No.

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
MINISTRY OF AGRICULTURE OF THE REPUBLIC OF CUBA (MINAG)

THE STUDY
ON
SUSTAINABLE TECHNICAL DEVELOPMENT
FOR
RICE CULTIVATION IN THE CENTRAL AREA
IN
THE REPUBLIC OF CUBA

FINAL REPORT

ANNEX

MARCH 2006

PACIFIC CONSULTANTS INTERNATIONAL
CUBAN COUNTERPART

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ANNEX I: PROJECT PROFILE

(1) Improvement of Cultivation Techniques

Improvement of Cultivation Technique - 1

Project name	**Project for the Creation of Production and Distribution Units of Earthworm Compost for Popular Rice Producers in the Municipalities**
Objective	Partly to satisfy the lack of fertilizers (nutrients) in the cultivation of popular rice by taking advantage of organic residues without affecting the environment.
Goal (Output/Benefit)	Actual rice production yield is increased by 1 t/ha.
Activities	The main activities would be focused on the creation of production and distribution units of earthworm compost by Popular Councils (Consejos Populares), in order to supply this product to the producers of popular rice.
Location	All the municipalities in the five central provinces.
Implementation period	2006 to 2010
Inputs	• Equipment (Transportation means and loaders) • Construction material • Manual farm tools • Fuel
Implementation structure:	
Implementation body	CCS or CPA
Implementation	Producers of Popular Rice
Related org.	Provincial and Municipal Delegations of Agriculture Popular rice units in the municipalities
Financial source	MINAG, GAIPA
Possibility of adapting to existing techniques	The use of this technique complements the existing ones.
Need of improvement	Due to the lack of mineral fertilizers in the country, it is feasible to use organic manure such as earthworm compost that could partly provide the soil with the necessary nutrients required for rice production.
Note	

Improvement of Cultivation Technique - 2

Project name	**Project to Support Production of Biological Pesticides in CREE of each Municipality**
Objective	Increase production of biological pesticides for producers of popular rice.
Goal (Output/Benefit)	Satisfy the demand of biological pesticides for the producers of popular rice.
Activities	The main activities would be focused on the support with material and equipment for the production of biological pesticides for the producers of popular rice.
Location	5 municipalities in the Study Area
Implementation period	2006 to 2010
Inputs	Equipment and material for the production of biological pesticides
Implementation structure:	
Implementation body	National Directorate of Crop Protection
Implementation	CREE in the municipalities
Related org.	INISAV, Provincial and Municipal Delegations of Agriculture, Popular Rice Units in the municipalities.
Financial source	MINAG, GAIPA
Possibility of adapting to existing techniques	The use of biological pesticides complements the existing techniques.
Need of improvement	The increase in production of biological pesticides will satisfy the need for this product among the producers of popular rice.
Note	It is necessary to define the demand for these products for popular rice in the municipalities.

Improvement of Cultivation Technique - 3

Project name	**Project for the Production of Small Machinery and Validation of Demonstration Areas for Popular Rice Producers**
Objective	Construction and distribution of drum seeders, hand weeders and straw cutters.
Goal (Output/Benefit)	Increase rice yield, labor productivity, planting quality, weed control and to take advantage of crop residues for incorporation into the soil through the extension of the use of drum seeders, hand weeders and straw cutters in the demonstration areas of small scale producers of popular rice. Establishment of a mechanized system of drilling, intermediate cultivation and weed control, as well as advantageously incorporating crop residues as green manure into the soil.
Activities	• The fundamental activities would be focused on the necessary improvement of the drum seeder, hand weeder of IRRI and establishment of continuous production of these machines in IIMA. Regarding the hand weeder, research should be carried out on the use of materials such as wood or bamboo. • Research and development on a straw cutter that can be adequate for the production of popular rice and the establishment of a continuous production system for the straw cutter in IIMA. A special research on an alternative power source will be important such as PTO of the tractor, small diesel engine, etc. • Procurement of machines to the areas of popular rice producers (leaders of producers of each region) of the 5 objective provinces. • Technical training on the use of small machinery in the fields of the leading producers of each region and establishment of demonstration areas. • Extension of technical instruction in the demonstration areas for neighboring producers. • Technical instructions on the management, operation and maintenance of the machinery by the extension staff of the 5 provinces.
Location	Areas of popular rice producers (leaders of producers of each region) in the 5 municipalities.
Implementation period	2006 to 2010
Inputs	Personnel (engineers/technicians) of IIMA and IIArroz, municipal extension officers, of construction material for farm tools and machinery, users' manuals for small machinery.
Implementation structure:	Technical instructions for the extension officers of the 5 objective municipalities by personnel (engineers/technicians) of IIMA and IIArroz, as well as technical instructions to the leaders of producers of each region by the extension officers.
Implementation body	CCS or CCSF
Implementation	IIMA, IIArroz
Related org.	Municipal and Provincial Delegations of Agriculture Extension unit for popular rice in municipality
Financial source	MINAG, GAIPA
Possibility of adapting to existing techniques	It is possible to adapt to existing techniques, nonetheless, research and improvement on the structure of the machinery is required by the engineers and technicians of IIMA or IIArroz.
Need of improvement	Regarding the hand weeder, research should be carried out on the use of materials such as wood or bamboo, in other words, production with more reasonable and easy to obtain materials. Regarding the straw cutter, research on the power source (PTO of the tractor or small diesel engine, etc.) will be important to make the machine more accessible and easier to use.
Note	Establishment of a continuous production system of machines in IIMA. Research on how to further generalize the machinery and farm tools should be carried out by the organizations and producers of the municipalities.

Improvement of Cultivation Technique - 4

Project name	**Project for the Improvement of Water Management at Field Level**
Objective	To support the introduction of improved cultivation techniques and to realize effective use of irrigation water through improved water management techniques in the field, focusing on the producers.
Goal （Output/Benefit)	To enable the expected water management required for cultivation technique through extension activities. To reduce water use and its cost through effective use of irrigation water.
Activities	• Establishing demonstration farms to improve water management techniques in the field of leaders of producers and interested persons. • Extending appropriate water management practices to neighboring producers from the demonstration farm. • Guidance and capacitation to producers by extension officers through visiting and advising, and through technical seminars. • Introduction of improved field management for producers, such as land leveling, minor improvement of field canals, etc. • Introduction of improved water management in the field, which is necessary for the improvement of cultivation techniques. • Obtaining and accumulating data from water users in the field by measuring water use in the field.
Location	Rice field of leaders of producers and interested persons in each municipality.
Implementation period	2006~2010
Inputs	Municipal extension officers, materials for seminar, measurement equipment.
Implementation structure:	Visiting and guidance by extension officer at the field of leaders of producers and interested persons.
Implementation body	Provincial Delegation of Agriculture
Implementation	Extension officers of municipality, leaders of producers and interested persons in each municipality.
Related org.	INRH, IIRD
Financial source	MINAG, GAIPA
Possibility of adapting to existing techniques	Existing facilities such as irrigation canals are to be used.
Need of improvement	In order to realize an effect of improvement of cultivation technique, improvement of water management in the field shall be integrated with improvement of extension activities for cultivation techniques.
Note	

Improvement of Cultivation Technique - 5

Project name	**Project for the Strengthening of Water User's Organization**
Objective	To achieve rational use of irrigation water through an adequate operation and maintenance by water users and appropriate water use adjustment.
Goal (Output/Benefit)	To strengthen the operation and maintenance of communal irrigation system by strengthening the activities of existing water user's organization. To introduce an appropriate water use adjustment through encouraging water user's organization and through strengthening the activities of coordination of existing public organizations.
Activities	• Encouraging the activities of CCS or water users' group in CCS . - Registration of water users' group in CCS - Establishing rule of water use in CCS or water users' group in CCS - Establishing rules of operation and management of communal facilities and encouraging their activities - Guidance and capacitation by extension officer to encourage these activities - Supporting the organization of new type of CCS as in case of Parceleros group • Strengthening function of coordination and adjustment of water use over the water user's organization. - Strengthening the cooperation of extension officers - Local INRH in order to establish frequent communication with producers
Location	CCS and other production organization using communal irrigation system in each municipality.
Implementation period	2006~2010
Inputs	Municipal extension officers and his transportation, materials for seminar
Implementation structure:	Visiting and guidance to CCSs by extension officers and local INRH.
Implementation body	Provincial Delegation Agriculture
Implementation	CCS, and its members, municipal extension officers and local INRH
Related org.	IIRD、ANAP
Financial source	CCS
Possibility of adapting to existing techniques	Existing organizations, especially CCS, are expected to strengthened the water user's organizations. Strengthening of organizations related to water use adjustment is expected by establishing close relation and coordination of the local office of INRH and extension officer in the municipality.
Need of improvement	Adequate operation and maintenance of facilities such as pump and canal system is indispensable to secure a stable operation and preserve its efficiency. Thus, the regular maintenance by water users is very important. So far, the existing system and organizations function in a regular condition. However, it will be necessary to encourage their activities to cope with unusual situations such as sever droughts.
Note	

(2) Improvement of Postharvest Techniques

Improvement of Postharvest Technique - 1

Project name	**Pilot Project for the Interoperation of Agricultural Machinery and Facilities by the Group of Popular Rice Producers**
Objective	Productivity enhancement and quality improvement of paddy at field level by the producers' group. Also, to upgrade the production efficiency by sharing the appropriate equipment and facilities. Furthermore, to develop the pilot project by progressive utilization of the equipment for the verification study.
Goal (Output/Benefit)	The operation group will consist of 100 producers, for a yearly production of 500 tons of dry paddy from 100ha. The operation group is necessary in order to establish a sustainable collaboration system for the operation of equipment and facilities. Producers will be involved in such practices as post harvest starting from reaping stage to paddy drying; milling practice will only be done for self-consumption. It means that in principle, the producers will sell dry paddy for marketing.
Background	One major constrain for increasing Popular Rice production and quality is the shortage of post harvesting equipment since this practice is not often implemented on time. Some producers' groups have already established their own operation system by sharing equipment and machines that are mainly old and large tractors and combine harvesters which were manufactured for large scale operations, in particular, the combine harvesters are not at all suitable for the small scale popular rice fields thus resulting in less working efficiency and higher losses. The problems of equipment for post harvest practices are detailed as follows: Existing milling machines (Engelberg type) that mainly work for rental milling generate more broken rice during the milling process and yield less milling recovery as a result. Under the above mentioned conditions, it is necessary to form producers' groups in order to establish a well-organized collaboration system by facilitating equipment and machines with the appropriate technology.
Activities	• Establishment of facilities for storing and shipment of products, and simultaneously creating a space for the agricultural machines and fixed equipment, such as the dryer and/or a husker/mill. • To decrease the reaping losses by enabling the optimum time for harvesting practices by sharing a walking type reaper (reaping width 1.0-1.2m) and an improved throw-in type thresher. • To facilitate a mechanical dryer with electric heating device in the case of difficulties of sun drying due to unfavorable weather conditions, which functions as a safety measure for protecting quality deterioration of wet paddy. The petroleum combustion is costly and its supply is not assured. • To improve milling recovery and milled rice quality by the combination of a rubber roller husker with the existing Engelberg type or with integrated milling systems that are mainly used for processing self-consumption rice.
Location	Pilot project will be implemented in the municipalities of the Study Area.
Implementation period	2 years are required for developing the model under the pilot project (3 years for other municipalities in the Study Area)
Inputs	• Machines used for the verification study shall be utilized as much as possible after technical improvement. • Machines to be supplemented: walking type reaper, electric heating device for box type dryer, sieves for separating paddy after husking, spare rubber rollers. • Facilities for the storage of equipment and paddy (innovation/ expansion work can be done on existing buildings, if any) • Establishment of a collaboration and management system for a sustainable operation and maintenance
Implementation structure:	
Implementation body	MINAG, IIArroz

Implementation	GAIPA, Producers' groups (CCS)
Related org.	ANAP
Financial source	GAIPA and producers' group (CCS)
Possibility of adapting to existing techniques	Fundamentally, the existing technology can be adaptable for the project because the sharing activity has been already implemented to some extent.
Need of improvement	Necessity of the training for operation and maintenance on newly introduced machines. Capacity building of human resources for the group because of the importance of the management system and technical aspects as well.
Note	Focusing more on the sharing functions of the machines and equipment than on the joint work.

Improvement of Postharvest Technique - 2

Project name	**Project for the Improvement of Paddy Drying System for Popular Rice Producers**
Objective	Establishment of a paddy drying system for popular rice producers Individual producers are able to produce dry paddy.
Goal (Output/Benefit)	Prevent quality deterioration of wet paddy. Keep paddy for self-consumption safely for longer period. Produce dry paddy for marketing. Extend the most convenient and low cost drying means.
Background	The paddy drying after harvesting is important for increasing the production of Popular Rice, especially during the rainy season which is the period of time when the rice is harvested the most. Then producers often encounter some difficulties to reap paddy at optimum time because of the shortage of drying yards. Generally, producers need to thresh paddy after reaping on the same day and need to dry the wet paddy immediately since it cannot be kept for a long period due to its high moisture content after threshing, therefore requires to be dried soon after reaping. Even though drying facilities exist, they are scarce and many times they are located far from the producers, and transportation is difficult and costly. Generally, producers spread their wet paddy on public roads and on their house roofs where space is limited and there is no means of controlling the temperature. Some producers have drying sheets made of reused sacks that were probably for milled rice or fertilizers, but these second-hand sacks are important as packing material for paddy/milled rice and are not strong enough as drying mats. GAIPA is planning to move drying facilities as industrial scale dryers for popular rice producers to some municipalities of the central provinces. As part of the Verification Study, a box type dryer with a capacity for 20 qq was introduced. This dyer caught the attention of the producers and some expressed their intention of constructing one. Additionally, IIMA has constructed a box type dyer.
Activities	• Popular rice producers will be given a sheet for paddy drying. In principle the mat should measure 100m^2 (10m x 10m) and it could be shared with neighbors. A drying sheet has the capacity of 1.0 ton if wet paddy is spread 2 cm thick, normally requiring 2 days to achieve 14% moisture content, provided that sunshine lasts at least half day in rainy season. • Construction of box type dryers, especially for producers of CCS and CCSF. • Establishment and promotion of a marketing system for wet paddy rice in the municipalities with drying facilities at industrial level. • Portable moisture meter should be given to agricultural extension officers of municipalities.
Location	5 municipalities in the Study Area
Implementation period	2006 to 2010
Inputs	Supply of low cost drying sheets. Construction material for box type dryer. Portable moisture meters for extension officers.
Implementation structure:	
Implementation body	MINAG
Implementation	IIArroz
Related org.	GAIPA
Financial source	MINAG, GAIPA
Possibility of adapting to existing techniques	There is possibility because some producers traditionally used available sheets to dry wet paddy. The use of box type dryer is simple and already many producers of the central region have seen them being used in the Study tours. The use of portable moisture meters is very easy.
Need of improvement	The improvement of the drying system is essential in order to increase to an industrial yield (percentage of milled and whole rice) as well as to improve the quality, appearance, flavor and smell.
Note	The participation of the producers is very important; mainly the organized groups of CCS and CCSF for the implementation of the project activities.

(3) Improvement of Extension Activities

Improvement of Extension Activity - 1

Project name	**Project for Capacity Building of Leaders among Producers and Extension Officers**
Objective	Capacity building for the leaders of producers and support as a nucleus for extension activities of the region.
Goal （Output/Benefit)	A technical extension system as a nucleus for the leaders among producers will be established.
Activities	The extension officers periodically supply information to the leaders of producers regarding the latest techniques in rice production such as disease control, new seed varieties, etc. They also provide orientation on the techniques that were proposed by the Plan, such as transplant, drilling, earthworm compost, organic pesticides and the use of small scale agricultural machinery, as well as postharvest techniques.
Location	Rice field of leading producers
Implementation period	2006 to 2010, one year for a leader of producers
Inputs	Production materials (certified seed, earthworm compost, organic pesticides, etc.), agricultural machinery (drum seeder, hand weeder, straw cutter, etc.), postharvest material (drying sheet, etc.).
Implementation structure:	
Implementation body	IIArroz, GAIPA
Implementation	Municipal extension officer, ETIA
Related org.	CCS, ANAP
Financial source	MINAG, GAIPA
Possibility of adapting to existing techniques	Training of leaders of producers is a new method for extension activities. The study tour as a method of extension activities has significant advantages since it allows the producers to actually observe the rice field and talk to other producers to share and exchange information regarding their experiences in cultivation.
Need of improvement	Extension of improved and/or new techniques is expected such as transplant, drilling, earthworm compost, organic pesticides, etc. at producers' level.
Note	GAIPA considers important to train the leading producers and is planning to increase the number of required municipal officers.

Improvement of Extension Activities - 2

Project name	**Project of Study Tours as an Extension Method**
Objective	Organize the opportunity so the producers can be trained on new techniques on rice production through visits to the field of leading practical farmers.
Goal (Output/Benefit)	Establish the Study Tours so the producers can exchange their opinions directly as one of the most effective extension methods, in addition to lecture style extension using manuals, video and explanations provided by extension officers.
Activities	The study tour is composed of (1) Lectures by IIArroz and ETIA, (2) Field observation at leading practical producers, and (3) Discussion among producers. The tour sets the implementation order from (1) to (3) for easier understanding of producers. Time distribution of the tour: more time should be allocated to activities (2) and (3).
Location	Field of leading practical producers
Implementation period	4 times/year (1 night-2 days)
Inputs	Manuals, video and others
Implementation structure:	The program is implemented by IIArroz and ETIA for the lecturers. Explanation of techniques is made by farmers themselves. It is crucial to secure an environment placing the importance on farmers' initiative during the tour.
Implementation body	IIArroz
Implementation	IIArroz, ETIA and extension officers
Related org.	GAIPA, ANAP
Financial source	MINAG, GAIPA
Possibility of adapting to existing techniques	This project is an extension method not applied before.
Need of improvement	Extension of improved/new techniques such as transplantation, drilling, earthworm compost, organic pesticide, small scale agricultural machinery use, and post harvest is expected.
Note	Study Tour is proposed to be implemented basically covering a municipality due to appropriate scale and access of participants. In case that transportation means for participants are provided, inviting producers out of municipality widely is effective. The tour in the Verification Study was implemented as a one night-two day trip and it was observed that this time schedule is enough to cover the required program.

(4) Action Plan for Related Organizations

Program - 1

Program name	**Program for the Improvement of the Extension System and Capacity Building**
Objective	The objective of the program is to strengthen the extension system and capacity building for popular rice.
Background and present conditions	Since the beginning of the Rice Development Program in 1967, the extension activities and capacity building were mainly focused on the technical personnel in charge of rice production in the Rice Enterprises (later called Rice CAI). These activities were easily performed as production technologies were similar in all the provinces and the trained directive personnel had a high technical and educational level. Since 1996, the Ministry of Agriculture started supporting the popular rice production. It became a big challenge for the institutions in charge of extension and capacity building, as there was a large diversity of technologies, production forms and producers' distribution. In order to increase popular rice production, spreading new technologies to producers becomes indispensable, such as spreading of transplantation (specially row transplanting), drilling, application of earthworm compost, crop rotation, introduction of small agricultural machinery either manual or with low fuel consumption, as well as the diffusion of technologies related to reaping and postharvest.
Activities	1. Training of extension officers, both at provincial and municipal level. 2. Strengthening the structures of popular rice units at provincial and municipal level. 3. Establishing the most convenient ways to train individual producers who are not organized at present (parceleros in some municipalities and prestamos in other cases, etc.).
Implementation site	The problems in extension activities and in capacity building were identified in all the municipalities in the Study Area; therefore the projects will focus on the specific conditions of each municipality, although most of the problems are common in the Study Area.
Implementation period, inputs and cost estimation	The implementation period, necessary inputs for the implementation and the cost estimation will be determined by the complexity and scope of each project conceived at the municipal level.
Organization of the implementation	The organization of the implementation will be done by clearly defining the organizations responsible for implementing every activity included in the projects. The participation of several entities such as the National Group of Popular Rice (belonging to GAIPA), Provincial Popular Rice Units, IIArroz and its experimental stations, and the different research institutes related to rice cultivation is expected.
Possible funds source	The Ministry of Agriculture, through the Branch Programs of Science and Technique can provide a portion of the budget in domestic currency (Cuban pesos) for the projects submitted and approved, considering their priority and expected impact. Some budget, also in domestic currency, is also possible from the Territorial Programs of the Ministry of Science, Technology and Environment (CITMA) in each province. The following fund sources, in foreign currency, might be mentioned for the budget to implement the projects. 1. Getting financing from international donors, requesting the support of the Ministry of Foreign Investment and Economic Collaboration (MINVEC) and the Ministry of Agriculture (MINAG). 2. Getting through the Ministry of Agriculture (MINAG) some inputs purchased abroad by the Cuban Government.
Remarks	The Ministry of Agriculture (MINAG), through GAIPA, has a proposal to increase the number of extension officers in the provinces and municipalities. This will allow improving extension activities and capacity building. Similarly, some modifications for producers who are using areas of prestamos are being considered. These modifications will encourage producers and their organization, enabling activities on capacity building.

Program - 2

Program name	**Program for Strengthening Production and Distribution of Certified Seeds for Popular Rice**
Objective	The objective is to establish a production and distribution system of certified seeds for popular rice producers.
Background and present conditions	The Production System for Certified Seeds established in Cuba has worked for the requirements of specialized rice production. Popular rice producers use non-certified seeds, while some of them get certified seeds from varieties produced by Rice CAIs, though generally these are not the most appropriate varieties for their cultivation conditions. The Seed Production System established for rice cultivation covers original seed production only in IIArroz headquarters, while basic seed is produced by IIArroz and its experimental stations located in the provinces of Sancti Spiritus, Camagüey and Granma. The Rice Experimental Station in Los Palacios also produces basic and original seed from its varieties. The registered seed and certified seed are produced in two farms located in Havana, belonging to IIArroz. Certified seed II is produced in specialized farms located in Rice CAIs. At the moment the volume of production of original, basic, and registered seed, as well as the number of varieties is insufficient, therefore it is necessary to increase them. Another problem is related to the system of seed certification of those producing Popular Rice. The system is well established for Specialized Rice but it should be adjusted for small and medium scale producers. Considering the annual increase of popular rice production and taking into account that the areas for popular rice are mainly cultivated from non-certified seeds, it is necessary to establish a new system for certified seed production and distribution, to cover the demand of popular rice producers.
Activities	1. To strengthen the capacity for producing original and basic seed in the research centers in charge of this activity. 2. To strengthen the production capacity of farms producing registered seeds. 3. To establish farms for certified seed production based on the characteristics of each municipality. 4. To modify technical regulations and quality specifications for certified seed production for popular rice.
Implementation site	The low degree of utilization of certified seed by popular rice producers is a major problem identified in all the municipalities in the Study Area, except for Vertientes. Project profiles should focus on the different levels of the production system of certified seeds proposed for popular rice producers. In the Program for reinforcing the production system and certification of seeds the Action Plans at municipality level and the level of the related organizations are closely related, since the activities for improving the production of original, basic and registered seed, as well as the adjustment of the system to certify seeds for Popular Rice correspond to related organizations, although the establishment of the production farms for certified seeds is an activity for each municipality.
Implementation period, inputs and cost estimation	The implementation period, necessary inputs for the execution and cost estimation will be determined by the complexity and scope of each one of the projects conceived for the different levels of the proposed system.
Organization of the implementation	The organization for the implementation will be done by clearly defining the organizations responsible for implementing every activity included in the projects. Among the main institutions concerned are IIArroz, ETIAs, seed production farms and Rice Experimental Station in Los Palacios. An important role will be played by the System of Inspection and Certification of Seeds (SICS) of the Ministry of Agriculture at both provincial and municipal level. The participation of the National Group of Popular Rice (belonging to GAIPA) and the Provincial Units of Popular Rice is expected.
Possible funds source	The financing in domestic currency (Cuban pesos) must be requested to the Ministry of Agriculture (MINAG) considering the expected impact of utilizing certified seed in popular rice. The following fund sources might be mentioned for the budget in foreign currency to implement the projects. 1. Getting financing from international donors, requesting the support of the Ministry of Foreign Investment and Economic Collaboration (MINVEC) and the Ministry of Agriculture (MINAG). 2. Getting through the Ministry of Agriculture (MINAG) some inputs purchased abroad by the Cuban Government.
Remarks	As part of the activities of the Development Program carried out, a Verification Study is being implemented at present in IIArroz to develop the capacity of production of original and basic seed.

Program - 3

Program name	**Program for the Improvement of Research and Development Activities**
Objective	The objective is to strengthen the activities of research and development on the technologies for popular rice.
Background and present conditions	Rice Research Institute (IIArroz) is the main center for research related to rice cultivation in Cuba, holding 3 experimental stations located in the provinces of Sancti Spiritus, Camagüey and Granma. Located in the headquarters of IIArroz, the Rice Germoplasm Bank of Cuba stores more than 2,300 domestic and foreign varieties, including those that have been traditionally cultivated by farmers during many years. In addition, there are other centers in Cuba performing research on this crop, such as Rice Experimental Station in Los Palacios, Pinar del Rio province. IIArroz and the experimental stations have equipment which has been used for many years, thus limiting the quality of investigations, extension activities and training of which they are responsible.
Activities	1. To provide the necessary equipment for research centers in order to produce new varieties and technologies adapted to the different conditions of popular rice cultivation. 2. To strengthen the capacity of the research centers for the preparation, edition and distribution of understandable texts and technical brochures for popular rice producers. rganized at present (parceleros in some municipalities and prestamos in other cases, etc.).
Implementation site	Project profiles must be implemented basically in the research centers related to rice cultivation.
Implementation period, inputs and cost estimation	The implementation period, necessary inputs and cost estimation will depend on the complexity and scope of the each one of the projects formulated.
Organization of the implementation	The organization of the implementation will be done by clearly defining the organizations responsible for implementing every activity included in the projects. Among the main institutions concerned are IIArroz, ETIAs, seed production farms and Rice Experimental Station in Los Palacios. The participation of other research centers is also expected, such as the Institute of Research on Agricultural Mechanization (IIMA), the Institute of Research on Plant Protection (INISAV), the Soil Research Institute, etc.
Possible funds source	The Ministry of Agriculture, through the Branch Programs of Science and Technique, can provide a portion of the budget in domestic currency (Cuban pesos) for the projects submitted and approved, considering their priority and expected impact. Some budget is also possible from the Territorial Programs of the Ministry of Science, Technology and Environment (CITMA) in each province. The following fund sources might be mentioned for the budget in foreign currency to implement the projects. 1. Getting financing from international donors, requesting the support of the Ministry of Foreign Investment and Economic Collaboration (MINVEC) and the Ministry of Agriculture (MINAG). 2. Getting through the Ministry of Agriculture (MINAG) some inputs purchased abroad by the Cuban Government.
Remarks	

ANNEX II: Environmental and Social Considerations

ANNEX II: ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

1. JICA Guidelines for Environmental and Social Considerations

(1) Necessity of Environmental and Social Considerations

The terms "Environmental and Social Considerations" refer to studies, including baseline surveys, predicting and evaluating adverse impacts and likely impacts that projects may have on the environment and local society, and the mitigation measures to avoid and minimize them.

"Environmental impact assessment" means evaluating environmental and social impacts that projects are likely to have, analyzing alternative plans and preparing adequate mitigation measures and monitoring plans in accordance with laws or guidelines of the recipient governments.

The JICA guidelines for the environmental and social considerations came into force on April 1, 2004.

(2) Objectives of the Guidelines

The objectives of the guidelines are to encourage recipient governments to implement appropriate environmental and social considerations as well as to ensure that JICA supports and confirms them adequately, by clarifying the responsibilities and procedures of environmental and social considerations that JICA takes, and the required conditions that recipient governments are requested to meet.

(3) Basic Principles of Environmental and Social Considerations

The guidelines recognize the following seven principles to be very important.

- The considerations are addressed to a wide range of impacts.
- Measures for environmental and social considerations are implemented at an early stage.
- Follow-up activities are carried out after cooperation projects are terminated.
- JICA is responsible for accountability when implementing cooperation projects.
- JICA asks stakeholders for their participation.
- JICA discloses information.
- JICA enhances organizational capacity.

(4) Categorization

The projects are classified under three categories according to the extent of environmental and social impacts. This classification takes into account an outline of the project, the scale, the site conditions, and the environmental impact assessment scheme in host countries.

In these guidelines, the screening (the examination of the necessity of the environmental and social considerations) is carried out by classifying the projects into 3 categories (A, B and C):

Category A: A project is classified as Category A if it is likely to have significant adverse impact on the environment and society.

Category B: A project is classified as Category B if its potential adverse environmental and

social impact is less adverse than that of Category A projects. Generally, it is considered that the impacts will only reach the implementation site and the irreversible adverse impacts are few.

Category C: A project is classified as Category C, if it is likely to have minimal or no adverse environmental and social impact.

(5) Process of Environmental and Social Considerations

Category A project: An Environmental Impact Assessment (EIA) study is conducted with public participation and information disclosure analyzing the measures to prevent or mitigate the environmental and social impact. Moreover, jointly with the government of the recipient country, JICA will discuss with the local people and will reflect the results of these discussions in the study. The results of the study are reflected in different reports that are prepared, and a development plan is prepared in collaboration with the host government.

Category B project: An Initial Environmental Examination (IEE) study is conducted and the public participation is included in a study if necessary. The results of the study are reflected in different reports that are prepared, and a development plan is prepared in collaboration with the host government.

Category C project: If the project falls into this category, no works for the environmental and social consideration will be conducted after the categorization.

2. Process of Scoping and Rough Outline of Environmental and Social Considerations

2.1 General Idea for the Development Plan

(1) Objective of the Plan

The objective of the development plan is the improvement of sustainable rice production (popular rice) in 5 provinces in the central area of Cuba.

(2) Location of the Plan

The area for the development plan includes 5 provinces in the central area of the Republic of Cuba, with selection of 1 municipality from each one of the provinces to carry out the Action Plan. The provinces and municipalities (in parenthesis) are the following: Cienfuegos (Aguada de Pasajeros), Villa Clara (Santo Domingo), Sancti Spíritus (Yaguajay), Ciego de Ávila (Chambas) y Camagüey (Vertientes).

(3) Benefited Population

The population in the area of the Development Plan is approximately 2,889,678 inhabitants (Anuario Estadístico de Cuba, 2001). Taking into account that one of the objectives of the development plan is the improvement of popular rice production, the whole Study Area will be benefited.

It is possible that with the implementation of the Development Plan, rice production will exceed the demand of the provinces within the development plan, making it possible to send the surplus to other provinces.

2.2 Content of the Development Plan

(1) Content of the Plan

In order to achieve the development target for the target year (2015), the action plans for the 5 municipalities will be formulated defining the roles that the participants such as the producers, MINAG, IIArroz, provinces, universities and other related organizations will have to play. An Action Plan will be formulated for each one of the municipalities; nonetheless, since the action plan takes a long period of time to prepare, therefore it will be necessary to revise the action plans periodically during several years and correct them taking into account any changes in external conditions. Consequently, in the Study, it is recommended to revise the action plan in 2010, taking into consideration the required period to obtain the effects of technical measures and extension activities.

(2) Type of projects

In order to improve the rice production (popular rice), agricultural supplies need to be increased and the limited agricultural supplies being used presently need to be improved, including the following:

- Improve productivity to its maximum by an efficient use of chemical fertilizers used presently combined with organic fertilizers, such as green manure, compost, etc.
- Improve productivity to its maximum by improving the efficiency of machinery, with the efficient use of fuel and combining animal and human power.
- Improve productivity by improving farming management and irrigation management.
- Improve the varieties adapted to the conditions of Popular Rice and extend the use of certified seeds.

(3) Content of Activities

Increase of the production of Popular Rice will be considered based on the improvement of productivity and the expansion of sowing areas.

1) Improvement of productivity

a. Increase of yield

Increase yields with the improvement of rice farming techniques, harvest and post harvest.

b. Efficient use of agricultural supplies

Increase productivity combining agricultural supplies new and currently being used (organic fertilizers, animal traction, etc.)

2) Expansion of sowing area

a. Use of land that presently is not fully used and promote diversification to other crops

The unused land that has the adequate characteristics for popular rice production, should be used. The conversion to rice of areas currently dedicated to sugarcane and other crops should be promoted.

b. Increase of popular rice producers

Increase the number of popular rice producers using Préstamos system

3) Improve the environment for production

The environment for production will improve by promoting improvement of productivity and expansion of the sowing area for popular rice.

a. Promotion of investments for popular rice production

Improve the possibilities to invest easily in infrastructure and improve land in the areas where popular rice is produced (e.g. facility for loans, extension of loan payment period, etc.)

b. Strengthening the system for agricultural support

Strengthening the agricultural support system providing information on popular rice by extension activities and training, etc.

(4) Overview of the Development Plan Area

The five provinces in the central area included in the Development Plan are progressively under the negative effect of the drought, like the Eastern area. This mainly includes a waved-plain-zone, the central area that has also mountains and forests located on the southeast, as well as swampy areas along the costs. Except for the areas along the rivers, most of the territory is not blessed with water.

The land is mainly used for cattle and agriculture: both for sugarcane cultivation and other crops. The cultivated area shows a tendency to increase in the long term, although sugar cane cultivation, previously a key industry, is recently showing a tendency to stagnation. There is large idle land in the East of the area for the Development Plan in Camagüey. Even though agriculture, cattle and sugar cane production are the main industries, local tourism is also being developed. Approximately 50% of the area for popular rice in the whole country is found in the 5 provinces.

(5) Mitigation and Alternative

Cuba is a food-importing country and the production of main food grains covers only 23% of the requirements. The import amount of rice, one of the principal foods of the population, is quite large. Furthermore, the specialized enterprises (CAI) have a technology based application of big amount of chemical fertilizers and pesticides, generally applied by airplanes. Considering that the rice production for last 10 years has been unstable, the increasing and stabilizing of rice production is a priority issue.

If the Development Plan will not be executed, this issue will not be solved, and it will not be possible to contribute to a national goal. Moreover, the employment opportunity for the production of popular rice will not increase, and the negative impacts to the air, soil and water by the big system of rice production in CAI will be continued.

The main purpose of the Development Plan is increasing popular rice production based a technological improvement; therefore, some changes are expected in the farm management system. Moreover, the Development Plan is one of the best production plans of the popular rice

in the situation where agricultural inputs are limited. Therefore, this Development Plan would be different from general infrastructure development plan, and the selection of alternative farm management isn't relevant.

(6) Monitoring Plan

Based on the contents of the Development Plan, the impacts of the implementation of the Plan will be forecast in the Study. Popular rice production, however, is done using few inputs, regardless of whether the management is small or medium scale. Therefore, the target of the Plan is to increase popular rice production by using few inputs (without extending the agricultural area with new inputs), establishing an infrastructure for irrigation and drainage or additional application of agro-chemicals and fertilizers. Although environmental and social impacts in the implementation of the Plan can be forecast, it is necessary to keep monitoring the situation periodically in order to confirm the results.

The Development Plan includes continuous monitoring of the agricultural techniques, post harvest, etc. and the contents of the Action Plan will be periodically reviewed and reconsidered. Thus, monitoring of the environmental and social items will be conducted together with the monitoring of the technical aspects. The following topics could be considered in the monitoring:

a. Degradation of the land due to inappropriate agricultural management.
b. Salinity and swamp degree caused by the effect of drainage.
c. Effect of agro-chemicals on soil pollution and water quality.
d. Problems in the use of water for irrigation.
e. Joint use of machines and materials.

In addition, the participation of the people concerned will be requested for the implementation of the monitoring.

(7) Discussion with People Concerned.

The comments of the people concerned in Japan and Cuba are very important for the Study, and their opinions will be reflected in the Development Plan. In this sense, workshops for problem analysis (December 2003) have been carried out for the 5 municipalities of the Development Plan, with the participation of producers and people concerned with the study. Moreover, a similar workshop took place in IIArroz.

Similarly, during the steering committees in the 5 provinces, the contents of the reports have been explained to the people concerned in the provinces and municipalities, as well as the contents and effects of the Development Plan. Furthermore, with the completion of the basic study (August and September 2004), the general idea of the verification study was explained as a base for the Development Plan in the 5 provinces of the Study Area, deciding by agreement the date and the places for the implementation of the study.

On the other hand, in the sites of the verification study located in the municipalities of Chambas and Yaguajay, the cooperation of the selected two CCS was requested and the contents of the verification study was explained. In addition, at the commencement of the verification study (December 2004) a workshop took place for the producers participating in the study, as well as

for farmers of the neighborhood, people concerned from other provinces and municipalities, CCS members and extension officers. The details of the verification study were discussed and the consensus for the implementation of the verification study was reached. In addition, once the verification study in the dry season was completed (July 2005), a workshop on interim evaluation took place with the people concerned.

3. Expected Environmental Impact

As mentioned previously, the main objective of the Development Study is to formulate a Development Plan to increase the sustainable production of rice (Popular Rice) in the 5 central provinces of the Republic of Cuba. The main aspects that should be taken into account regarding possible environmental impacts are the following:

(1) Social Environment

The Development Plan does not expect to carry out infrastructure changes in the area for the Development Plan, so migration of the population is not expected. As for increasing new areas for the production of Popular Rice, it is expected that the majority will be from the restructuring process areas of the Ministry of Sugar as well as the leased land increased for lands belonging to the Ministry of Agriculture. In connection with land use, in some cases the crop will be changed, but the land use will remain as agricultural activity. The activities of the study will have a positive effect on the local economy in the area for the Development Plan.

(2) Natural Environment

In the Development Plan there will not be any changes that affect the topography and likewise, no practice will be carried out that could cause soil erosion. However it will be necessary to clearly include some measures for soil protection, keeping in mind that for most of the land dedicated to the production of Popular Rice, the physical and chemical characteristics are unknown for establishing a correct strategy for their protection and conservation. In the Development Plan the volume of water is not expected to be remarkably increased for irrigation farming, although it is expected to establish some measures to increase drainage efficiency. The new areas that will be increased for rice cultivation are presently used for other agricultural crops, so the land use will not change and the flora and fauna in the area of the Development Plan will not be affected at all.

(3) Contamination

The Development Plan will be formulated under the principles of establishing a sustainable crop production, where there will be a minimum application of chemical products for fertilization, weed control, insects and against diseases. It is also expected to widely use organic fertilizers and bio-pesticide products thoroughly, so it is not likely for soil, air or water contamination to occur. In the Development Plan there will not be any type of activity that could cause large scale waste or noises that affect the population.

4. Cuban Legislation related to Protection of the Environment

The government of the Republic of Cuba has paid special attention to the protection of the environment. Article 27 of the Constitution postulates that: "The State protects the environment and the natural resources of the country. It recognizes the tight link with sustainable economic and social

development to make human life more rational and assure the survival, well-being and security of the present and future generations. It corresponds to the competent authority to apply this policy. It is the duty of the citizens to contribute to the protection of water, the atmosphere, soil conservation, flora, fauna and all the rich natural potential".

Everything related to the protection of the environment is under Law 81 "Environmental Law", of July 11 1997. In this Law, basic concepts are expressed such as, sustainable agriculture, environmental damage, evaluation of environmental impact, etc.

In addition to Law 81, there are other laws, ordinance-laws, ordinances and resolutions that regulate aspects for the protection of natural and human resources.

5. Examination of Category

Generally, the Development Plan in the agricultural sector for small scale is classified under category B from the point of view of environmental and social considerations. When the general idea of the development plan for the Study was prepared and the environmental and social impacts for the execution of the development plan were predicted, neither negative environmental influence nor deterioration was foreseen. Since there is not any impact that contradicts the environmental and social regulations of Cuba, it can be established that the Development Plan for the study is applicable to Category C of the JICA Guidelines for Environmental and Social Considerations.

ANNEX III: Verification Study

ANNEX III: VERIFICATION STUDY

1. Necessity and Purpose of Verification Study

In order to achieve increase of popular rice production, it is necessary to realize technical improvement in each step of rice production. Prior to examining the future development plan, it is indispensable to confirm the propriety and adoptability of suggested technical improvement. Hence, verification study has been implemented as to confirm the level of actual implementation of the improvement technologies and methodologies in the field of cultivation, post-harvest, extension and supporting system, etc. Since it is difficult to include all of the suggested technical improvements due to limited period and input of the Study, technical improvements directly concerning present constraints and ones expected to produce significant impact, and ones likely to be accepted by producers are selected and applied to the Verification Study. The results of the Verification Study will be used as technical background in the formulation of the Development Plan. The effect of spreading improvement technology by demonstration at the verification site is also expected as a major impact of the Verification Study. In addition, the experience of the Verification Study is expected to accelerate the performance of similar study to be implemented by Cuban side in the future.

2. Contents of Verification Study

The Verification Study has of two components: one is the strengthening of activity of IIArroz to improve the support system for popular rice production, the other is Verification Study in the Field which aims to verify and modify the suggested technical improvement of popular rice production. The strengthening of IIArroz will focus on improving the seed production techniques of IIArroz, in order to improve the seed supply system. In the Verification Study in the Field, the suggested technical improvement will be combined into a package of farming practice and it will be applied in the field with participation of producers. The impact, adoptability and acceptability of the technical measures will be verified through the Study.

3. Strengthening IIArroz

3.1 Outline of Strengthening of IIArroz

The verification study to Strengthen IIArroz focuses on the improvement of seed production techniques, productivity and quality, by implementing several mechanized activities, such as transplanting, harvest and drying, which are carried out manually at present, and by improving seed drying and grading process and strengthening the functions of evaluation and quality control. Necessary equipment was procured in the verification study as well as for improving the irrigation and drainage system in the paddy fields for breeder and basic seed production.

