develop licensing program for rice inspection and facilities. Complete licensing program (10 days TA)	Evaluate facilities for domestic monitoring. Draft job description performance standards, wage rates and hiring procedures.
12	19	Approve licensing program and complete draft regulations.	Set up training schedule, locations, equipment requirements and prepare materials.		Develop operating guidelines. Prepare budget estimates. fee schedules record keeping procedures, billing and payment invoices.

DATE:

Month:	Day:	Development/Implementation	Training	Specific Regulations	Administration/Operations
1985					
1	5	Approve training program, purchase and ship training equipment required for phase 3. Review facility recommendations.			Appraise record keeping. Evaluate staff requirements. Submit list of applicants. Develop accounting documents security procedures, planning and accountability documents.
2	9	Review operating guidelines and 1st quarter performance.	Begin training sessions for licensing grain inspection and GIS personnel.		Complete work assignments.
	13	In-country assessment of phase 3. Review staff requirements and applicants.	Evaluate training, issue licenses, determine training needs for 1984.		Complete assignment, (9 months half time) (TA)
	27	Implementation of GIS supervision/monitoring for domestic inspection.	Ongoing training as required to be provided by GIS.		
	16	Review of second quarter performance. Assessment of program.			

1/ Development/Implementation- Manage the project, direct activities, coordinate required technical assistance and resources, provide evaluation and assessment at completion of each phase.

2/ Training- Provide schedules, location, and training topics for two Guyanese to train in the United States with an assessment report at the completion of training. Provide two courses including training materials and instructors at Georgetown. One course to consist of one week's instruction on general rice inspection. The second course to consist of week's training on supervision of an inspection service. Each course to train up to fifteen student selected by GDD and USAID.

3/ Specific Regulations- Provide technical material to support the Grain Inspection Act covering necessary functions of standards, regulations, certification, and licensing.

4/ Administration/Operations- Provide technical support in operational activities and administration of Grain Inspection Service implementation program.

DETAILED STAFFING PATTERN

(a) Applied Research:

	<u>Present</u>	<u>Projected</u>
<u>Professional Staff</u>		
Plant Breeder	1	1
Agronomist	<u>-</u>	<u>1</u>
Sub-total	<u>1</u>	<u>2</u>
 <u>Sub-Professional Staff</u>		
Technical field Officers	4	8
Junior Technical field officers	<u>2</u>	<u>2</u>
Sub-total	<u>6</u>	<u>10</u>
 <u>Clerical and Other Support Staff</u>		
Typist/Clerk	1	1
Driver	1	1
Laborers	<u>12</u>	<u>32</u>
Sub-total	<u>14</u>	<u>34</u>
 GRAND TOTAL	<u>21</u>	<u>46</u>

(b) Seed Production:

Projected

Professional Staff

Seed Production Officer

1

Sub-Professional Staff

Assistant Seed Production Officer

3

Seed Production Assistant

3

Seed Technician

3

Seed Certification Inspector

3

Sub-total

12

Clerical and Other Support Staff

Plant Operator

3

Driver

1

Typist/Clerk

1

Laborers (casual)

18

Sub-total

23

GRAND TOTAL

36

(c) Rice Grading:

	<u>Projected</u>
<u>Professional Staff</u>	
Director	1
Assistant Director	1
Chief, Operations	1
Chief, Standardization	<u>1</u>
Sub-total	<u>4</u>
 <u>Sub-professional Staff</u>	
Secretary	1
Clerk/Typist	1
Grading Officer	4
Grading Assistants	<u>4</u>
Sub-total	<u>10</u>
GRAND TOTAL	<u>14</u>

ALLOCATION OF FIELD COMMODITIES PURCHASED UNDER THE IRI CONTRACT

COMMODITY DESCRIPTION	PRESENT LOCATION	ALLOCATED TO			COMMENTS
		RESEARCH	SEED MULTIPLICATION	RICE GRADING	
1-Measuring Wheel	Research	X			
3-Tape, 30m	"	X			
6-BMB Knapsack Sprayer	"	X			
3-Motor-cycles	In-storage		X		
1-Air Elast Seed Cleaner, Almaco Model ABSC	Research	X			
1-Seed Blower Table, with tube set	"	X			
1-Boerher Seed Divider	"	X			
1-Toledo Scale - Model 4181C	"	X			
1-Toledo Scale - Model 4030	"	X			
Diesel Power Generating Unit 10 KVA	EBP	X			To be re-installed at MARDS
Centrifugal Pump, 3 HP with accessories	Research	X			
Land Rover, SWB, PBB 5984	GRB		X		
Jeep, CJ 7, PBB 6079	IRI Head Office	MARDS			} To be repaired and shared } with seed production at the } locations.
Jeep, CJ 7, PBB 6080	"	BBP			
Jeep, CJ 7, PBB 6081	"	Esseq.			
Toyota, Sedan PBB 63919	IRI Head Office	X			Shared with seed production
Toyota, Sedan PBB 6320	GRB			X	For use by Consultants
Madza, Sudan, PBB 6522	Research	X			For use by Specialist
Madza, Sudan, PBB 6523	Seed Prod.		X		For use by Specialist
Land Rover, LWB, PBB 6924	Research	X			
Land Rover, LWB, PBB 6925	Hope Estate			X	