- Study site: Experimental field of IIArroz headquarters
- Target group: Plant Breeding Department of IIArroz

(1) Selection of Subject: Verification of the Impact of Improvement Technique for Original and Basic Seed Supply

Introduction and expansion of certified seed is considered as one of the most important ways to increase productivity of the popular rice. Even though the demand of popular rice producers for certified seed is observed in the field, the system of production and distribution of certified seed for

popular rice is insufficient and it cannot satisfy the demand at present. IIArroz is in charge of breeder and basic seed production, but it does not have the required infrastructure to warrant good quality researches. On the other hand, it is impossible to produce the necessary seed to cover all the needs of Popular Rice Program. As a result of discussion between the Study Team and counterparts, it was agreed that the verification study in IIArroz would be focused on the strengthening of seed supply, due to its importance in the activities of IIArroz and expected contribution to the increase of popular rice production.

(2) Present Condition of Seed Supply of IIArroz

Nearly 4 tons of basic seed from two varieties are produced annually in the institute headquarters, in Havana (about 2 tons of each variety). Every year, breeder seed Phase I and II are produced from approximately 7 varieties. From the transplanting to the seed drying, production is carried out manually due to lack of necessary machines for these activities. Consequently, it is not possible to produce seeds from the varieties used by producers in the Popular Rice Program. In addition, the heavy load of seed production activity obstructs the research and development activities of researchers.

The institute's paddy fields are irrigated by pumping underground water. The pump has been used for many years and consumption of diesel fuel is high. It occasionally breaks down for several days, making problems for the experiments and seed production. Maintenance is necessary in the irrigation and drainage system. Water management is deficient since the machinery is not suitable for the area size. The terraces being long and narrow, cause deficiencies in soil preparation and leveling.

In parallel with the Study, a low temperature seed stock had been provided by the cooperation of the JICA follow-up program for training course which started to operate in September 2005.

(3) Seed Production Program of IIArroz

IIArroz has 46 ha of experimental field besides headquarters, of which 36 ha are functional at present. Seed production activity for popular rice will occupy 10 ha of the field and the plots are to be used in a 3-year rotation. 14 tons of original and basic seed of popular rice are planned to be produced in the IIArroz field.

3.2 Implementation Plan

(1) Target of Verification Study in IIArroz

The target of the verification study in IIArroz is set to contribute to increase of popular rice production through improvement of original and basic seed production techniques of IIArroz.

(2) Expected Impact

This Verification Study should have the following impacts:

- To increase the number of varieties in basic seed production, from present 2 to 4 varieties each year.
- To increase the amount of basic seed production from 2.0 to 3.5 tons per variety.
- To increase the seed quality by obtaining a higher germination capacity.
- To reduce the manual works of the researchers in transplanting and seed harvest.

- To develop work conditions and abilities to increase the productivity in the seed areas (around 10 ha) by improving the infrastructure of irrigation and drainage.

(3) Activities of Verification Study in IIArroz

1) Improvement of workability and productivity by improving infrastructure of the seed area

- Maintenance of the irrigation system in the seed areas of around 10 ha (repairing damaged valves and pipes).
- Maintenance of the drainage system in the seed areas of around 10 ha, including the collecting channel, secondary channels and buried drainage in the plots.

2) Improvement of cultivation technique by introducing field machinery

- Improvement of soil preparation.
- Selection the sowing season according to the characteristics of the varieties.
- Transplanting using the new technology. (Introducing motor type transplanter. Experimental introduction of manual type transplanter.)
- Irrigation management including water stress during the tillering stage.
- Plant protection by applying insecticides and fungicides.
- Seed harvesting using small reaper and thresher. .

3) Improvement of seed quality by introducing seed grader and mechanical dryer

- Seed drying by mechanical dryers with the specifications required by the specialists.
- Appropriate seed cleaning and grading.
- Seed conservation in bins.
- Seed analysis in the laboratory.

(4) Implementation Schedule

The implementation schedule for the Verification Study in IIArroz is shown below.

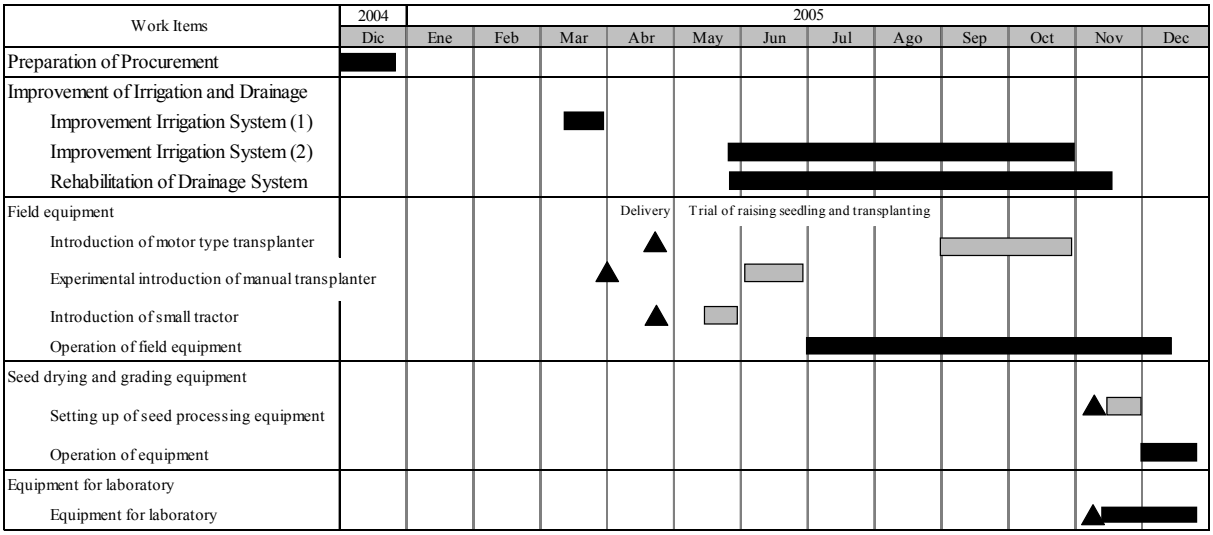

Fig. 3.2.1 Implementation Schedule of Verification Study in IIArroz

3.3 Required Equipment and Facilities

(1) Input by Japanese Side

1. Equipment for seed production
   - Agricultural machinery in the field (Tractor, Side delivery type reaper, Self propelled thresher, Transplanter, etc.)
   - Seed grading and drying equipment (Gravity separator, Seed grader, Seed dryer)
2. Equipment for quality analysis (Rice husker, Rice pearling machine, Winnower, Grain moisture meter, Scales, Incubator for germination test)
3. Improvement of infrastructure of seed production area
   - Improvement of irrigation system (Introduction of eclectic pump, Replacement of pipelines and valves)
   - Improvement of drainage system (Excavation of drainage canal)

(2) Input by Cuban Side

1. Building and site
   - Experimental field for seed production
   - Storage area of field equipment and seed processing equipment
   - Room for installation of equipment for quality analysis
2. Placing staff
   - Field management
   - Operator of field equipment
3. Materials and operation cost
   - Fuel, electrical charge, etc.
   - Agricultural input (seed, fertilizer, chemicals, etc.)
4. Others
   - Equipment and facility of power supply for irrigation pump
   - Maintenance of irrigation and drainage facilities

3.4 Monitoring Plan

From the technical viewpoint, IIArroz has already established the methodologies for the production of breeder and basic seed, which are produced with high agricultural yield and quality. Considering this condition, the monitoring was focused on the work conditions of introduced machinery and equipment in the regular activities of IIArroz.

3.5 Results and Lessons of the Verification Study

(1) Introduction of Machinery and Improvement of Infrastructure of Paddy Field

The improvement of the infrastructure of seed area was conducted from March 2005 to November 2005 as follows:

- The pipeline system including 1,246 m of pipelines and valves in the plots No. 13 ~ No.16, which was for seed production for popular rice, was replaced.

- Dredging and reshaping of drainage canals, that was 3,340 m in total including the collecting, preliminary and secondary drainage of above seed area.

The field machinery listed below was introduced and delivered to IIArroz on April 2005.

- Riding type tractor, 4 wheel drive, diesel engine 25HP, Including tractor implements of paddy wheel, rotary tiller and bottom plow.
- Side delivery type reaper, walking type, binding function, reaping by 2 rows.
- Self propelled thresher
- Walking type rice transplanter, 2 wheels, Number of rows planted at a time: 4.

Seed grading machine, mechanical dryer and equipment for seed laboratory listed below were introduced and delivered to IIArroz on November 2005.

- Circulation Dryer for Grain, with batch capacity 1 ton
- Gravity Separator for Seed, with capacity 50~100 kg/hr
- Sieve Grader for Seed, with capacity 50~100 kg/hr
- Equipment for laboratory testing

(2) Monitoring Result of Agricultural Machinery in the Field

Thresher (Fuji)

This machine has had a positive impact among the workers who have operated it due to the high efficiency achieved during threshing, and because there are no observed losses neither in the panicles nor in the straw when the rice plants have the established humidity for harvesting, reaching a productivity of 7.5 sacks of 30 kg/hour with three operators, which is considered satisfactory.

However, the majority of the harvest was done in fields where water was puddled and sometimes the plants had too much humidity causing the plants to get lodged, which reduced productivity to 3.6 sacks of 30 kg/hr with 2 operators. If the thresher is operated under this condition of high level of humidity, the feeding into the machine decreases because the threshing gets stuck in the mesh that is below the thresher drum, as well as on the outing where the straw comes out, in the rear part of the machine. It was observed that it also gets stuck in the grain conveyor due to the high humidity of the grain.

It is recommended that when the plants have high moisture, after they have been cut they should be placed on a dry surface for a few hours until some of the excess moisture is removed and afterwards they can be threshed.

Binder (Kubota RJ55D)

The binding machine was well accepted. In normal working conditions, the results of this machine are similar to the results obtained in Chambas and Mayajigua with a productivity of 0.7 ha in an 8 hour working shift. This machine has the same problem as the Fuji thresher because this machine was mostly used in fields of puddled water, with a high percentage of plants that get lodged and in these conditions, the productivity decreases to 0.43 ha per shift, highly increasing its fuel consumption.

Tractor (Kubota L2605DT 4WD)

The main job that has been accomplished with the use of this tractor is a good quality puddling, in spite of the working conditions being quite difficult due to the large amount of weeds in the field.

The productivity that was reached by this tractor was from 0.8 to 1.07 ha per working day, although the achieved results could have been much higher in better conditions, since the volume of work was affected due to the lack of water in the terraces and the lack of transmission oil.

It is recommended that together with this tractor, there is a need for a mower to be used at the borders of the field and a trailer or tower is needed for transportation. Presently, the use of the bottom plough (arado de vertedera) has just started.

Self-propelled transplanter (Kubota JP-4)

A training seminar was given to 2 workers regarding the preparation of nurseries. At that time, the machine was started and put to use training the operator and the technician in charge of this machine. A test program was set up and the charcoal made from rice husks was prepared as well as the soil that was to be set on the trays.

24 trays were planted, 8 of which had clayish soil, 8 had soil plus 20% rice husk charcoal and 8 other trays had soil plus 40% rice husk charcoal. The puddling was prepared in the field and the transplanting was carried out with the machine. The machine operated properly when it was used with the 2 densities planted, and even though the level of water was too deep, the transplanting was achieved with optimum quality. The performance of the machine was very similar when it was used with the plantlets on three different soil mixtures.

The plants were 15 days old after germination and they had a height of 22 cm with a good healthy color and vigor, achieving a productivity of 0.95 ha per working day.

Manual transplanter (IRRI)

- From the technical viewpoint, the transplanting machine will allow normal transplants. It slides smoothly over the mud and it deposits the seedlings right at the recommended depth.
- In this first test, one of the operators was able to achieve a productivity of 0.20 ha per day of work, which is quite acceptable considering that the recommended productivity for this machine is 0.25 ha.
- From the structural viewpoint, the bar of the seedling tray is quite weak because it detached from the welding when it was being used.

Problems

Problems	Causes	Solutions
1. It was very difficult to cut open the soil layer to extract the seedlings.	The soil of the nursery was very clayish	Improve the soil's friability by mixing some material with it.
2. The seedlings were slanted in the mud.	The soil is too soft The seedlings are too tall.	The soil should be allowed to hardened for 1 or 2 days.
3. Some spaces were left without plants.	The seedling did not slide smoothly from the tray. A low sowing density was used when planting the nursery tray.	Water the trays. Clean the trays. Sowing of the nursery trays should be done at the correct density.
4. Detachment of the tray bar.	Weak welding	Repair the welding.

(3) Results and Lessons of the Verification Study

Due to delay of completion of the construction work of the infrastructure, the verification of the field activity with introduced field machinery in the IIArroz was carried out using existing paddy field. The seed production in the improved paddy field was started as a crop in the dry season of which transplanting was conducted on December 2005. Because the cultivation in the improved field had been in progress so far, monitoring the effect of increased of variety and production of seed will be continued in the regular activity of IIArroz. The verification of improvement of seed quality by introducing seed grader and mechanical dryer will be also continued to be monitored in the regular activity of IIArroz due to delay of delivery of necessary equipment.

1) Improvement of workability and productivity by improving infrastructure of the seed area

Irrigation and drainage system of around 10 ha of paddy field for seed production was improved and so it was possible to apply them for appropriate water management in the field at the necessary time. By securing the paddy field with appropriate water management for seed production, the quality of seed is expected to be improved and the quantity is expected to increase. In addition, the improvement of water management enables the introduction of mechanized farming proposed in the verification study and it is expected to improve the workability and productivity in the field. The rotational use of seed area in 3-year cycle will contribute to improve quality of seed by preventing variety mixing in the field. The improved seed area will be in-service from the crop in the dry season of 2005-2006 and it is expected that the target of IIArroz, that is to increase the number of basic seed production to 4 varieties and the amount of production to 3.5 tons in each variety, will be realized.

2) Improvement of cultivation technique by introducing field machinery

a. Rice transplanter

A tractor with rotary tiller introduced in the verification study was used for land preparation works in the paddy field such as plowing, leveling and puddling. It is noted that land leveling was enabled at a high level, which was indispensable to introduce rice transplanter, due to new machinery system. Rice planter is expected to increase efficiency of field work of seed production; however, it is necessary to consider introduction of adequate land preparation work integrated with appropriate mechanized farming.

b. Small tractor and rotary tiller

In comparison with large tractor which had been used for field work in the IIArroz, advantages of small tractor were confirmed, that is to enable plowing and puddling suitable for small plot, to enable to reduce fuel consumption, etc.. Above all, puddling by small tractor with rotary tiller has a remarkable positive effect to improve land leveling and it is considered indispensable for introducing rice transplanter.

c. Side delivery type reaper and self propelled thresher

Introducing mechanized harvesting and threshing process using reaper and self propelled thresher is able to significantly reduce workload of harvesting work which was carried out by hand. It is also a recognized advantage of workability that introduced small machinery was suitable to small plot of IIArroz rather than large scale combined harvester. Because the

verification study was conducted in the field where drainage system was not developed, some problems on quality and workability of harvesting were observed due to inadequate drainage condition of the paddy field. It is considered that the strengthening drainage function of the field by improvement of drainage system is indispensable to introduce mechanized harvesting and threshing process using reaper and self-propelled thresher.

d. Operation and maintenance of machinery of IIArroz

The introduced machinery was operated and maintained by IIArroz satisfactorily without any serious trouble or problem. It was confirmed that operator and staff of workshop had the necessary skill and knowledge to use the machinery. Necessary consumables such as fuel, lubricant, etc. were prepared by IIArroz as planned except for one particular lubricant. Because it is expected that some of spare parts are difficult to obtain in Cuba, it is recommended to consider procurement of spare parts necessary for operation and maintenance after this study.

3) Improvement of seed quality by introducing seed grader and mechanical dryer

a. Circulation dryer

Seed grains used to be dried by sun drying in the open space due to superannuation and malfunction of existing dryer of IIArroz. Owing to renewing of mechanical dryer with circulation type dryer, it is expected to increase quality of seed through applying appropriate moisture control of seed, reducing drying unevenness, reducing variety mixing, etc. In addition, it is expected to contribute to reduce workload of researchers and staff of IIArroz.

b. Seed grader

Due to superannuation and malfunction of existing seed grader, it used to be difficult to apply adequate seed grading and to meet problems of impurities and unevenness of quality. Introduced equipment for seed grader is expected to contribute to improve quality, stability and uniformity of seed.

c. Future tasks

Due to delaying delivery of machinery/equipment, the verification study of the improvement of seed quality was not carried out sufficiently during the study period. It is expected for IIArroz to continue the verification study using the delivered machinery/equipment as activities of IIArroz. The following activities are recommended for future tasks:

Contents of verification and activities	Lessons, Observation	Future Tasks
a) To improve the post-harvest practices for rice seed multiplication.	・ Post-harvest practices of seed production has not established yet.	・ Guideline of post-harvest practices for seed production.
b) To reduce the rate of husked grains under processes of reaping and threshing to improve seed quality. ・ To measure the rate of husked grains generated by the binding type of reaper.【husked grains】 ・ To measure the rate difference of husked grains by panicle thresher and throw-in thresher. 【husked grains】	・ Husked gains are scarcely observed while threshing just after reaping for seed production. ・ Manual seed threshing carefully to some extent, but no seed thresher for exclusive use exists yet. Foot-pedal type seed thresher for sole use is required.	・ Clarification of husked grains in practices of reaping and threshing. ・ Development of seed thresher.
c) To dry paddy by circulated type combustion dryer by keeping seed quality. ・ To provide with the best operation skill for circulated type dryer. 【rate of cracked grains, grain temperature, air temperature, air volume and velocity】	・ Dryer operator needs to learn the technical skill for seed drying under the best conditions, but the dryer has not started in operation yet.	・ Establishment of the best methodology for drying conditions for seed by analyzing not only drying data but also data of seed germination and vigor.
d) To classify the seed paddy by utilization of air force and grain size and gravity. ・ To purify the seed paddy by using power-winnower and grain size and gravity. 【mixture of foreign matter, empty grain, immature grains】	・ Operator needs to learn the technical skill to bring out the best functions and efficiency fitting into seed standards, but the machine has not started in operation yet.	・ Establishment of operating method for the machine on the basis of seed standards.

4) Experimental introduction of manual type rice transplanter

Manual type rice transplanter is expected to contribute to expansion of transplanting technology because labor-saving is possible without fuel. Also, it is possible to expand regular transplanting technology by using machinery while random transplanting is still major even in the area where transplanting is popular. Even though the above merits and advantages are recognized, there are several problems to be solved to expand widely manual type rice planter into producers such as: mechanical improvement and organizing mass-production, development of guideline and orientation procedure of preparation of nursery, and introduction of improvement of farming practice including land leveling. IIArroz and IIMA are expected to solve these problems.

4. Verification Study in the Field

4.1 Outline of Verification Study in the Field

(1) Objectives and Selection of Verification Activities

The objective of verification study in the field is verifying of impacts of improvement of farming practice suggested in the development plan.

The plan of the verification study in the field was established based on the following basic ideas:

- The verification study will be carried out in the field of individual producer(s) belonging to CCS. Participatory producer(s) are in Yaguajay and Chambas Municipality. 0.6 ha of the verification field will be set for the verification study in each municipality.
- Participatory producer(s) will cultivate in verification field under instruction of the verification study team.

- The verification field will be divided into 2 areas of 0.3 ha each, and the suggested technology or farming practice will be introduced to each area for comparison.
- The farming system with direct seeding will be introduced to Yaguajay site and the farming system with transplanting will be introduced to Chambas site.
- The Verification Studies will be implemented during the sowing campaigns of the dry season in 2004-2005 and the rainy season in 2005.

It is difficult to verify all suggested farming practices in the field within a limited period. However, it is expected that some of the important factors may be verified. The importance for this verification study is for the farming practices for small-scale producers, who cannot get enough agro-inputs/fuels at present. In other words, the verifying farming practices should focus on the production techniques for small-scale individual producers.

Therefore, it is not necessary to verify the newest and most modern technology for use with high amount of agro-inputs/fuels, because getting agro-inputs/fuels is one of the biggest difficulties for the popular rice producers. But, it is necessary to verify even the old and primitive technologies with low agricultural inputs/fuels in the same amount as used presently.

The production techniques used in the verification study are techniques that have been studied and developed in Cuba and are ready to be applied by the producers. The agricultural materials, cultivation machinery and tools used in the verification study are available in Cuba and in the rural areas, too.

The verification study in the field will consists of the following verification items:

1) Verification study on production techniques

- Technique for weed control with agronomic management (Technique using cultural soil preparation of dry puddling, technique using hand weeder in regular planting or row seeding, and technique using field ponding.)
- Technique to improve the physical and chemical properties of the paddy field soil. (Technique for the production and application of earthworm compost by the producers, technology by using of air-drying effect on mineralization of organic nitrogen and phosphorus, and technique to incorporate clipped straw into the soil.)
- Technique to increase the quality of germination and crop stand. (Application of certified seeds, technique for seed selection through gravity method.)
- Technique to control pests through the use of biopesticide. (Technique using biopreparations of Metharizium and Bacillus which are produced by CREE.)

2) Verification study on reaping and post harvesting

- Evaluation of harvesting/post-harvesting loss
- Paddy threshing (Adaptability of axial flow type thresher)
- Paddy drying (Sheet sun drying, adaptability of box-type dryer)
- Rice milling (Effects of rubber-roller husker)

3) Verification study on irrigation management

- Improvement of water management in the field

- Improvement of irrigation and drainage system
- Collection of data of actual water use in the field in popular rice production

4) Verification study on agricultural machinery

- Introduction of small scale machinery in the field
- Operation and maintenance of machinery

5) Verification study on group works

- Collective management of agricultural machinery
- Collective management of post harvest equipment
- Collective production of organic fertilizer
- Introduction of collective farm works

6) Verification study on extension activities

- Preparation of a manual for popular rice
- Study tour

(2) Selection of Province / Municipality for Verification Study

The Study Area covers the five provinces in the central area in Cuba: namely Cienfuegos, Villa Clara, Sancti Spiritus, Ciego de Ávila and Camaguey. In each of these provinces, one municipality was selected for the formulation of the Action Plan. The selected municipalities in each province are Aguada de Pasajeros (Cienfuegos), Santo Domingo (Villa Clara), Yaguajay (Sancti Spiritus), Chambas (Ciego de Ávila) and Vertientes (Camaguey).

In the discussions delivered between the Study Team and the Cuban Counterpart, it was agreed to select the municipalities of Yaguajay and Chambas, considering the following items:

1. The municipalities of Yaguajay and Chambas are separated by Jatibonico del Norte River, the main areas for popular rice production being located on the riversides. In this sense, the machines introduced can be used in both municipalities.
2. Rice producers in both Yaguajay and Chambas represent approximately the average of producers in the whole Study Area. One of the verification factors being related to transplanting technology, the area used for transplanting is 31% in Yaguajay and 24% in Chambas. Transplanting in Aguada de Pasajeros and Santo Domingo is more than 90%, while in Vertientes it is 0%. Therefore, it is not possible to verify this factor in the other municipalities.
3. Located at the central part of the Study Area, both municipalities have accommodation facilities, allowing the **study tours and field days**, so that producers coming from the five provinces may observe the demonstration areas.
4. The Regional Station of Investigations of Paddy Rice “Sur del Jibaro” is located in Sancti Spiritus, which will be in charge of taking care and monitoring of the verification points.

(3) Selection of Site

The verification sites from Mayajigua Area of Yaguajay Municipality and from Mabuya Area of

Chambas Municipality have been selected. In addition, a site from El Rio Area of Yaguajay Municipality has been adopted as a supplementary data collection.

Province / Municipality	Site	Producer	Organization	Water resources	Remarks
Sancti Spiritus / Yaguajay	Mayajigua Site	Ruben Cuadrado	CCSF Frank Pais	Surface water (small river) Individual system by gravity	Verification of farming practice with direct seeding technology
	El Rio Site	Irenio Perez	CCSF Savino Hernandez	Surface water (Jatibonico del NorteRiver) Individual system by pump	Supplementary data collection for verification of farming practice with transplant technology
Ciego de Avila / Chambas	Mabuya Site	Pastor Gonzalez	CCSF Maximo Gomez	Surface water (Jatibonico del NorteRiver) Communal system by pump	Verification of farming practice with transplant technology

The locations of the selected sites are shown in the following map:

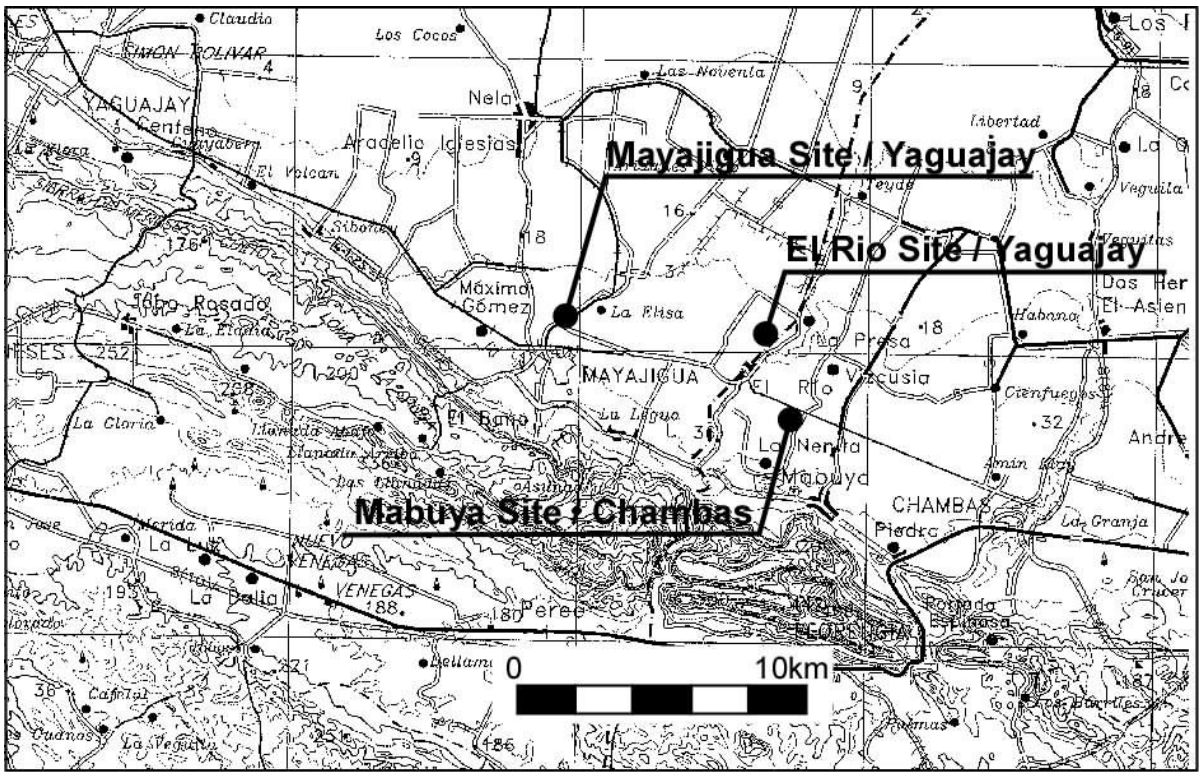

Fig. 4.1.1 Location Map of Verification Study

(4) Outline of CCS

1) Yaguajay

CCS Fortalecida: Frank Pais

Organizational structure

The CCS Fortalecida, Frank Pais, has now 207 members. Among them, 165 members have their own farmland, and remaining 42 do not now. However, most of 42 members can expect inheritance of farmland from their own family in the future. Only 6 to 7 members do not have prospects to gain inherited farmland.

Organizational structure of the CCS is similar to general type of CCS. The main structure is

composed of executive board and administration committee as central structure and members. The board comprises President, Vice President, Organizer, Ideologico (all of them are volunteer work), and the committee does Administrator (250 peso/month)、Economist (250 peso/month)、Comprador (commission basis).

Besides, the group of laborers, called *Brigada*, officially registered an organization in November 2004 in the CCS. Laborers obtained merits by this official establishment, which enables them to receive pensions with solid social status.

Management of machinery

The CCS, Frank Pais, has 3 tractors and 1 combine as properties of the organization. Rental fee of tractor is 3 peso per cordel and 4 peso per quintal for combine. Preparation for fuel is responsibility of the users themselves.

Management and operation of machines are assigned to operators under exclusive contract with a machine individually. Operators have responsibility to repair and change parts in addition to its normal operation. Cost to repair and purchase parts are divided equally between operators and CCS in many cases.

Operation schedule is coordinated by the Administrator of the CCS. Operators provide operation services to CCS members in accordance with working plan made by the Administrator under the mix system of secured minimum salary and commission.

2) Chambas

CCS Fortalecida: Maximo Gomez

Organizational structure

The CCS, Maximo Gomez, has 80 members now, half of whom have their own farmland and the remaining half do not now, even though most of them will receive farmland as inheritance in the future.

Organization structure of the CCS is almost the same as the CCS, Frank Pais. The main structure of Maximo Gomez comprises executive board, which has President, Vice President, Organizer, Ideologico, Chief of Production (all are voluntary basis position), and administration committee composed of Administrator (250 peso/month) and Economist (250 peso/month).

Besides the central structure, there are 8 to 10 labors called Obrero. They receive 20-30 peso/day for **general work, 60 peso/cordel for transplant, and 1 peso/bag or 20 peso/day to dry paddy. However, they have not formed an official group of labors as Frank Pais did.**

Management of machinery

Maximo Gomez has one bulldozer (rental fee: 100 peso/day), one tractor (3 peso/cordel), and one truck (10 peso/hour). Users are required to prepare fuel for their own use.

Operators are assigned to each machine, and take responsibility for management and repair. The CCS normally covers the cost to maintain and repair, and operators are in charge of logistics to purchase parts.

Operation schedule is coordinated by the Administrator of the CCS looking at distribution of requested areas.

4.2 Implementation Schedule and Implementation Plan

(1) Implementation Organization of the Verification Study in the Field

Organizations and their roles concerning the implementation of the verification study in the field are summarized below:

Organization/participants	Expected role in the verification study
• Experts of the Study Team • Cuban counterparts in Havana	• Monitoring and evaluation through reporting from extension officers/ETIA • Instruction and suggestion to extension officers/ETIA • Review of the verification plan
• Provincial MINAGRI	• Support to extension officers • Support to implementation of study tour • Support to supply local material
• Universities/Research institutes	• Technical support and suggestion to the verification study
• Extension officer in municipality • ETIA Sur del Jíbaro	• Instruction farming practice and monitoring activities to participant producers • Extension officer will take daily visiting, communication and instruction to producers directly. • ETIA is expected periodical visiting to the field and giving suggestion to extension officers.
• Participant producers • CCS	• Implementing farming activities at the verification field

(2) Monitoring System

The monitoring of the verification study in the field will be carried out by the participant producers through their observation, measurement and book-keeping. ETIA Sur del Jíbaro will take a role of instruction and management of the monitoring by producers and extension officers will instruct the actual monitoring activity to producers by daily communication. The results of the monitoring will be reported to the Study Team and counterparts periodically and they will be evaluated and used for the review and modification of the monitoring plan and implementation plan of the verification study.

The monitoring factor of each verification items will be discussed in the plan of each activity.

(3) Implementation Schedule

The tentative implementation schedule of the verification study is shown in Fig. 4.2.1.

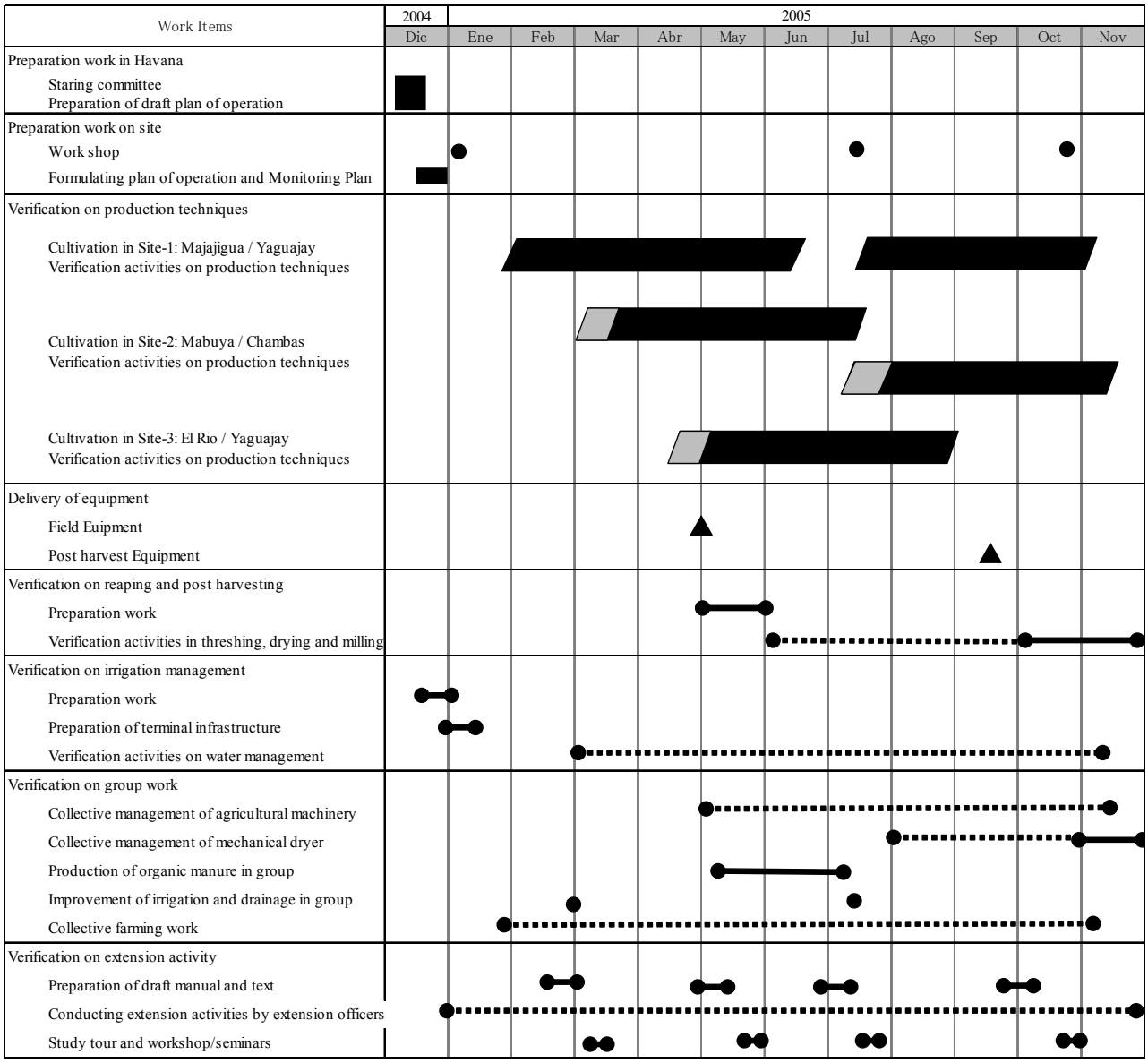

Fig. 4.2.1 Implementation Schedule of Verification Study in the Field

(4) Required Material and Equipment

The required material and equipment for the verification study in the field and the expected share between Japanese side and Cuban side are summarized below:

Items	Japanese side	Cuban side
Production technique	• Field equipment (small tractor and attachment, manual drum seeder, manual slayer, push-type manual weeder, etc.) • Agricultural input (certified seed, organic fertilizer, bio-chemicals, etc) • Fuel for field equipment • Office supplies	• Land for verification field • Warehouse for field equipment • Manpower (participants for verification) • Labor wage for manual transplanting • Electric charge
Reaping and post harvesting	• Equipment for verification on post harvesting • Materials for measurement • Fuel • Office supplies	• Work place • Warehouse for equipment and materials) • Space for stationary dryer • Manpower (participants for verification) • Electric charge
Irrigation technique	• Small distribution facilities • Measurement facilities (small Parshall-flume) • Office supplies	• Labor wage for manual transplanting • Operation cost of irrigation pump (electric charge in Chambas)
Group work	Input required for group work of agricultural machinery, post harvest equipment, maintenance of irrigation and drainage facilities and collective farm work is included to the items of production technique, reaping and post harvesting, and irrigation technique.	
Collective production of organic fertilizer (earthworm compost)	• Fuel • Field equipment for verification of production technique will be used for necessary transportation. • Office supplies	• Land for producing earthworm compost • Manpower (participants for verification)
Extension activity	• Motorbike for extension officer • Fuel for extension officer and ETIA activities (transportation) • Printing technical manual • Transportation of study tour (hiring buses) • Cost for monitoring workshop • Office supplies	• Place of staff for instruction, communication and monitoring (extension officers, staff of ETIA) • Preparing technical manual (IIArroz) • Cost of accommodation and meals for study tour participant, place for seminar of study tour

4.3 Verification Study on Production Technique

The production techniques used in the verification study have been studied and developed in Cuba and are ready to be applied by the producers. The agricultural materials, cultivation machinery and tools used in the verification study are available in Cuba, and in the rural area too.

(1) Outline of the Verification Study

It is difficult to verify all suggested farming practices in the field within a limited period. The production techniques used in the verification study have been studied and developed in Cuba and are ready to be applied by the producers. The agricultural materials, cultivation machinery and tools used in the verification study are available in Cuba, and in the rural area too. The verification study in the field will consists of the following verification items: 1) Technology on weeds control, 2) Technology on fertilizer application, 3) Technology on of seeding, 4) Technology on pest control, and 5) Technology on cultivation method.

The following techniques were examined during the verification study:

1) The technology on weeds control by agronomic management

a. Weeds control technology during paddy field preparation in the dry field
b. Weeds control technology by manual rotary weeder combined with row seeding and regular planting.

c. Weeds control by the maintenance of flooding condition in the paddy field

2) Technology on fertilizer application

a. Production and application technology of earthworm manure
b. Technology of mineralization of organic nitrogen, phosphate and potassium by middle season drainage
c. Technology on the incorporation of rice straw

3) Technology on the improvement of germination percentage and the establishment of the good stand

a. Use of certificated seed
b. The seed selection by specific gravity

4) Technology on pest control by biocides

a. The application technology of Metharizium and Bacillus produced by CREE

The outline of the verification study is shown in Table 4.3.1 and the implementation plan for the Verification Study (the dry season cropping) is shown in Table 4.3.4. The improvement of farming practices with direct seeding will be applied in Yaguajay and with transplanting will be applied in Chambas.

In Mayajigua Site of Yaguajay, a farming practice of row seeding by using manual machine (manual drum seeder) in combination with the improvement of manuring practices will be verified (YHF, YSHP). In addition, the improvement of row seeding in rainfed conditions (Secano favorecido) during rainy season (YHF) will be applied as well as the improvement of direct seeding in irrigated paddy field (YSHP). In Mabuya Site of Chambas and El Rio Site of Yaguajay, the farming practice of regular planting in combination with the improvement of manuring practices will be applied during both seasons (CHTHF, CHTHP). The practice of random transplanting, which is applied in the ordinary way in the area, in combination with the improvement of manuring practices will be applied as well as regular planting in order to verify advantages and disadvantages (CHTNF, CHTNP). In both areas, the farming practice in traditional pattern (YVF, YSVP, CHTTF, CHTTP) will be applied in part of the verification field, in order to compare the above improved farming practices.

Table 4.3.1 Outline of Verification Study in Each Site

<table>
<tr><th rowspan="2">Site</th><th colspan="3">Farming Practice</th><th rowspan="2">Post Harvest</th></tr>
<tr><th colspan="2">Verification Plot</th><th>Control Plot</th></tr>
<tr><td>Mayajigua Site – Yaguajay Municipality</td><td colspan="2">Cropping system with row seeding with drum seeder in combination with suggested countermeasures</td><td>Cropping system in traditional patter with broadcast seeding</td><td>Verification on post harvest technology</td></tr>
<tr><td>El Rio Site – Yaguajay Municipality</td><td rowspan="2">Cropping system with regular planting in combination with suggested countermeasures</td><td rowspan="2">Cropping system with random planting in combination with suggested countermeasures</td><td rowspan="2">Cropping system in traditional patter with random planting</td><td></td></tr>
<tr><td>Mabuya Site – Chambas Municipality</td><td></td></tr>
</table>

(2) Monitoring Plan

The monitoring of the verification study in the field has been carried out by the participant producers through their observation, measurement and book-keeping. ETIA Sur del Jibaro has

taken a role of instruction and management of the monitoring by producers, and extension officers will instruct the actual monitoring activity to producers by daily communication. The results of the monitoring were reported to the Study Team and counterparts periodically and they evaluated and used for the review and modification of the monitoring plan and implementation plan of the verification study. The monitoring of each verification item was discussed in the plan of each activity.

(3) Result of Verification Study

General growth condition

Since precipitation of the dry season of 2004-2005 was insufficient more than last year, the verification study (verification of direct seeding method) at Mayajigua site, Municipality Yaguajay was not able to be executed well. The shortage of river irrigation water caused the delay at sowing time, the suppression of the growth of rice, and the loss of chance to control the weeds by the maintenance of flooding condition of paddy field. But there was enough water for the irrigation at El Río site, Yaguajay, although the start of the verification study was delayed.

The was enough rainfall to execute the verification study in the rainy season of 2005, and at both sites the growth of rice was excellent.

Yield

The results of the yield obtained by the verification Study are shown in the following table.

The yield obtained by the traditional technology was higher than the value in ordinary years that was obtained by interview of surrounding producers in every case, except for about 1 ton/ha lower at Mayajigua site, Municipality Yaguajay.

The yield obtained in the field where the cultivation technique was verified greatly exceeded the value in the ordinary year, and it was deemed satisfactory by the producers who executed the Verification Study.

In case of the direct seeding, the yields of the row seeding were higher than that of the broadcast sowing in the dry and rainy seasons. In the case of the transplanting, the yields of the regular planting were a little bit higher than that of the random planting in the dry and rainy seasons.

Table 4.3.2 Yield of Verification Study

	Treatment	Yield (dry paddy, t/ha)
Dry season cropping	Broadcast seeding (Traditional technology)	2.78
	Row seeding with drum seeder (Improved manuring practice)	4.53
Rainy season cropping	Broadcast seeding (Traditional technology)	3.70
	Row seeding with drum seeder (Improved manuring practice)	4.91
Dry season cropping *	Random planting (Traditional technology)	6.36
	Random planting (Improved manuring practice)	5.69
	Regular planting (Improved manuring practice)	6.89
Rainy season cropping	Random planting (Traditional technology)	4.82
	Random planting (Improved manuring practice)	4.94
	Regular planting (Improved manuring practice)	4.93

*Though it is rainy season cropping by the agricultural calendar in Cuba, this is considered to be dry season cropping.

(4) Comparisons of Costs of Each Technology that Verify by Verification Study

The comparison of costs of each technology confirmed by the verification Study are shown in Table 4.3.6.

Fertilizer application: Since the amount of application increased by using earthworm manure, the manpower and the materials expense of the improved manuring practice were higher than those of the traditional technology for dry seasons cropping, but were lower than those of traditional technology for rainy seasons cropping when the earthworm manure is not applied.

The cost of the transplanting was lower than that of the direct seeding with the improvement of manuring practices in the whole year.

Seed: The amount of seed by direct seeding was higher than that of the transplanting by 3 to 4 times. The amount of seed by row seeding was lower than that by broadcast seeding by about 40%.

Planting pattern: The manpower and labor cost of transplanting were higher than those of the direct seeding. The producers will not accept the increase of expense when the producers shift the planting pattern from the random planting to the regular planting, but they will accept the increase when the producers shift to the cultivation style from the direct seeding to the transplanting, and there is a possibility of this becoming a factor to hesitate in the introduction of the transplanting culture.

Weeding: In direct seeding in dry seeding, the manpower and the labor cost were high because the weeds cannot be controlled by using of herbicide, the maintenance of flooded condition of paddy field and weeding is manual, and much red rice and the rice grown from the seed dropped in the previous cropping season grew in direct seeding compared with the transplanting in both the traditional technology and improved manuring practice.

Although the weeding cost for the regular planting, where the weeds in furrows and interhill spaces were able to be controlled by the manual rotary weeder, is higher than that of the random planting, the weeds could be controlled well. Also the weeds in the row seeding where the manual rotary weeder could be used could be controlled well; however, since the growth of the red rice and the rice grown from the seed dropped in the previous cropping season in both direct seeding could not be prevented, there was a cost for its removal.

Pest control: since the rice bug was generated in the broadcast seeding and row seeding in dry season cropping, insecticide was used in both. The manpower and the materials expense for the improved manuring practice was higher than that of traditional technology, since the biocide was applied without the generation of pests.

(5) Production Cost and Benefit of the Verification Study

Production cost and benefit of the Verification Study are shown in Table 4.3.7.

Manpower: The labor cost of the paddy field preparation and weeding of the direct seeding culture were higher than that of transplanting culture, because the paddy field was plowed by animal power and the removal of the red rice and the rice grown from the seed dropped in the previous cropping season was done by manpower. On the other hand, the labor cost of transplanting was higher than that seeding. Therefore, there was not much difference in the labor cost for the whole year

between the direct seeding culture and the transplanting culture.

Cost of rental agricultural machinery and fuel: The cost of rental agricultural machinery and fuel for the transplanting culture were high compared with the direct seeding culture, because the paddy field was plowed by animal power for the direct seeding field and by tractor for the transplanting culture. The cost of the rainy season cropping was lower than the dry season cropping, because the consumption of fuel of the power tiller supplied by the Study Team was used for the puddling and leveling in the rainy season cropping a little.

Agricultural materials: Since the prices of the fertilizer, insecticide and herbicide were calculated based on the assigned price, the cost of the traditional technology was lower than the market cost. Since the amount of the seed of the direct seeding was more than that of the transplant culture cultivation, the cost of the agricultural materials of the direct seeding culture was more than that of the transplanting culture.

Total Production cost: Since there was a significant cost of irrigation, total production cost of the direct seeding except for the row seeding in the rainy season cropping was lower than that of transplanting culture. The total production cost of the row seeding in the rainy season cropping was higher than that of the row planting, because the cost for removing the red rice and the rice grown from the seed dropped in the previous cropping season of the row seeding was higher than that of row planting.

Profit: After excluding the irrigation cost, the profit from the transplanting culture was higher than that from the direct seeding culture. But it is possible that the profit from direct seeding culture is higher than that of transplanting culture in the paddy field with low density of the red rice and the rice grown from the seed dropped in the previous cropping season plowed under by tractor. When rice planted by direct seeding at the paddy field where the density of the red rice and the rice grown from the seed dropped at the previous cropping season are low, there is a possibility that a high profit is obtained from the direct seeding than the transplanting, because the cost for weeding is low and the yield does not decrease.

Cost-benefit analysis indicated that productivity gains exceeded the increase of total costs. Whereas cost analysis reveals that both labor and machinery costs do not differ much in the traditional and improved cases (i.e., labor requirements and fuel consumption have not changed much), input items have changed from those of chemical origin to organic origin. It means that the proposed improvement will contribute to increase popular rice production with maintaining present level of imported essential input dosage, by decreasing reliance on limited energy resources increasing on those of animals and humans.

(6) Lesson of the Verification Study

The interview survey was carried out with four producers: 3 of them executing the verification study and one who has adopted the same technology as the verification study.

Planting style and the improved manuring practice:

Opinions concerning the introduction of row seeding by producers who have use to the ramrod transplanting were as follows:

Even if the row seeding has the advantage that the weeds in furrows are able to be controlled by the

manual rotary weeder and in interhill spaces are controlled easily by hand weeding, they don't like to introduce row seeding because it is necessary to drain irrigation water to promote the germination after sowing and extra cost of irrigation is required.

The cultivation technologies for improving the growth and increasing rice production that all farmers wanted to recommend to Surrounding producers were: the application of earthworm manure, use of certified seeds and seed selection by gravity method, as well as the use of the manual rotary weeder combined with regular transplanting and row seeding.

The results of the interview survey on the verification technology with the producers follow:

Technology	Evaluation	Reason for high evaluation
Earthworm manure	high	Since popular rice production used to be grown by the application of only a small amount of urea as fertilizer, the supply of phosphate and potassium from earthworm manure and the specific character of earthworm as a slow-release fertilizer act effectively on the plant growth. The leaf color in the heading stage was still green.
Certificated seed and seed selection by specific gravity	high	Contamination with other varieties did not occur when using certified seed. The germination percentage and the growth after germination in the paddy field or nursery bed were good.
Manual rotary weeder combined with row seeding and row planting	high	The effect of weeding by manual weeder was very good and the amount of labor and working hours were less than weeding manually. The producers immediately understood the effect of the manual rotary weeder, and they used it for two directions (in the row and interhill space) in the regular planting field, although the labor cost doubled. The red rice and the rice grown from the seed dropped in the previous cropping season in the interhill space which could not be controlled by manual rotary weeders were controlled easily by hand weeding.
Effect of the middle season drainage	medium	There were fields where the drainage was not able to be done well. Since the cost of this technology is low, they want to try this technology for the future.
Application of biocide	medium	The damage of pests, especially rice bugs, was small. Since the cost of this technology is low, they want to try to establish this technology for the future.
Incorporation of rice straw	low	The producers understand the importance of mixing rice straw with soil. The cutting machine from Japan is effective to be scattered the pieces uniformly in the paddy fields but it consumes precious fuel that is hard to obtain and costly .
Weed control by agronomic management	low	The problem to introduce this technology by the producers is the cost of fuel for the irrigation pump except where producers adopt gravity irrigation.

Weed management:

In the direct sowing culture, since the paddy field was not flooded just after seeding in order to promote germination, the red rice and the rice grown from the seed dropped in the previous cropping season were also germinated. In the case of row seeding, the red rice and the rice grown from the seed dropped in the previous cropping season in the inter row space were controlled easily by the manual rotary weeder and those in the inter hill space were controlled by the hand weeding. In the case of broadcast sowing, it was difficult to control them by the herbicides, because they are

in the same spaces as the rice. This seems to be the reason why the yield of broadcast sowing is lower than that of row seeding.

It is necessary to avoid the direct seeding culture, especially broadcast sowing, to the paddy field where the weed management of the red rice and the rice grown from the seed dropped in the previous cropping season has not been carried out well.

Since popular rice producers have difficulties to obtain agricultural inputs, such as fertilizers, herbicide, and insecticides, the verification study could show the method to increase popular rice production and get profit by regular planting and row seeding with improved manuring practice. Especially for low fertile paddy fields, the superiority of improved manuring practice to traditional technology was pointed out.

Table 4.3.3 Composition of Verification Study

		Yaguajay				Chambas					
		YHF	YVF	YSHP	YSVP	CHTHF	CHTNF	CHTTF	CHTHP	CHTNP	CHTTP
		Dry season		Rainy season		Dry season			Rainy season		
		Proposed	Traditional	Propuesta	Traditional	Proposed		Traditional	Proposed		Traditional
						Improved	Traditional		Improved	Traditional	
Weeds control at the paddy field preparation	Plowing at dry condition, and puddling and leveling	○	○	○	○	○	○	○	○	○	○
Fertilizante	Earth manure	○		○		○	○		○	○	
	Urea		○		○			○			○
Seed	Certified	○	○	○	○	○	○	○	○	○	○
	Selected	○		○		○	○		○	○	
Sowing	Transplante en hilera					○			○		
	Transplante tradicional						○	○		○	○
	Siembra directa en hileras	○		○							
	Siembra a voleo		○		○						
Contron of water level	Water stress	○		○		○	○		○	○	
Control fo weed	Depth of water layer	○	○	○	○	○	○	○	○	○	○
	Escardador	○		○		○			○		
	Manual		○		○		○	○		○	○
Control of pest and disease	Biological medium	○		○		○	○		○	○	

YHF	Row seeding by drum seeder in puddling field during dry season 2004-2005
YVF	Broadcast seeding in puddling field during drt season 2004-2005
YSHP	Row seeding by drum seeder in puddling field (Secano favorecido) during rainy season 2005
YSVP	Broadcast seeding in puddling field (Secano favorecido) during rainy 2005
CHTHF	Regular planting in puddling field during dry season 2004-2005
CHTNF	Random planting in puddling field during dry season 2004-2005
CHTTF	Random planting in puddling field during dry season 2004-2005
CHTHP	Regular planting in puddling field during rainy season 2005
CHTNP	Random planting in puddling field during rainy season 2005
CHTTP	Random planting in puddling field during rainy season 2005

Table 4.3.4 Implementation Plan for Verification Study (Dry season cropping)

VERIFICATION STUDY 09/01/2005

Producer: Rubén Cuadrado. CCS: Frank País. Municipality: Yaguajay. Province: Sancti Spíritus

IMPLEMENTATION SCHEDULE

YHF- Stripe direct seeding technology by using machine on puddled paddy field during the dry season 2004-2005. Área 0.3 ha.
Early variety IACUBA 31 (125 days)

ITEMS	ACTIVITIES AND TECHNICAL REQUIREMENTS	MOMENT (Days before sowing)	EVALUATIONS	PLAN SCHEDULE	
				Start	Completion
1- Organic matter application.	1-Before breaking up the soil, apply earthworm compost by hand on 1.8 t/0.3 ha.	17		13/1/ 2005	13/1/2005
2- Soil preparation on dry paddy field.	1-To break dry soil 15 cm depth using animal power (oxen) and bottom plow. 2-To delimit plots based on a slope of ± 3 cm. 3-To construct or reconstruct dikes.	16	1-Depth of the work in 10 points of the plot. 2-Preparation cost. - Time, area, fuel and lubricants, wage.	14/1/2005 17/1/2005	17/1/2005 17/1/2005
3- Irrigation	1-Irrigation to promote weed germination.	12	See point 1 in irrigation monitoring	18/1/2005	18/1/2005
4- Wait	1-Wait during one week so that weeds might germinate.	12	- Percentage of weed covering per m² (in 5 frames.)	18/1/2005	25/1/2005
5- Flooding	1-Flooding plots keeping water level at 5 cm hingh.	4	See point 1 in irrigation monitoring	26/1/2005	26/1/2005
6- Puddling using animal power (oxen)	1-To puddle at 10 cm depth using animal power, until all residuals and weeds be incorporated into the paddy field.	4	1-Puddling quality (Visual: good- not very good- bad). 2-Preparation cost. - Time, area, fuel and lubricants, wage.	26/1/2005	27/1/2005
7- Smoothing in puddled paddy field using animal power.	1-To smooth using a soothing board until no hill is observed.	2	1-Uniformity of water level in 10 points of the plot. 2-Preparation cost. - Time, area, fuel and lubricants, wage.	28/1/2005	29/1/2005
8- Seed preparation	1-To use certified seed of some rice variety resistant to Sogatodes and tolerant to mite. 2-To select 25 Kg of seed using the floating egg method. 3-To pregerminate seeds during 24 hours in water and 24 hours out of water under roof.	12 2 2	1-Seed germination (5 samples of 100 grains/each one)	18/1/2005 30/1/2005 30/1/2005	26/1/2005 30/1/2005 1/2/2005
9- Plot drainage.	1-To drain plots completely one day before seeding.	1	See point 2 in irrigation monitoring	31/1/2005	31/1/2005
10- Seeding using machine	1-Stripe seeding using machine in puddled paddy field. 2-Seeding density 68 Kg/ha.	MOMENT (Days after germination)	1-Moment of 100% of germination. 2-Germinated plants / m² 10 days after germination in 10 points of the plot. 3-Counting stems /m, 40 days after germination and when harvesting. 1- Height of plants 10, 20 and 40 days and	1/2/2005	1/2/2005

			when harvesting.		
11- Water management.	1-Periodical irrigation until the height of plants allow establishing a permanent water level. 2-Flooding until reaching the moment of maximum tillering. 3-Water stress during 7-10 days once reached the moment of maximum tillering. 4-Flooding after water stress. 5-Drainage 15 days before harvesting.	1, 4, 8 10 a 40 40 a 50 51-110 110	See points 1 & 3 of irrigation monitoring See points 1 & 3 of irrigation monitoring See points 2 & 3 of irrigation monitoring See points 1 & 3 of irrigation monitoring See point 2 of irrigation monitoring	10-13-17/2/ 2005 19/2/2005 21/3/2005 1/4/2005 30/5/2005	10-13-17/2/ 2005 21/3/2005 31/3/2005 26/5/2005 30/5/2005
12- Pests and diseases control.	1-To control pests using only **biological products** as recommended by specialists of Plant Protection.		1-To carry out daily checking of pests and diseases.	9/2/2005	26/5/2005
13- Weed control	1-Weed control using manual weeder along rows, when weeds are observed.	15, 30	1-Weed expansion (%) per m² 2-Quality of weed control (Visual: good –not very good-bad).	24/2/2005 11/3/2005	24/2/2005 11/3/2005
14- Reaping	1-To reap using mechanized harvester, 25 days after reaching 100% of panicle formation or once rice grains get 22 % of moisture. 2-To thresh using thresher.	125	1-To specify the moment when the panicle formation stage reaches 100%. 2-Components of yield: Panícles/m², grains/panícle and weight of 100 grains. 3-Grain losses while threshing (pound/ quintal) 4-Grain cleanning (% of impurities) 5-Grain losses when reaping. 6-Evaluation of axial flow threshing. 7-See monitoring factors in reaping.	14/6/2005	17/6/2005
15- Post-harvest	1-Rice drying. 2-Rice milling	125,126	1-Evaluation of rice drying. 2-Evaluation of efficiency of existing rice mills. 3-Evaluation of new equipments for rice milling. 4-See monitoring factors.	14/6/2005	17/6/2005

VERIFICATION STUDY

09/01/2005

Producer: Rubén Cuadrado. CCS: Frank País. Municipality: Yaguajay. Province: Sancti Spíritus

IMPLEMENTATION SCHEDULE

YVF- Traditional technology. Manual broadcasting seeding on puddled paddy field during the dry season 2004-2005. Area 0.3 ha.
Early variety IACUBA 31(125 days)

ITEMS	ACTIVITIES AND TECHNICAL REQUIREMENTS	MOMENT (Days before sowing)	EVALUATIONS	PLAN SCHEDULE	
				START	COMPLETION
1- Soil preparation on dry paddy field.	1-To break dry soil 15 cm depth using animal power (oxen) and bottom plow. 2-To delimit plots based on a slope of ± 3 cm. 3-To construct or reconstruct dikes.	17	1-Depth of the work in 10 points of the plot. 2-Preparation cost. - Time, area, fuel and lubricants, wage.	13/1/2005	18/1/2005
2- Flooding	1-Flooding plots keeping water level at 5 cm hingh.	4	See point 1 in irrigation monitoring	26/1/2005	26/1/2005
3- Puddling using animal power.	1-To puddle plots using animal power spike harrow at a depth of 10 cm, until all residuals and weeds are incorporated into the paddy field.	4	1-Puddling quality (Visual : good-not very good- bad) 2-Preparation cost. - Time, area, fuel and lubricants, wage.	26/1/2005	27/1/2005
4- Smoothing in puddled paddy field.	1-To smooth using a soothing board until no hill is observed.	2	1-Uniformity of water level in 10 points of the plot.	28/1/2005	29/1/2005
5- Seed preparation.	1-To use 25 kg of seed of the same variety used in the verification. 2-To pregerminate seeds, 48 hours in water and 24 hours out of water under roof.	12 3	1-Seed germination (5 samples of 100 grains/each one)	18/1/2005 29/1/2005	26/1/2005 1/2/2005
6- Manual broadcasting seeding	1-Broadcast seeding on water level. 2-Seeding density 68 Kg/ha.	0 MOMENT (Days after germination)	1-Moment of 100% of germination. 2-Germinated plants/ m² 10 days after germination in 10 points of the plot. 3-Counting of stems /m² 20, 40 days after germination and when reaping. 4-Plants' height 10, 20 and 40 days after germination and when reaping.	1/2/2005	1/2/2005
7- Drainage	1-To drain plots 24 hours after sowing.		See point 2 in irrigation monitoring.	31/1/2005	31/1/2005
8- Water management	1-Periodical irrigation until plants' height allow establishing permanent water level. 2-Flooding 12, 32 and 52 days after germination. 3-Stop flooding 2 days before applying urea. 4-Flooding until 15 days before reaping. 5-Drainage 15 days before reaping.	1, 4, 8 12, 32 y 52 8, 28 y 48 52-109 110	See points 1 and 3 of irrigation monitoring. See points 1 and 3 of irrigation monitoring. See point 3 of irrigation monitoring. Only 48 days after germination. See points 1 and 3 of irrigation monitoring. See point 2 of irrigation monitoring.	10-13-17/2/2005 21/2/2005 13/3/2005 2/4/2005 17/2/2005 9/3/2005 29/3/2005 30//5/2005	10-13-17/2/2005 24/2/2005 16/3/2005 4/4/2005 17/2/2005 9/3/2005 29/3/2005 30/5/2005

9- Nitrogen fertilization.	-Urea 30 kg/0.3 ha..10 days after germination. -Urea 30 kg/0.3 ha. 30 days after germination. -Urea 30 kg/0.3 ha. 50 days after germination	10 30 50		19/2/2005 11/3/2005 31/3/2005	19/2/2005 11/3/2005 31/3/2005
10- Pest and disease control.	-To control pests and diseases as recommended by the producer.		1-To check pests and diseases daily.	30/1/2005	26/5/2005
11- Weed control	1-Manual weed control when weeds are observed.	15, 30º	1-Weed expansion (%) per m² 2-Weed control quality (Visual: good –not very good-bad).	24/2/2005 11/3/2005	24/2/2005 11/3/2005
12- Reaping	1-Reaping and manual threshing 25 days after reaching 100% of the panicle formation stage or when rice grains get 22 % of moisture. .	125	1-To specify when panicle formation reaches 100%. 2-Yield componenets: Panícles/m², grains/panícle and weight of 100 grains. 3-Grain losses while threshing (pound perquintal) 4-Rice grain cleaning(% of impurities) 5-Reaping losses. 6-Evaluation of axial flow thresher. See monitoring factors in reaping.	14/6/2005	17/6/2005
13- Post-harvest	1-Rice drying. 2-Rice milling	125,126 ¿	1-Evaluation of rice drying. 2-Evaluation of the efficency of existing rice millling. See monitoring factors in post-harvest.	14/6/2005	17/6/2005

VERIFICATION STUDY 09/01/2005

Producer: Pastor González CCS: Máximo Gómez Municipality: Chambas Province: Ciego de Ávila

IMPLEMENTATION SCHEDULE

CHTHF- Row transplanting technology on puddled paddy field during the dry season 2004-2005. Área 0.3 ha.
Early rice variety IACUBA 31 (130 days).

CONTENTS OF THE VERIFICATION STUDY	ACTIVITIES AND TECHNICAL REQUIREMENTS	MOMENT (Days before transplanting)	EVALUATIONS	PLAN SCHEDULE	
				START	COMPLETION
1- Organic matter application.	1-Before breaking up the soil, apply earthworm compost manually: 1.8 t/0.3 ha.	41		13/1/2005	13/1/2005
2- Soil preparation on dry paddy field.	1-To break up dry soil at 15 cm deep using tractor with bottom plow. 2-To delimit plots based on a slope of ± 3 cm. 3-To construct or reconstruct dikes.	40	1-Depth of the work in 10 points of the plot. 2-Preparation cost. - Time, area, fuel and lubricants, wage.	14/1/2005	17/1/2005
3- Irrigation	1-Irrigation to promote weed germination.	17	See point 1 in irrigation monitoring	17/1/2005	17/1/2005
4- Wait	1-Wait during one week so that weeds might germinate.	37		17/1/2005	25/1/2005
5- Flooding	1-Flooding plots keeping water level at 5 cm hingh.	29	See point 1 in irrigation monitoring	25/1/2005	25/1/2005
6- Puddling and smoothing by animal power.	1-To puddle plots using animal power spike harrow at a depth of 10 cm, until all residuals and weeds are incorporated into the paddy field.	28	1-Puddling quality (Visual : good-not very good- bad) 2-Preparation cost. - Time, area, fuel and lubricants, wage.	26/1/2005	28/1/2005
7- Seed preparation.	1-To select seeds through the egg floating method. 2-Seed pregermination. 9 kg../ 0.3 ha.	33	1-Seed germination (5 samples of 100 grains/each one)	21/1/2005	24/1/2005
8- Seeding and nursery care.	1-To seed 9 kg of seeds in the nursery in order to transplant 0.3 ha. 2-To apply earthworm compost 100 g/m². 10 days after germination.	30 20	-To specify when germination reaches 100 % in the nursery.	24/1/2005 3/2/2005 13/2/2005	22/2/2005 3/2/2005 13/2/2005
9- Puddling and final smoothing.	1-To smooth using a board until no hill is observed.	2	1-Uniformity of water level in 10 points of the plot.	21/2/2005	22/2/2005
10- To uproot seedlings.		1		22/2/2005	27/2/2005
11- Row transplanting	1-Row transplanting using a cord keeping a spacing of 20 cm between plants and 20 cm between rows.	0		23/2/2005	27/2/2005
12- Water management.	 1-Flooding until the moment of maximum tillering. 2-Water stress during 7-10 days. 3-Flooding until 15 days before reaping. 4- Drainage of plots.	**(Days after transplanting)** 1-45 46-55 56-94	-To count the number of stems in 10 hills 20 days after transplanting. See points 1 & 3 of irrigation monitoring See points 2 & 3 of irrigation monitoring See points 1 & 3 of irrigation monitoring	 15/3/2005 24/2/2005 10/4/2005	15/3/2005 9/4/2005 20/4/2005

		95	See point 2 of irrigation monitoring	29/5/2005	29/5/2005
13- Pest and disease control.	1-Daily check of pests. 2-To control pests using only biological products.	Diario		23/1/2005	12/6/2005
14- Weed control	1-To control periodically using manual weeder between rows.	20	-Percentage of weed expansion on the area. To evaluate inside 1 m².	15/3/2005	15/3/2005
15- Reaping	1-To specify when the panicle formation stage reaches 100%. 2-To reap using harvesting machine 25 days after reaching 100% of panicle formation. 3-To thresh using threshing machine.	60 110 110	1-To specify when the panicle formation stage reaches 100%. 2-Yield components: Panicles/m², grains/panicle and weight of 100 grains. 3-Grain losses while threshing(pound per quintal) 4-Rice grain cleaning (% of impurities) 5-Evaluation of new axial flow threshers.	24/4/2005 13/6/2005 13/6/2005	24/4/2005 15/6/2005 15/6/2005
16- Post-harvest	1-Drying 2-Milling	110-112	1-Evaluation of rice drying. 2-Evaluation of the efficiency of existing milling. 3-Evaluation of new milling equipments. 4-Monitoring of marketing of processed rice.	13/6/2005	15/6/2005

VERIFICATION STUDY 09/01/2005

Producer: Pastor González CCS: Máximo Gómez Municipality: Chambas Province: Ciego de Ávila

IMPLEMENTATION SCHEDULE

CHTNF- Normal transplanting technology on puddled paddy field during the dry season 2004-2005. Área 0.15 ha.
Early rice variety IACUBA 31 (130 days).

CONTENTS OF THE VERIFICATION STUDY	ACTIVITIES AND TECHNICAL REQUIREMENTS	MOMENT (Days before transplanting)	EVALUATIONS	PLAN SCHEDULE	
				START	COMPLETION
1- Oraganic matter application.	1-Before breaking up the soil, apply earthworm compost manually 1.8 t/0.3 ha.	41		13/1/2005	13/1/2005
2- Soil preparation on dry paddy field.	1-To break up dry soil at 15 cm deep using tractor with bottom plow. 2-To delimit plots based on a slope of ± 3 cm. 3-To construct or reconstruct dikes.	40	1-Depth of the work in 10 points of the plot. 2-Preparation cost. - Time, area, fuel and lubricants, wage.	14/1/2005	17/1/2005
3- Irrigation	1-Irrigation to promote weed germination.	37	See point 1 in irrigation monitoring	17/1/2005	17/1/2005
4- Wait	1-Wait during one week so that weeds might germinate.	37		17/1/2005	25/1/2005
5- Flooding	1-Flooding plots keeping water level at 5 cm high.	29	See point 1 in irrigation monitoring	25/1/2005	25/1/2005
6- Puddling and smoothing by animal power.	1-To puddle plots using animal power spike harrow at a depth of 10 cm, until all residuals and weeds are incorporated into the paddy field.	28	1-Depth of the work in 10 points of the plot. 2-Preparation cost. - Time, area, fuel and lubricants, wage.	26/1/2005	28/1/2005
7- Seed preparation.	1-To select seeds through the egg floating method. 2-Seed pregermination. 9 kg../ 0.3 ha.	33	1-Seed germination (5 samples of 100 grains/each one)	21/1/2005	24/1/2005
8- Seeding and nursery care.	1-To select seeds through the egg floating method. 2-Seed pregermination. 9 kg../ 0.3 ha.	30 20	 -To specify when the nursery reaches 100% of germination.	24/1/2005 3/2/2005	22/2/2005 3/2/2005
9- Puddling and final smoothing.	1-To smooth using a board until no hill is observed.	2	1-Uniformity of water level in 10 points of the plot.	21/2/2005	22/2/2005
10- Uprooting seedlings.		1		23/2/2005	27/2/2005
11- Traditional transplanting.	Random transplanting (without any cord) keeping a spacing of 20 cm between rice plants.	0		23/2/2005	27/2/2005
12- Water management.	 1-Flooding until the moment of maximum tillering.. 2-Water stress during 7-10 days. 3-Flooding until 15 days before reaping. 4-Drainage of plots.	**(Days after transplanting)** 1-45 46-55 56-94 95	-To count the number of stems in 10 hills 20 days after transplanting. See points 1 & 3 of irrigation monitoring See points 2 & 3 of irrigation monitoring See points 1 & 3 of irrigation monitoring See point 2 of irrigation monitoring	 15/3/2005 24/2/2005 10/4/2005 29/5/2005	 15/3/2005 10/4/2005 20/4/2005 28/5/2005

13- Pest and disease control.	1-Daily check of pests. 2-To control pests using only biological products.	Diario		23/1/2005	12/6/2005
14- Weed control	1-To control periodically using manual weeder between rows.	20	-Percentage of weed expansion on the area. To evaluate inside 1 m².	15/3/2005	12/3/2005
15- Reaping	1-To specify when the panicle formation reaches 100%. 2-To reap using harvesting machine 25 days after reaching 100% of pannicle formation. 3-To thresh using a threshing machine.	60 110 110	1-To specify when the panicle formation reaches 100%. 2-Yield components: Panicles/m², grains/panicle and weight of 100 grains. 3-Grain losses when threshing (pound per quintal) 4-Rice grain cleaning (% of impurities) 5-Evaluation of new axial flow threshers.	13/6/2005 13/6/2005	15/6/2005 15/6/2005
16- Post-harvest	1-Drying 2-Milling	110-112	1-Evaluation of rice drying. 2-Evaluation of the efficiency of existing milling. 3-Evaluation of new milling equipments. 4-Monitoring of marketing of processed rice.	13/6/2005	15/6/2005

VERIFICATION STUDY 09/01/2005

Producer: Pastor González CCS: Máximo Gómez Municipality: Chambas Province: Ciego de Ávila

IMPLEMENTATION SCHEDULE

CHTTF- Traditional transplanting technology on puddled paddy field during the dry season 2004-2005. Área 0.15 ha.

Early rice variety IACUBA 31 (130 days)

CONTENTS OF THE VERIFICATION STUDY	ACTIVITIES AND TECHNICAL REQUIREMENTS	MOMENT (Days before transplanting)	EVALUATIONS	PLAN SCHEDULE	
				START	COMPLETION
1- Soil preparation on dry paddy field.	1-To break up dry soil at 15 cm deep using tractor with bottom plow. 2-To delimit plots based on a slope of ± 3 cm. 3-To construct or reconstruct dikes.	40	1-Depth of the work in 10 points of the plot. 2-Preparation cost. - Time, area, fuel and lubricants, wage.	14/1/2005	17/1/2005
2- Irrigation	1-Irrigation to promote weed germination.	37	See point 1 in irrigation monitoring	17/1/2005	17/1/2005
3- Wait	1-Wait during one week so that weeds might germinate.	37		17/1/2005	24/1/2005
4- Flooding	1-Flooding plots keeping water level at 5 cm high.	29	See point 1 in irrigation monitoring	25/1/2005	25/1/2005
5- Puddling and smoothing	1-To puddle using animal power harrow at 10 cm deep until all residuals and weeds are incorporated.	27	1-Puddling quality(Visual : good-not very good- bad)	25/1/2005	26/1/2005
6- Seed preparation.	1-Seed germination test. 2-Seed pregermination.	43 33	1-Seed germination (5 samples of 100 grains/each one)	11/1/2005 21/1/2005	11/1/2005 21/1/2005
7- Seeding and nursery care.	1- Seeding density: 15 Kg./0.3 ha. 2- Urea 10 g/m²	30		24/1/2005	22/2/2005
8- Puddling and final smoothing.	1- o smooth using a board until no hill is observed.	2	1-Uniformity of water level in 10 points of the plot.	21/2/2005	22/2/2005
9- Uprooting seedlings.		1		22/2/2005	22/2/2005
10- Traditional transplanting.	1-Random transplanting (without any cord) at a spacing of 20 cm between plants.	0		23/2/2005	27/2/2005
		(Days after transplanting)			
11- Flooding	-Flooding after transplanting until two days before fertilization.	1	See points 1 and 3 in irrigation monitoring	24/2/2005	22/3/2005
12- Stop flooding.	-Stop flooding two days before fertilization.	28	See point 3 in irrigation monitoring	23/3/2005	23/3/2005
13- Nitrogen fertilization.	-Urea 30 kg/0.3 ha 30 after transplanting.	30		25/3/2005	25/3/2005
14- Water	-Flooding until 15 days before reaping.	32-94	See points 1 and 3 in irrigation	26/3/2005	29/5/2005

management.	-Drainage of plots.	95	monitoring See point 2 in irrigation monitoring		
15- Pest and disease control.	1-Daily check of pests. 2-Usual pest control.	Daily		23/1/2005	12/6/2005
16- Weed control	1-Periodical manual control.	20	- Percentage of weed expansion on the area. To evaluate inside 1 m².	15/3/2005	15/3/2005
17- Reaping	1-To specify when the panicle formation reaches 100%. 2-Manual reaping 25 days after reaching 100% of panicle formation. 3-Manual threshing.	 110 110	1-To specify when the panicle formation reaches 100%. 2-Yield components: Panicles/m², grains/panicle and weight of 100 grains. 3-Grain losses when threshing (pound per quintal) 4-Rice grain cleaning (% of impurities).	 13/6/2005 13/6/2005	 15/6/2005 15/6/2005
18- Post-harvest	1-Rice drying 2-Rice milling	110-112	1-Evaluation of rice drying 2-Evaluation of the efficiency of the existing milling. 3-Monitoring of marketing of processed rice.	13/6/2005	15/6/2005

Table 4.3.5 Cultivation Method and the Growth Pattern of the Rice Plants of the Verification Study

Dry Season

		Yaguajay					
Direct seeding		YHF				YVF	
		Proposal				Traditional	
		Amount	Unit			Amount	Unit
Area		8	cord.			8	cord.
Date of Sowing		2005/2/2				2005/2/3	
Date of germination		2005/2/16				2005/2/16	
Fertilizer Application	Erathworm manure (about 2 % of nitorgen)	6	t/ha			-	-
	Urea (46% of nitrogen)	20	Kg./ha			140	Kg./ha
	P+K	45+45	Kg./ha			45+45	Kg./ha
Amount of Seed	Selection	74	Kg./ha			-	-
	Non selection	-	-			74	Kg./ha
Planting pattern (Distance)	Row seeding	17	cm.			-	-
	Broadcast seeding	-	-			al azar	
Weed Control	Maintenance od flooding condition	Iintermittently				Iintermittently	
	Manual rotary weeder	X				-	-
	Hand weeding	X	-			X	
	Herbicide					X	
Pests control	Biocide (Metarhizium antisopliae)	X				-	-
	Incecticide	Karate (1)				Karate (1)	
Date of harvesting		2005/6/23				2005/6/23	

		Yaguajay (El Río)					
Transplanting		CHTHF		CHTNF		CHTTF	
		Proposal				Traditional	
		Improved		Normal			
		Amount	Unit	Amount	Unit	Amount	Unit
Area		4	cord.	7	cord.	6.5	cord.
Date of Sowing at the Nursery		2005/4/3		2005/4/3		2005/4/3	
Date of germination		2005/4/13		2005/4/13		2005/4/13	
Date of Trenaplantiong		2005/5/6		2005/5/6		2005/5/7	
Fertilizante	Erathworm manure (about 2 % of nitorgen)	6	t/ha	6	t/ha	-	-
	Urea (46% of nitrogen)	-	-	-	-	45	Kg./ha
Amount of Seed	Selection	30	Kg./ha	30	Kg./ha		
	Non selection	-	-	-	-	30	Kg./ha
Planting pattern (Distance)	Regular Planting	25 X 25		-	-	-	-
	Random planting	-	-			al azar	
Weed Control	Maintenance od flooding condition	X		X		X	
	Manual rotary weeder			-	-	-	-
	Hand weeding	X	-	X		X	
Pests control	Biocide (Metarhizium antisopliae)	X		X		-	-
	Incecticide					X	
Date of harvesting		2005/8/9		2005/8/9		2005/8/9	

Rainy Season

		Yaguajay (Mayajigua)					
Direct planting		YHF				YVF	
		Proposal				Traditional	
		Amount	Unit			Amount	Unit
Area		8	cord.			8	cord.
Date of Sowing		2005/7/21				2005/7/21	
Date of germination		2005/7/29				2005/7/29	
Fertilizer Application	Erathworm manure	-	t/ha			-	-
	Urea (46% of nitrogen)	-	Kg./ha			-	t/ha
	P+K	-	Kg./ha			-	Kg./ha
Amount of Seed	Selection	74	Kg./ha			-	-
	Non selection	-	-			74	Kg./ha
Planting pattern (Distance)	Row seeding	17	cm.			-	-
	Broadcast seeding	-	-			al azar	
Weed Control	Maintenance od flooding condition	Rain-fed	-			Rain-fed	
	Manual rotary weeder	x	-			-	-
	Hand weeding	x	-			x	
	Herbicide		-			x	
Pests control	Biocide (Metarhizium antisopliae)	x	-			-	-
	Incecticide	Karate (1)	-			Karate (1)	
Date of harvesting		2005/11/4				2005/11/4	

		Yaguajay (El Río)					
Transplanting		CHTHF		CHTNF		CHTTF	
		Proposal				Traditional	
		Improved		Normal			
		Amount	Unit	Amount	Unit	Amount	Unit
Area		4	cord.	7	cord.	6.5	cord.
Date of Sowing at the Nursery		2005/7/31		2005/7/31		2005/7/31	
Date of germination		2005/8/2		2005/8/2		2005/8/2	
Date of Trenaplantiong		2005/8/24		2005/8/25		2005/8/26	
Fertilizante	Erathworm manure	-	t/ha	-	t/ha	-	-
	Urea (46% of nitrogen)	-	-	-	-	45	Kg./ha
Amount of Seed	Selection	30	Kg./ha	30	Kg./ha		
	Non selection	-	-	-	-	30	Kg./ha
Planting pattern (Distance)	Regular Planting	25 X 25	cm.	-	-	-	-
	Random planting	-	-		-	al azar	
Weed Control	Maintenance od flooding condition	x	-	x	-	x	
	Manual rotary weeder	-	-	-	-	-	-
	Hand weeding	x	-	x	-	x	
Pests control	Biocide (Metarhizium antisopliae)	x	-	x	-	-	-
	Incecticide	-	-	-	-	x	
Date of harvesting		2005/11/22		2005/11/22		2005/11/22	

Table 4.3.6 The Comparison of the Cost of Thetechnology Used for the Verification Study

Cropping season	The technology for the verification	Fertolizer application			Seed		Planting system		Weed control			Pest control		
		Labor		Material	Material		Labor		Labor		Material	Labor		Material
		man･day/ha	peso/ha	peso/ha	kg/ha	peso/ha	man･day/ha	peso/ha	man･day/ha	peso/ha	peso/ha	man･day/ha	peso/ha	peso/ha
Dry season cropping	Broadcast seeding (Traditional technology)	3	60	30	120	594	2	60	52	1,515	18	3	90	14
	Row seeding with drum seeder (Improved manuring practice)	6	180	294	75	371	6	180	18	495	0	3	90	8
Rainy season cropping	Broadcast seeding (Traditional technology)	3	60	30	120	594	2	60	24	675	38	3	45	14
	Row seeding with drum seeder (Improved manuring practice)	1	30	25	75	371	6	180	39	1,125	0	3	90	8
Dry season cropping (1)	Random planting (Traditional technology)	3	90	30	20	99	18	1,080	4	80	20	0	0	0
	Random planting (Improved manuring practice)	6	180	294	20	99	18	1,080	4	80	20	3	90	24
	Regular planting (Improved manuring practice)	6	180	294	20	99	18	1,080	10	260	20	3	90	24
Rainy season cropping	Random planting (Traditional technology)	3	90	10	20	99	18	1,080	4	80	38	0	0	0
	Random planting (Improved manuring practice)	0	0	0	20	99	18	1,080	4	80	20	3	90	24
	Regular planting (Improved manuring practice)	0	0	0	20	99	18	1,080	10	260	20	3	90	24
Whole year	Broadcast seeding (Traditional technology)	6	120	60	240	1,188	4	120	76	2,190	57	6	135	29
	Row seeding with drum seeder (Improved manuring practice)	7	210	319	150	742	12	360	57	1,620	0	6	180	16
Whole year	Random planting (Traditional technology)	6	180	40	40	198	36	2,160	8	160	58	0	0	0
	Random planting (Improved manuring practice)	6	180	294	40	198	36	2,160	8	160	40	6	180	48
	Regular planting (Improved manuring practice)	6	180	294	40	198	36	2,160	20	520	40	6	180	48

(1) Though it is rainy season cropping by the agricultural calendar in Cuba, this is considered to be dry season cropping

Note 1: The cost of the technology of the weed control at the time of paddy field preparation was exclided , because this technology has been widely recognized as a good method to control red rice and rice grown from the seed dropped at the previous cropp

Note 2: The prices of the fertilizer, insecticide and herbicide are the assigned price.