COMMODITY DESCRIPTION	PRESENT LOCATION	ALLOCATED TO			COMMENTS
		RESEARCH	SEED MULTIPLICATION	RICE GRADING	
1-McGill Miller #2	Research	X			
1-McGill Sample Sheller	"	X			
2-Dole Moisture Tester	"	X			
2-Vogel Bundle Thresher, 18"	"	X			
3-Aramitsu Power Sprayer	"	X			
1-Soil Grinder with Screens and Sieves	"	X			
1-Optical Range - Tape measure	"	X			
1-Germinating Cabinet	"	X			
2-Sudbury Soil Test Kit	"	X			
1-PH Meter with case, adapter conductivity bridge and cells	"	X			
1-Torsion Balance DLM-2 with weights	"	X			
1-O Haus Solution Balance	"	X			
1-O Haus Dial - Gram Balance	"	X			
1-Blender	"	X			
2-Gram Scale	"	X			
1-Swift Microscope	"	X			
1-Gator Submersible Lo-life Pump, 12"	BBP State Farm	X			To be used at MARDS Research Center and shared with seed production
1-Mower, 3 pt Hitch, 6 ft. cutting width	"	X			"
1-Levee (Mere) Squeeze Plow	"	X			"

COMMODITY DESCRIPTION	PRESENT LOCATION	ALLOCATED TO			COMMENTS
		RESEARCH	SEED MULTIPLICATION	RICE GRADING	
1-Brillion Plow Packer with offset Hitch	BBP State Farm	X			To be used at MARDS Research Center and shared with Seed production
1-Marden Triplex Weed Cutter	"	X			"
1-Niplo Power Harrow	"	X			"
1-Vicon Power Harrow	"	X			"
1-Rome Disc Ridger with heavy duty tool bar	"	X			"
1-Rome Model TCQ 24-24 Wheel Type Harrow	"	X			"
1-Rome/Gurries Leveller GL-8	"	X			"
1-Rome/Reynolds Model 6C Scraper	"	X			"
5-MF 290 Tractors Nos. 13683-7	"	X			3 for MARDS, 1 Esseq. and 1 BBP, to be shared with Seed production.
1-Caterpillar Tractor, D4E with angle blade	"	X			To be used at MARDS and shared with seed production.

AMENDMENT NUMBER ONE  
TO THE  
PROJECT AUTHORIZATION

NAME OF COUNTRY: Guyana  
NAME OF PROJECT: Rice Modernization II  
NUMBER OF PROJECT: 504-0072

1. Pursuant to Part I, Chapter 1, Section 103 of the Foreign Assistance Act, as amended, the Rice Modernization II Project for Guyana was authorized on August 28, 1978. That authorization is hereby amended to add the following Condition Precedent to Disbursement:

Conditions Precedent to Disbursement of funds during Project  
Extension Period (June 30, 1984 to June 30, 1985)

a. Rice Grading Authority:

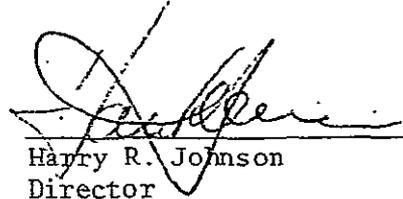
Except as A.I.D. may otherwise agree in writing, prior to the disbursement under the Grant, or to the issuance by A.I.D. of documentation pursuant to which disbursement will be made for the element of the Project supporting the establishment of a Rice Grading Authority, the Grantee will furnish to A.I.D., in form and substance satisfactory to A.I.D., evidence that satisfactory progress has been made in the implementation of changes in the rice sub-sector agreed to by the Grantee and the Inter-American Development Bank (IDB) as part of the Agricultural Sector Loan 660/SF-GY being funded by IDB.

b. Technical Assistance and Commodities:

Prior to any disbursement under the Grant, or to issuance by A.I.D. of documentation pursuant to which disbursements will be made for technical assistance and commodities after sixty (60) days from the date of this Agreement to the extent not irrevocably committed to third parties, the Grantee will, except as the parties may otherwise agree in writing, furnish in form and substance satisfactory to A.I.D.:

- 1) Evidence that adequate counterpart staff, in accordance with Annex I of this Amendment, have been assigned to the Project;
- 2) Evidence that it has assigned two Project Managers, acceptable to A.I.D., to manage this Project -- one from the Agricultural Research Institute and one from the Rice Grading Authority;
- 3) A time-phased Implementation Plan for the balance of the Project;
- 4) A statement of the name of the person holding or acting in the office of the Grantee specified in Section 8.2 of the Agreement, and of any additional representatives, together with a specimen signature of each person specified in such statement.

2. The authorization cited above remains in force except as hereby amended.



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Harry R. Johnson  
Director  
US AID Mission to Guyana

6/29/84

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Date