Table 4.3.7 Production Cost and Profit of Verification Study

Cropping season	The technology for the verification	Cost of the prodiction (Peso/ha)						Paddy yield 14 % moisture	Paddy yield 22 % moisture	Ingresso bruto	Ganaicia (excluding the irrigation fee)
		Labor	Rental fee and fuel expenses	Materialsn	Irrigatiin fee (2)	Total (excluding the irrigation fee)	Total				
		man･day/ha	peso/ha					(t/ha)	(t/ha)	peso/ha	peso/ha
Dry season cropping	Broadcast seeding (Traditional technology)	132	4,215	2,308	657	1,200	7,180	8,380	2.78	3.07	8,105	925
	Row seeding with drum seeder (Improved manuring practice)	111	3,525	2,815	688	1,200	7,028	8,228	4.53	4.99	13,174	6,146
Rainy season cropping	Broadcast seeding (Traditional technology)	68	2,040	3,196	677	450	5,913	6,363	3.70	4.08	10,771	4,858
	Row seeding with drum seeder (Improved manuring practice)	135	4,275	3,415	418	450	8,108	8,558	4.91	5.41	14,282	6,174
Dry season cropping (1)	Random planting (Traditional technology)	94	3,545	4,850	149	1,500	8,544	10,044	6.36	7.01	18,506	9,962
	Random planting (Improved manuring practice)	106	3,875	4,744	437	1,500	9,056	10,556	5.69	6.27	16,553	7,497
	Regular planting (Improved manuring practice)	121	3,638	5,095	437	1,500	9,170	10,670	6.89	7.60	20,064	10,894
Rainy season cropping	Random planting (Traditional technology)	103	3,515	3,824	147	1,200	7,486	8,686	4.82	5.31	14,018	6,532
	Random planting (Improved manuring practice)	103	3,515	3,861	143	1,200	7,519	8,719	4.94	5.45	14,388	6,869
	Regular planting (Improved manuring practice)	109	3,695	3,858	143	1,200	7,696	8,896	4.93	5.44	14,362	6,666
Whole year	Broadcast seeding (Traditional technology)	200	6,255	5,505	1,333	1,650	13,093	14,743	6.48	7.15	18,876	5,783
	Row seeding with drum seeder (Improved manuring practice)	246	7,800	6,231	1,106	1,650	15,136	16,786	9.44	10.40	27,456	12,320
Whole year	Random planting (Traditional technology)	197	7,060	8,673	296	2,700	16,030	18,730	11.18	12.32	32,524	16,494
	Random planting (Improved manuring practice)	209	7,390	8,605	580	2,700	16,575	19,275	10.63	11.72	30,941	14,366
	Regular planting (Improved manuring practice)	230	7,333	8,954	580	2,700	16,866	19,566	11.82	13.04	34,426	17,560

(1) Though it is rainy season cropping by the agricultural calendar in Cuba, this is considered to be dry season cropping

(2) The irrigation fee is the tipicla value fir the irrigation method

Surface wateran and gravity irrigation system: (Rainy season：75 peso/ha、Dry season：100 peso/ha)、for direct seeding culture

Surface water and pumping system (Rainy season：1200 peso/ha、Dry season：1500 peso/ha)、for transplanting culture

The value of the surface wateran and gravity irrigation system for dry season was adopted as the Direct seeding culture at dry season

As the surface water and pumping system was used for the direct seeding at the rainy season, the irrigation cost was caluculated as 1/3 of Surface water and pumping system and 2/3 of the surface wateran and gravity irrigation system.

4.4 Verification on Post-harvest Practices by Farmers

(1) Implementation Plan

Audit in the Area of the Verification Study

Content of the Audit:

a) Investigate the influence on post-harvest practices and losses in the fields of direct sowing and transplanting.

- To compare the working efficiency for bottom and middle position cutting by hand reaping. 【working time】
- To assess the losses by normal hand-reaping and combine harvester. 【quantity losses】
- To establish the drying method for individual farmers in the rainy season.
- To compare the working efficiency between conventional cleaning and hand operated winnower.【working time, purity (mixture of foreign matter)】

b) Establish the drying method for the individual producers during the rainy season

- To confirm the sun-drying method using a sheet. 【working time, cracked grain rate, ease to handle, and deterioration of sheet material】
- To confirm the availability of mechanical dryer for emergency cases (e.g.. Continued rainy days). 【working time, difficulty for procuring heat source, rate of cracked grain】

c) Provide farmers with the screening method.

- To compare the working efficiency between conventional cleaning and hand operated winnower.【working time, purity (mixture of foreign matter)】

d) Introduce the technology for increasing milling recovery (yield) by custom milling.

- To compare milling efficiency between one-pass and two-pass operation for Engelberg type milling machine. 【milling recovery (yield), rate of head grains】
- To operate the combination of rubber roller husker and Engelberg machine. 【milling recovery (yield), rate of head grains】

Location:

- Field in verification study located in Chambas and Yaguajay and some fields in the surroundings.
- Traditional mills in Yaguajay (Mayajigua).

Implementation time:

- It should be implemented at harvest time

(2) Monitoring Results:

Verification No. 1

Topic: Evaluation of the loss of harvest, preparation of management for the threshing and process of threshing.

Date: 13-23 May, 2005

Location: Instituto de Investigaciones del Arroz

Objective:
Confirm the methods and material required to do the evaluation of the loss of harvest, preparation of management of threshing and process of threshing.

Preparation:

- Field with transplanted seedlings at random
- Variety used: IAcuba 35, height 80 cm
- A uniform area of 100 m2 (10 x 10 m), from a field of about 0.1 ha.
- The harvested plants, before putting them through the thresher, were transported to a sheet (4 x 3 m) located at the border of the selected area. There, they were left for 3 hours until the thresher arrived.
- 5 sampling points were marked on the diagonal lines (each one of 2 x 2 m) to evaluate crop losses.

Operation:

- Two people carried out the manual cutting by sickle. The cut was very low. The humidity of the grains at harvest time was 19.2%.
- For the evaluation of the crop losses, 4 people using tweezers gathered the paddy rice that had fallen and the panicles that were left in the field. It was only possible to do it at one of the 5 marked points because it took 1 hour. In the remaining points were left undone due to the limitation of time.
- In order to evaluate the losses that occurred in the thresher or management, the grains left on the sheet were picked up after the end of the operation.
- To evaluate the losses in the thresher, the fallen grains were gathered from the blanket (5 x 9 m) under the thresher and the grains that came out due to the discharge of the shafts and straw after operation. The thresher that was used was internal shot, built in Brazil and coupled by 3 points to a tractor. In the thresher operation, 5 people participated, including the tractor operator. The operation lasted for 6 minutes for a production of 25.65 kg. According to this, the hourly capacity was 256 kg.
- The samples were dried off in the sun up to 13% moisture; later they were cleaned in a manual winnower and a sieve (grooves of 1.8 mm) to weigh them.

Results:
The results of the evaluation of the losses are shown below:

Practice	Weight (g)	Losses (%)
Production (100 m2)	25,650	---
Lossduring reaping (4 m2)	98	9.6
Loss during placement (100 m2)	480	1.9
Loss during threshing (100 m2)	962	3.8

Review:

- It is recommended 1㎡x5 plots/cordel for reaping loss assessment following the method of production survey in Cuba and maintaining the reliability of standard deviation at 95%(±5%).

- It is presumed that the main factor causing reaping losses was missing optimum time for reaping. Losses for threshing preparation and threshing were within normal range.

Verification No.2

Topic: Assessment of the reaping losses by manual and a new machine, and the losses by existing type thresher

Date: 23 June, 2005

Location: Mayajigua and El Rio, Yaguajay

Objectives: Comparison of losses between manual reaping by sickle and mechanical reaper of 2-row and binding type, and threshing loss assessment by Maccomic type thresher

Preparation:

Operation:

Results:
The results of the evaluation of the losses are shown below:

DMY	Location	Variety	Days after paniculation	Yield kg/ha	Reaping loss (%)			Threshing loss (%)	
					MC	Sickle	Machine	IRRI	Maccomic
07May, 05	Mayajigua	IACUBA31	35	5,065	21.4	4.53	6.14		1.62
07May, 05	Mayajigua	IACUBA31	35	3,567	16.4		8.41		2.35
15May, 05	Mayajigua	IACUBA31	35	5,570	16.5		5.39		
15May, 05	El Rio	IACUBA31			22.0-24.0		Trace		
	Mayajigua	Reforma			22.0-24.0		Trace		

Review:

- Although the reaping losses were low when paddy has high moisture content, it is necessary to consider yield decrease because of early reaping before optimum time.
- Reaping losses are mainly derived from the delay of reaping operation. Delay is often caused by the shortage of manpower or the difficulty of thresher arrangement, in addition to bad weather conditions.

Verification No.3

Topic: Effects to the rice quality by the different method of sun drying

Date: 30 June, 2005

Location: Mayajigua, Yaguajay

Objective: To verify the effects to milled rice quality by using the difference of sheet material and rice-stand under sun drying method

Preparation:

Operation:

- The reaping and threshing were carried out on the same day of 23 June, 2005, but sun drying for wet paddy was not possible because of continuous rainfall for 5 days. During these days, the mouth of the paddy bags was opened to protect heat damage. Sun drying was executed on the 6th and 7th day after reaping and threshing.

Results:

- The table below shows the data of the 2nd day of sun drying.

Table 4.4.1 Changes of paddy moisture content (%) by different sun-drying method

Sun-drying method	MC at reaping	2nd day for sun-drying		
		10:30	12:30	14:30
Vinyl sheet	21.4	12.7		9.8
Canvas sheet	21.4	13.2		11.5
Drying stand	21.4	15.4	12.8	12.1

- The verification focused on the quality analysis of milled rice in order to assess the effects of different method of sun drying, in lieu of the study on cracked grain generation during sun drying. Equipment utilized was the test husker and Mack Gill No.1 milling machine. The table below shows the results.

Table 4.4.2 Effects on milling quality of different sun-drying method (%)

Sun-drying method	Husk	Brown rice	Milling recovery	Bran	Head rice	Broken rice	Chips
Vinyl sheet	22.73	80.33	69.30	10.10	37.90	28.50	2.10
Canvas sheet	21.60	79.20	67.80	10.73	39.07	26.33	1.97
Drying stand	20.80	79.75	68.05	10.60	59.40	6.00	1.50

Review:

- Drying speed varies by using different types of sheet materials and method of drying stand (Hasakake) because grain temperature increases differently under sun drying.
- Drying on the vinyl sheet that goes faster than other methods gives negative effect to milled rice. On the other hand drying stand (Hasakake) gives moderate and uniform effects. However the method of drying stand requires the practices of bottom cutting, binding and possible utilization of straw after threshing.

(3) Lessons, Observations and Future Tasks of Verification Study

Contents of verification and activities	Lessons, Observation	Future Tasks
a) Investigate the influence on post-harvest practices and losses on the fields of direct sowing and transplanting. **(Test No.1 and No.2)** ・ To compare the working efficiency between bottom and middle height cutting by hand reaping.【working time】 ・ To assess the losses by normal hand-reaping and combine harvester.【quality losses】 ・ To compare the efficiency between panicle threshing for bottom reaping and throw-in threshing for middle reaping.【HP efficiency, purity (mixture of foreign matter)】	・ Lack of combine-harvester, thresher, manpower result in the loss increase at reaping due to missing optimum time of reaping. ・ Panicle threshing easily leaves unthreshed panicles due to unequal stem length and irregular panicles although there is high efficiency of power, selection and sorting. ・ The economical way to develop the most appropriate thresher will be to choose the most appropriate specifications among threshers disseminated in South East Asia.	・ Effects on reaping work efficiency and losses by the deference between direct sowing and transplanting. ・ Comparison of working efficiency between hand reaping at bottom and middle height. ・ Comparison of losses between hand reaping and combine harvester. ・ Selection, manufacturing, and dissemination of throw-in type thresher that is most appropriate for Cuba.
b) To establish the drying method for individual producers in rainy season. (Test No.3) ・ To confirm the availability of sun-drying by using a sheet.【working time, cracked grain	・ Lack of sun-drying sheets though it is the most adaptable and acceptable for popular rice. There were no prominent technical issues. ・ Mechanical drying should be minimally utilized only for	・ Determination of the specifications for the most appropriate sheet, and plan of sheet procurement. ・ To utilize electricity and biomass as heating sources for mechanical drying in order to achieve low-cost

rate, easiness to handle a sheet and deterioration of sheet material】 ・ To confirm the availability of mechanical dryer for emergency case (rainy days). 【working time, difficulty for procuring heat source, rate of cracked grain】	emergency cases because fuel is hard to obtain and costly.	operation.
c) To provide rice producers with an efficient cleaning method. ・ To compare the working efficiency between conventional cleaning and hand operated winnower.【working time, purity (mixture of foreign matter)】	・ Threshing just after reaping causes low efficiency of cleaning. It is necessary to disseminate hand-winnowers among producers so that they can clean paddy after drying.	・ To define empty grain and impurities under paddy standards. ・ Production and distribution of hand-winnowers.
d) To introduce the technology for increasing milling recovery (yield) by custom milling. ・ To compare milling efficiency between one-pass and two-pass operation for Engleberg type milling machine. 【milling recovery (yield), rate of head grains】 ・ To operate the combination of rubber roll husker and Engleberg. 【milling recovery (yield), rate of head grains】	・ Regulations is necessary for the in-series operation of 2 sets of Engleberg machine which has surplus in terms of quantity and capacity. ・ Technology of rubber-roll husker and rolls should be introduced for domestic production because they expect to produce a huge amount of benefits.	・ Clarification of technical advantage by in-series operation of 2 sets of Engleberg. ・ To develop proto-type of rubber roll husker, and its roll production.

4.5 Verification Study on Irrigation Management

(1) Implementation Plan

1) Contents of the study

Water management is very important in rice cultivation even before sowing, because good water management is required when using mudding technology in soil preparation. Correct water management is also an important point in weed control without applying herbicides. Unfortunately, a large number of popular rice producers do not have efficient irrigation systems, and most of them do not know much about correct water management. The contents of the Verification Study focused on three main items:

- Improvement of water management in the field
- Improvement of irrigation and drainage system
- Collection of data of actual water use in the field in popular rice production

2) Impacts

The following impacts are expected in the Verification Study:

- Establishment of efficient water management inside the plots
- Increase of the uniformity of water level in the plots
- Reduction of water losses in the field

3) Methodologies and Activities

Methodologies were designed for easy monitoring of each verification objective and assessment of the impact of the suggested measures. The planned activities of the verification study in irrigation and drainage sector are summarized below:

Table 4.5.1 Areas & Activities of Verification Study of Irrigation Management

Area	Expected Impact	Index for monitoring	Activities
1. Improvement of water management in the field	Enable expected water management required from the aspect of cultivation technique • minute control of ponding depth according to the growing stage • introduction of controlled ponding water release (mid-stage drainage and water release in adequate timing) • increase of uniformity of ponding condition in plot	Record of water management in the field	• Introduction of individual irrigation instead of plot-to-plot irrigation. (Preparation of distribution canal and improvement of levee are required.) • Reduction of necessity hours for filling and draining water in plot. (Improvement of land leveling in plot and improvement of plot shape are required.) • Securing irrigation water with necessary timing. (This is enabled by Area No.1) • Securing drainage condition. (Improvement of field drainage is required) (This is enabled by Area No.2)
	• Effective use of irrigation water through reduction of water loss in the field • Reduction of water loss in the field	Record of water management in the field	• Introduction of intermittent irrigation instead of spill-over irrigation. (Introduction of small gates and change of manner of water use are required.) • Improvement of land leveling in plot • Improvement of levees and introduction of levee coating • Introduction of puddling (which should be introduced in cooperation with the improvement of cultivation technique.) • Measurement of water use in plot (This is include in Area No.3)
2. Improvement of irrigation system	• Securing water supply to the field • Providing circumstance to enable expected water management in the field	• Record of operation and maintenance of pump and related equipment • Record of irrigation (Irrigated area and frequency of irrigation) • Record of collective maintenance work of irrigation canal • Record of water management in the field	• Confirmation of the scheme and condition of the irrigation system • Strengthening of collective maintenance by water users
3. Obtaining information of actual water use in the field of popular rice production	To contribute establishing basic information for irrigation planning of popular rice by obtaining information of actual water use in the field	Record of water management in the field	• Measurement of intake water amount and operation of irrigation system • Measurement of intake water amount of plot • Measurement of water consumption in the field • Metrological observation nearby the sites

4) Schedule of Verification Study

The schedule of the Verification Study of water management will take place simultaneously with the Verification Study of farming techniques.

(2) Input and Facilities

In the verification study, no large scale construction work such as development of infrastructure will be introduced. Only re-arrangement of parcels and terminal channels and installation of flow measuring equipment will be introduced.

Items	Japanese side	Cuban side
Irrigation technique	• Measurement facilities (small Parshall flume) • Office supplies	• Labor wage for manual transplanting • Operation cost of irrigation pump (electric charge in Chambas)

(3) Monitoring Plan

The monitoring items are shown below. The monitoring activity will be carried by producers creating a work record with the support of an extension officer and staff of ETIA Sur del Jibaro.

Monitoring item	Monitoring activities
Item 1. Record of irrigation	a) Record the operation of irrigation b) Measure the discharge, twice in a irrigation (using Parshall flume) c) Measure the water depth in plot, twice in a irrigation (using fixed stake in plot)
Item 2. Record of drainage in midterm and harvesting drying	a) Record the operation of drainage b) Measure the water depth of plot before starting drainage
Item 3. Measurement of water requirement in depth	a) Measure the water depth in plot every morning (scheduled time)during the periods below: b) Weather and irrigation if executed shall be recorded too.
Item 4. Record of pump operation	a) Daily operation of pump shall be recorded. (operation time, hour)

(4) Results of Verification Study

1) Conditions of rainfall and water resources of the verification study sites

The record of rainfall at the verification site from January to October 2005, which was the period the verification study was carried out, is summarized below:

Table 4.5.2 Precipitation at the Verification Site on 2005 (Las Vegas Station, Chambas, Ciego de Avila)

Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Monthly rainfall (mm)	9.1	0.0	26.5	42.0	63.8	208.5	188.3	96.7	141.4	310.6
Number of rainy days	2	0	4	7	4	16	6	9	11	15
Effective rainfall (mm)	5.9	0.0	21.3	24.4	50.7	160.1	101.7	69.0	96.5	242.2

- Record of Las Vegas Rain-gauge Station, Chambas, Ciego de Avila
- The effective rainfall was determined as 80% of daily rainfall, with the condition that daily rainfall less than 5mm and more over than 80mm was neglected.

The verification study sites suffered severe drought and shortage of water from winter of 2004 to spring of 2005. In Chambas site, the Jatibonico del Norte River, which is the water source for the irrigation system at the verification site, was under restriction for water intake by INRH, so the verification site had difficulty obtaining the necessary irrigation water. In order to solve this problem and take water temporarily, a mobile diesel pump was introduced to neighboring small rivers and a pond. Due to the limitation of the temporary water resources, it was difficult to irrigate with the required amounts of water and it affected the growing conditions of the paddy at the site. The water source of Yaguajay site, which is a small river originating at a spring, also

suffered severe drought and the water level was down. Because it was difficult to take water by gravity due to the low water level of the river, a small diesel pump was introduced privately at the end of April. However, a part of the verification plot and the whole control plot suffer lack of irrigation water; thus, the irrigation management was not able to be performed as scheduled.

The conditions of rainfall from January to March of year 2005, which affected the growth of crops in the dry season in the verification study, are shown below in comparison with recent years.

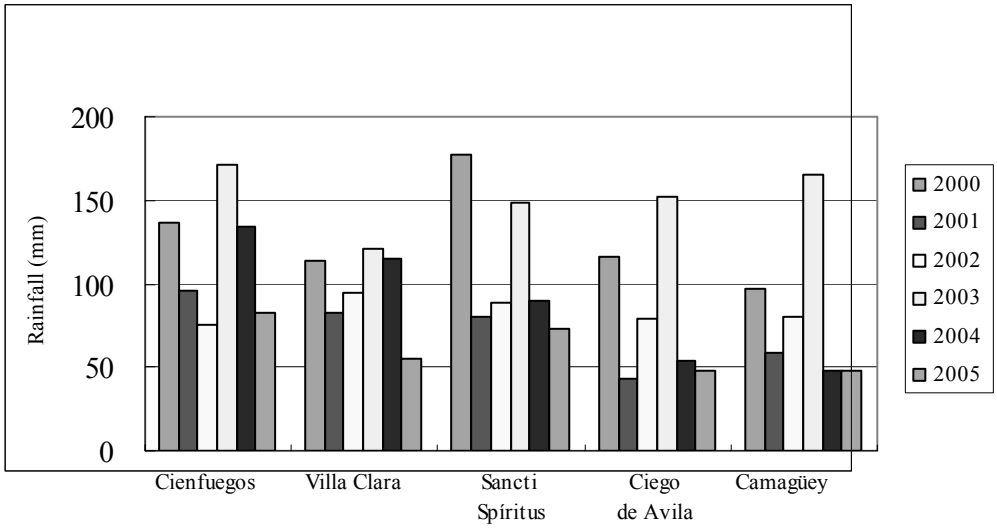

Fig. 4.5.1 Accumulated Rainfall of January –March of 2005 and Recent Years

In the rainy season of 2005, the irrigation was conducted as scheduled in the verification sites owing to seasonable rainfall after June. Due to confusion of the change of sites, irrigation data of crops in the rainy season was abandoned at the Chambas site.

2) Monitoring results of verification study

The monitoring results of the activities of the verification are summarized in Table 4.5.1. The water management required by the improvement of cultivation technique was not carried out satisfactorily for the crop in the dry season of 2004-2005 due to affect of severe drought; however, the crop in the rainy season of 2005 received adequate water management in the field.

The record of irrigation activities in the field is summarized in Table 4.5.2. In accordance with the monitoring record, the amounts of water intake observed were 21,100 m3/ha for verification plot and 15,700 m3/ha for control plot in the dry season, and 6,000 m3/ha for verification plot and 9,7600 m3/ha for control plot in the rainy season. In spite of this effort, it was concluded that the collected data had a problem in accuracy for quantitative analysis, due to affect of drought and problems of recording work. It is recommended to continue to collect data and make analysis of the water consumption of popular rice cultivation as activities of the Cuban side.

3) Operation and maintenance of irrigation system by water users

The irrigation system supplying water to the verification site is a communal system managed by CCS. Jatibonico del Norte River is the water resource of the system and the system has an

electric pump and canal system approximately 1,500 m in length. Prior to the first crop (dry season) of the verification site, CCS carried out cleaning and maintenance work as a communal activity of CCS. In CCS, regular maintenance of the canal system is being carried out once a year, and there has not been any difficulty in such communal activity. CCS has staff to maintain the pump system and so it has been maintained well.

The small river which supplies water to Yaguajay site serves a small group of 4 CCS members; however, the irrigation canal system is developed and maintained individually by each member. The cleaning and maintenance work of the canal system of Yaguajay site was carried out by the producer individually.

4) Adjustment of water use by users

As mentioned above, INRH decided to restrict to water use from the Jatibonico del Norte River during the dry season of 2004-2005. The irrigation system of the Chamnbas site is a communal irrigation system belonging to CCS, which depends for water on that river. CCS decided to stop cultivating rice in the dry season of 2004-2005 to cope with the restriction by INRH. Thus, the activity of water use adjustment was not observed in that period. As for cultivating rice in the rainy season of 2005, there was seasonal flow in the river, so no problems were not observed in the operation of the irrigation system. During that cultivation period, water use adjustment between water users was adequately conducted by CCS.

The water resource of Yaguajay site is a small river, which INRH does not control directly but is usually self-managed by water users. In the neighboring area of the verification site, 5 individual producers who belong to the same CCS take water from the river and have formed an informal small group for water use in CCS. This small group for water uses functions well, so that coordination and adjustment of water use are practically organized. During the severe drought of 2004-2005, the group had water use adjustment and the members decided to put priority on the water use of the verification site. However, this kind of coordination is limited to inside the group and CCS, but there is no usual communication with external users or organizations located downstream. During the cultivation in the dry season of 2004-2005, a conflict over water use with an animal industry cooperative in the downstream area occurred and mediation by municipality office and INRH was necessary to solve it. For rice cultivation in the rainy season of 2005, the flow condition of the river was normal and there was no conflict in water use owing to good coordinated water use adjustment in the group.

(5) Lessons from Verification Study

1) Improvement of water management in the field

Producers understand the importance of careful water management in the field from the aspect of cultivation and they have positive intention to introduce it. They are expected to introduce adequate water management in the field based on the conditions of the field, such as condition of irrigation and drainage system . The water used in the field using gravity irrigation system relying on small surface water resources is strongly affected by the rainfall conditions especially in the dry season. In order to use the limited water resources effectively, it is necessary to prepare a reserve pump system for emergency, even in a gravity system. Improvement of water management in the field is expected to contribute to management of crops and weeds.

Irrigation and drainage system in the field which enabled adequate water management for producers is expected to reduce water loss in the field. Because producers using pump system are well aware of the need for water saving, which directly contributes to fuel saving, they have high possibility to introduce irrigation with efficient water use in combination with technical instruction for improving cultivation technique. Even though concrete data or information on reduction of water loss in the field could not be obtained in the verification study, there is the possibility to reduce water loss in the field by improving canal structure, introducing puddling, and improving plot shape.

2) Improvement of irrigation system

Securing water supply is indispensable to realize adequate water management in the field. However, it is impossible to realize it without large investment in the case of irrigation system relying on small surface water. In such an area relying unstable water resources, it is necessary to consider improving conditions by improving the efficiency of water use or adjusting the cultivation period, not by large scale construction work. In addition, preparation of small pump by producers as reserve equipment might be effective to cope with drought to some degree.

Adjustment of water use between water users is comparatively easy to conduct by producers in the case of neighborhood water users located together. Especially in the case of users within a CCS, usual communication of producers facilitates adjustment such as introduction of circulating irrigation. On the other hand, voluntary adjustment between remote groups by themselves is difficult to expect and the intervention of local INRH and extension officer is required. Two basic policies can strengthening of water users organization from the aspect of water use adjustment: one is encouraging and strengthening water users relationship based on CCS or neighboring group, and the other is strengthening intervention by public organization such as INRH for adjustment between remote groups. Local INRH and extension offices have an important role for promoting, encouraging and strengthening such activities in both cases.

3) Obtaining information of actual water use in the field for popular rice

Practice of water use in the production of popular rice, such as type of water resource, form of water access, level of water management, varies widely by producers. It is necessary to continue effort to obtain data on water use by producers in order to grasp actual water use and realize rational water use.

Table 4.5.3 (1) Results of Verification Study of Yaguajay Area

Area	Expected Impact	Activities	Results of Activities	
			Crop in Dry Season 2004-2005	Crop in Rainy Season on 2005
1. Improvement of water management in the field	Enable expected water management required from the aspect of cultivation technique	Introduction of individual irrigation instead of plot-to-plot irrigation.	・ Plot shape has been used as is. ・ Irrigation canal connected to group of plots. ・ Individual irrigation by plot was not introduced to the verification site.	
		Reduction of necessary hours for filling and draining water in plot.	・ The necessary time of fulfilling water to plots was approximately 17 hours / 0.33 ha in verification plots and 21 hours / 0.33 ha in control plots. The necessary time to drain plots was approximately 12 hours / 0.33 ha in verification plots and 8 hours / 0.33 ha in control plots. ・ At the verification site, it was observed that it has enough capability for irrigation and drainage required by farming practice; even in both plots, the verification one and the control one used the existing system.	
		Securing irrigation water at the necessary timing.	・ Private small pump was introduced to cope with low level of water of the original resource due to drought. ・ It was difficult to secure necessary irrigation water in a part of verification plot and whole control plot. ・ It affected the production in the control plot severely. ・ Maintaining ponding condition was difficult both in verification plot and control plot.	・ The necessary irrigation water was secured by the existing gravity irrigation system. ・ Necessary water management in the field required for the improvement of rice cultivation technique was satisfied.
		Securing drainage condition	・ Drainage system was used as is. Capacity of drainage was secured for realizing appropriate water management.	
		Achievement of Expected Impact: ・ It was difficult to maintain water sheet in the plot due to the lack of water resources. As a result, weed control by managing water sheet was not effective. ・ Practice of water management in plot required for the improvement of rice cultivation technique was adequately carried out by producer under the condition that they do not suffer a lack of water by drought. ・ Necessary water management in the field required for the improvement of rice cultivation technique was satisfied in the cultivation in the rainy season.		
	Reduction of water loss in the field	Improvement of land leveling in plot	・ Due to improvement of land leveling, water management in comparatively shallow water sheet was realized.	
		Improvement of levees and introduction of levee coating	・ Not implemented.	
		Introduction of puddling	・ Puddling was observed to improve land leveling. ・ A comparison test was not carried out.	
		Measurement of water use in plot	・ Flow measurement equipment (Parshall Flume) was installed at the intake of plot group.	

<table>
<tr><th rowspan="2">Area</th><th rowspan="2">Expected Impact</th><th rowspan="2">Activities</th><th colspan="2">Results of Activities</th></tr>
<tr><th>Crop in Dry Season 2004-2005</th><th>Crop in Rainy Season on 2005</th></tr>
<tr><td></td><td></td><td></td><td colspan="2">Achievement of Expected Impact:
・ The data concerning the reduction of water loss in the field was not successfully obtained in the crop in the dry season.
・ It is recommended to continue the verification study on the reduction of water loss in the field by improvement of water management.</td></tr>
<tr><td rowspan="3">2. Improvement of irrigation system</td><td rowspan="3">• Securing water supply to the field
• Providing circumstance to enable expected water management in the field</td><td>Confirmation of the scheme and condition of the irrigation system</td><td>・ Gravity system could not provide enough water to the field.
・ Private small pump was introduced to the system temporarily.</td><td>・ Necessary provision and maintenance was carried out by producer adequately.</td></tr>
<tr><td>Strengthening of collective maintenance by water users</td><td>・ The canal system was maintained by producer individually because it belongs to individual producer.
・ Necessary provision and maintenance was carried out by producer adequately.
・ To meet with the low water level of the river, adjustment of water use was coordinated within producers of CCS and between a producer group on lower stream of the river. As a result of the adjustment, damming up was given up for a certain period and a pump was introduced.</td><td>・ Adjustment of water use between producers in the CCS was well coordinated for the period of damming up.</td></tr>
<tr><td colspan="3">Achievement of Expected Impact:
・ Operation and maintenance of irrigation canal were conducted adequately by water users.
・ Because of the character of irrigation system which relies on small surfaces water, a stable water supply was not secured in some part due to the influence of the drought.
・ Introduction of a small pump by the producer could supply water for irrigation.
・ The adjustment of water use during severe drought period was well coordinated spontaneously by water users within producers of CCS. However, an intervention of local INRH and extension officer was necessary to adjust between users group of CCS and on lower stream of the river located far from the CCS.
・ In the crop in the rainy season, the adjustment of water use was coordinated by water users and the water was provided stably, owing to enough water in the river.</td></tr>
<tr><td rowspan="2">3. Obtaining information of actual water use in the field of popular rice</td><td rowspan="2">To contribute establishing basic information for irrigation planning of popular rice by obtaining information of actual water use in the field</td><td>• Measurement of intake water amount of plot
• Measurement of water consumption in the field</td><td colspan="2">・ Water use was monitored through Item 1 and 2, so that the following record was observed. The data observed in the field is summarized in Table 4.5.2.
Amount of water intake in the field
<table>
<tr><th></th><th>Crop in Dry Season 2004-05</th><th>Crop in Rainy Season on 2005</th></tr>
<tr><td>Verification plot</td><td>21,100m^3/ha</td><td>6,000m^3/ha</td></tr>
<tr><td>Control Plot</td><td>15,700m^3/ha</td><td>9,600m3/ha</td></tr>
</table></td></tr>
<tr><td colspan="3">Achievement of Expected Impact:
・ The data observed in the field has a problem of accuracy for quantitative analysis.
・ It is recommended to continue to collect data and analysis of the water consumption of popular rice cultivation</td></tr>
</table>

Table 4.5.3 (2) Results of Verification Study of Chambas Area

Area	Expected Impact	Activities	Results of Activities and Achievement of Expected Impact	
1. Improvement of water management in the field	Enable expected water management required from the aspect of cultivation technique	Introduction of individual irrigation instead of plot-to-plot irrigation.	Plot shape has been improved. Irrigation canal connected to group of plots. (Individual irrigation was not introduced.)	・ The expected water management required from the aspect of cultivation technique was not provided due to the lack of water resources, both the original one and the alternative one.
		Reduction of necessity hours for filling and draining water in plot.	Activity of irrigation has been recorded.	
		Securing irrigation water in necessary timing.	Alternative water resource was prepared to cope with lack of water of the original resource due to drought.	
		Securing drainage condition	Used as is.	
	Reduction of water loss in the field	Introduction of intermittent irrigation instead of spill-over irrigation.	Intermittent irrigation was applied; however, it was forced by shortage of water due to drought.	・ The measurement of reduction of water use was not conducted due to lack of water resources.
		Improvement of land leveling in plot	Land leveling by tractor.	
		Improvement of levee and introduction of levee coating	Not implemented.	
		Introduction of puddling	Introduced in whole plots.	
		Measurement of water use in plot	Flow measurement equipment (Parshall Flume) was installed at the intake of plot group. However, the measurement has been stopped due to change of intake to cope with alternative water resources.	
2. Improvement of irrigation system	• Securing water supply to the field • Providing circumstance to	Confirmation of the scheme and condition of the irrigation system	Difficulty of securing irrigation water occurs due to drought. Alternative resource such as neighboring small river was used with a mobile pump.	・ Maintenance work of communal irrigation canal system was carried out as a group activity of the CCS without any problem. ・ A restriction of water taking was declared to the main

Area	Expected Impact	Activities	Results of Activities and Achievement of Expected Impact	
	enable expected water management in the field	Strengthening of collective maintenance by water users	Regular cleaning and maintenance work of canal system was carried out as a communal activity of the CCS.	water resource of the irrigation system. ・ Even though a permission for taking water for the verification site was issued, it was difficult to carry water management in the site due to a large loss of the irrigation system because the permission was limited to small portion, comparing it with the capacity of the system.
3. Obtaining information of actual water use in the field of popular rice	To contribute establishing basic information for irrigation planning of popular rice by obtaining information of actual water use in the field	• Measurement of intake water amount of plot • Measurement of water consumption in the field	• Refer to Items 1 and 3.	・ Due to lack of irrigation water, observation was not carried out.

Table 4.5.4 Monitoring Results of Irrigation in Yaguajay Site

Crop in Dry Season on 2004-2005

Plot No.	Area (cordel)	Area (ha)	Number of irrigation (times)	Total hours of irrigation (hr)	Amount of water (m^3)	Water depth managed (cm)
Improvement Plot-1	2.32	0.0959	19	72.0	1,596	3-8cm
Improvement Plot-2	1.45	0.0599	19	45.5	1,034	4-10cm
Improvement Plot-3	0.88	0.0363	18	62.5	1,436	4-9cm
Improvement Plot-4	1.41	0.0584	17	52.0	1,122	3-6cm
Improvement Plot-5	1.95	0.0806	19	82.5	1,796	3-12cm
Total	8.00	0.3311			6,984	
	Amount of water per ha				21,093	(m^3/ha)

Crop in Dry Season on 2004-2005

Plot No.	Area (cordel)	Area (ha)	Number of irrigation (times)	Total hours of irrigation (hr)	Amount of water (m^3)	Water depth managed (cm)
Traditional Plot-1	0.35	0.0145	13	20.0	349	7-12cm
Traditional Plot-2	3.52	0.1457	13	110.8	2,322	6-10cm
Traditional Plot-3	2.51	0.1039	13	80.5	1,646	5-8cm
Traditional Plot-4	1.71	0.0708	12	47.0	954	5-8cm
Total	8.09	0.3349			5,272	
	Amount of water per ha				15,739	(m^3/ha)

Crop in Rainy Season on 2005

Plot No.	Area (cordel)	Area (ha)	Number of irrigation (times)	Total hours of irrigation (hr)	Amount of water (m^3)	Water depth managed (cm)
Improvement Plot-1	2.32	0.0959	8	17.0	325	5-6cm
Improvement Plot-2	1.45	0.0599	8	22.3	412	6-10cm
Improvement Plot-3	0.88	0.0363	8	16.5	319	5-6cm
Improvement Plot-4	1.41	0.0584	8	18.9	360	4-6cm
Improvement Plot-5	1.95	0.0806	8	28.8	555	5-10cm
Total	8.00	0.3311			1,970	
	Amount of water per ha				5,950	(m^3/ha)

Crop in Rainy Season on 2005

Plot No.	Area (cordel)	Area (ha)	Number of irrigation (times)	Total hours of irrigation (hr)	Amount of water (m^3)	Water depth managed (cm)
Traditional Plot-1	0.35	0.0145	12	20.5	341	3-8cm
Traditional Plot-2	3.52	0.1457	12	82.3	1,560	5-9cm
Traditional Plot-3	2.51	0.1039	11	34.0	673	4-8cm
Traditional Plot-4	1.71	0.0708	11	33.1	630	5-10cm
Total	8.09	0.3349			3,204	
	Amount of water per ha				9,566	(m^3/ha)

4.6 Verification Study on Agricultural Machinery

The Agricultural machinery used in rice production in Cuba such as tractors and combines are so large size that in case of small size field of popular rice production, the work efficiency is low and the fuel consumption per unit working area is high. Also the use of large size machines makes arable soil very hard and it has influence on the growth of rice plants. In this study, the technical adaptability of small size agricultural machinery for popular rice production field will be verified.

(1) Executing Plan

Through communal use of small size field machinery such as working tractor and reaper, etc.

introduced at two verification areas in CCS, the verification study of following points shall be carried out.

- Use condition of small size field machinery
- Operation and maintenance situation of machinery

(2) Inputs and Installations

Inputs and installations for the verification study are shown in the following table.

Table 4.6.1 Inputs and Installations for the Verification Study

No.	Input	Yaguajay	Chambas	Note
Field machinery				
1	Working tractor	1	1	12HP
	Rotary tiller	1	1	
	Paddy wheel	1	1	
	Reversible single plow	1	1	
	Ridger	1	1	
2	Trailer	1	1	for No. 1
3	Manual seeder	1		IRRI type
4	Manual sprayer	2	2	Knapsack type
5	Hand weeder	1	1	IRRI type
6	Straw cutter	1	1	
7	Reaper	1	1	Binder
8	Thresher	1	1	IRRI type
9	Spare parts	1	1	for 1 & 7
Others				
1	Warehouse	1	1	by CCS
2	fuel	1	1	by producer*
3	Oil	1	1	

Note: * Fuel to be used for verification field shall be procured by the study team.

The form of farm works using introduced machinery are described below.

Land preparations

The land preparation under dry conditions shall be carried out by working tractor equipped with reversible single plow or rotary tiller (work efficiency, 0.5 h/day).

Paddling and leveling

Paddling and leveling to be carried out by the working tractor equipped with paddy wheel and rotary tiller (work efficiency, 0.5 h/day).

Seeding and transplanting

Seeding shall be made by the drum type manual seeder of IRRI type. Transplanting will be carried out by cooperative work of CCS members or employing workers using transplanting rope or other type of marking.

Fertilization

Transport of a fertilizer or compost of earthworm used by the trailer attached of working tractor to the field, and after spreading by hand, plow with bottom plow or rotary tiller.

Weed control

Perform weed control by using hand weeder of IRRI type.

Insect and disease control

Spray insecticide etc. by use of knapsack type manual sprayer. Biological product shall be used.

Harvest

Harvest with working type reaper (work efficiency, 0.8 h/day).

Threshing

Perform threshing with axial flow type thresher in the field.

Rice straw processing

After threshing rice, cut rice straw by use of straw cutter in a field, and later on, dry and bury in soil by plowing with bottom plow or rotary tiller

Transport

The transport of machines and products etc. shall be carried out on the trailer attached to working tractor.

(3) Monitoring Plan

The monitoring of verification shall be carried out by filling out the monitoring form by the person in charge of machinery management or an operator who manage, operate and maintain the same in CCS, and also making interviews with producers as the occasion permits.

The monitoring points shall be as follows.

Use condition of small size field machinery

Field crop, farm working list, number of men, working hours, fuel consumption, etc.

Operation and maintenance situation of machinery

Machinery-use hours, date and maintenance items, change and lubrication of oil, record of repair and spare parts change, etc.

Others

Problems, advantage and disadvantage of use of small size machines in the field and operation and maintenance.

(4) Results and Lessons from Verification Study

1) Use of small machinery in the field

a. Working tractor

The working tractor equipped with a trailer has been used to do several jobs related to cultivation techniques, such as transportation of rice, earthworm organic material, cultivation materials, as well as other small machinery such as the reaper and rotary tiller. There are many opinions regarding if this machines is feasible or not since it uses a small motor for gasoline. On the other hand, there are some producers that say that the capacity was not sufficient and it takes too long to move due to its low speed.

Small machinery such as the bottom plow, rotary tiller and the ridger have been used for land preparation and puddling of the soil. Among the field jobs, the advantages of the working tractor have been confirmed such as obtaining a higher work yield in a small scale field, as well as its low fuel consumption when compared to the use of big tractors. On the other hand, it has the advantage of preventing the soil to become hard due to its light weight. Cultivation with the use of the rotary tiller has more advantages when breaking up and mixing the soil than when

plowing the field traditionally, and it is favorable for returning green manure into the soil. For puddling jobs it was observed that it reduces the yield because the wheels slide, making it difficult to cultivate in hard clay soils. In this case, the use of animal traction should be considered as an alternative.

Puddling was carried out equipped with steel wheels and rotary tiller. Especially when it is being used for soil puddling activities, an improvement has been observed in the efficiency of breaking down the soil, as well as for land leveling, furthermore these field jobs were done without damaging the bottom of the soil due to the light weight of the working tractor, if we compare it with the use of tractors and animals. Additionally, the yield and the job quality of future crops were improved. On the other hand, when it is used for bottom plowing, it was observed that the yield decreases because the tires slip and it is difficult to do a good job in hard clay soils. The working tractor is a valuable machinery, therefore its introduction will be a topic of future research.

b. Drum Seeder

The IRRI drum seeder is transported with floaters that slide over the paddy field; that is why the traction is easier compared with the seeder with wheels since it improves the work yield when comparing it to the seeder that was introduced in the Vietnam project for IIArroz. Seeding is carried out by only one operator, but when the machine has to turn, it is easier when it is done with a helper; therefore it requires three people in total, one on each side of the field.

The floaters make it possible to keep the drums in a stable position from the rice field, keeps the seeding width uniform and it prevents the drum holes from getting mud on them reducing seeding mistakes, overall improving the quality of sowing. However, in order to use this machine leveling the rice field after puddling is very important, as well as draining well the field. If there is water left in the rice field, when the seeds are sown, the seeds will move around with the water and the quality of the drills will be lower. After puddling and draining the water, it is better to allow the field one day to dry in order to start seeding.

With the use of the drum seeder, it is possible to sow more efficiently, with fewer personnel and reduces in half the amount of necessary seed when comparing it to the traditional method. When using the row seeding technique, weed control is easier and more efficiently because it is done in a mechanized way after sowing. The drum seeder is an essential machinery for the introduction of drill seeding, for the intermediate crop and for mechanized weed control.

c. Manual Rotary Weeder

With the use of the IRRI manual rotary weeder, weed control becomes mechanized and easily done, avoiding the use of herbicides. The yield and job quality of the machine have been accepted by the producers. Weeds can be eliminated almost completely, but although the depth is adjustable by changing the angle of the steer, the width cannot be adjusted and therefore different types of this machine can be fabricated adaptable to the width of the drum seeder.

The IRRI type is made of steel, except for the steer therefore, it is heavy and extended use of it in the rice field is very tiresome. Therefore, it is convenient to research the use of different materials such as wood or bamboo and review the structure in order to reduce the weight. The

manual rotary weeder is an essential machinery for the introduction of the drilling technique, for the intermediate cropping and for mechanized weed control.

d. Manual Sprayer

The manual sprayer has been used to apply biological products. It is a machine commonly used in Cuba, with a simple structure and there were no problems when it was used.

e. Mechanical Reaper

The use of the mechanical binder improves the job yield during harvest, if compared with the manual type. The job is easily done if it is done carefully and improves the quality when compared with the big harvester combine.

This is a new machine in Cuba and therefore training is necessary for its operation. In the same manner as with the tractor, the operators are not used to shifting gears by hand so special attention should be placed when the machine is in fast forward and reverse. Also, in order to insure the capacity of the machine, the work should be done when the paddy field is dry.

By using the mechanical reaper, the work yield increases and the load is reduced when compared to doing it manually. Also, the work achieved is better and the harvesting can be finished during the appropriate period with fewer personnel, careful work is easier and harvest losses are reduced when comparing it to the use of large combined harvesters.

However, some producers say that fuel is expensive and difficult to obtain for the gasoline motor. The mechanical binder is a very valuable machinery and the introduction of the adequate harvester for small scale production of popular rice will be a topic for further research.

f. Thresher

In this study, the thresher of axial flux with gasoline engine IRRI type was introduced. The machinery is designed to be transported by four people, and therefore there were several opinions in the difficulty of transporting it. On the other hand, presently in most of Cuba, rice harvest and threshing are done when the rice is not dry enough, therefore the rice has a high content of humidity as well as the straw gets stuck in the drum of the machinery, reducing the yield in the threshing. To reduce this loss, it is important to dry the rice in the field before it is going to be threshed. The introduction of a smaller harvester, as well as an adequate thresher for small scale production of popular rice will be a topic for further research.

g. Rice Straw Cutter

The straw cutter has been used to cut the rice straw after harvest and threshing. This has caught many people's attention because of the high efficiency of the straw cutter and its capacity for spreading the straw pieces in the field.

The rice straw was piled up at the same distance, and at each end the cutting and spreading will be done using the machinery. Since cutting and spreading of the pieces of straw is done simultaneously, it reduces time and efficiently returns green manure to the soil. Therefore field preparation can be advanced for the following sowing.

Although the machine is lined for security, when the machine is being used, precaution is required for not touching the sharp cutters. Some producers mentioned that fuel is expensive and difficult to obtain for the gasoline motor. The machinery moves with a small gasoline engine; however it is necessary to further research the use of PTO of the tractor or a diesel engine as an alternative. The straw cutter is an essential machinery to return green manure into the soil, since it incorporates harvest residues into the soil.

2) Operation and maintenance of the small machinery

In general, the operation and maintenance of the small machinery introduced in this study have been done adequately and without problems. The person in charge of the machinery and the operator had experience in the operation and maintenance of the equipment from CCS and was confirmed that they have enough experience to work with the small machinery.

The regular check-ups have been carried out including oil changes, but there were some problems with the monitoring, such as lack of records of operation and maintenance, etc. In this study, the supply of fuel, lubricants and spare parts of the machinery were in charge of the Study Team, however in the future since some spare parts will be difficult to be obtained in Cuba, it is important to study the procurement method after finishing the study.

4.7 Verification Study on Group Works

Some of the proposed components of verification study cannot be expect ed to have economic or physical impact if introduced individually. It is necessary to introduce group work or collective activity of producers to gain exact merit in those items. In the verification study of group works, it is expected to establish a producers group with the owner of the verification study site (plot) and neighboring producers, to demonstrate the methodology and know-how of collective activities in farm works.

(1) Implementation Plan

The following five activities are verification subjects for group works.

a. Collective management of agricultural machinery

To introduce shared use of the following machinery and equipment by group, coordination of farm working, operation and maintenance by group, collection of operation and maintenance cost is necessary.

- Machinery for land preparation (tractor and implements)
- Equipment for seeding
- Paddy field weeder
- Chipper for rice straw

The group will be established in CCS as a small group in the cooperative. The members will participate voluntarily. The number of group members is assumed to be less than 10.

b. Collective management of post harvest equipment

Collective management is necessary to introduce shared use of mechanical dryer of paddy by group, along with necessary coordination of farm working, operation and maintenance by group, and collection of operation and maintenance cost.

In principal, the group limits users within CCS. The drying request outside the group may be accepted when the dryer has surplus working capacity in addition to the group's paddy.

c. Collective production of organic fertilizer

The following activities are necessary to produce earthworm manure by farmers group:

- To prepare necessary farmyard to produce earthworm manure
- To obtain material for earthworm manure collectively
- To share the maintain work of compost yard
- To provide transportation to obtain material and deliver outcome

The group will be established as a small group in CCS. The members will participate voluntarily. The number of group members is assumed to be less than 10. The same group for the collective management of agricultural machinery may be considered.

d. Collective development and maintenance of irrigation and drainage facilities

To provide the necessary irrigation and drainage function, the maintenance work of canal system and construction of simple water facilities for water management will be implemented by user participation:

- Maintenance works such as regular weeding, clearing and repairing shape of canal system
- Preparing distribution canal connected to plot
- Installing small facilities for water management in the field level such as small gate equipment of inlet/outlet

A unit in the group will be composed of the users of the certain irrigation system. Small sub-group for developing water management facilities will be established, if necessary.

e. Introduction of collective farm works

To improve coordination of time and method between group members for farm works which require collective style works:

- Collective work of smoothening of paddy field surface by manual
- Simultaneous applying of biological pesticide in the area

The group will be established in CCS as a small group in the cooperative. The members will participate voluntarily. The number of group members is assumed to be less than 10. It is considered that the same members as the collective management of agricultural machinery activities will comprise the group for collective farm work.

(2) Input Materials and Facilities

The following table shows inputs corresponding to each verification subject from ① to ⑤.

Group works	Materials	Facilities
a) Collective management of agricultural machinery	• Small tractor and attachment • Manual drum seeder • Manual sprayer • Push-type manual weeder • Threshing machine • Chipper for rice straw ＊Fuel for field equipment (only for verification site)	• planning to use the verification site owner's plots to keep materials
b) Collective management of post harvest equipment	• Dryer of paddy • Engelberg type rice milling machine • Rubber type rice milling machine ＊Fuel for verification project only	• planning to use the location of CCS member's housing plot to install machines
c) .Collective production of organic fertilizer	• Earthworm etc.	• Planning to use the verification site owner's plot or another CCS member's to produce organic fertilizer
d) Collective development and maintenance of irrigation and drainage facilities	• None	• None
e) Introduction of collective farm works	• None	• None

(3) Monitoring Plan

Monitoring of a) Collective management of agricultural machinery and b) Collective management of post harvest equipment are made on the basis of activity record by extension officers and study team/counter part. Topics of monitoring covers not only working condition of collective machinery use but also management of incoming and outgoing cash generated by machine operation. Also attention is paid to possible impacts such as conflicts between the new machine and existing machine, pressure to expand users or to reduce users in/out of CCS.

As to c) production of organic fertilizer, monitoring focuses on condition of work sharing among production members and material procurement at the early stage. After the first production is available, monitoring also pays attention to conditions of its distribution and actual use, and also the rise and fall of number of producers/users in the mid-long run.

(4) Results of Verification Study

The verification study examined the effectiveness and the feasibility of proposed group work activities by farmers. The following table shows the results of the performance in the study.

Group works	Results
a) Collective management of agricultural machinery	(Yaguajay) • Rules regarding the fee of machine use, fuel, profit management and others were determined by CCS meeting. • All the machines have been kept well at the verification site by the site's owner. • They determined 10 users who can have access to the machines with one operator. The number of users was determined by consideration of machine capacity. • Some of 10 fixed users have not used machines yet; therefore, machines have been idle for sometime. The reasons are: it was difficult to use some of new/unfamiliar machines by them; they judged that Cuban thresher is more cost-effective than the one introduced by the Study. • There are no serious conflicts between existing machines of CCS and the machines by the Study. It is partly because CCS administration manages the use of existing machines. (Chambas) • Rules regarding the fee of machine use, fuel, profit management and others were determined by CCS meeting. • They determined 4 users who can have access to the machines with one operator. But machines have been utilized less than expected, apart from the verification site. • The change of a farmer in charge of verification study created confusion in collective machine use.
b) Collective management of post harvest equipment	• Installation of the post harvest equipment was completed in October, 2005. • Rules of the machine use also will be discussed.
c) Collective production of organic fertilizer	• Production of earthworm compost has been conducted on an individual basis. The production by group-basis has not been realized yet. • Producers prefer individually producing work to group-basis work because production by group work entails certain complexity in sharing works, responsibility, and its distribution in particular.
e) Collective development and maintenance of irrigation and drainage facilities	• Irrigation and drainage facilities have been continuously managed in the existing facility sites. There are no new developments of the facilities by group-basis activities under the study.
f) Introduction of collective farm works	• Although the Study promoted collective farm works especially in transplanting, it could not find any positive results. All the works have been done by the owner's family or some paid laborers.

(5) Lessons from Verification Study

Feasibility to extend group works in the target area differs from area to area as well as regional backgrounds especially in organizational capability of farmers groups. Looking at the area of the group works, at first, collective management of agricultural machinery has relatively higher feasibility to be sustainably promoted among farmers. The primary reasons for the relatively good performance in Yaguajay was good performance of the owner of the verification site, who works as a keeper of the machines, and adequate control by administrative unit of CCS. As long as the both key factors are secured (namely, a person in charge of machine management in the field and administrative unit of CCS), collective management of machinery itself is quite feasible. However, since the verification study showed less utilization of some machines, the variety of introduced machines was an important negative factor for its sustainable collective management.

Collective management of post harvest equipment also applies the same assumption basically as collective machine-use in the field. However, there are some unique points for collective use of post harvest equipment. Post harvest equipment entails more commercial opportunities than agricultural machinery above-mentioned. Thus, users of the equipment can easily expand outside of their own CCS. Hence, CCS needs to establish well-considered operation plans and rules, which

should include how to lower the demand season of rice.

On the other hand, collective farm works are quite difficult to be accepted by farmers. Tradition of payment-basis labor work has existed in the area for long time. Farmers and laborers have a fixed long-time relationship, and moreover, many CCS recently began establishing their own labor groups. Thus, it is quite difficult for collective farm works to be promoted.

In conclusion "collective management and use" of machinery shows sufficient acceptability by producers and is expected to have sustainability of its management and use; however, "collective farm work or production" is difficult to be accepted.

4.8 Verification Study on Extension Activities

(1) Implementation Plan

The instruction of the suggested production technique and farming practice will be compiled as a technical manual for popular rice, and the instructions to producers in the manual will be used in the verification study. Several study tours for representatives of popular rice producers from 5 municipalities together with showing some of the activities in the verification study are holding seminar for them introducing suggested countermeasures, and discussing on the applicable counter measures for each popular rice producers.

a. Technical manual for popular rice production

The Verification Study of extension activities will be carried out in the following stages:

1. IIArroz prepare the production manual for popular rice. This production manual will show every suggested countermeasure for each working items of farming practice (land preparation, seeding, fertilizer, diseases control, water management, post harvest, etc.) with several different conditions such as soil, amount of agricultural inputs, labor force, form of management (like the menu of a restaurant). Also, IIArroz will supply this manual to every extension officer.
2. Extension officers should always carry this manual and make instruction for popular rice producers based on this manual.
3. Popular rice producers shall select some of the countermeasures from the manual and try to find out the most suitable ones by themselves based for their specific conditions.

b. Study tour

The study tour will be conducted in order to achieve the following objectives:

1. To realize the demonstration effect of verification activities.
2. To evaluate acceptability and applicability of suggested countermeasures through the discussion with popular rice producers of neighboring area and other area of the verification field. The result of the evaluation will be reflected to the areas of countermeasures.
3. To verify the understandability of the manual to producers in order to improve the contents.

The implementation plan of the study is summarized as below:

1. **Frequency and period of the study tour** is 2 times in each crop season (4 times in total).

Each study tour will take 2 days.

2. **Expected participants** are approximately 10 participants from each municipality, of which 2~3 from participants of extension officers and province and 7~8 from representatives of producers.
3. **Methodology** of the study tour consists of visiting the verification field and holding discussion between producers participating in the verification study and the participants of the study tour, and holding a seminar on the technical manual, questionnaire to participants, etc.

(2) Input Materials and Facilities

Motorbike and cellular phone were both provided to extension officers looking after the verification sites. Manuals on rice cultivation were also handed to the participants of the study tour.

(3) Monitoring Plan

The crucial points to monitor are the following reactions by farmers as to whether they would apply techniques into their own farmland. Analysis on the reasons not to apply them is an important topic in this study.

Monitoring the performance of extension officers is also crucial after the project distributed inputs such as motorbike and cellular phone, lack of which were regarded as the largest obstacles to smooth extension activities.

(4) Results of Verification Study

a. Technical manual for popular rice production

Technical manuals for popular rice production were distributed to extension officers, taking the opportunities of the study tours. Although they have important information on rice cultivation, they contain more academic contents than hands-on techniques, which may cause difficulties for extension officers to fully utilize in field level activities. Reflecting the results and their comments, IIArroz has already started to discuss ideas to improve them.

b. Study tour

The study tour showed positive results as follows:

(Objective) 1. To realize the demonstration effect of verification activities.
2. To evaluate acceptability and applicability of suggested techniques

(Result)
Farmers participated in the tour showed strong interest in new or improved techniques of rice production. Some of them have already started to introduce the techniques to their own farmland. At this moment the Study team confirmed that two farmers started to produce earthworm compost in Yaguajay, and more are trying to introduce drilling and transplantation. Also, there is one farmer in Santo Domingo who secured one farming plot to introduce the techniques learned in the tour (The Study team offered some technical support to the farmer in Santo Domingo after being requested).

c. Extension activities

The Study introduced motorbike and cellular phone to extension officers in charge of the verification sites, lack of which were regarded as the largest obstacles to smooth extension activities before the verification study started.

Motorbike has been fully utilized and showed strongly positive effectiveness in extension works. On the other hand, it was sometimes difficult to secure communication by cellular phone because of poor reception in the area. In addition, although it is a very useful tool for extension activities, it may be difficult to balance its effectiveness and the necessary cost to maintain the cellular phone.

(5) Lessons from Verification Study

It is evaluated that study tour is a very effective method as an extension activities, based on the results of the tours. The basic principle of the tour, which tried to transfer information from farmer to farmer, not lecturer to farmer on as many occasions as possible, contributed to better results.

Providing motorbike and cellular phones to extension officers were also confirmed to be very effective for their extension works, but at the same time they raised difficult questions such as whether the effectiveness exceeded the necessary cost particularly for cellular phones. The verification study as a result showed positive effectiveness on introduction of motorbike, but neutral or negative on cellular phone.

4.9 Workshop and Study Tour

(1) Workshop

In Mayajigua, Yaguajay district, the workshop welcomed CCS members in Yaguajay and Chambas who belonged to the CCS that are directly involved in the verification project in each location. The workshop brought opportunities to explain the project's contents/schedule, roles of farmers participating, and other personnel related to the project.

Beside the workshop focusing on explanation of the project, technical instruction at site was offered 15 times during the Verification Study by the study team and counterparts including ETIA (There were more technical instructions at sites by counterparts and ETIA when study team were away from Cuba).

(2) Study Tour

The Study tour was implemented in March, May, August and October 2005 as follows:

a. Outline of Study Tour

Participants:

The Study tour invited two extension officers from each province and district, and eight producers from each province as well; this totaled 10 participants from five provinces. The tour invited the same participants in the first tour and the second because the full contents of the tour could be distributed only by attending both tours, which enabled participants to watch from the preparation stage to the harvest stage. Most producers were CCS members, with some from other organizational bodies such as CPA and UBPC. More than 30-40 people actually attended

the Study tour (the bottom table shows only 22 participants because some of them missed answering questionnaires).

Table 4.9.1 Participants of First Study tour in March 2005

	CCS	Parcelero	Prestamo	CPA	UBPC	GENT	Total
Aguada	1		1	1	1		4
St. Domingo	3	1	1	1			6
Yaguajay	4	1			1	1	7
Chambas	1						1
Vertientes	2		1	1			4
Total	11	2	3	3	2	1	22

Table 4.9.2 Participants of Second Study tour in May 2005

	CCS	Parcelero	Prestamo	CPA	UBPC	Others	Total
Aguada							
St. Domingo	4			1		1	6
Yaguajay	7				1		8
Chambas	1	1	2		1		5
Veritientez	1						1
Total	13	1	2	1	2	1	20

Study Tour Schedule

The Study tour held several major activities during two days: introduction of techniques, verification site visits, discussion among producers after answering questionnaires.

Table 4.9.3 Study Tour Schedule

1st day		2nd day	
PM	• Explanation of verification project • Self introduction by participants • Presentation of techniques (transplant, earthworm manure, post-harvest etc.)	AM-PM	• Verification site (explanation by producers) • Questionnaire • Discussion

b. Result of Study Tour

The following four types of techniques were introduced in the first Study tour: 1) transplant, 2) drilling (direct seeding in drill), 3) earthworm manure, 4) seed selection. Information of post harvest and weed control were added in the second Study tour. Participants showed interest in each category as follows:

Table4.9.4 Interest in Techniques Presented in First Study Tour in March 2005

	transplant	drilling	earthworm manure	seed selection
Techniques I had interest	77% (17)	45% (10)	41% (9)	77% (17)
Techniques I will possibly introduce to my farmland	59% (13)	32% (7)	27% (6)	36% (8)

Table4.9.5 Interest in Techniques Presented in Second Study Tour in May 2005

	transplant	drilling	weed control	earthworm manure	post harvest
Techniques I had interest	85% (17)	80% (16)	65%(13)	75% (15)	65% (13)
Techniques I will possibly introduce to my farmland	75% (15)	60% (12)	55%(11)	60% (12)	40% (8)

Most people expressed concerns about possibility of material procurement for introduction of techniques presented. The concerns were high regarding the techniques on transplant (10 persons responded in March and May) and earthworm manure (7 persons in March and 9 in May responded). Availability of technical support is also one of the concerns for producers.

Technical support on transplant (8 persons responded in March) and drilling (8 persons responded in May) were expressed as necessary topics. As to manpower, concerns were expressed regarding transplantation and drilling.

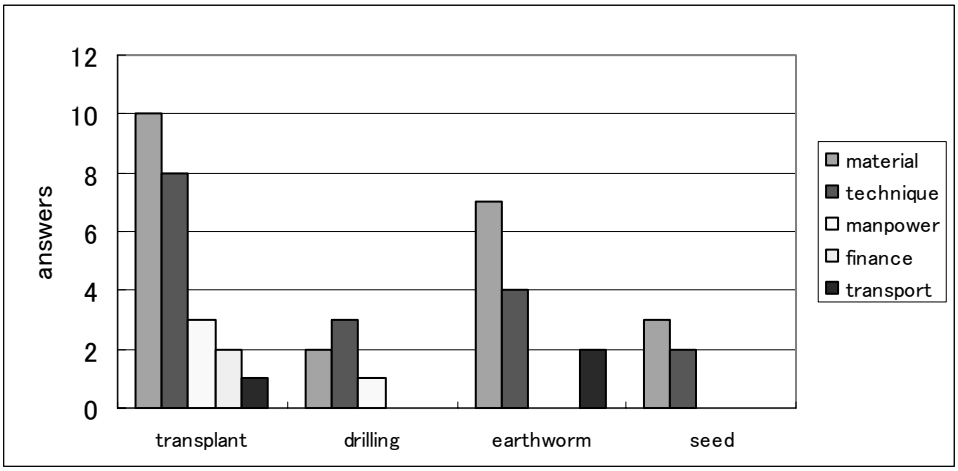

Fig. 4.9.1 Concerns for Introduction of Techniques Presented in March 2005

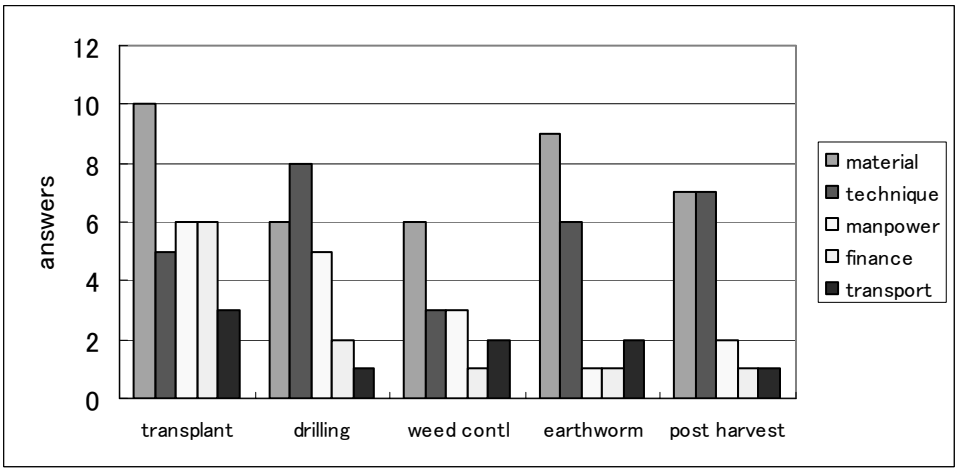

Fig. 4.9.2 Concerns for Introduction of Techniques Presented in May 2005

ANNEX IV: Provisional Farming Cost of Rice Cultivation Type

ANNEX-IV: PROVISIONAL FARMING COST OF RICE CULTIVATION TYPE

The farming costs of proposed rice cultivation type were calculated provisionally as shown in the following tables. The basic idea to calculate provisional farming cost is as shown blow:

The background of the technology that adopts for the provisional cost calculation

The cultivation style of the popular rice production that started in 1994 shifted from the broadcast seeding to the random planting, because the popular rice production producers recognized that it is indispensable to control the weed and the red rice and the rice grown from the seed dropped at the previous cropping season to improve the popular rice production by the random planting, under the difficult situation to obtain the herbicide by the producers.

On the other hand, it seems that the price that corresponds to the produce cost even if a lot of farmers who want to adopt the random planting that a lot of labors are necessary for the transplant, the labor cost is high, still exist.

The technologies that calculate cost

The technologies that calculate the cost are the almost same as the technology that verifies by the Verification Study. For the evaluation to those verification technologies, they pointed out to want to use positively it in the future, because the manual rotary weeder was effect remarkably to control the weeds. The regular planting where the manual rotary weeder exhibits its maximum ability to control weeds is introduced to calculate the production cost. On the other, the row seeding combined with the manual rotary weeder is introduced to calculate the production cost, for the case that the labor forces for transplanting the rice seeding can not be secured. The levering for the row seeding paddy field should be carried by the animal.

The cultivation technologies for the regular planting and row seeding that differ from the traditional technology are as follows.

Seed: Certificated seed, seed selection by specific gravity
Fertilizer: Earthworm manure, incorporation of the rice straw
Weeding: Manual rotary weeder
Agricultural chemicals: Biocide (Metharizium)

Other than above mentioned technologies, the following technologies combined with the irrigation and drainage technology are introduced.

Weed control at paddy field preparation (Seco fangueo), maintenance of the flooding condition at the paddy field, the revelation of the effect of air-drying effect on the mineralization of organic nitrogen, phosphate and potassium.

Referred materials

The result of the interview survey on the farm practices to the popular rice producers in the 5 municipals of 5 provincials in the Study area. (Augusts - September, 2004)

The registration results on the farm practices, such as number of laborers, working hours, daily allowance, input of agricultural materials, by the producers where the Verification Study was executed. (December 2004 – November 2005)

COST SUMMARY（per ha, Cuban pesos)

	Cultivation type 1			Cultivation type 2			Cultivation type 3			Cultivation type 4			Cultivation type 5		
	Rice in rainy season-Transplanting-Economic crop			Double rice cropping-Transplanting			Double rice cropping-Direct sowing			Rice in rainy season-Transplanting-Soil maintaining crop			Rice in rainy season-Direct sowing-Soil maintaining crop		
	Actual ①	Improved ②	②／①	Actual ①	Improved ②	②／①	Actual ①	Improved ②	②／①	Actual ①	Improved ②	②／①	Actual ①	Improved ②	②／①
Dry Season															
Labor cost				2,395	3,270	137%	1,210	2,790	231%						
Machinery cost				3,888	4,537	117%	3,351	3,325	99%						
Material cost				77	417	542%	414	536	129%						
Irrigation cost				2,800	2,800	100%	2,800	2,800	100%						
Total Cost				9,160	11,024	120%	7,775	9,451	122%						
Yield				4,500	5,500	122%	4,000	5,000	125%						
Gross income				11,880	14,520	122%	10,560	13,200	125%						
Profit				2,720	3,496		2,785	3,749							
Rainy Season															
Labor cost	2,395	3,150	132%	2,395	3,030	127%	1,210	2,460	203%	2,395	3,150	132%	1,210	2,670	221%
Machinery cost	3,726	4,537	122%	3,726	4,285	115%	3,042	3,220	106%	3,726	4,375	117%	3,042	3,310	109%
Material cost	77	221	287%	77	123	160%	414	242	58%	77	221	287%	414	493	119%
Irrigation cost	2,300	2,300	100%	2,300	2,300	100%	2,300	2,300	100%	2,300	2,300	100%	2,300	2,300	100%
Total Cost	8,498	10,208	120%	8,498	9,738	115%	6,966	8,222	118%	8,498	10,046	118%	6,966	8,773	126%
Yield	4,000	5,500	138%	4,000	5,000	125%	3,000	4,500	150%	4,000	5,000	125%	3,000	4,500	150%
Gross income	10,560	14,520	138%	10,560	13,200	125%	7,920	11,880	150%	10,560	13,200	125%	7,920	11,880	150%
Profit	2,062	4,312		2,062	3,462		954	3,658		2,062	3,154		954	3,107	
Total double cropping															
Total Cost				17,658	20,762	118%	14,741	17,673	120%						
Total Income				22,440	27,720	124%	18,480	25,080	136%						
Total Profit				4,782	6,958		3,739	7,407							

(1) Production cost of Random Planting (Rainy Season Cropping) Area: 1 ha

Item		Unit	Quantity	Uint price	Total
A. Labor force sub-total			**47**		**2,395**
2. Aplication of urea	Manual	Peso	2	20	40
3. Preparation of the paddy field at dry soil condition					
- Plowing	Tractor + prow (IUMZ+ADI-3)	Peso	3	30	90
- Harrowing	Oxen	Peso	6	30	180
4. Puddling and levelling					0
- Puddling and levelling	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	3	160	480
5. Seeding preparation					
- Establishment of the nursery bed	Tractor + prow (IUMZ+Rueda RIT)	Peso	6	40	240
- Transplanting	Manual	Peso	12	70	840
6. Weed Control		Peso			
- Cutting of weeds (Levee)	Machete	Peso	3	15	45
7. Pests control					
- Aplication of insecticide (For Rice bug)	Manual sprayer	Peso	0	30	0
8. Harvesting					
	Manual, Traditional thresher	Peso	12	40	480
B. Machinery sub-total					**3,726**
Prowing (Fuel, Liter)	Tractor + prow (IUMZ+ADI-3)	Peso	30	15	450
Puddling and leveling (Fuel, Liter)	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	105	15	1,575
Establishment of the nursery bed (Fuel, Liter)	Tractor + prow (IUMZ+Rueda RIT)	Peso	25	15	375
Threshering (Fuel, Liter)	Traditional thresher	Peso	18	15	270
Threshering (Rental cost)	10 % of the amount of the rice harvested	Peso	4,000	10%	1,056
C. Materials sub-total					**77**
Local seed		kg	25	2.90	72.50
Urea (1)		kg	20	0.20	4.00
Karate (1)		Liter	0	9.50	0.00
D. Irrigation		Peso			2,300
E. Total cost					**8,498**

(1): Assigned prices

Yield	Wet paddy	kg	4,000
Price of CAI	Wet paddy	kg	2.64
Gross income			10,560
Profit			2,063

(1) Production Cost of Regular Planting (Rainy Season Cropping) Area: 1 ha

Item		Unit	Quantity	Uint price	Total
A. Labor force sub-total			**75**		**3,150**
1. Transport of erathworm manure	Tractor + trailer (MTZ80)	Peso	4	15	60
2. Application of erathworm manure	Manual	Peso	2	30	60
3. Preparation of the paddy field at dry soil condition					
- Plowing	Tractor + prow (IUMZ+ADI-3)	Peso	3	30	90
- Harrowing	Oxen	Peso	6	30	180
4. Puddling and levelling		Peso			
- Puddling and levelling	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	3	160	480
5. Seedling preparation					
- Establishment of the nursery bed	Tractor + prow (IUMZ+Rueda RIT)	Peso	6	40	240
- Transplanting	Manual	Peso	12	70	840
6. Weed control					
- Weeding	Manual rotary weeder	Peso	12	30	360
- Cutting of weeds (Levee)	Machete	Peso	3	15	45
7. Pests control					
- Aplication fo insecticide (For Rice bug)	Manual sprayer	Peso	3	30	90
8. Harvesting					
	Manual, Traditional thresher	Peso	12	40	480
9. Rice straw cutting					
	Rice straw cutter	Peso	9	25	225
B. Machinery sub-total					**4,537**
Transport of erathworm manure (Fuel, Liter)	Tractor + trailer (MTZ80)	Peso	6	15	90
Prowing (Fuel, Liter)	Tractor + prow (IUMZ+ADI-3)	Peso	30	15	450
Puddling and leveling (Fuel, Liter)	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	105	15	1,575
Establishment of the nursery bed (Fuel, Liter)	Tractor + prow (IUMZ+Rueda RIT)	Peso	25	15	375
Threshering (Fuel, Liter)	Traditional thresher	Peso	25	15	375
Threshering (Rental cost)	10 % of the amount of the rice harvested	Peso	5,500	10%	1,452
Rice straw cutting (Fuel, Liter)	Rice straw cutter	Peso	10	22	220
C. Materials sub-total					**221**
Earthworm manure		Ton	2	49.00	98
Certificated seed		kg	20	4.95	99
Biocide (Metarhizium)		kg	3	8.00	24
D. Irrigation		Peso			2,300
E. Total cost					**10,208**

Yield	Wet paddy	kg	5,500
Price of CAI	Wet paddy	kg	2.64
Gross income			14,520
Profit			4,312

(2) Production Cost of Random Planting (Dry Season Cropping) Area: 1 ha

Item		Unit	Quantity	Uint price	Total
A. Labor force sub-total			**47**		**2,395**
2. Aplication of urea	Manual	Peso	2	20	40
3. Preparation of the paddy field at dry soil condition					
- Plowing	Tractor + prow (IUMZ+ADI-3)	Peso	3	30	90
- Harrowing	Oxen	Peso	6	30	180
4. Puddling and levelling					
- Puddling and levelling	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	3	160	480
5. Seedling preparation					
- Establishment of the nursery bed	Tractor + prow (IUMZ+Rueda RIT)	Peso	6	40	240
- Transplanting	Manual	Peso	12	70	840
6. Weed Control					
- Cutting of weeds (Levee)	Machete	Peso	3	15	45
7. Pests control					
- Aplication of insecticide (For Rice bug)	Manual sprayer	Peso	0	30	0
8. Harvesting					
	Manual, Traditional thresher	Peso	12	40	480
B. Machinery sub-total					**3,888**
Prowing (Fuel, Liter)	Tractor + prow (IUMZ+ADI-3)	Peso	30	15	450
Puddling and leveling (Fuel, Liter)	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	105	15	1,575
Establishment of the nursery bed (Fuel, Liter)	Tractor + prow (IUMZ+Rueda RIT)	Peso	25	15	375
Threshering (Fuel, Liter)	Traditional thresher	Peso	20	15	300
Threshering (Rental cost)	10 % of the amount of the rice harvested	Peso	4,500	10%	1,188
C. Materials sub-total					**77**
Local seed		kg	25	2.90	72.50
Urea (1)		kg	20	0.20	4.00
Karate (1)		Liter	0.0	9.50	0.00
D. Irrigation		Peso			2,800
E. Total cost					**9,160**

(1): Assigned prices

Yield	Wet paddy	kg	4,500
Price of CAI	Wet paddy	kg	2.64
Gross income			11,880
Profit			2,721

(2) Production cost of Regular Planting (Dry Season Cropping) Area: 1 ha

Item		Unit	Quantity	Uint price	Total
A. Labor force sub-total			**79**		**3,270**
1. Transport of erathworm manure	Tractor + trailer (MTZ80)	Peso	4	15	60
2. Application of erathworm manure	Manual	Peso	6	30	180
3. Preparation of the paddy field at dry soil condition					
- Plowing	Tractor + prow (IUMZ+ADI-3)	Peso	3	30	90
- Harrowing	Oxen	Peso	6	30	180
4. Puddling and levelling		Peso			
- Puddling and levelling	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	3	160	480
5. Seedling preparation					
- Establishment of the nursery bed	Tractor + prow (IUMZ+Rueda RIT)	Peso	6	40	240
- Transplanting	Manual	Peso	12	70	840
6. Control de malezas					
- Weeding	Manual rotary weeder	Peso	12	30	360
- Cutting of weeds (Levee)	Machete	Peso	3	15	45
7. Pests control					
- Aplication of insecticide (For Rice bug)	Manual sprayer	Peso	3	30	90
8. Harvesting					
	Manual, Traditional thresher	Peso	12	40	480
9. Rice straw cutting					
	Rice straw cutter	Peso	9	25	225
B. Machinery sub-total					**4,537**
Transport of erathworm manure (Fuel, Liter)	Tractor + trailer (MTZ80)	Peso	6	15	90
Prowing (Fuel, Liter)	Tractor + prow (IUMZ+ADI-3)	Peso	30	15	450
Puddling and leveling (Fuel, Liter)	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	105	15	1,575
Establishment of the nursery bed (Fuel, Liter)	Tractor + prow (IUMZ+Rueda RIT)	Peso	25	15	375
Threshering (Fuel, Liter)	Traditional thresher	Peso	25	15	375
Threshering (Rental cost)	10 % of the amount of the rice harvested	Peso	5,500	10%	1,452
Rice straw cutting (Fuel, Liter)	Rice straw cutter	Peso	10	22	220
C. Materials sub-total					**417**
Earthworm manure		Ton	6	49.00	294
Certificated seed		kg	20	4.95	99
Biocide (Metarhizium)		kg	3	8.00	24
D. Irrigation		Peso			2,800
E. Total cost					**11,024**

Yield	Wet paddy	kg	5,500
Price of CAI	Wet paddy	kg	2.64
Gross income			14,520
Profit			3,496

(2) Production Cost of Random Planting (Rainy Season Cropping) Area: 1 ha

Item		Unit	Quantity	Uint price	Total
A. Labor force sub-total			**47**		**2,395**
2. Aplication of urea	Manual	Peso	2	20	40
3. Preparation of the paddy field at dry soil condition					
- Plowing	Tractor + prow (IUMZ+ADI-3)	Peso	3	30	90
- Harrowing	Oxen	Peso	6	30	180
4. Puddling and levelling					0
- Puddling and levelling	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	3	160	480
5. Seedling preparation					
- Establishment of the nursery bed	Tractor + prow (IUMZ+Rueda RIT)	Peso	6	40	240
- Transplanting	Manual	Peso	12	70	840
6. Weed Control					
- Cutting of weeds (Levee)	Machete	Peso	3	15	45
7. Pests control					
- Aplication of insecticide (For Rice bug)	Manual sprayer	Peso	0	30	0
8. Harvesting					
	Manual, Traditional thresher	Peso	12	40	480
B. Machinery sub-total					**3,726**
Prowing (Fuel, Liter)	Tractor + prow (IUMZ+ADI-3)	Peso	30	15	450
Puddling and leveling (Fuel, Liter)	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	105	15	1,575
Establishment of the nursery bed (Fuel, Liter)	Tractor + prow (IUMZ+Rueda RIT)	Peso	25	15	375
Threshering (Fuel, Liter)	Traditional thresher	Peso	18	15	270
Threshering (Rental cost)	10 % of the amount of the rice harvested	Peso	4,000	10%	1,056
C. Materials sub-total					**77**
Local seed		kg	25	2.90	72.50
Urea (1)		kg	20	0.20	4.00
Karate (1)		Liter	0	9.50	0.00
D. Irrigation		Peso			2,300
E. Total cost					**8,498**

(1): Assigned prices

Yield	Wet paddy	kg	4,000
Price of CAI	Wet paddy	kg	2.64
Gross income			10,560
Profit			2,063

(2) Production cost of Regular Planting (Rainy Season Cropping) Area: 1 ha

Item		Unit	Quantity	Uint price	Total
A. Labor force sub-total			**69**		**3,030**
3. Preparation of the paddy field at dry soil condition					
- Plowing	Tractor + prow (IUMZ+ADI-3)	Peso	3	30	90
- Harrowing	Oxen	Peso	6	30	180
4. Puddling and levelling		Peso			
- Puddling and levelling	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	3	160	480
5. Seedling preparation					
- Establishment of the nursery bed	Tractor + prow (IUMZ+Rueda RIT)	Peso	6	40	240
- Transplanting	Manual	Peso	12	70	840
6. Control de malezas					
- Weeding	Manual rotary weeder	Peso	12	30	360
- Cutting of weeds (Levee)	Machete	Peso	3	15	45
7. Pests control					
- Aplication of insecticide (For Rice bug)	Manual sprayer	Peso	3	30	90
8. Harvesting					
	Manual, Traditional thresher	Peso	12	40	480
9. Rice straw cutting					
	Rice straw cutter	Peso	9	25	225
B. Machinery sub-total					**4,285**
Prowing (Fuel, Liter)	Tractor + prow (IUMZ+ADI-3)	Peso	30	15	450
Puddling and leveling (Fuel, Liter)	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	105	15	1,575
Establishment of the nursery bed (Fuel, Liter)	Tractor + prow (IUMZ+Rueda RIT)	Peso	25	15	375
Threshering (Fuel, Liter)	Traditional thresher	Peso	23	15	345
Threshering (Rental cost)	10 % of the amount of the rice harvested	Peso	5,000	10%	1,320
Rice straw cutting (Fuel, Liter)	Rice straw cutter	Peso	10	22	220
C. Materials sub-total					**123**
Certificated seed		kg	20	4.95	99
Biocide (Metarhizium)		kg	3	8.00	24
D. Irrigation		Peso			2,300
E. Total cost					**9,738**

Yield	Wet paddy	kg	5,000
Price of CAI	Wet paddy	kg	2.64
Gross income			13,200
Profit			3,462

(3) Production Cost of Broadcast Seeding (Dry Season Cropping) Area: 1 ha

Item		Unit	Quantity	Uint price	Total
A. Labor force sub-total			**34**		**1,210**
2. Aplication of Urea	Manual	Peso	2	20	40
3. Preparation of the paddy field at dry soil condition					
- Plowing	Tractor + prow (IUMZ+ADI-3)	Peso	3	30	90
- Harrowing	Oxen	Peso	6	30	180
4. Puddling and levelling					
- Puddling and levelling	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	3	75	225
5. Broadcast sowing	Manual	Peso	2	30	60
6. Weed Control		Peso			0
- Herbicide	Manual sprayer	Peso	3	30	90
- Cutting of weeds (Levee)	Machete	Peso	3	15	45
7. Pests control					
- Aplication of insecticide (For Rice bug)	Manual sprayer	Peso	0	30	0
8. Harvesting					
	Manual, Traditional thresher	Peso	12	40	480
B. Machinery sub-total					**3,351**
Prowing (Fuel, Liter)	Tractor + prow (IUMZ+ADI-3)	Peso	30	15	450
Puddling and leveling (Fuel, Liter)	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	105	15	1,575
Threshering (Fuel, Liter)	Traditional thresher	Peso	18	15	270
Threshering (Rental cost)	10 % of the amount of the rice harvested	Peso	4,000	10%	1,056
C. Materials sub-total					**414**
Local seed		kg	135	2.90	392
Urea (1)		kg	20	0.20	4
Karate (1)		Liter	0.0	9.50	0.00
Propanil (1)		Liter	6.0	3.08	18.48
D. Irrigation		Peso			2,800
E. Total cost					**7,775**

(1): Assigned prices

Yield	Wet paddy	kg	4,000
Price of CAI	Wet paddy	Peso/kg	2.64
Gross income			10,560
Profit			2,785

(3) Production cost of Row seeding (Dry Season Cropping) Area: 1 ha

Item		Unit	Quantity	Uint price	Total
A. Labor force sub-total			**72**		**2,790**
1. Transport of erathworm manure	Tractor + trailer (MTZ80)	Peso	4	15	60
2. Application of erathworm manure	Manual	Peso	6	30	180
3. Preparation of the paddy field at dry soil condition					
- Plowing	Tractor + prow (IUMZ+ADI-3)	Peso	3	30	90
- Harrowing	Oxen	Peso	6	30	180
4. Puddling and levelling					0
- Puddling	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	3	160	480
- Levelling	Oxen	Peso	6	30	180
5.Seeding at puddling and leveling field	Drum seeder	Peso	6	25	150
6. Weed Control					
- Weeding	Manual rotary weeder	Peso	6	30	180
- Weeding	Hand weeding	Peso	12	30	360
- Cutting of weeds (Levee)	Machete	Peso	3	15	45
- Extraction of red rice etc.(1)	Manual	Peso	3	30	90
7. Pests control					
-Aplication of biocide	Manual sprayer	Peso	3	30	90
8. Harvesting					
	Manual, Traditional thresher	Peso	12	40	480
9. Rice straw cutting		Peso	9	25	225
	Rice straw cutter				
B. Machinery sub-total					**3,325**
Transport of erathworm manure (Fuel, Liter)	Tractor + trailer (MTZ80)	Peso	6	15	90
Prowing (Fuel, Liter)	Tractor + prowing (IUMZ+ADI-3)	Peso	30	15	450
Puddling and leveling (Fuel, Liter)	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	60	15	900
Threshering (Fuel, Liter)	Traditional thresher	Peso	23	15	345
Threshering (Rental cost)	10 % of the amount of the rice harvested	Peso	5,000	10%	1,320
Rice straw cutting (Fuel, Liter)	Rice straw cutter	Peso	10	22	220
C. Materials sub-total					**536**
Erathworm manure		Ton	6	49.00	294
Certificated seed		kg	75	2.90	218
Biocide (Metarhizium)		kg	3	8.00	24
D. Irrigation		Peso			2,800
E. Total cost					**9,451**

(1): Weeds, red rice and the rice grown from the seed dropped at the previous cropping season

Yield	Wet paddy	kg	5,000
Price of CAI	Wet paddy	kg	2.64
Gross income			13,200
Profit			3,750

(3) Production Cost of Broadcast Seeding (Rainy Season Cropping) Area: 1 ha

Item		Unit	Quantity	Uint price	Total
A. Labor force sub-total			**34**		**1,210**
2. Aplication of Urea	Manual	Peso	2	20	40
3. Preparation of the paddy field at dry soil condition					
- Plowing	Tractor + prow (IUMZ+ADI-3)	Peso	3	30	90
- Harrowing	Oxen	Peso	6	30	180
4. Puddling and levelling					
- Puddling and levelling	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	3	75	225
5. Broadcast sowing	Manual	Peso	2	30	60
6. Weed Control		Peso			
- Herbicide	Manual sprayer	Peso	3	30	90
- Cutting of weeds (Levee)	Machete	Peso	3	15	45
7. Pests control					
- Aplication of insecticide (For Rice bug)	Manual sprayer	Peso	0	30	0
8. Harvesting					
	Manual, Traditional thresher	Peso	12	40	480
B. Machinery sub-total					**3,042**
Prowing (Fuel, Liter)	Tractor + prow (IUMZ+ADI-3)	Peso	30	15	450
Puddling and leveling (Fuel, Liter)	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	105	15	1,575
Threshering (Fuel, Liter)	Traditional thresher	Peso	15	15	225
Threshering (Rental cost)	10 % of the amount of the rice harvested	Peso	3,000	10%	792
C. Materials sub-total					**414**
Local seed		kg	135	2.90	392
Urea (1)		kg	20	0.20	4
Karate (1)		Liter	0	9.50	0.00
Propanil (1)		Liter	6	3.08	18.48
D. Irrigation		Peso			2,300
E. Total cost					**6,966**

(1): Assigned prices

Yield	Wet paddy	kg	3,000
Price of CAI	Wet paddy	Peso/kg	2.64
Gross income			7,920
Profit			954

(3) Production cost of Row seeding (Rainy Season Cropping) Area: 1 ha

Item		Unit	Quantity	Uint price	Total
A. Labor force sub-total			**69**		**2,460**
3. Preparation of the paddy field at dry soil condition					
- Plowing	Tractor + prow (IUMZ+ADI-3)	Peso	3	30	90
- Harrowing	Oxen	Peso	6	30	180
4. Puddling and levelling					0
- Puddling	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	3	160	480
- Levelling	Oxen	Peso	6	30	180
5.Siembra en fanguillo	Drum seeder	Peso	6	25	150
6.Control de malezas					
- Weeding	Manual rotary weeder	Peso	3	30	90
- Weeding	Hand weeding	Peso	12	30	360
- Cutting of weeds (Levee)	Machete	Peso	3	15	45
- Extraction of red rice etc.(1)	Manual	Peso	3	30	90
7. Pests control					
- Aplication of biocide	Manual sprayer	Peso	3	30	90
8. Harvesting					
	Manual, Traditional thresher	Peso	12	40	480
9. Rice straw cutting		Peso	9	25	225
	Rice straw cutter				
B. Machinery sub-total					**3,220**
Prowing (Fuel, Liter)	Tractor + prowing (IUMZ+ADI-3)	Peso	30	15	450
Puddling and leveling (Fuel, Liter)	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	60	15	900
Threshering (Fuel, Liter)	Traditional thresher	Peso	20	15	300
Threshering (Rental cost)	10 % of the amount of rice harvested	Peso	4,500	10%	1,350
Rice straw cutting (Fuel, Liter)	Rice straw cutter	Peso	10	22	220
C. Materials sub-total					**242**
Certificated seed		kg	75	2.90	218
Biocide (Metarhizium)		kg	3	8.00	24
D. Irrigation		Peso			2,300
E. Total cost					**8,222**

(1): Weeds, red rice and the rice grown from the seed dropped at the previous cropping season

Yield	Wet paddy	kg	4,500
Price of CAI	Wet paddy	kg	2.64
Gross income			11,880
Profit			3,659

(4) Production cost of Randon Planting (Rainy Season Cropping) Area: 1 ha

Item		Unit	Quantity	Uint price	Total
A. Labor force sub-total			**47**		**2,395**
2. Aplication of urea	Manual	Peso	2	20	40
3. Preparation of the paddy field at dry soil condition					
- Plowing	Tractor + prow (IUMZ+ADI-3)	Peso	3	30	90
- Harrowing	Oxen	Peso	6	30	180
4. Puddling and levelling					0
- Puddling and levelling	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	3	160	480
5. Seedling preparation					
- Establishment of the nursery bed	Tractor + prow (IUMZ+Rueda RIT)	Peso	6	40	240
- Transplanting	Manual	Peso	12	70	840
6. Weed Control		Peso			
- Cutting of weeds (Levee)	Machete	Peso	3	15	45
7. Pests control					
- Aplication of insecticide (For Rice bug)	Manual sprayer	Peso	0	30	0
8. Harvesting					
	Manual, Traditional thresher	Peso	12	40	480
B. Machinery sub-total					**3,726**
Prowing (Fuel, Liter)	Tractor + prow (IUMZ+ADI-3)	Peso	30	15	450
Puddling and leveling (Fuel, Liter)	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	105	15	1,575
Establishment of the nursery bed (Fuel, Liter)	Tractor + prow (IUMZ+Rueda RIT)	Peso	25	15	375
Threshering (Fuel, Liter)	Traditional thresher	Peso	18	15	270
Threshering (Rental cost)	10 % of the amount of the rice harvested	Peso	4,000	10%	1,056
C. Materials sub-total					**77**
Local seed		kg	25	2.90	72.50
Urea (1)		kg	20	0.20	4.00
Karate (1)		Liter	0	9.50	0.00
		Peso			2,300
					8,498

Yield	Wet paddy	kg	4,000
Price of CAI	Wet paddy	kg	2.64
Gross income			10,560
Profit			2,063

(4) Production Cost of Regular Planting (Rainy Season Cropping) Area: 1 ha

Concepto		Unidad	Cantidad	Costo unitario	Total
A. Mano de obra sub-total			**75**		**3,150**
1. Transport of erathworm manure	Tractor + trailer (MTZ80)	Peso	4	15	60
2. Application of erathworm manure	Manual	Peso	2	30	60
3. Preparation of the paddy field at dry soil condition					
- Plowing	Tractor + prow (IUMZ+ADI-3)	Peso	3	30	90
- Harrowing	Oxen	Peso	6	30	180
4. Puddling and levelling		Peso			
-Fangueo y alisamiento	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	3	160	480
5. Seedling preparation					
- Establishment of the nursery bed	Tractor + prow (IUMZ+Rueda RIT)	Peso	6	40	240
- Transplanting	Manual	Peso	12	70	840
6. Weed Control					
- Weeding	Manual rotary weeder	Peso	12	30	360
- Cutting of weeds (Levee)	Machete	Peso	3	15	45
7. Pests control					
-Aplication of biocide	Manual sprayer	Peso	3	30	90
8. Harvesting					
	Manual, Traditional thresher	Peso	12	40	480
9. Rice straw cutting		Peso	9	25	225
	Rice straw cutter				
B. Machinery sub-total					**4,375**
Transport of erathworm manure (Fuel, Liter)	Tractor + trailer (MTZ80)	Peso	6	15	90
Prowing (Fuel, Liter)	Tractor + prow (IUMZ+ADI-3)	Peso	30	15	450
Puddling and leveling (Fuel, Liter)	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	105	15	1,575
Establishment of the nursery bed (Fuel, Liter)	Tractor + prow (IUMZ+Rueda RIT)	Peso	25	15	375
Threshering (Fuel, Liter)	Traditional thresher	Peso	23	15	345
Threshering (Rental cost)	10 % of the amount of the rice harvested	Peso	5,000	10%	1,320
Rice straw cutting (Fuel, Liter)	Rice straw cutter	Peso	10	22	220
C. Materials sub-total					**221**
Earthworm manure		Ton	2	49.00	98
Certificated seed		kg	20	4.95	99
Biocide (Metarhizium)		kg	3	8.00	24
D. Irrigation		Peso			2,300
E. Total cost					**10,046**

Yield	Wet paddy	kg	5,000
Price of CAI	Wet paddy	kg	2.64
Gross income			13,200
Profit			3,154

(3) Production Cost of Broadcast Seeding (Rainy Season Cropping) Area: 1 ha

Item		Unit	Quantity	Uint price	Total
A. Labor force sub-total			**34**		**1,210**
2. Aplication of Urea	Manual	Peso	2	20	40
3. Preparation of the paddy field at dry soil condition					
- Plowing	Tractor + prow (IUMZ+ADI-3)	Peso	3	30	90
- Harrowing	Oxen	Peso	6	30	180
4. Puddling and levelling					
- Puddling and levelling	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	3	75	225
5. Broadcast sowing	Manual	Peso	2	30	60
6. Weed Control		Peso			
- Herbicide	Manual sprayer	Peso	3	30	90
- Cutting of weeds (Levee)	Machete	Peso	3	15	45
7. Pests control					
- Aplication of insecticide (For Rice bug)	Manual sprayer	Peso	0	30	0
8. Harvesting					
	Manual, Traditional thresher	Peso	12	40	480
B. Machinery sub-total					**3,042**
Prowing (Fuel, Liter)	Tractor + prow (IUMZ+ADI-3)	Peso	30	15	450
Puddling and leveling (Fuel, Liter)	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	105	15	1,575
Threshering (Fuel, Liter)	Traditional thresher	Peso	15	15	225
Threshering (Rental cost)	10 % of the amount of the rice harvested	Peso	3,000	10%	792
C. Materials sub-total					**414**
Local seed		kg	135	2.90	392
Urea (1)		kg	20	0.20	4
Karate (1)		Liter	0	9.50	0.00
Propanil (1)		Liter	6	3.08	18.48
D. Irrigation		Peso			2,300
E. Total cost					**6,966**

(1): Assigned prices

Yield	Wet paddy	kg	3,000
Price of CAI	Wet paddy	Peso/kg	2.64
Gross income			7,920
Profit			954

(3) Production cost of Row seeding (Rainy Season Cropping) Area: 1 ha

Item		Unit	Quantity	Uint price	Total
A. Mano de obra sub-total			**78**		**2,670**
1. Transport of erathworm manure	Tractor + Trailer (MTZ80)	Peso	4	15	60
2. Application of erathworm manure	Manual	Peso	2	30	60
3. Preparation of the paddy field at dry soil condition					
- Plowing	Tractor + prow (IUMZ+ADI-3)	Peso	3	30	90
- Harrowing	Oxen	Peso	6	30	180
4. Puddling and levelling					0
- Puddling	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	3	160	480
- Levelling	Oxen	Peso	6	30	180
5.Seeding at puddling and leveling field	Drum seeder	Peso	6	25	150
6. Weed Control					
- Weeding	Manual rotary weeder	Peso	6	30	180
- Weeding	Hand weeding	Peso	12	30	360
- Cutting of weeds (Levee)	Machete	Peso	3	15	45
- Extraction of red rice etc.(1)	Manual	Peso	3	30	90
7. Pests control					
-Aplication of biocide	Manual sprayer	Peso	3	30	90
8. Harvesting					
	Manual, Traditional thresher	Peso	12	40	480
9. Rice straw cutting					
	Rice straw cutter	Peso	9	25	225
B. Machinery sub-total					**3,310**
Transport of erathworm manure (Fuel, Liter)	Tractor + trailer (MTZ80)	Peso	6	15	90
Prowing (Fuel, Liter)	Tractor + prowing (IUMZ+ADI-3)	Peso	30	15	450
Puddling and leveling (Fuel, Liter)	Tractor + cage wheel (IUMZ+Rueda fang.)	Peso	60	15	900
Threshering (Fuel, Liter)	Traditional thresher	Peso	20	15	300
Threshering (Rental cost)	10 % of the amount of the rice harvested	Peso	4,500	10%	1,350
Rice straw cutting (Fuel, Liter)	Rice straw cutter	Peso	10	22	220
C. Materials sub-total					**493**
Erathworm manure		Ton	2	49.00	98
Certificated seed		kg	75	4.95	371
Biocide (Metarhizium)		kg	3	8.00	24
D. Irrigation		Peso			2,300
E. Total cost					**8,773**

(1): Weeds, red rice and the rice grown from the seed dropped at the previous cropping season

Yield	Wet paddy	kg	4,500
Price of CAI	Wet paddy	kg	2.64
Gross income			11,880
Profit			3,107

ANNEX V: Summary of Questionnaire Survey

ANNEX-V: SUMMARY OF QUESTIONNAIRE SURVEY

1. Preliminary Report of Some of the Characteristics of the Selected Municipalities

The following list was established based on the preliminary analysis of the information received from the municipalities:

1. The average age of the farmers is considered acceptable since about 70% to 92% of the surveyed producers are younger than 60 years old and more than 60% of the surveyed farmers are less than 50 years old.
2. In the municipalities there are some differences related to the farmers belonging to any cooperative organization. In the case of Vertientes, there are many farmers that are using Préstamos and are not yet organized; however in Santo Domingo it seems that the sample size of 80 producers does not reflect the real situation of the municipality.
3. Regarding farm management, in all the municipalities more than 50% of the surveyed farmers are cultivating only rice with the exception of Yaguajay, where the percentage of farmers who are cultivating only rice is low.
4. The rotation of the areas where rice is planted is a very common practice among farmers that plant more than one crop or raise cattle. In Yaguajay only 15% of the farmers are rotating the land when planting rice.
5. The sale prices are close to the ones reflected in the previous reports. The average price reported in Aguada de Pasajeros should be confirmed.
6. Regarding tractor ownership, more than 35% of the total surveyed farmers own a tractor, especially in the municipality of Aguada de Pasajeros with 66%. It should be noted that in all the cases, the tractors have been used for more than 25 years and the condition of the tractors is bad, and they lack spare parts.
7. Most of the farmers have irrigation facilities and the main problems are related to the lack of water during the dry season, as well as to the maintenance of the systems.
8. Regarding soil, except for Vertientes the prevailing soil type in the rest of the municipalities is light and light-heavy where cultivation tasks are possible by using animal traction.
9. In all the municipalities, practically more than 60% of the area is planted during rainy season and this is due to the reduced availability of water to cultivate during the dry season, besides the fact that other crops are being planted during the dry season.
10. In the municipalities of Santo Domingo and Yaguajay, the sample of the 80 farmers does not reflect the reality in the municipality. In Vertientes and Aguada de Pasajeros, the data reflects those obtained from the survey carried out in the year 2003.
11. The percentage of producers using certified seeds is low in all the municipalities, except for Vertientes, since Rice CAI has seeds available and is sold to the producers of popular rice.

12. The use of chemical fertilizers is low in Aguada de Pasajeros and in Santo Domingo. On the other hand, in Yaguajay and Vertientes more than 90% of the farmers have reported al least one application. In all the cases, the amount applied is insufficient.
13. In all the municipalities a low percentage of producers have reported the use of organic fertilizers and only in Santo Domingo 55% of the farmers have reported using some kind of organic fertilizer, basically chicken manure and compost.
14. Regarding the use of herbicides for weed control, only Santo Domingo has reported a low percentage of use, while in the other municipalities more than 55% of the farmers have reported at least one application. The highest percentage is seen in Vertientes due to the fact that the farmers with Préstamos receive certain amount of herbicide through Rice CAI.
15. Regarding the use of insecticides, the same practice as with the herbicides is being observed, but in general the percentages are lower.
16. The municipality of Aguada de Pasajeros presented the most critical situation regarding training in 2003 since only 2% of the surveyed producers had some kind of training. In the rest of the municipalities, more than 45% of the surveyed producers received some type of training.
17. The training topics that most of the producers reported as needing were: cultivation management techniques, post-harvest techniques and management of varieties.
18. The main problems posed by the producers were: lack of certified seeds, lack of supplies, lack of water and lack of machinery.

SURVEY SUMMARY

Summary of some of the Characteristics of the Individual Farmers

No	Characteristics	Aguada de Pasajeros	Santo Domingo	Yaguajay	Chambas	Vertientes
1	Farmers' age (% less than 60 years old)	88 (%)	92 (%)	70 (%)	68(%) [less than 50 years old]	86 (%)
2	Members of Coop.(%)	100 (%)	54 (%)	84 (%)	40(%)	40 (%)
3	Planting only rice (%)	51 (%)	54 (%)	5 (%)	73 (%)	73 (%)
4	Crop rotation (%)	49% Y / 51% No	41% Y / 59% No	15% Y / 85% No	20% Y / 80% No	70% Y / 30% No
5	Sale price[1] (pesos/lb)	2.5 – 3.2	2.6	2.5 – 3.5	NA	2.7 – 3.5
6	Own a tractor	52 (66 %) (+ 25 yrs old)	18 (23 %) (+ 25 yrs old)	19 (24 %) (+ 25 yrs old)	42 (%)	30 (37 %) (+ 25 yrs old)
7	Irrigation facilities (%)	56 %	69 %	95 %	83 %	83 %
8	Type of soil (%)	Light 51 % Light-heavy 29 % Heavy 20 %	Light 52 % Light - heavy 34 % Heavy 14 %	Light 30 % Light - heavy 30 % Heavy 40 %	Light , Light - heavy 33 % Heavy 67 %	Light 28.3 % Light - heavy 5.1 % Heavy 66.6 %
9	Planting season (%)	Rain 58 % / Dry 42 %	Rain 64 % / Dry 36 %	Rain 95 % / Dry 5 %	Rain 74 % / Dry 26 %	Rain 80 % / Dry 20 %
10	Planning technique (%)	75 Transpl/ 25 Direct	42 Transpl/ 58 Direct	70 Transpl/ 30 Direct	2 Transpl/ 98 Direct	1.5 Transpl/ 98.5 Direct
11	Certified seeds (%)	10 Y / 90 No	26 Y / 74 No	10 Y / 90 No	NA	78.3 Y / 21.7 No
12	Chemical fertilizers (%)	17 Y / 83 No	28 Y / 72 No	90 Y / 10 No	NA	92 Y / 8 No
13	Organic fertilizers (%)	10 Y / 90 No	55 Y / 45 No	5 Y / 95 No	NA	7 Y / 93 No
14	Herbicides (%)	59 Y / 41 No	9 Y / 91 No	55 Y / 45 No	88 Y / 12 No	88 Y / 12 No
15	Insecticides (%)	30 Y / 70 No	23 Y / 77 No	30 Y / 70 No	55 Y / 45 No	57 Y / 43 No
16	Training in 2003	2 Y / 98 No	46 Y / 54 No	70 Y / 30 No	44 Y / 56 No	47 Y / 53 No
17	Need of training	Crop Protection Variety management	Crop management Post harvest technology	Technical assistance Seed selection Rice storage	Pest management Reaping and post harvest Use of soils New variety Agro-machines	New varieties Fertilization Water management
18	Main problems	Certified seeds Lack of supplies Lack of water	Certified seeds Lack of training	Certified seeds Lack of supplies Lack of water	Lack of agro-machinery Lack of capacitation	Lack of supplies Lack of machinery

Remarks: [1]White rice

2. Aguada de Pasajeros

2.1 Individual Producers

Typology of the surveyed producers:

The surveyed producers (80) belong to CCS. In this municipality, all small producers belong to some CCS, even parceleros.

Basic data:

The following table shows the ages (years old) reported in the survey.

20-30	%	31-40	%	41-50	%	51-60	%	>60	%
1	1,25	10	12,5	37	46,25	23	28,75	9	11,25

The most prevailing age range is 41 to 50 years old and 51 to 60 years old.

In general, producers have experience in agriculture, as 78.75 % of them have been working for 15 or more in the agricultural sector.

1960-1970	%	1971-1980	%	1981-1990	%	1991-2000	%	>2000	%
18	22,5	29	36,25	16	20	15	18,75	0	0

As a general rule, men work directly in the farm.

Number of persons	Total	Average
Family members	368	4,60
Working directly in the farms	196	2,45
Men working in the farm	179	2,24
Women working in the farm	25	0,31
Retired men	22	0,28
Retired women	4	0,05

Use of agricultural area (ha):

The proportion of rented land is low compared to private lands. The largest areas for rice cultivation are private lands.

	Total	Average
Agricultural area (ha):	725,89	9,07
Area for rice (ha):	335,61	4,20
Private area (ha):	607,55	7,59
Rented land (ha):	104,08	1,30

Farm management:

51% of the producers cultivate only rice in their farms, basically those holding the smallest areas. Crop rotation is mainly practiced with cattle (45%) and roots (38.75%). Beans, maize and melon are frequently used as alternative crops, as these are highly preferred. Many surveyed producers are not clear about the concept of crop rotation.

Crop rotation:

Dry season (nov. – April)	Rainy season (may - oct.)
Sweet potato-maize	Sweet potato-rice
Sweet-potate-tomato	Rice-beans
Melon-rice	Rice-malanga
Bean-rice	Rice
Bean-roots	
pasture	

Agricultural production in 2003:

The yields of rice cultivation were relatively low (2,5 t.ha-1). The sowing time in the spring takes place in June-July, and in the dry season in November-February. The area sowed in spring is larger (206 ha more) than the area sowed in winter, mainly due to the shortage of water and availability of irrigation systems.

Destiny of rice production in 2003:

According to the collected data, the main destiny of rice production was sold without contract (30%) and self-consumption.

	Total (kg)	%
1- Sales with non-specialized contract	3240	21,62
2- Sales without contract	4519	30,16
3- Self-consumption	4228	28,21
4- Seeds for self-consumption	2872	19,17
5- Seeds for selling	126,3	0,84
6- Individual sales	0	0,00
Total	14985,3	

Rice was mainly sold to Acopio and Rice Provincial Enterprise. On the other hand, a considerable part of the production was sold individually.

Agro-machinery:

66.25% of the producers hold some type of agro-machine. However, because these equipments have been used for many years, the cost of maintenance and operation is high.

Name of the machine	Total number	Total (years)	%
1- Tractor	54	25,5	65
2- Thresher	0	0,0	0
3- Harrow	23	22,6	6,25
4- Plow	45	21,8	56,25
5- Ditcher	0	0,0	0
6- Harvester	4	10,0	5
7- Track	4	49,0	5
8- Pump	44	26,3	42,5
9- Others	22	17,7	

Use of fuel:

The following table shows the average figures of the cost of each activity of rice cultivation, according to producers:

	Average
A → weeding (kniffe)	61,33
B → dry preparation	127,62
C → puddling preparation	261,18
D → chemical fertilizer application	2700
E → organic manure application	0
F → direct seeding	0
G → irrigation	561,29
H → manual weeding	0
I → pesticide application	0
J → reaping	222,91
K → Transportation	72,68
L → Threshing	42,38
LL → drying	67,27
M → Milling	44,03
Total	4160,73

Irrigation and drainage:

In the municipality, 43.75% of the producers have not any irrigation facilities ; this situation is one of the constraints to practice double-rice cropping and to cultivate rice in the dry season causes.

Most of the available irrigation facilities are private systems (39 producers). The most common irrigation source is underground water, which is taken from wells that generally have not any name. There are other water sources, such as the rivers Violeta, Siguanea, Magdalena and Hanabana.

Pumping is basically done using diesel pumps, with a capacity ranging from 4 to 12 inches (the 4-inche type is the most common).

Only 207.49 ha have enough irrigation water in spring; in the dry season this number becomes reduced almost by half.

A considerable number of farms have not any drainage system.

It seems that bad drainage is not considered by producers as a problem.

Soils

Covering 51.25 % of the surface, middle-heavy soils are the most common category. Middle-type soils cover 28.75% of the surface; this type of soil has no constraints for the use of machine. However, as heavy soils cover 20% of the surface, the choice of areas and technologies must be taken into account.

Agricultural practices of rice:

The area of rice seeding in the rainy season (May-Oct.) is 59.04 larger than the cultivated area in the dry season.

	Total (ha)	%
Rainy season (May / Oct.)(ha)	218,2	57.8
Dry season (Nov. / April) (ha)?	159,16	42.2

The main constraint for double-rice cropping is the shortage of investments in irrigation (to dig wells, electrification, etc.).

Practiced in 74.34% of the total area, transplanting is the most common method, as shown bellow:

	Total (ha)	% of sowed area
Direct seeding	93,31	25,66
Transplanting	270,39	74,34

The following table shows the reasons by which producers choose the sowing method:

Direct seeding	Transplanting
• Lower cost • Preference of the producers • Less water is required • Because there is shortage of fertilizers • Better economic results • Higher rice production • Less expenses • It is easier to apply	• Higher yields • Appropriate for low lands • Higher grain quality • Better weed control without applying chemicals • Salty soils • Higher rice production • Preference of the producers

Because of the lack of appropriate agro-machines and implements, rice sowing is commonly practiced manually in both direct seeding and transplanting.

Regarding the type of technology applied, the consensus of opinion of the surveyed producers is that transplantation must be carried out 34 days after planting the nursery; however, transplantation is often applied 40 days after this date.

The average sowing density is 30 lbs/cord –sometimes 70 lbs/cord; the average spacing is 22 cm.

Producers learn the technologies and methods basically from the experience of their parents and/or from neighbors of the surrounding areas.

Seed management:

Everyone knows that seed quality plays an important role in getting high yields; however, the results of the questionnaire show that 90% of the surveyed producers do not use certified seeds. They explain that the main reason by which certified seed is not used is that it is not available in the market, which reveals the inefficiency, at least in the region, of the official system of seed supply. Because of this situation, producers exchange their seeds every two years on average, as a renewal way.

According to the answers provided by producers, the most used varieties are listed bellow:

- 410
- Reforma
- IACUBA 30
- 5 estrella
- CIAT
- Amistad
- J-104
- 1529
- Alba
- Perla

- Perla improved
- Sancho

Fertilization:

Chemical fertilizers are applied by 80% of the surveyed producers, while 8% of them apply organic manures. The most applied fertilizers are urea, as a carrier of nitrogen, and triple super phosphate. Depending on the purchasing power of producers, the dosages vary drastically. The average dosage is around 120 kg. The prevailing opinion is that "the larger the amount of fertilizer, the higher rice production".

The use of pesticides depends also on the purchasing power of producers and on the availability. The most applied pesticides are shown bellow:

Herbicides	Insecticides	Fungicides
• Glifosate • Surcapul • Aminol • Treflan	• Cipermetrina • Karate • Tamaron • Methyl parathion • Sinovil	• Kitazin • Dicofol • Estalion

Use of alternative power:

According to the questionnaire, no producer uses animal power in the agricultural practices of rice cultivation. This is, therefore, an aspect that should be considered in future activities of capacity building and investment (however, producers did not identify this aspect as a necessity).

Technical assistance and capacity building

79 producers have not received any kind of capacity builiding, which shows the existing failures in the extension system. Producers are most interested in the items listed bellow:

- Training in rice cultivation in general.
- Soils.
- Plant protection.
- Certified seeds.
- Fertilisation.
- Rice Varieties.

The most critical problems affecting rice production in Aguada de Pasajeros municipality are as follows:

- Shortage of good quality
- Shortage of chemicals
- Shortage of fertilizers
- Shortage of fuel
- The production cost is high
- General capacity building
- Electrification of irrigation systems
- Organic manure
- Lack of technology

2.2 UBPC and CPA

In Aguada de Pasajeros municipality, there are only 12 organizations integrating the group of UBPC and CPA: 8 UBPC and 4 CPA. The following table shows the proportion of this type of organizations per Popular Councils:

Popular Councils	Number of entities
Consejo Popular Real Campiña	2
Consejo Popular A. Sánchez	2
Consejo Popular 1ro de Mayo	4
Consejo Popular Libertad	1
Consejo Popular Federal	1
Consejo Victoria	2

Of the above entities, 11 belong to the MINAZ and 1 to the MINAG.

In order to collect the necessary data, the following representatives were interviewed: 9 presidents of cooperatives, 2 managers and 1 chief of production.

Year of establishment:

1971-1980	1981-1990	1991-2000
1	3	8

The distribution of the land use and the average per entity are shown in the following table:

Physic area		Agricultural area		Rice area		Cattle area	
Total	Average	Total	Average	Total	Average	Total	Average
11945,6	995,47	10578,07	881,51	170,05	14,17	1701,38	141,78

Administrative aspects:

The surveyed organizations have 991 members, averaging 82.58 workers per entity. Of this figure, 925 are direct workers in agriculture (77.08 per organization on average).

The number of workers engaged in popular rice production per entity:

Entity	1	2	3	4	5	6	7	8	9	10	11	12	Total	Average
Rice workers	0	33	0	3	5	4	4	4	3	4	4	20	84	7,00

Form of farm management:

All entities cultivate other crops besides rice itself. The combination of crops is shown bellow:

	Cattle	Vegetables	Roots	Forestry	Sugar cane	Others
Number of entities	12	7	10	9	9	6

Only 2 entities practice crop rotation in the rice areas as shown bellow:

Dry season (Nov.-April)
- Maize
- Beans-maize
- Beans-sweat potato

Rainy season (May-Oct.)

Rice

The organizations do not rent any land for popular rice production, nor do they get any land from outside.

Agricultural production in 2003 (including other crops besides rice).

Cultivation area (cab)

1- Rice (rainy season – spring)	Total
2- Rice (dry season – winter)	14,1
3- Grains	4,95
4- Roots	0,98
5- Vegetables	0,62
6- Fruits	0
7- Sugar cane	32

Cultivation period (interval)

	1	2	3	4	5	6	7	8	9	10	11	12
1-Rice(rainyseason–spring)	July-Dec.	May-Dec.	June-Nov.	July-Nov.	Januar y-May	June-Nov		June-Nov		July-nov		July-Nov
2-Rice(dryseason–winter)					Nove mber	Januar y-May		Januar y-May				Dec-May
3-Grains			June-Nov.	Nov.-June	July-oct							
4-Roots		Nov.-Dec.	June-Nov.	January-Dec.								
5-Vegetables												
6-Fruits												
7-Sugarcane	May-Sept.	Dec.-April										

Harvested amount

Harvested amount	1	2	3	4	5	6	7	8	9	10	11	12	Total (kg)
1- Rice (rainy season – spring)	100	310	300	1700	750	500		600		500		4800	9560
2- Rice (dry season – winter)					750	500		600				4800	6650
3- Grains			24	1093									1117
4- Roots		26,4	120	2640									2786,4
5- Vegetables													0
6- Fruits													0
7- Sugar cane	1511000	123200											1634200

Yield (qq/cab)

Yield (qq/cab)	1	2	3	4	5	6	7	8	9	10	11	12	Total (kg)
1- Rice (rainy season – spring)	666	310	300	1700	1200	1000		1200		1000		1200	8576
2- Rice (dry season – winter)					1200	1000		1200				1200	4600
3- Grains			0,07	1500									1500,07
4- Roots		13,2	0,37	14176									14189,57
5- Vegetables													0
6- Fruits													0
7- Sugar cane	12250	9206											21456

Destiny of rice production in 2003

Amount of white rice (kg)

Destiny of the production	Total (kg)	%
1- Sales with non-specialized contract	0	0
2- Sales without contract	200	7,96
3- Self-consumption of the organization	727	28,96
4- Seeds for self-consumption	40	1,59
5- Seeds for selling	0	0
6- Sales to the members	1543	61,47

Amount of paddy rice (kg)

Destiny of the production	Total (kg)	%
1- Sales with non-specialized contract	0	0
2- Sales without contract	9728	95,65
3- Self-consumption of the organization	170	1,67
4- Seeds for self-consumption	220	2,16
5- Seeds for selling	0	0
6- Sales to the members	52	0,51

Price of white rice ($MN/kg)

Destiny of the production	Average ($MN/kg)
1- Sales with non-specialized contract	
2- Sales without contract	2,33
3- Self-consumption of the organization	0,3
4- Seeds for self-consumption	
5- Seeds for selling	
6- Sales to the members	0,8

Price of paddy rice ($MN/kg)

Destiny of the production	Average ($MN/kg)
1- Sales with non-specialized contract	
2- Sales without contract	
3- Self-consumption of the organization	
4- Seeds for self-consumption	
5- Seeds for selling	0,25
6- Sales to the members	

Receiver	Self-consumption of the organization	Agricultural market	Members
1- Sales with non-specialized contract			
2- Sales without contract		yes	
3- Self-consumption of the organization	yes		
4- Seeds for self-consumption			
5- Seeds for selling			
6- Sales to the members			yes

Agro-machinery

All entities have some kind of agro-machine.

Tractors

Tractors	Number	Average (years)
1- Light (30 - 80 hp)	73	20
2- Middle (80 - 120 hp)	19	20,33
3- Heavy (> 120 hp)	0	

They use the agro-machine only in the organization.

Implements for rice production

The following table shows the number of organizations that have implements (available) and those that do not have any (unavailable).

available	unavailable
10	2

Harvesters are not available in any organization.

Tracks and vans.

Number	Total	Average (years)
1	15	18,77
2	2	20

Irrigation pumps

Number of electric pumps	Number of diesel pumps	Average (years)
6	2	19,57

Organizations use the agro-machines only for themselves.

Mills, dryers and other machines are not available.

Workshops

Only 9 of the 12 organizations have their own workshop. Only 3 of these workshops have lathe, welder and oxygen-cutting machines.

The staff comprises 7 technicians and 3 supporting workers.

In general, workshops do not have suitable conditions because of the following constraints:

- They do not have roof cover
- Shortage of tools
- Shortage of lathe
- Shortage of drills
- Problems with the electric installations
- Shortage of machine-tools
- Shortage of spare parts
- Shortage of grindstones

The frequent hurricanes which have recently affected the territory have severely damaged the roof covers of the workshops.

Irrigation and drainage

Irrigation and drainage facilities are available in 7 organizations. The use of underground water is the most common way, taking the water from wells having no official name. Pumping is done mainly by using electric pumps (5 organizations) and diesel pumps (2 organizations). The pumping capacity is 8 inches on average.

Irrigation use in 2003

Irrigation area. Dry season (ha):

Total	Average
95	16

Irrigation area. Rainy season (ha):

Total	Average
109,42	15,63

Only 24 ha are cultivated as upland rice (secano), both in dry and rainy season.

Area having enough irrigation water. Dry season (ha):

Total	Average
31	10,33

Area having enough irrigation water. Rainy season (ha):

Total	Average
38,41	9,60

The low percent of areas having irrigation water is mainly due to the shortage of energetic carriers and equipments. According to the surveyed producers, these are the main problems:

- Shortage of electrical pumps
- The existing pumps are very old
- Shortage of diesel

Do you have drainage system?

yes	No
4	8

91.6% do not have problems with drainage that could hinder the use of agro-machines. The following table shows the number of those having problems (yes) and those that do not have (no).

yes	no
1	11

Only 3 ha have problems with leveling.

Soils

According to the surveyed persons, the characteristics of the soils of their organizations are as follows:

Soil characteristics	Number of entities
Light (animal power can be used for all agricultural practices).	1
Heavy light (except plowing, animal power can be used for all agricultural practices)	2
Heavy (all agricultural practices require tractors)	9

Agricultural practices of rice

Area cultivated with rice:

Rainy season May / Oct. (ha)	Dry season Nov. / April (ha)
180,63	122,14

Five entities intend to increase the cultivation area in the dry season, but there are several constraints, such as:

- Irrigation is not available in the area
- Shortage of irrigation systems and equipments
- Shortage of water in the dry season
- Problems to get diesel
- In spite of that, double-rice cropping is practiced in 115.14 ha.

The following table shows the number of organizations intending to introduce double-rice cropping (yes) and those not intending to (no):

yes	no
2	10

The problems to extend double-rice cropping are related to the constraints in irrigation.

Present sowing method

Sowing area (ha):

Direct seeding		Transplanting	
Total	Average	Total	Average
60,42	30,21	116,05	10,55

In case of direct seeding:

Dry season (Nov.- April) (ha)	Rainy season (May.- Oct.) (ha)
47	13,42

Direct seeding is applied manualy. Land preparation is carried out through the methods of Seco – seco and Seco – fangueo. Pregerminated seeds are broadcasted.

Those intending to continue using the direct seeding find that this is the method they know best and that its cost is lower.

The technique has been passed on from producer to producer.

In direct seeding, they never apply any kind of fertilizer.

Transplanting:

Period of transplanting:

Dry season (Nov.- April) (ha)		Rainy season (May.- Oct.) (ha)	
(ha)	Number of entities	(ha)	Number of entities
69,14	7	103,63	11

Transplanting is carried out manualy in all cases.

Sowing density in the nursery (lb/cordel)

Survey												
1	2	3	4	5	6	7	8	9	10	11	12	Average
80	150	80	-	10	10	20	15	15	10	10	10	37,27

As it can be observed, in some cases there is too much seed applied.

Number of days in the nursery (days)

Survey												
1	2	3	4	5	6	7	8	9	10	11	12	Average
30	35	35	-	30	30	30	30	40	30	40	30	32,72

Average space sowing (cm)

Survey												
1	2	3	4	5	6	7	8	9	10	11	12	Average
20	25	25	-	20	20	20	20	20	20	20	20	20,90

All the cases intend to continue using transplantation for the following reasons:

- Better weed control
- Tradition
- Weather
- The system is more productive
- Herbicides are not necessary
- Good results
- Higher yields
- The soils used at present are more suitable for this method

Most of them learned this method from other producers.

Use of herbicides

The following table shows the number of those using herbicides (yes) and those not using (no):

yes	no
3	8

Manual weeding

yes	no
10	1

Applying fertilizers before sowing

yes	no
4	7

Applying fertilizers during cultivation

yes	No
5	6

- Rainy season (spring) May - Oct:

The following table shows when (month) the agricultural practices are carried out:

Survey												
Items	1	2	3	4	5	6	7	8	9	10	11	12
1- Direct seeding				July								June
2-Planting the nursery	June	July	July		July	May	May	May	June	July	July	MAY
3- Trasplanting	July	July	July		July	June	June	June	Aug.	July	Aug.	June
4- Harvest	Nov.	Nov.	Nov.	Nov.	Dec.	Nov.	Nov.	Nov.	Nov.	Nov.	Dec.	Jan.

Planting the nursery is commonly practiced in May-June, transplantation in June-July and harvest in Nov-Dec.

Number of days required for the agricultural practices:

Items	1	2	3	4	5	6	7	8	9	10	11	12	Average
1- Direct seeding				6								5	5,5
2- Nursery planting	1	3	3		1	1	1	1	2	1	1	1	1.4
3- Trasplantation	4	2	4		7	5	10	5	7	5	6	10	5.9
4- Harvest	4	5	3	3	3	2	3	2	5	2	6	3	3.1

- Dry season (winter) Nov - Apr:

The following table shows when (month) the agricultural practices are carried out:

Items	5	6	7	8	9	10	11	12
1- Direct seeding								December
2-Planting the nursery	December	November	January	December	February		January	November
3- Trasplanting	January	December	February	January	March		February	December
4- Harvest	April	May	May	May	June		June	April

- Late sowing is common in winter.

Number of days required for the agricultural practices:

Items	5	6	7	8	9	10	11	12	Average
1- Direct seeding								5	5
2- Nursery planting	1	1	1	1	2		1	1	1,14
3- Trasplantation	7	5	10	5	7		5	10	7
4- Harvest	3	2	3	2	5		2	3	2,85

Seeds

No organization uses certified seeds.

They use non-certified seeds produced by themselves.

According to the general opinion, certified seeds are not available in the territory.

Seed renewal is practiced as shown bellow:

Survey												
1	2	3	4	5	6	7	8	9	10	11	12	Average
1	2	3	1	1	1	1	1		1	1	1	1,27

The most used rice varieties, according to the producers themselves, are the following:

15-29, ALBA-50, Reforma, Estrellas, CIAT-24, 410, 15-30, ALBA dwarf, J-104

Chemicals

The following table shows the number of organizations using chemical fertilizers (yes) and those not using (no):

Yes	No
7	4

Type of fertilizers used in rice:

Type of fertilizer	Number of organizations	Total amount (kg)	Average
Urea	6	6377	1062,83
SFT	3	3591	1795,50
KCL	5	3430	1143,33
FC	0	0	0

Dosage applied (kg/ha)

	Survey												
	1	2	3	4	5	6	7	8	9	10	11	12	Average
Urea	100			130	120		100		116		115		113,5
SFT	150		92	175									139
KCL	150		92	190					46		45		104,6

Organic fertilizers

The following table shows the number of organizations using organic fertilizers (yes) and those not using (no):

Yes	No
3	9

Of the 3 entities using organic manure, only one produces it. Organic manures are produced from the crop residuals in order to cover the agricultutral needs.

The dosage is 6125 (kg/ha) and the amount applied is 147000 Kg.

Herbicides

The following table shows the number of organizations using herbicides (yes) and those not using (no):

Use of herbicides

Yes	No
4	8

Type of herbicide used for rice

herbicide	Dosage (kg/ha)	Total (lit.)
Surcapur	2,5	55
Esterol	4	12
Proparroz	3	25

Insecticides

The following table shows the number of organizations using insecticides (yes) and those not using (no):

Yes	No
2	10

Type of insecticide used for rice:

Type of insecticide	Dosage (kg/ha)	Total (lit.)	Controlled pest
Tamaron	0.1	10	Rice bug
Cipermetrina	2	10	Rice bug

Fungicidas:

These organizations do not apply any kind of fungicides in rice cultivation.

Fuel:

All organizations (100%) get fuel for rice cultivation.

Amount (litres)

Survey													
1	2	3	4	5	6	7	8	9	10	11	12	Total	Average
500	300	50	1300	1000	500	1000	200	500	200	600	5000	11150	929,1667

The price at which they get fuel is 0.20 pesos.

Use of agro-machines:

Name of the machines:

Items	Machine
A-Weeding	MTZ-80 con Weeder
B-Dry preparation	Tractor and plow
C-Puddling preparation	Tractor y rueda fangueadora
D-Applying chemical fertilizers	
E-Applying organic manures	
F-Direct seeding	
G-Irrigation	Tractor and pump
H-Weeding	
I-Pesticides application	
J-Reaping	Combine
K-Transportation	Tractor-trailer
L-Threshing	
LL-Drying	
M-Milling	Tractor and husker

Fuel consumption (litres)

Items	2	3	4	5	7	8	9	10	11	12	Total	Average
A	114		45								159	79,5
B	513	50	45	173	1622	160	100	170	290	1805	4928	492,8
C	912	40	60	350	1622	300	150	300	480	5415	9629	962,9
D										0	0	0
E										0	0	0
F										0	0	0
G	570										570	570
H										0	0	0
I										0	0	0
J	912	15	80		260			134	96	1060	2557	365,3
K	200	15			80			30	20	35	380	63,3
L										0	0	0
LL										0	0	0
M		10			40						50	25

Productivity (ha/h):

Items	2	3	4	7	9	11	12	Average
A	0,8		0,5					0,65
B	4,8	2	0,2	0,2	1,25	0,7		1,52
C	3,8	3	0,2	0,2	1,25	0,6		1,50
D							0	0
E							0	0
F							0	0
G	1					0,3		0,65
H							0	0
I							0	0
J	1	5	0,5	1,81		0,7		1,80
K							0	0
L							0	0
LL							0	0
M							0	0

Items	Renting and contract source	Price unit (peso/ha) or (pesos/h):
A		
B		
C	Private	
D		4,16
E		
F		
G	Private	3
H		
I		
J	Private	2,75
K		
L		
LL		
M	Private	100

Use of manual labor force

Family labor (person/day):

Items	1	2	3	4	5	6	7	8	9	10	11	12	Average
A		1		1	1							2	1,25
B	2	1		1	1	1	1	1				8	2
C	2	2		1	1	1	1	1				10	2,37
D	1		20	4	5		4		5		6		1
E		2						1				0,00	0
F			12	8								8	9,33
G	30	40	150		20	20	4	4	20		30	20	33,8
H		4			1	4	4					4	3,4
I			10			4	4					0,00	0
J		3	5	8								0,00	0
K	30	12	300	5	1	1	1	4	20				30
L	30		80						20				30
LL	10	10	40		20	4	4	4	20		15		10
M												0,00	0

Contracted labor force

The following table shows the number of those contracting laborers (yes) and those not contracting (no) for the agricultural practices:

	Yes	No
A → Weeding	0	0
B → Dry preparation	1	0
C → Puddling preparation	2	0
D → Applying chemical fertilizers	1	0
E → Applying organic manures	0	0
F → Direct seeding	1	0
G → Trasplanting	1	0
H → Water management	0	0
I → Weeding	0	0
J → Appying pesticides	0	0
K → Reaping	1	0
L → Threshing	2	0
LL →Drying	1	0
M → Others	0	0

Contract with groups or brigades:

Price unit (peso/ha or peso/h):

Items	Average
A → Weeding	
B → Dry preparation	1,17
C → Puddling preparation	1,185
D → Applying chemical fertilizers	1,17
E → Applying organic manures	
F → Direct seeding	1,2
G → Trasplanting	1,17
H → Water management	
I → Weeding	
J → Appying pesticides	
K → Reaping	1,17
L → Threshing	1,185
LL →Drying	1,17
M → Others	

Post-harvest

After reaping:

Number of days for rice storage before milling (paddy rice):

	1	2	3	4	5	6	7	8	9	10	11	12	Average
Wet paddy in bags	4	1			2	3	2	1	2	1	2	1	1,9
Dry paddy in bulk			90	90									90

After milling:

	1	2	3	4	5	6	7	8	9	10	11	12	Average
In bags	10	90		180	60	80	60	45	120	SN	SN	SN	80,62
In bulk			90										90

In general, rice is stored as dry paddy. Husking depends on the demand of consumption and sale. No product is used in order to conserve rice.

Technical assistance and capacity building:

Only 2 organizations have received some kind of external training.

Forms of technical assistance and capacity building:

	Number
Courses	2
Workshops	1
Variety colection	0
Technical brochures	2
Field days	0
Others	0

The most urgent aspects for technical assistance and the frequency are listed bellow:

- How to increase the yield (1)
- Information and introduction of new varieties (8)

- How to make a better use of soils (1)
- Providing general technical materials (4)
- Crop protection (1)

Future plan for rice production:

Of the 12 organizations, 5 intend to increase rice production, due to following reasons:

- It is a source of family income
- To improve the economy
- To increase the income-yield capacity
- Self-consumption and selling to the staff
- To increase the profit

Investments are to be made in only one entity, which is related to irrigation aiming at a larger production; even though the source for financing has not been yet defined.

Most critic problems in the rice production and the order in which these problems were given by the surveyed persons:

- We do not have enough land for this cultivation.
- The land has saltpeter (1)
- Lack of consumption of agrochemicals (9)
- Deficiency in the irrigation system (5)
- Need for an effective drying process (1)
- Lack of fuel (5)
- Lack of resources in general (1)
- Problems with storage (1)
- Low level of the mechanization of the cultivation (1)

3. Santo Domingo

3.1 Individual Producers

Type of producers:

40 CCS, 19 Préstamo, Parceleros 9, Others 10: Total 78

Basic data

1. Age: 20-30 (8); 31-40 (28); 41-50 (18); 51-60 (22); more than 60 (8)
2. when started in agriculture:

-60	70-71	80-81	90-91	2000-	Total
8	15	14	13	28	78

When started producing popular rice:

60-70	71-80	81-85	86-90	91-95
0	22	16	12	28

3. Number of family members: : Average 2.78, Total 217.
4. Number of persons working directly in the farm:: men 85 (average 1.24), women: 10 (average 0,12), among them, retired (men) 18 (average 0,23), (women) 2.
5. Agricultural area: 88,64 ha. Area for rice 60,03 ha

6. (private land) 672. 39 ha Area for rice 234.9 ha
7. (rented land) 54.7 ha Area for rice as rented land 28.48 ha
8. Belonging to some organization Yes (42) No (36)

Farm management

9. Form of farm management. Select from bellow:

(1) Rice cultivation only Yes (46), No (32)

(2) Cultivation combined with: 1) Cattle 16 2) Tobacco 5 3) Vegetables 25
4) Roots 26 5) Sugar cane 19

(3) Crop rotation in rice areas Yes 32 No 46

In case of (yes): kinds of crops used in rotation

Tabaco (A)	Vegetable (B)	Viandas (C)	Forestry (D)
7	8	10	1

Cultivation during crop rotation

Dry season (Nov-April)

A	B	C
12	8	2

Rainy season (May – Oct.)

A	B
10	5

Do you carry out the rotation every year?

Number of Yes	Number of No
32	46

In case of no: Frequency of area rotation : every year

Agricultural production in 2003 - - - including other crops other than rice

8.a) Crop	8.b) Cultivation area (cordel)	Total (ha)
1) Rice (rainy season)	1	70
2) Rice (dry season)	2	15.8
3) grains	3	1,27
4) Roots	4	2,54
5) Vegetables	5	1.90
6) Fruits	6	0
7) Sugar cane	7	0
8) Forestry	8	0

Destiny of rice production in 2003

Destiny of rice production	Amount (qq)		Receiver	Price	
	White rice	Paddy rice		White rice peso/pound	Paddy rice peso/ qq
Sales* with non-specialized contract	550.0	970.00	CAI	5,67	
Sales* without contract	1 235.00	147.00	Acopio, cattle enterprise, agricultural market,	5,72	
Family Self-consumption	1 061.00	10 265.00			
Seeds for self-consumption	93.4	230.90			
Seeds for selling	0	202.00			

*Note: Sales with non-specialized contract: amount of rice sold based on a contract with CAI or other agricultural organizations. Sales without contract: rice sold without any contract with CAI, Acopio or other organizations.

Agro-machinery

10. Machine tenure

Number of Yes	Number of No
22	56

Name of the machine	Number of machines	Number of years used
Tractor	5	25,5
Thresher	6	00
Harrow	3	10
Plow	0	20
Ditcher	0	0
Harvester	0	0
Track	0	45
Pump	4	7
Others	0	0

Irrigation and drainage

11. Irrigation

1) Availability of irrigation and drainage facilities

Number of Yes	Number of No
54	24

In case of Yes:

- Type of irrigation facilities:

Number of A	Number of B
26	28

- Type of water source: dams 20% rivers 75% springs 5%
- Energy source:

Number of A	Number of B	Number of C
3	22	19

- Capacity of the pump (liters / second or inches).: 5.76 lt/sec. average

2) Use of irrigation in 2003

Area with irrigation	dry season: 3.88 ha
	Rainy season: 8.95 ha
Upland area (secano)	dry season: 1,2 ha
	Rainy season: 1,04 ha
Area with enough irrigation	dry season: 3,76 ha
	Rainy season: 5,32 ha

In case of insufficiency, mention the reason
Shortage of water, shortage of pumps.

Availability of drainage systems Yes 38 No 24

Are there problems in drainage limiting the use of machines? Yes 38 No 40
Which? Low capacity
Areas with problems 37.0 ha

Soils

12. Soil characteristics:

a) Light (all practices can be carried out by using animal power) 46.3 ha

b) Light heavy (excepting plowing, all practices can be carried out by using animal power) 30,14 hha

c) Heavy (tractor is necessary for all practices) 12,3 ha

Agricultural practices of rice

13. Rice area in the rainy season (May – Oct.) 62,23 ha

Rice area in the dry season (Nov – April) 43.08 ha

In case of not sowing in the dry season or the area is small:

(1) Intention of introducing or extending rice in the dry season Yes 15 No 63

(2) In case of having the intention of introducing or extending rice in the dry season, mention the problems : 100% of the producers mention the shortage of water and pumps, shortage of agro-machines and rice varieties.

14. Area for double-rice cropping 22,4 ha

In case of not doing double-rice cropping or the area is small: (1) Intention of introducing or extending double-rice cropping Yes 3 No 45

(1) In case of having the intention of introducing or extending double-rice cropping, mention the problems : Shortage of resources, low irrigation capacity, constraints on agro-machine.

15. Sowing method at present:

Area (1) Direct seeding: 58,39 ha (2) Transplanting: 41,71 ha

(1) In case of direct seeding:

a) Period of seeding

Dry season (Nov-April) 1,4 ha Rainy season (May-Oct.) 14,45 ha

b) Way of applying direct seeding

- Manual 60

- Type of land preparation and sowing

Seco-seco	Fangueo-seco	Desinfección-fangueo	doblaje
7	35	2	12

- Broadcast seeding with pre-germinated seeds Yes 12 No 30

- Stripe direct seeding ? Yes 21 No 40

c) Intention of continuing with the same method in the future Yes 11, No 40

- In case of continuing:

Mention the reason by which you will continue using direct seeding:

Shortage of laborers; the direct seeding method is easier, more practicable and economical.

How did you know about this technique? : through the extension officer and Rice CAI.

- In case of changing into transplantation:

Mention the reasons: Because agricultural yield becomes higher; economical reasons.

How did you know about this technique? .: through the extension officer

- Mention the reason to change.

Shortage of water (6), shortage of resources (11)

e) Do you apply weeding manually? In case of no, mention the way:

Yes (63), No (15)

f) Fertilizer application before seeding Yes 10 No 68

g) Fertilizer application during cultivation Yes 12 No 56

(2) Transplantation:

a) When do you apply transplanting?

Dry season (Nov – April) 16,78 ha Rainy season (May – Oct) 49,93 ha

b) How?

- Manual 72 By machine 0
- Sowing density in the nursery: 10 lb/cordel
- Number of days in the nursery: 25-30 days (90%)
- Average sowing spacing: cm.: 12 to 25 cm

c) Will you continue with this method in the future? Yes 54, No 24

- In case of continuing,
  Mention the reason : Higher yield, weed control, lower production cost.
  How did you know about this technique? :

IIArroz	Rice CAI	Japanese	Researchers
6	2	0	11

- Producers do not intend to change into direct seeding.

f) Fertilizer application before transplanting Yes 19 No 31

g) Fertilizer application during cultivation Yes 22 No 31

16. Agricultural practices in each season:

Items	Rainy season (spring) May - Oct		Dry season (winter) Nov – Apr.	
	Month	Number of days required	Month	Number of days required
1. Direct seeding	0	2.3		
2. Nursery planting	2,4,5,6	23.6	1,11,12	4.6
3. Transplantation	5,6,7	33.1	1,2,12	34
4. Harvest	8,9,10,11	15.5	2,4,6,7	5

17. Seeds

(1) Use of certified seeds No

In case of Yes,
Do you produce non-certified seeds by yourself? No 100% Do you buy?
Yes 100% No _0__
In case of buying: From whom? Extension officer.

Do you have certified seeds every year? No 100%
In case of No, explain the causes :
100% of producers explain that there is not seed supply, and that there are many procedures to purchase seeds. Yes 2 No 2

Frequency of seed renewal . 1 to 5 years.

(2) Use of non-certified seeds Yes 100%

In case of Yes,
Do you produce non-certified seeds by yourself? Yes 100% No 0 , Do you buy? No 100%
Why don't you use certified seeds? It is unavailable.
Frequency of seed renewal : 2 to 3 years

(3) Type of rice variety used : Bolito, Amistad 82, Reforma, Caribe, J-104, Pinareño

(4) Is it certified seed? Yes 20 No 58

18. Fertilizers

(1) Chemicals

Use of chemicals Yes 12 No 36

Types of fertilizers used for rice and amount.

Type of fertilizer	Dosage (Kg. / ha)
NPK 32% (a complete formula)	120
Urea 68%	80

(2) Organic fertilizers

Use of organic fertilizers Yes 40 No 35

Do you produce organic manures by yourself? Yes 36 No 4

In case of Yes: Where do you get the row material from? : Others

The amount applied is enough? Yes 30 No 10

Do you buy it in the market? Yes 2 No 38

Types of organic fertilizers used for rice:

Dry	Semi-dry	Humid	Ferment
10	11	0	0

19. Herbicides

Use of herbicides Yes 7 No 71

Types of herbicides used for rice:

Type of herbicide	Dosage (Kg. / ha)
Glyphosate	2
Surcopur	10
Gramoxone	1.5-2

20. Insecticides

Use of insecticides Yes 18

Types of insecticides for rice:

Type of insecticides	Dosage (Kg. / ha)	Total amount (lit.)	Controlled pest
Tamarón 60 CS	1		Rice bug, grasshopper
Bi 58	0.5		Rice bug, grasshopper

21. Fungicides

Use of fungicides No

22. Fuel

Use of fuel Yes 42 No 36

Source: Most of producers get fuel through selling/buying without contracts.

Contract with CAI	Contract with CCS	Asignment to various cultivation	Market (UPET)
10	4	4	0

Based on		Amount (lit.)	Price (peso / lit.)	Price (USD / lit.)
Non-specialized contract 95%		441.25	2.00	
Contract with CCS 5%		178.0	0,25	
Contract for crops other than rice	Crop:	88.5	0	

23. Use of agro-machines, animal power and labor force.

(1) Use of agro-machines

Items	Name of the machine	Fuel consumption (liter)	Productivity (ha / h)
Dry preparation	Tractor, disc harrow	231,2	15,3
Puddling preparation	Tractor with pneumatics	355,8	18,3
Application of chemical fertilizers		125,00	
Application of organic manures	_		
Direct seeding	_		0,6
Irrigation	Pump or canal	29,7	
Weeding			
Pesticide application			25,1
Reaping	Combine	335.0	5
Transportation	Tractor, track	190.0	0,2
Threshing	Thresher	143.0	
Drying	Sun drying, dryer		
Milling	Domestic mills		
Others			

Where and whom is the contract with?

Items	
Dry preparation	
Puddling preparation	1 private
Application of chemical fertilizers	2 private.
Application of organic manures	
Direct seeding	
Irrigation	
Weeding	1 private
Pesticide application	
Reaping	
Transportation	1
Threshing	1
Drying	7
Milling	
Others	7

(2) Use of animal power

Items	Kind of animal and equipment (implement)	Productivity (head h/ha)	Form of tenure (own, collective, rented, contract)	In case of not own	
				Where and whom is the contract with	Price unit peso / ha peso / h
Dry preparation	Harrow	0.025 – 0.03	12 own		
Puddling preparation	Flat harrow	0.025 – 0.03	4 own		
Direct seeding	Triple shovel		1 own		
Weeding			2 own		
Transportation	Small cart		1 own		

(3) Use of manual labor force

Items	Work of the members (person / day)	Contract with individual laborers	Contract with groups or brigades	Price unit peso/ha, or peso/h, wage
Weeding (knife)	11,8	2		3.00 pesos/h
Dry preparation	9.8			
Puddling preparation	7,75	5		240 p/ha
Application if chemical fertilizers	3,08	11		5 p/ha
Application of organic manures	10,25			
Direct seeding	18.9	6		
Transplantation	21.6	222		960 p/ha
Water management	25.8		72	
Weeding	5.5			
Pesticides application	15.5			4 p/ha
Reaping	28.6			3 p/ha
Threshing	15.6		31	7 p/ha
Drying	11.18		26	3 p/ha

24. Pos-harvest

a) From harvest.

Number of days and way to store paddy rice before milling:

	Paddy rice	
	Wet	dry
In bags	78	
In bulk		

b) After milling.

Number of days and way to store white rice:

	White rice	
	Consumption	Sales
In bags	25	
In bulk		

c) Use of some products to control pests in stored rice: Yes 18 No 60

In case of Yes. What type? Cipermetrina

Problems with these operations Shortage of inputs

Technical assistance and capacity building.

25. Technical assistance and capacity building in 2003:

Yes 36 No 42

Forms of technical assistance and capacity building:

forms of technical assistance and capac.	Frequency	Organization in charge
Courses	2	JICA, INCA, IIA
Workshops	5	
Variety collection	8	
Distribution of technical brochures	36	
Field days (selection fairs)		
Others	27	

26. Urgent topics for technical assistance and capacity building:

Seed selection
Rice conservation

27. Future plan for rice production.

a) Intention of increasing rice production Yes 39 No 39

Mention the reason :Limitation of areas; shortage of water; economical improvement.

b) Intention of making some investment: Yes 21 No 57

What kind of investment? : Purchasing one small tractor

Why? :It is necessary to work

c)Idea of implementing the plan: Credits are necessary.

28. Problems in rice production.

Most critical problems:

1) Certified seed
2) Inputs (fuel, fertilizers, pesticides, bags)
3) Water and agro-machines
4) Capacity building
5) Dryers

3.2 UBPC and CAP

Basic data

1. Organization: UBPC 4 , CPA 4

2. Ministry to which it belongs: MINAG 4 ; MINAZ 4

3. Established year: 1970-81: 2, 1981-90: 3, 1991-2000: 3.

4. Total physical area: 5 878.6 ha
   - Total agricultural area: 3 339.5 ha
   - Area for rice: 152.2 ha
   - Area for cattle: 1 602.9 ha

Administration

5. Administration
   - Members: 37 persons
   - Personnel related to production : : 58 persons
   - Among them, those working in popular rice production: : 36.3 personas

Farm management

6. Form of farm management:

(1) Rice cultivation only 2 (yes) and 6 (no)

(2) Cultivation combined with: :1) Animal husbandry 4 2) tobacco 0 3) Vegetables 4
4) Roots 6 5) Forestry 0 6) Sugar cane: 3 7) Others 0

(3) Crop rotation in rice areas : 3 (yes) 5 (no)

In case of (yes): kinds of crops used in rotation :

Crop 1 roots Crop 2 vegetables Crop 3 sugar cane Natural pasture grounds

Cultivation during crop rotation

- Dry season (Nov. – April) : vegetables roots
- Rainy season (May – Oct.) : rice 3 ha

Do you carry out the rotation every year? 1 (yes) and 2 (no)

In case of (no): Frequency of area rotation : 5 years

Renting land for popular rice production

7. Does the organization rent some area for popular rice production? : 5 yes) 3 (no)

9. Agricultural production in 2003 (including crops other than rice).

a) Crop	b) Cultivation area (ha)	c) Cultivation period (sowing month ~ harvest month)	d) Harvested amount (kg)	e) Yield (kg/ha)
1) Rice (rainy season)	10.78	April, May, Sept.	85 022.72	3 087.2
2) Rice (dry season)	0	~		
3) grains	0	February, November	108 008.00	147 016.00
4) Roots	0,6	April, June	70 840.00	209 300.00
5) Vegetables	0,4	August	8 648.00	18 400.00

10. Destiny of rice production in 2003

Destiny of rice production	Amount (kg)		Receiver	Price	
	White rice	Paddy rice		White rice peso/kg	Paddy rice peso/ kg
Sales* with non-specialized contract	169 280.00	0	Self-consumption or staff's lunch	4,40	3.30
Sales* without contract	211 600.00	0	Acopios	5,50	0
Self-consumption of the organization	16 928.00	28 704.00			0
Seeds for self-consumption	52 900.00	90 160.00			0
Seeds for selling	0	0			0
Selling to the staff	161 920.00	62 640.00		2,20	1,43

*Note: Sales with non-specialized contract: amount of rice sold based on a contract with CAI or other agricultural organization. Sales without contract: rice sold without any contract with CAI, Acopio or other organization.

Agro-machinery

11. Machine tenure Yes 6 No 2

Tractors			
Capacity	Light 30 – 80 hp	Middle 80 – 120 hp	Heavy > 120 hp
Number	62	0	2
Number of years used	15 to 30 years	0	20 to 25 years

Do you have implements for rice production? yes 5 No 3

Types: plows 3; harrows 2; Land Plane; 1; Ditchers; 1; leveling machine: 1

Track and van					
Capacity	6 ton.	12 ton.			
Number	4	1			
Number of years used	More than 20 years				

Irrigation pumps

Capacity	
Type (elect./ diesel)	30 y 150
Number	6 y 2
Number of years used	26 y 19

Workshops

1	Workshop availability	Yes 5	No 3
2	Type of machine tools available	Welding 6	
		Lathe 1	
		Drill 1	
3	Number of staff	Mechanicians	Others
4	Workshop services offered to other producers	12 mechanicians	8 per workshop.
5	Main problems in the workshops	Shortage of tools, shortage of spare parts.	

Irrigation and drainage for rice

12. Irrigation

1) Availability of irrigation and drainage facilities yes 8 No 0

In case of yes:

- Type of water source: dams 6; rivers 2; underground waters 0
- Energy source: gravity 2; diesel pump 4; electrical pump 2
- Capacity of the pump (liters / second or inches): ; 43.6 l/sec average

2) Use of irrigation in 2003

Area with irrigation
Dry season: 5,2 ha. Rainy season: 20,4 ha

Upland area (secano)
Dry season: 0 Rainy season: 4,5 ha

3) Area with enough irrigation

Dry season: 0 ha Rainy season: 6 ha (average)

In case of insufficiency, mention the reason : Drought.

4) Availability of drainage systems yes 4 No 4

5) Are there problems in drainage limiting the use of machines?

Yes 1; No 2.

Which? : Low areas

Areas with problems 4 ha

Soils

13. Soil characteristics:

a) Light (all practices can be carried out by using animal power) 0 ha

b) Light heavy (excepting plowing, all practices can be carried out by animal power) 1 ha

c) Heavy (tractor is necessary for all practices) 3 ha

Agricultural practices of rice

14. Rice area in the rainy season (May – Oct.)? 104,5 ha

Rice area in the dry season (Nov – April)? 12,5 ha

In case of not sowing in the dry season or the area is small:

(1) Intention of introducing or extending rice in the dry season Yes 1 No 3

(2) In case of having the intention of introducing or extending rice in the dry season, mention the problems : Lack of irrigation, drought.

15. Area for double-rice cropping 13,0 ha

In case of not doing double-rice cropping or the area is small:

(1) Intention of introducing or extending double-rice cropping
Yes 1; No 2.

(2) In case of having the intention of introducing or extending double-rice cropping, mention the problems ; shortage of irrigation water

16. Sowing method at present

Area (1) Direct seeding: 3 ha (2) Transplanting: 95.5 ha

(1) In case of direct seeding:

a) Period of seeding

Dry season (Nov-April) : 0 ha Rainy season (May-Oct.) : 9 ha

b) Way of applying direct seeding

- Manual 2 By machine 0 By airplane 0

- Type of land preparation and sowing :
Dry-dry 1 Dry-puddling 1 Dry-disinfection: 0 Puddling – double cropping: 0

- Broadcast seeding with pre-germinated seeds : Yes 2 No 0
Stripe direct seeding? Yes 0 No 0

c) Intention of continuing with the same method in the future. Yes 1; No 1

- In case of continuing:
Mention the reason by which you will continue using direct seeding

- The results are the same as using puddling; better work; more economic.
How did you know about this technique?

-Through the extension officer 1; Others 1.

d) Fertilizers application before seeding : Yes 0 No 10

e) Fertilizer application during cultivation : Yes 9 No 1

(2) Transplanting: No entity applies transplantation.

17. Agricultural practices in each season:

Items	Rainy season (spring) May - Oct		Dry season (winter) Nov. - Apr	
	Month	Number of days required	Month	Number of days required
1. Direct seeding	June – July	20		
2. Nursery planting				
3. Transplantation				
4. Harvest	Nov. – Dec.	30		

18. Seeds

(1) Use of certified seed Yes 1 No 6

In case of Yes,
Do you produce certified seeds by yourself? Yes 0 No X Do you buy? Yes 1 No 6

In case of buying: from whom? Professionals, Price: $ 30.00 pesos / qq

Do you have certified seeds each year? Yes 1 No 4

In case of No, mention the causes.

The prime cause is the shortage of seed.

Frequency of seed renewal : each 3 years on average..

(2) Use of non-certified seeds : Yes 6 No 1

In case of Yes,
Do you produce non-certified seeds by yourself? Yes 6 No 1 Do you buy? Yes 2 No 2

Frequency of seed renewal : 3 years

(3) Type of rice variety used : Reforma, Amistad-82, Perla, J-104, Jucarito

(4) Is it certified seed? No

19. Fertilizers for rice

(1) Chemicals

Use of chemicals Yes 4 No 4

Types of fertilizers used for rice:

Type of fertilizer	Dosage (Kg. / ha)	Total amount (Kg.)
Potassium	100	
Urea	120	

(2) Organic fertilizers

Use of organic fertilizers Yes 2; No 6.

20. Herbicides for rice

Use of herbicides Yes 1 No 4

Types of herbicides used for rice:

Type of herbicide	Dosage (Kg. / ha)	Total amount (lit.)
Biester	4 kg/ha	

21. Insecticides for rice

Use of insecticides Yes 1 No 4

Types of insecticides for rice:

Type of insecticides	Dosage (Kg. / ha)	Total amount (lit.)	Controlled pest
Tamaron 60 CE	1		Rice bug

22. Fungicides for rice: Yes o; No 7

23. Fuel

Fuel for rice production Yes 2 No 5

In case of Yes,
Amount : 1 156,00 lt and price : 0.36 pesos/liter

Use of machines

Items	Agro-machinerys				
	Name of the machine	Fuel consumption (liter)	Productivity (ha / h)	In case of not own	
				From where and with whom is the contract	Price unit. peso / ha peso / h
A Weeding (knife)			1.5		
B Dry preparation	Tractor with plow	185.3		own	
C Puddled preparation	Tractor with wheels	287.5	6.5	private	
D Application of chemical fertilizers					
E Application of organic manures	manual				
F Direct seeding					
G Irrigation	pump	810.0	8.0	UBPC	
H Weeding	Manual				
I Pesticide application	sprayer				
J Reaping	combine	140.0	6.0	State, other crops enterprise and AGROFAR	
K Transportation	trailer	150.0	4.0	own	
L Threshing	thresher	190.0	0.2	private	
LL Drying	Tractor and trailer	130.0			
M Milling	Electric mill				
Others					

Use of animal power

24. Productivity (head h/ha). Puddling preparation 2,7 cord./ha

Use of manual labor force

Items	Work of the members (person / day)	CONTRACTED LABOR FORCE		
		Contract with individual laborers	Contract with groups or brigades	Price unit peso / ha, or peso / h, wage
Weeding (knife)	4			
Dry preparation	4			
Puddling preparation	20	1		40 pesos/ha
Direct seeding	7			
Transplantation	90	24		$ 1 680.00/ha
Water management	24			Basic wage
Weeding	113			Basic wage
Pesticide application				
Reaping	64	5		480 pesos/ha
Threshing	12			5 pound/quintal (wage)
Drying	51			
Others	6			Basic wage

25. Post-harvest.

a) After harvesting.

Number of days and way to store paddy rice before milling:

	Paddy rice	
	Wet	Dry
In bags	4	
In bulk		

b) After milling

Number of days and way to store white rice:

	White rice	
	Wet	Dry
In bags	6	
In bulk		

c) Use of some products to control pests in stored rice: Yes 0 No 8

In case of Yes. What type? 0

Problems with these operations : 0

4. Yaguajay

4.1 Individual Producers

Type of producers: members of CCS 81% préstamo 3.8 % parcelero 12% others 3.2%

Basic data:

1. Age: 30 – 40 35% 40 – 60 35% + 60 30%
2. Starting year in agriculture: – 80 (40%); 80-90 (30%), 90 -95 (20%) 95– 00 (10%.)

   Starting year in popular rice production: -80(20%),80-90(30%), 90-95(20%), 90-95(10%)
3. Number of family members: : Family of 1(50%), Family of 3-5(25%) and Family of+ 5 (25%) persons.
4. Number of persons working directly in the farm: (men: 84% persons, women: 16% persons), among them, Retired: 16% men, 0 women.
5. Agricultural area: 693.27 ha Area for rice 258.42 ha
   (private land) : 672. 39 ha Area for rice : 234.9 ha
   (rented land) : 36. 23 ha Area for rice : 23.49 ha
6. Belonging to some organization : Yes (84%) No (16%)

Farm management

7. Form of farm management. Select from bellow:
   (1) Rice cultivation only : 5%
   (2) Cultivation combined with: 1) Cattle 75% 2) Tobacco 51% 3) Vegetables 45%
   4) Roots 40% 5) Forestry 51%
   6) Sugar cane __ 7) Others 30%
   (3) Crop rotation in rice areas: Yes15% No 85%
   In case of (yes): kinds of crops used in rotation
   Crop 1 _____ Crop 2 _____ Crop 3 100% Pastures _____
   Cultivation during crop rotation
   Dry season (Nov-April) 100%
   Rainy season (May – Oct.) 75%
   Do you carry out the rotation every year? Yes 75% No 25%
   In case of no: Frequency of area rotation : 75% every 2 years 25% 3 years

Agricultural production in 2003 - - - including other crops other than rice

Crop	Cultivation area(cordeles)	Cultivation period (sowing month ~ harvesting month)	Harvested amount (qq)	Sold amount (qq)	Price
Rice (rainy season)	6580.7	July ~ Dec.	19352	822	2,5 – 3,5
Rice (dry season)	333	Nov ~ April	1299	475	3.0 -3.5

9. Destiny of rice production in 2003

Destiny of rice production	Amount (qq)		Receiver	Price	
	White rice	Paddy rice		White rice peso/pound	Paddy rice peso/ qq
Sales* with non-specialized contract	893	3533	Acopio 78% CAI 17% Others 5%	0.3 - 0.4	12
Sales* without contract	991	1858	Acopio 23% CAI 7% Market 70%	2.5 – 3.5	100 - 120
Family Self-consumption	1395	4456			
Seeds for self-consumption		376			
Seeds for selling		50			2

*Note: Sales with non-specialized contract: amount of rice sold based on a contract with CAI or other agricultural organizations. Sales without contract: rice sold without any contract with CAI, Acopio or other organizations.

Agro-machinery

10. Machine tenure : Yes (40%) No (60%)

Name of the machine	Capacity - 65Hp 65 Hp +65Hp	Number of machines	Number of years used
Tractor	4 14 1	19	25
Implements: light plow		8	20
Light harrow		4	20
Harvester	qq / working day		
Track	5TM	2	30
Pump	Inches (l /sec.) 10 l/sec. 40% 10 – 20 l/sec. 40% +20 l /sec. 20%	45	+15
Others			

Irrigation and drainage

11. Irrigation

(1) Availability of irrigation and drainage facilities : Yes 95% No 5%

In case of Yes:

- Type of irrigation facilities: common use of irrigation system: 95%, private irrigation system: 5%
- Type of water source: dams 20%, rivers 75%, springs 5%
- Energy source: gravity 40% diesel pump 60%
- Capacity of pumps (liters/sec. or inches). 5 - 10 l/sec. (42%) ,10 – 20 l/sec. (40%), +20 l/sec. (18%)

(2) Use of irrigation in 2003

Area with irrigation Dry season: 40.9% ha
Rainy season: 59.1%ha

Upland area (secano) Dry season: 9% ha
Rainy season: 9% ha

(3) Area with enough irrigation Dry season: 0 ha
Rainy season: 0 ha

In case of insufficiency, mention the reason
Shortage of water 60%; 40% do not have irrigation systems.

(4) Availability of drainage systems Yes 85% No 15%

(5) Are there problems in drainage limiting the use of machines? Yes 5% No 95%

Which? Lack of canals
Areas with problems 2.5 ha

Soils

12. Soil characteristics:

a) Light (all practices can be carried out by using animal power) : 30% ha

b) Light heavy (excepting plowing, all practices can be carried out by animal power) : 30% ha

c) Heavy (tractor is necessary for all practices) : 40% ha

Agricultural practices of rice

13. Rice area in the rainy season (May – Oct.): __ ha

Rice area in the dry season (Nov – April) : __ ha

In case of not sowing in the dry season or the area is small:

1) Intention of introducing or extending rice in the dry season : Yes 70 % No 30%

2) In case of having the intention of introducing or extending rice in the dry season, mention the problems: 100% of the producers mention the shortage of water; 5% mentions the shortage of agro-machines; 15% mention other causes (inputs, mainly fuel).

14. Area for double-rice cropping 60% ha

In case of not doing double-rice cropping or the area is small:

1) Intention of introducing or extending double-rice cropping : Yes 50 % No 50%

2) In case of having the intention of introducing or extending double-rice cropping, mention the problems: 66.6% have problems with water supply; 33% have shortage of inputs in general.

15. Sowing method at present:

Area 1) Direct seeding: 70% ha 2) Transplantation: 30% ha

(1) In case of direct seeding:

a) Period of seeding

Dry season (Nov-April) : 15% ha Rainy season (May-Oct.) : 85% ha

b) Way of applying direct seeding

- Manual 95% By machine 5% By airplane 0
- Type of land preparation and sowing
  Seco – seco 20%, Seco- fangueo 65% , Seco-desinfección 5%, Fangueo – doblaje 10%
- Broadcast seeding with pre-germinated seeds: Yes 100% No 0
- Stripe direct seeding? : Yes 10% No 90%

c) Intention of continuing with the same method in the future

- In case of continuing:
  Mention the reason by which you will continue using direct seeding 55% Yes
  The economic efficiency in direct seeding is higher (55%).
  How did you know about this technique? : Tradition (46%); By audiovisual aids (54%).
- In case of changing into transplantation:
  Mention the reasons: 15% Yes. The agricultural yield becomes higher (33%); economical reasons (67%).
  How did you know about this technique? . Through information provided (100%).
  Mention the reason to change . 100% mention the problem with labor force.

d) Herbicide application : Yes 35% No 65%

e) Do you apply weeding manually? : In case of no, mention the way

35% carry out weeding by applying herbicides.

f) Fertilizer application before seeding :Yes 0 No 100%

g) Fertilizer application during cultivation : Yes 90% No 10%

(2) Transplantation:

a) When do you apply transplanting?

Dry season (Nov – April) : 15% ha Rainy season (May – Oct): 85% ha

b) How? (15-2-3)

- Manual 100% By machine 0
- Sowing density in the nursery: 3 lb. / cordel on average.
- Number of days in the nursery: 25-30 days (90%)and less than 25 days (10%)
- Average sowing spacing: .: 15 cm x15 cm (63%) , 20 cm x20 cm (37%)

c) Will you continue with this method in the future? Yes 54, No 24

- In case of continuing,
  Mention the reason..: Economical reasons; higher yield (87.55%).
  How did you know about this technique?: Tradition (66%); through information provided (34%).
- Producers do not intend to change into direct seeding.

d) Fertilizer application before transplanting : Yes 0 No 100%

e) Fertilizer application during cultivation : Yes 100% No 0

16. Agricultural practices in each season:

Items	Rainy season (spring) May - Oct		Dry season (winter) Nov – Apr.	
	Month	Number of days required	Month	Number of days required
1. Direct seeding	July	58% (3 days), 17% (1 day), 25% (5 days).	Dec.	1day
2. Nursery planting	June	1 day 100%	Dec.	1 day
3. Transplantation	July	- 5 days (30%), 5 days (60%), +5 (10%)	Januar y	- 5 (30%) 5 days (60%) +5 (10%)
4. Harvest	Nov.	25% (1day), 35% (3days), 40%(+ 5 days)	April	25% (1day) 35% (3 days) 40% (+ 5days)

17. Seeds

(1) Use of certified seeds : Yes 10% No 90%

In case of Yes,
Do you produce non-certified seeds by yourself? Yes 0 No 100%
Do you buy? Yes 100% No 0

In case of buying: From whom? CAI (S.Jíb.) Amount: 10 qq Price: 22.4 $/qq

Do you have certified seeds every year? Yes 0 No 100%

In case of No, explain the causes. 100% of producers explain that there is not seed supply.

Frequency of seed renewal Every 3 years

(2) Use of non-certified seeds Yes 90% No 10%

In case of Yes,
Do you produce non-certified seeds by yourself? Yes 100% No 0
Do you buy? Yes 0 No 100%

Why don't you use certified seeds?. 5% of producers explain that it is very expensive; and 95% explain that there is not seed supply.

Frequency of seed renewal Every 2 years (66%); every 1 year (25%); every 3 years (9%).

(3) Type of rice variety used : Is it certified seed? : Yes 1% No 99%

Reforma 61%	1% Certified	99% non-certified
J 104 17%		100
IAC 31 4 %		100
CICA 4 9%		100
Others 9%		100

18. Fertilizers

(1) Chemicals

Use of chemicals : Yes 95% No 5%

Types of fertilizers used for rice and amount.

Type of fertilizer	Dosage (Kg. / ha)
NPK 32% (a complete formula)	66 % (100), 34% (120)
Urea 68%	42% (100), 42% (120) 10% (80) 6% (30)

(2) Organic fertilizers

Use of organic fertilizers Yes 5% No 95%

Do you produce organic manures by yourself? Yes 0 No 100%

In case of Yes: Where do you get the row material from?

The amount applied is enough? Yes 0 No 100%

Do you buy it in the market? Yes 0 No 100%

Types and amount of organic fertilizers used for rice:

Type of fertilizer**	Dosage applied (Kg. / ha)	Total amount (Kg.)	Self-produced or buy?	Purchasing price $/ Kg.
Earthworm compost	4000	130	Buy	0.59

**:Specify. It was dry when buying

19. Herbicides

Use of herbicides : Yes 55% No 45%

Types of herbicides used for rice:

Type of herbicide	Dosage (Kg. / ha)
Surcopur 31%	6 – 9
Sal ammoniac 31%	0.4 – 0.5
Furore 31%	0.5 – 1

20. Insecticides

Use of insecticides : Yes 30% No 70%

Types of insecticides for rice:

Type of insecticides	Dosage (Kg. / ha)	Total amount (lit.)	Controlled pest
Tamarón 100%	0.1		Rice bug, grasshopper
Bi 58	0.5		Rice bug, grasshopper

21. Fungicides

Use of fungicides : Yes 0 No 100%

22. Fuel

Use of fuel : Yes 95% No 5%

Source: Most of producers get fuel through selling/buying without contracts.

Based on	Amount (lit.)	Price (peso / lit.)	Price (USD / lit.)
Non-specialized contract 95%		4 -5	
Contract with CCS 5%		0.45	
Contract for crops other than rice			

23. Use of agro-machines, animal power and labor force.

(1) Use of agro-machines

ITEMS	AGRO-MACHINERY					
	Name of the machine	Fuel consumption (liter)	Productivity (ha / h)	Form of tenure (own, collective, rented, contract)	In case of not own	
					Where and whom is the contract with	Price unit peso / ha peso / h
Dry preparation	Tractor, plow, harrow		0.15 – 0.25	40% own. 60% rented		5 peso./ h
Puddling preparation	Puddling tractor		0.05 – 0.1	60 % own 40 % rented		30peso / h
Application of chemical fertilizers			0.4	50 % own 50 % rented		25peso/ha
Application of organic manures	_		0.08	50 % own 50 % rented		25peso/ha
Direct seeding	_		0.05 – 0.1	100% own		_
Irrigation	Pump or canal			80 % own 20 % rented		1,5peso./h
Weeding	Sprayer		0.05 – 0.1	100% own		
Pesticide application	Sprayer		0.05 – 0.1	100% own		
Reaping	Combine		0.2 – 1	11 % own 89 % rented		25peso./h
Transportation	Tractor, track			43% own 57% rented		20peso./h
Threshing	Thresher			100%rented		100peso/h
Drying	Sun drying, dryer			50 % own 50 %rented		5peso./h
Milling	Domestic mill			20% own 80 % rented		3peso./qq
Others						

(2) Use of animal power

ITEMS	ANIMAL POWER				
	Kind of animal and equipment (implement)	Productivity (head h/ha)	Form of tenure (own, collective, rented, contract)	In case of not own	
				Where and whom is the contract with	Price unit peso / ha peso / h
Dry preparation	Plow	0.025 – 0.03	100 own		
Puddling preparation	Rake	0.025 – 0.03	100 own		
Direct seeding					
Weeding					
Transportation	Small cart		100 own		
Threshing					
Milling					
Others					

(3) Use of manual labor force

Items	Work of the members (person / day)	CONTRACTED LABOR FORCE		
		Contract with individual laborers	Contract with groups or brigades	Price unit peso / ha, or peso / h, wage
Weeding (knife)	3 a 6	100%		
Dry preparation	6.5 h / day (66%)	4 (34%)		3$ / h
Puddling preparation	4.3 (87.5%)	3.6 (12%)		5$ /h
Application if chemical fertilizers	3.3 (75%)	5 (25%)		4$ / h
Application of organic manures	1 (100%)			
Direct seeding	4.3 (77%)	3 (12%)		20$ / h
Transplantation	5 (67%)	3.5 (33%)		70$ / h
Water management	4.6 (85%)	3 (15%)		2$ / h
Weeding	2 (25%)	2 (75%)		3$ / h
Pesticides application	1.5 (60%)	4 (40%)		3$ / h
Reaping	3 (40%)	12 (60%)		5$ / h
Threshing	4 (50%)	3 (50%)		2$ / h
Drying	6 (72%)	5 (28%)		4$ / h
Others				

24. Pos-harvest

a) From harvest.

Number of days and way to store paddy rice before milling

	Paddy rice	
	Wet	Dry
In bags	3 (29%)	300 (71%)
In bulk		200 (100%)

b) After milling.

Number of days and way to store white rice:

	White rice	
	Consumption	Sales
In bags	30 (58%)	25 (42%)
In bulk		

c) Use of some products to control pests in stored rice: Yes 5% No 95%

In case of Yes. What type? Biorrat

Problems with these operations

1) Shortage of this product 55%
2) Shortage of bags 22%
3) Shortage of store places 23%

Technical assistance and capacity building

25. Technical assistance and capacity building in 2003 : Yes 70% No 30%

Forms of technical assistance and capacity building

Forms of technical assistance and capac.	Frequency	Organization in charge
Courses		
Workshops	33%	IIA
Variety collection	16.5%	IIA and ETIA
Distribution of technical brochures	16.5%	IIA
Field days (selection fairs)	16.5%	IIA
Others	16.5%	Others

26. Urgent topics for technical assistance and capacity building:

1) Technical assistance 61%
2) Seed selection 26%
3) Rice conservation 13%

27. Future plan for rice production.

a) Intention of increasing rice production: Yes 45% No 55%

Why?
For economical reasons (45%); to get higher productions (55%).

b) Intention of making some investment: Yes 25% No 75%

What kind of investment?
Increase of the area
Why?
For economical reasons (75%); to increase production (25%).

c) Idea of implementing the plan: 100% explain that credits are necessary.

28. Problems in rice production.

Most critical problems:
1) Certified seed
2) Inputs (fuel, fertilizers, pesticides, bags)
3) Water and agro-machine
4) Capacitation

<u>Comments</u>

The results of the questionnaire survey shows that young people are the prevailing age group among producers: 70% of the surveyed producers are less than 60 years old; they started in agriculture before 1990. 80% of the surveyed producers started in rice cultivation after the 80's.

Regarding the family composition, 75% of the families have less than 5 persons; 84% are men; only 16% of the total is retired. Most of the producers belong to some cooperative organization.

As for farm management, most of producers sow during the rainy season (June-July) and the harvest takes place in Nov.-Dec. During the dry season, sowing is carried out in Dec.-January and the harvest takes place in April-May. The number of producers cultivating during the rainy season is significantly higher, combining with two or more crops, rather than crop rotation. Direct seeding is more common than transplanting, as producers consider that this system has more advantages in economy and use of labor force. This method has been learnt through popular tradition. Crop management is mainly carried out by applying herbicides and flooding control, combining with fertilizer application, basically containing nitrogen, and the application of some insecticides, though practically unavailable in the market. On the other hand, fungicides are not applied as these products are extremely difficult to get.

Only 10% can get certified seeds from CAI Sur del Jibaro, but seed renewal cannot be carried out every year.

As for the use of agro-machines, the rate of tractors/ha is quite low: there is only one tractor/36 ha. The productivity is in accordance with the number of years used (more than 25 years). Most of tractors are private or rented from other organizations. In general, there is shortage of implements and lack of irrigation and drainage systems and techniques. There is also a general shortage of fuel, which in most cases has not any contract with a supplying entity.

The productivity of the labor force is acceptable. A considerable percentage of the work is done by the family labor force, while the smallest percentage is done by individual laborers.

A high percentage of the production was sold without specialized contract. In case of white rice, prices ranged from 2,5-3,5 pesos/pound, while the price of paddy rice ranged from 100-120 pesos/qq. 50% of the total amount of was separated fro self-consumption of the family.

Conclusions:

The most urgent items shown in the survey are as follows:

1. Supply of certified seed
2. Water supply and systems of irrigation and drainage
3. Shortage of specialized agro-machines for popular rice production.
4. Shortage of inputs (fuel, fertilizers, pesticides, bags, etc.)
5. Lack of drying spaces.
6. Lack of capacitation in all senses.

4.2 UBPC and CAP

Basic data

1. Type of organization: UBPC 7 CPA 2 CCS 1
2. Ministry: MINAG 2 MINAZ 8
3. Established year: 1980-85 2 ,91-95 6 96-2000 2
4. Total physical area: 16 575.5 ha

   Total agricultural area: 10531.5 ha
   Rice area: 1005.6 ha

Cattle area: 8340.2 ha

Administration:

5. Administration

Number of members: 390 persons
Personnel related in the production:
Among them, those engaged in popular rice production: 143 persons

Farm management

6. Form of farm management. Select from bellow:

(1) Rice cultivation only 0

(2) Combined with: 1) Cattle 6 2) Tobacco 0 3) Vegetables 4
4) Roots 10 5) Forestry 0
6) Sugar cane 2 7) Others 0

(3) (Crop rotation in rice areas : Yes 10 No __

In case of (yes): kinds of crops used in rotation
Crop 1 roots Crop 2 vegetables Crops 3 sugar cane Pastures natural pasture grounds
Cultivation during crop rotation
Dry season (Nov. – April) : vegetables roots
Rainy season (May – Oct.) : rice
Do you carry out the rotation every year? Yes 8 No 2
In case of (no): Frequency of area rotation 2 years

Renting land for popular rice production

7. Does the organization rent some area for popular rice production? Yes 0 No 10

9. Agricultural production in 2003 (including crops other than rice).

a) Crop	b) Cultivation area (cab)	c) Cultivation period (sowing month ~ harvest month)	d) harvested amount (qq)	e) yield (qq / cab)
1) Rice (rainy season)	+ 0.5 10	~		600 a 800
2) Rice (dry season)	0	~		MO

10. Destiny of rice production in 2003

Destiny of rice production	Amount (qq)		Receiver	Price	
	White rice	Paddy rice		White rice $ peso/pound	Paddy rice $ peso/ qq
Sales* with non-specialized contract			Self-consumption and staff's lunch	0.32	
Sales* without contract					
Self-consumption of the organization			10		100
Seeds for self-consumption			10		
Seeds for selling					
Selling to the staff			10		100

*Note: Sales with non-specialized contract: amount of rice sold based on a contract with CAI or other agricultural organization. Sales without contract: rice sold without any contract with CAI, Acopio or other organization.

Agro-machinery

11. Machine tenure Yes 10 No ___

Tractors			
Capacity	Light 30 – 80 hp	Middle 80 – 120 hp	Heavy > 120 hp
Number	1 to 15	4	3
Number of years used	25 or more	25 or more	25 or more

Do you have implements for rice production? Yes 8 No 2

Types: plows 8 Harrows 8 Land plane __ Others 1 (leveling machine)

Harvester					
Capacity	qq/ working day	qq/ working day	qq/ working day	qq/ working day	qq/ working day
Number 1	150				
Number of years used	25				

Track and van					
Capacity	ton.	ton.	ton.	ton.	ton.
Number 10	1 to 4				
Number of years used	25 or more				

Irrigation pump					
Capacity	liters / sec. Or inches of diameter	liters / sec. Or inches of diameter	liters / sec. Or inches of diameter	liters / sec. Or inches of diameter	liters / sec. Or inches of diameter
Type (elect./ diesel)	30 and 150				
Number 2					
Number of years used	2 and 20				

Workshops

1	Do you have your own workshop?	Yes 8	No 2
2	In case of Yes, mention the type of machine tools	welding 6	
		lathe 1	
3	Number of staff	Mechanicians	Others
4	Workshop services offered to other producers	2 mechanicians in each workshop	3 in each workshop
5	Main problems in the workshops	Shortage of tools, shortage of spare parts.	

Irrigation and drainage for rice

12. Irrigation

1) Availability of irrigation and drainage facilities : Yes 8 No 2

In case of yes:
- Type of water source: dams 3 rivers 2 underground water 2
- Energy source: gravity 5 diesel pump 2 electric pump 1
- Capacity of the pump (liters / second or inches):
50% + than 20l/sec., 30% 10 to 20 l/sec., 20% less than 10l/sec.

2) Use of irrigation in 2003

Area with irrigation
Dry season a: 0 ha
Rainy season: 10 a 161 ha

Upland area (secano)
Dry season: 0 ha
Rainy season: 0 ha

3) Area with enough irrigation

Dry season: 0 ha Rainy season: 0 ha
In case of insufficiency, mention the reason
Shortage of water 2 , shortage of pumps 7

4) Availability of drainage systems : Yes 8 No 2

5) Are there problems in drainage limiting the use of machines? : Yes 2 No 8

Which? the areas are surrounded by other land owners; a common system has not been established yet.

Areas with problems : 2 ha

Soils

13. Soil characteristics:

a) Light (all practices can be carried out by using animal power) : 0 ha

b) Light heavy (excepting plowing, all practices can be carried out by animal power) : 0 ha

c) Heavy (tractor is necessary for all practices) : 924 ha

Agricultural practices of rice

14. Rice area in the rainy season (May – Oct.)?: 924 ha

Rice area in the dry season (Nov – April)? 0 ha

In case of not sowing in the dry season or the area is small:

1) Intention of introducing or extending rice in the dry season? : Yes 7 No 3

2) In case of having the intention of introducing or extending rice in the dry season, mention the problems.: Shortage of water

15. Area for double-rice cropping : 0 ha

In case of not doing double-rice cropping or the area is small:

1) Intention of introducing or extending double-rice cropping : Yes 7 No 3

2) In case of having the intention of introducing or extending double-rice cropping, mention the problems : Shortage of water

16. Sowing method at present

Area 1) Direct seeding: 9 ha 2) Transplantation: 1 ha

(1) In case of direct seeding:

a) Period of seeding

Dry season (Nov-April) 0 ha Rainy season (May-Oct.) 10 ha

b) Way of applying direct seeding

- Manual 10 By machine 0 By airplane 0
- Type of land preparation and sowing
  Dry-dry 2 Dry-puddling 8 Dry-disinfection ___
  uddling- double cropping ____
- Broadcast seeding with pre-germinated seeds : Yes 3 No 3
- Stripe direct seeding : Yes 3 No 7

c) Intention of continuing with the same method in the future.

- In case of continuing:
  Mention the reason by which you will continue using direct seeding :
  It is more economical.
- How did you know about this technique? : -Learned through tradition.

d) Fertilizers application before seeding : Yes 0 No 10

e) Fertilizer application during cultivation : Yes 9 No 1

(2) Transplanting: No entity applies transplantation

17. Agricultural practices in each season:

Items	Rainy season (spring) May - Oct		Dry season (winter) Nov. - Apr	
	Month	Number of days required	Month	Number of days required
1. Direct seeding	June – July	20		
2. Nursery planting				
3. Transplantation				
4. Harvest	Nov. – Dec.	30		

18. Seeds

(1) Use of certified seed : Yes 5 No 5

In case of Yes,
Do you produce certified seeds by yourself? : Yes 0 No 5
Do you buy? : Yes 5 No 0
In case of buying: from whom?: CAI (SJ), Price: 22.49 $MN /qq
Do you have certified seeds each year?: Yes 0 No 10
In case of No, mention the causes. : The prime cause is the shortage of seed.
Frequency of seed renewal : 2 and 4 years.

(2) Use of non-certified seeds : Yes 5 No 5

In case of Yes,
Do you produce non-certified seeds by yourself?: Yes 5 No 5
Do you buy? : Yes 5 No 5
Frequency of seed renewal : 2 to 4

(3) Type of rice variety used

Is it certified seed?	Yes	5	No	5
J – 104		5		5
I A Cuba		5		5
L P 5		5		5

19. Fertilizers for rice

(1) Chemicals

Use of chemicals : Yes 10 No __

Types of fertilizers used for rice:

Type of fertilizer	Dosage (Kg. / ha)	Total amount (Kg.)
Urea	120	

(2) Organic fertilizers

Use of organic fertilizers : No

20. Herbicides for rice

Use of herbicides : Yes 3 No 7

Types of herbicides used for rice:

Type of herbicide	Dosage (Kg. / ha)	Total amount (lit.)
Surcopur	11	
Sal ammoniac	3	

21. Insecticides for rice

Use of insecticides : Yes 1 No 9

Types of insecticides for rice:

Type of insecticides	Dosage (Kg. / ha)	Total amount (lit.)	Controlled pest
Tamaron	4		Rice bug
Parathion	4		Rice bug

22. Fungicides for rice: NO

23. Fuel

Fuel for rice production : Yes 8 No 2

In case of Yes,
Amount : 12664 l and Price : 0.24pesos/litro

Use of machines

24. Use of agro-machines, animal power and labor force

(1) Use of agro-machines

Items	Agro-machines				
	Name of the machine	Fuel consumption (liter)	Productivity (ha / h)	In case of not own	
				From where and with whom is the contract	Price unit. peso / ha peso / h
Weeding (knife)					
Dry preparation	Tractor		0.15-0.25		
Puddling preparation	Tractor		0.05.1		
Application of chemical fertilizers			0.4		
Application of organic manures			0.08		
Direct seeding			0.05-01		
Irrigation	Pump				
Weeding	Sprayer		0.05-0.1		
Pesticide application	Sprayer		0.05-0.1		
Reaping	Combine		0.2-1.0		
Transportation	Track and trailer				
Threshing					
Drying	Tractor and trailer				
Milling					
Others					

Note: the third column was not completed because the data provided were not logic.

(2) Use of animal power : The organizations do not use animal power

(3) Use of manual labor force:

Items	Work of the members (person / day)	CONTRACTED LABOR FORCE		
		Contract with individual laborers	Contract with groups or brigades	Price unit peso / ha, or peso / h, wage
Weeding (knife)	4.0			
Dry preparation	33			
Puddling preparation	19			
Direct seeding	1.2			
Transplantation	35			
Water management	7.0			
Weeding	14.2			
Pesticide application	5			
Reaping	22			
Threshing	12			
Drying	200.0			
Others				

25. Post-harvest.

a) After reaping.

Number of days and way to store paddy rice before milling:

	Paddy rice	
	Wet	Wet
In bags		365
In bulk		

b) After milling

Number of days and way to store white rice:

	White rice	
	Consumption	Sales
In bags	30	15
In bulk		

c) Use of some products to control pests in stored rice: Yes 2 No 8

In case of Yes. What type? : Rodenticides

Problems with these operations:

1) Dryers are not available in the municipality
2) Shortage of bags and sheets
3) Shortage of fuel and other inputs
4) Shortage of certified seed

Technical assistance and capacity building

Most of the organizations were established in the 90's in order to reach self-sufficiency of food of the enterprises to which they belong, by providing agricultural products for their staff.

The machines and implements can be rented to small producers from outside; workshop services are also offered, such as welding, lathe, and small repairing of equipments.

Being in shortage, herbicides are applied in low amounts.

The main problems of these organizations are listed bellow:

- Shortage of water.
- Shortage of seed.
- Shortage of inputs.
- Shortage of dryers.
- Lack of capacity building.

5. Chambas

5.1 Individual Producers

Basic Data

The questionnaire survey covered a total number of 60 individual producers, of whom 23% belong to CCS, 44% are prestamos and 33% are parceleros. The average age of 68% of producers being less than 50 years, it can be considered that they are quite young. As for the starting year in agriculture, 72% of producers surveyed started before 1990, though 57% started popular rice cultivation alter 1996.

The average number of members in each family is 4.4 persons, among whom 2.1 members work directly in the faro. The average number of men working in the faro is 2.0, while the number of women is 0.2. The average of retired men working in the faro is 0.4, while the number of retired women is only 0.03. The producers surveyed hold an average area of 13.8 ha, because many of them are CCS members and prestamos.

The average of private land is 7.6 ha, while the average of private land for rice cultivation is 3.1 ha.

Farm management

40% of the surveyed producers belong to some cooperative organization, while 73% cultivate only rice in their farms. Among those producers cultivating rice combined with other crops, 52% combine with cattle and 30% combine with roots; the remaining portion combines with vegetables and other crops.

Only 20% of producers declared to carry out crop rotation: 33% of them rotate with pastures, 25% with vegetables and 25% with roots. 70% of these producers carry out crop rotation every year.

During the rice production of 2003, 9235 qqs were produced in the dry season, while in the rainy season the production was 37790 qqs of paddy rice. As for white rice sales, 71% was done as non-specialized contract, 19% as sales without contract (fairs, market) and 10% was kept for self-consumption. Only 1% was set apart as seed.

The average selling price was 120 pesos/qq in paddy rice and 260 pesos/qq in white rice.

Agro-machinery

As for agro-machines, 42% of producers have their own tractors, which have all been used for more than 20 years.

Irrigation and drainage

83% of producers surveyed have some irrigation system, of which 55% is for common use. 60% of them get the water from dams, 18% from rivers, 14% from underground water and 8% from springs. 62% use the gravitation method for irrigation, 34%use diesel pumas and only 4% is electrified. Drainage systems are available for 80% of producers; only 4% explained that the use of agro-machines is limited by problems in drainage.

Soils

67% of surveyed producers explained that the soils of their lands is heavy, hindering the use of animal power for some activities.

Agricultural practice of rice

74.2% of the total area is sown in the rainy season. 55% of the surveyed producers intend to sow in the dry season but there are several constraints, such as shortage of water, inputs and fuel. The area for double-rice cropping is only 12.7 % and only 38% intend to apply double-rice cropping. The main problems to achieve this are the shortage of agro-machines and resources.

Direct seeding represents 98%, while transplanting is only 2%. Among the producers applying direct seeding, 64% apply it manually. Dry land preparation is carried out by 59.3% of producers, while 20% applies the dry-puddling technique. The rest of producers apply the dry-disinfection technology. Dry seeds are used by 70% of producers; only 30% uses pre-germinated seeds. 80% of producers declare that they will continue using this method as it is more economical.

The results of the questionnaire survey show that there is little knowledge about the transplantation technique, and that 55% of producers knew about this technique from persons not having any connection with IIArroz, Rice CAI, extension officers, etc.

Herbicides are used by 88% of producers, mainly Propanil (to control gramminous weeds) and some hormonal herbicides to control wide-leaf weeds. 55% of producers use insecticides such as Tamaron, Cipermetrina to control mites, *Spodoptera frugiperda* SMITH-ABB, etc. Only 20% of producers apply fungicides, mainly Kitasin and Hinosan to control Pyricularia grisea.

Fuels

96.5% of producers use fuel. Of the total amount of fuel declared by producers, 73% was purchased in the market (CUPET) and 27% through contracts.

Use of agro-machines

As for the use of agro-machines, in this municipality there are all forms of tenure/ownership and different forms of renting and offering of agro-machine services. Organizations such as UBPC, state farms and CCS-F offer their agro-machine services.

Post-harvest

Regarding post-harvest, producers store dry paddy rice during 60 days in bags; in case of storing in bulk, the number of days is 90. White rice is only stored in bags, during 60 days. Main problems in post-harvest are shortage of bags, shortage of dryers, etc.

Technical assistance and capacity building

44% of producers surveyed have received some capacity building and technical assistance, mainly as field days, distributing technical brochures and courses. Main organizations providing technical assistance and capacitation are CAI, INCA and ETIA Sur del Jibaro.

The most urgent needs for technical assistance and capacity building are shown bellow:

1. Pest management.
2. Reaping and post-harvest problems
3. Use of soils
4. New varieties
5. Agro-machines

89% of producers wish to increase rice production for economical reasons and family tradition. 25% intend to make some investment mainly to improve the irrigation system.

According to the surveyed producers, the most critical problems related to popular rice production are the shortage of agro-machines and capacitation to producers.

5.2 UBPC and CPA

This assessment was made in the municipality of Chambas, Ciego de Avila province to characterize the rice production. The survey was conducted in various Popular Councils, all belonging to this municipality. A total of 20 persons were surveyed. These people work as managers of the different ways of organizing land-holding. The organization is as follows: Presidents 60%, Economic managers 15% and administration 25%.

Basic data:

As to the type of organization of the production, 35% correspond to the CPA form, 15% to the CCS and the rest, and 50% in UBPC form. 40% of this form of production belongs to the MINAG and 60% belong to the MINAZ. 35 % of these forms of production were founded in the decade before the 90s, and the rest were founded in the following years. Among other reasons, this was due to the economic situation of the entities and to the process of rearrangement of MINAZ. It can be said that, according to the criteria of the people that carried out the survey, more than 80% of producers have experience in agricultural activity, which in the last years has been combined with animal husbandry and rice cultivation.

The different forms of organization occupy an area of about 900 ha, which are completed with some regions of animal husbandry and with other crops. This is a logical situation, because some years ago this area was destined only to sugar production.

Administration:

The average number of members of the forms of production is 25.5 persons. Of this number, 67.83 % is directly related to agriculture and the rest is engaged in popular rice production.

Farm management

Farm management has two forms: monoculture of rice (59.80% of the producers) and the rest of them combine with cattle, roots, grains, vegetables, tobacco, fruits and sugar cane.

Crop rotation is not extended, perhaps because these areas have traditionally been cultivated with sugar; only some small areas were fallow lands for animal husbandry. Consequently, crop rotation is preferably practiced in the dry season (Nov.-April), corresponding to 72% of producers. It is mainly carried out with sugar cane, roots and vegetables (notably sweat potato and tomatoes). The remaining 28% of the producers practice crop rotation every 3 to 5 years.

Land renting for popular rice production.

Of these organizations, 75% do not rent their lands; only 25% rent part of their lands for popular rice production, for 6 months to 1 year. Most of the surveyed persons did not declare the exact way by which the payment is done. Some of them explained different forms of payment, such as payment in kind (20% of the production), payment for the value of 85% of the inputs supplied, and the official form of payment established for popular rice. The number of members of the organization ranges from 2 to 165 persons, and the number of contracts ranges from 1 to 15 (it must be said that the surveyed persons did not always provide this information). The average of rented land (prestamos) ranges from 13 to 68 ha; some of the organizations rent less than 2 ha.

Agricultural production

The amount of rice production corresponding to the rainy season is approximately 26 000 qq, achieving an average yield of 4 100 qq / cab, while the rice production of the dry season is 12 700 qq at an average yield of 4 900 qq/ cab. Grain production is 2300 qq at a yield of 570 qq/cab. The average production of roots is 17 000 qq, at a yield of 4620 qq/cab.

Destiny of rice production

The amount of rice sold as non-specialized contract (CAI) is 5324 qqs (paddy rice) at the price ranging from 100 to 110 pesos/qq. The selling price for self-consumption of the organization is 0.20 and 0.60 pesos/pound (white rice).

Agro-machinery

For this item of the questionnaire, the answers provided by the surveyed persons did not always contain the veracity required, the information being rather approximated. Capacity of the machines: 80 tractors of light capacity, 21 tractors of middle capacity and 3 tractors of heavy capacity. The number of years that these machines have been used is as follows: light tractors have been used for 10 to 30 years, medium tractors have been averagely used for 15 years and heavy tractors for 20 to 30 years. These machines are basically used only in the organization.

81% have s for rice production; 63% of these have plows, 71% have harrows, 27% have land plane, 35% have ditchers and 42% have other implements.

Harvester: available in 20%; used for 25 to 29 years; only 10% contract their machines from outside producers and 23% rent the machines to outsiders.

Track and van: available in 53%; used for 20 to 25 years on average; only 23% use these machines exclusively in the organization, while 36% rent the machines to outside producers.

Irrigation pumps: 3% are electrical pumps and 8% are diesel pumps; used for more than 25 years on average. It should be noted that there is a general shortage of this equipment in the municipality; consequently, most of producers use the water from canals and/or retaining basins, as well as from Chambas dam and Los Perros river.

There are only 2 windmills, which are in bad conditions.

Workshops: 53% of the organizations have their own workshops. The existing machine tools are not enough to cover all the maintenance works.

27% of the staffs of the workshop are qualified mechanicians.

These workshops do not offered any service to other producers.

One of the main problems in the workshops is the shortage of tools.

Irrigation and drainage

Irrigation is applied by 73% of rice producers. 63% of the producers use surface water, while 27% of them use the irrigation water from Chambas dam.

As for energy sources, 89% use gravity systems. The other forms of irrigation were mentioned above (8% using diesel and 3% with electricity). According to the data provided by most of the surveyed producers, the capacity of pumps is around 8 inches.

In general, the administrative personnel surveyed do not know the area with irrigation, although some of them declared 13.42 to 94 ha.

It was not possible to state precisely the total data; some of them mentioned the shortage of electrical transformers and other inputs.

Drainage: available in 80% of rice areas; 20% have problems in drainage which hinder the use of agro-machines.

Soils

100% of the areas are heavy soils.

Agricultural practices of rice.

As mentioned above, most of the areas are cultivated with rice in the rainy season, while crop rotation is practiced in the dry season, mainly due to the characteristics of the soils.

Most of the organizations (78 %) practice double-rice cropping in the rice areas; the rest intend to introduce this practice. The main problems are related to the shortage of water and other inputs necessary for water management.

All the surveyed producers apply direct seeding and only 20% rarely apply transplantation to practice double-rice cropping. The sowing method, whether manual or mechanized, varies depending on the availability of resources. Approximatly 85% use machines for seeding.

Land preparation is practiced using the technology of seco-seco (72%), seco-fangueo (18%) and seco-desinfeccion (10%).

Broadcast seeding using pre-germinated seeds is applied by 5% of the surveyed persons; the rest apply stripe seeding.

83% intend to continue with the same sowing method because of the following reasons:

- They have experience in this practice.
- It is easier and more comfortable.
- They consider that this method is more effective.

They have known about this technique from CAI (9%) and from other producers (45%).

Those who will change to transplantation state that by applying the transplanting technique, production can be increased, although the demand of labor force could be a constraint.

9% of them know about transplantation from CAI. The problems for changing into transplanting are the lack of knowledge, material and human resources.

Use of herbicides and fertilizers:

68% apply chemical herbicides.

24 % do not apply manual weeding. Herbicides are applied through irrigation, by using machines or by airplane.

48% apply fertilizers before seeding, while 55% apply fertilizers during cultivation.

Trasplantation

16% do not apply herbicides; 9% practice manual weeding. 9% do not apply fertilizers before transplanting, neither during cultivation.

Agricultural practices

Direct seeding is carried out from March to July, during 3 to 12 days.

The sowing in winter is carried out from December to February, during 10 to 12 days.

As for nursery planting and transplantation, the surveyed persons did not mention the exact intervals, mainly because of the shortage of water.

The harvest of the spring crop takes place from July to November during 3 to 6 days. The harvest of the dry season takes place in May-August during 5 to 30 days.

Seeds

Certified seeds are used by 72% of the surveyed. Of this number, 72% do not produce the certified seeds by themselves. 81% of producers buy rice seeds from CAI (averagely 168 qq/surveyed) at the price of 23.7 pesos / quintal.

55% get certified seeds every year and renew the seed yearly.

45% of producers use non-certified seeds.

Rice varieties used:

- Reforma,
- Perla,
- IIA Cuba-65
- J-104.
- Amistad 82
- Caribe 71

Fertilizantes para arroz

Chemical fertilizers are applied by 78% of the surveyed persons. The types of fertilizers used are urea, phosphorus, potassium, the dosages ranging from 70 to 130 kg/ha. 72% do not apply organic manures, while 20% do apply. 8% produce organic manure by themselves, though they think the amount produced is not enough.

Herbicides

53% do not apply herbicides. The most used types are Surcapur, Propanol, Esterol and hormonal types. The basic dosage is 3 to 10 litters/ha.

Insecticides for rice

83% of producers do not apply insecticides; the remaining 17% apply Permetrina and Tamaron at the dosages of 2 to 5 litters/ha to control piricularia and afido.

89% do not apply fungicides. Only 11% applies fungicides (Zineb and Mancozeb) to control fungus.

Fuel

67% do not receive any fuel. Though the remaining 33% gets fuel, they evaded answering about the price.

Use of agro-machine

Mechanized weeding is carried out by using a Yum-6 tractor, requiring 240 litters of fuel/working day, at a productivity of 2.63 ha/h.

The same type of tractor and T-150 tractors are used for dry preparation, requiring 1476 litters of fuel/working day, at a productivity of 4.6 ha/h. The machines belong to themselves and other machines are hired too.

The agricultural practices with harrow are carried out by using Yum-6 tractors, requiring 63 litters of fuel/cab, at a productivity of 9.38 ha / day.

The productivity of the terrestrial machines used for direct seeding is 0.5 ha/h.

Reaping is sometimes carried out by using harvesters, requiring 4780 litters of fuel, at a productivity of 6 ha/h.

Tractors are used for transportation, requiring 270 litters of fuel.

Threshing is carried out by using harvesters and mills, requiring 480 litters of fuel.

Drying is carried out manually.

Milling is carried out by using mills.

Use of manual labor force

For dry preparation, the number of laborers contracted is 18/day on average, and the wage is 20 pesos/h.

For the application of chemical fertilizers, the wage is 25 pesos/h.

For the application of organic manures, the average number of laborers is 15/day.

For direct seeding, using tractors and drilling machines, the number of laborers is 10/day and the wage is 15 pesos/h.

For transplanting, there is no report of contracted labor force.

For water management, the number of laborers is 4/day and the wage is 15 pesos/h.

For rice reaping, using the harvester, the number of laborers is 14/day and the contracted labor force is 13 individual workers, with a wage of 50 pesos/ha.

When reaping is carried out manually, threshing requires 6 laborers/day, with a wage of 12 pesos/h.

For drying, using mills, the average number of laborers is 20/day, the contracted labor force is 15 individual workers, with a wage of 12 pesos/h.

Post-harvest

After reaping, wet paddy rice is stored in bags during 90 days on average. In case of storing in bulk, the amount of time is one year.

After milling, white rice is stored in bags during 2 months.

For weed control, 55% apply chemicals to protect rice crop against insects and rodents. Mechanical control is used by using traps and hand-made baits.

Technical assistance and capacity building

During the last few years, 75% of the surveyed persons received some kind of capacity building, as short courses, brochures, videos, talks and discussions, led by the extension officer.

The most urgent topics for technical assistance and capacity building are listed bellow:

1. Transplanting
2. Pest and diseases
3. Drainage
4. Seed production
5. Mechanization

Concerning the future plans for rice production, 42% intend to increase rice production, basically in order to improve the family economy in general and to increase popular rice production. In addition, a number of producers consider that rice is necessary for Cuba.

Most of the people that were interviewed (more than 90%) show interest in making investments related to the water for irrigation as well as in the infrastructures, agricultural machinery. Others point out that there is a need for increasing the area for cultivation.

Most critical problems in the production of rice that were pointed out by the people who carried out the survey:

1. Equipment that is linked with irrigation and drainage. (pump, machinery, canals, etc)
2. Availability of fuel and machinery.
3. Inputs
4. Conditions of storage.

6. Vertientes

6.1 Individual Producers

The diagnosis was carried out in the municipality of Vertientes, Camaguey province, Cuba, to characterize the production of popular rice producers. The questionnaire survey was applied in several Popular Conceals, in Vertientes municipality. The surveyed producers, totaling 80, work with various types of production, in the following proportion: 36.67 % belonging to CCS, 30 % belonging to the category of Préstamo, 26.67 % to parceleros and 6.67 % belonging to other types of production.

Basic data:

The average age of the surveyed persons is shown in the following proportion: 15% between 20-30 years old, 23.33% between 31 and 40 years old, 30% between 41 and 50 years old, 30% between 51 and 60 years old, and 13.33% with more than 60 years old.

As for the date when they started in agriculture, the proportion is shown bellow:

- 23.33% started between 1960 and 1970
- 26.67% started between 1971 and 1980
- 21.67% started 1981 and 1990
- 20% started between 1991 and 2000
- 8.33% started after the year 2000.

Concerning rice cultivation itself, the proportion is as follows:

- 3.33% started cultivating rice between 1960 and 1970
- 11.67% started between 1971 and 1980
- 3.33% between 1981 and 1985
- 6.67% started between 1986 and 1990
- 18.33% between 1991 and 1995
- 25% between 1996 and 2000
- 25% started after 2000

The average number of family members is 4.3 persons. Among them, 2.08 work directly the land in the following composition:

- 91.6% are men
- 8.4% are women
- 18.83% from the total average are retired (from whom 92.57 are men and 7.43% are women).

The total agricultural area ranges from 2 ha to 13.83 ha (average), from which 88.91% are dedicated to rice cultivation.

Regarding the land tenure, 77.41 belongs to Prestamos, from which 87.70% are used to rice cultivation and the remaining 12.30% are used for other crops.

Among the surveyed producers, 22.59% declare being landowner: 41.11% is used for rice cultivation and the rest is used for other crops and cattle.

60% of the surveyed producers declare no belonging to any organization, while the remaining 40% affirm their belonging to some organization or cooperative.

Agricultural management

Popular producers manage their agricultural area as follows:

- 73.33% cultivate only rice
- 26.73% cultivate rice with cattle (50%), vegetables (15.75%) and forestry (6.25%).

Crop rotation is made in rice areas by 70% of the surveyed producers, combining with vegetables, roots and other crops. The ratio of crop rotation is as follows:

- 20% of the surveyed producers in the dry season (November to April)
- 50% of the surveyed producers in the rainy season (May to October)
- 80% of the surveyed carry out crop rotation every year

The remaining 20% carry out crop rotation on average every 2 years.

The agricultural production area in 2003 is shown bellow (in cordeles):

1- Rice (rainy season)	13984,00
2- Rice (dry season)	2450,70
3- Grains	160,00
4- Roots	50,00
5- Vegetables	122,00

This production corresponds to the rainy season (June-November) and the dry season (January-June).

The production amount in this stage, as well as the amount sold and the average prices according to the surveyed producers are shown bellow:

Harvested amount	qq
1- Rice (rainy season)	37 789,50
2- Rice (dry season)	9 235,00
3- Grains	3 070,00
4- Roots	3 970,00
5- Vegetables	620,00
8- Forestry	600,00
Amount sold	qq
1- Rice (rainy season)	687,00
2- Rice (dry season)	35,00
3- Grains	420,00
4- Roots	2 195,00
5- Vegetables	5,00

Price	$\ lbs
1- Rice (rainy season)	2,84
2- Rice (dry season)	2,66
3- Grains	1,50
4- Roots	0,25
5- Vegetables	0,50

In the opinion of the personnel that carried out the survey, it seems that individual producers did not declare all the amount of rice that they actually sold...

The destiny of the production of that year is shown in the table bellow:

White rice	Amount in qq
Sales with non-specialized contract	9 730
Sales without contract	2 677
Self-consumption	1 342
Seed for self-consumption	2
Seed for selling	0
Paddy rice	Amount en qq
Sales with non-specialized contract	10 160
Sales without contract	930
Self-consumption	1 752,5
Seed for self-consumption	264
Seed for selling	30
Average price for white rice	$\ lbs
Sales with non-specialized contract	2,69
Sales without contract	2,8
Average price for paddy rice	$\ qq
Sales with non-specialized contract	140
Sales without contract	120

Machinery

Popular producers hold the following machines:

Only 30 producers among all surveyed persons hold tractors. It can be said that 45% of these tractors have up to 60 HP, while 25% have up to 80 HP and the remaining 30% have more than 80 HP.

These tractors have been used during 23 years on average.

The available implements are shown bellow:

Implement	Amount	Years used
2- Thresher	1	30
3- Harrow	21	23,33
4- Plow	13	20,75
5- Ditcher	3	35
6- Harvester	0	0
7- Track	3	36,5
8- Pomp	9	32
9- Others	14	16

Irrigation and drainage

Irrigation and drainage facilities are available for 83.33% of the surveyed producers, from whom 66% use the common irrigation system and 34 % hold private irrigation system.

There are various water sources, with the following proportion:

Dams	39
Rivers	14
Springs	6
Underground water	8

The energy source is supplied as follows:

Gravity	42
Diesel pumps	22
Electric pumps	2

Most of the pumps have an average capacity of 2 to 8 inches.

In 2003, irrigation water was used in the following way:

	Average
Irrigation area. Dry season (ha):	20
Irrigation area. Rainy season (ha):	13,59
Upland area (secano). Dry season (ha):	17
Upland area (secano). Rainy season (ha):	15,27
Area having enough irrigation water. Dry season (ha):	12,60

The main reasons causing shortage of water are related to the bad conditions of canals and low irrigation capacity.

On average, 17 ha of the land of surveyed producers are affected by these problems.

Soils

The main characteristics of the soil in the areas belonging to the surveyed producers are shown bellow:

A → Light	28,33 % of the surveyed producers
B → Heavy light	5,1% of the surveyed producers
C → Heavy	66,66% of the surveyed producers

Agricultural practices of rice

Direct seeding is the most common sowing method, applied on a total area of 1119, 03 ha. In the dry season, direct seeding is applied in 230,69 ha, while in the rainy season the area is 888,34 ha.

Transplanting is applied in 16,5 ha.

The surveyed producers apply direct seeding in a total area of 1118.34 ha, of which 888.34 correspond to the rainy season and 230.7 ha to the dry season.

These producers carry out double cropping in 160.68 ha. Though 38.83% among them intend to extend double rice cropping in the dry season, they explain that there are basic constraints, such as shortage of fuel, water, budget and material resources.

Direct seeding is basically applied as follows:

- Manual seeding: applied by 63,33 % of the surveyed producers
- Using machines: 35 % of the surveyed producers
- Using airplane: 1,67 % of the surveyed producers

Land preparation and seeding are carried in the following way:

Dry-dry (Seco seco)	75 % of the surveyed producers
Dry-puddling (Seco fangueo)	18,33 % of the surveyed producers
Dry-disinfection (Seco desinfección)	5 % of the surveyed producers
Puddling-Double cropping (Fangueo doblaje)	1,67 % of the surveyed producers

Carried out both manually and by machine, 31.66% of the surveyed producers apply broadcasting sowing using pre-germinated seeds.

Stripe seeding is applied by 26.67% of the producers.

Due to the reasons shown bellow, 67% of the producers intend to continue with the same method:

- The results shown so far
- Shortage of resources
- The method is economic
- Shortage of labor force
- It is the traditional method

Several producers wish to change the method to transplanting as they have seen the results of other producers, such as a higher yield.

Transplanting is known from popular rice extension officers, CAI, other producers, as well as from the Japanese experts and other professionals.

For producers, the basic constraints to apply transplanting are the following:

- Necessity of labor force
- Poor knowledge
- Shortage of water
- Field conditions (many weeds)

Eighty-eight percent of the surveyed producers apply herbicides; 22% do manual weeding and 25% use sprayer.

Before seeding, 57% of the surveyed producers apply fertilizers, while 92% apply fertilizers during the cultivation.

Transplanting is carried out in 4ha on average during the dry season and 12.05ha on average during the rainy season. Transplanting is completely applied manually (100%). Sowing density per nursery is 2, 73 lb / cordel on average. The average amount of time in the nursery is 24 days, while the average sowing spacing is 22cm.

All the producers using this technique intend to continue with this method in the future due to the following reasons:

- Higher yield,
- Low chemical and fertilizers,
- Rice plants become more resistant to pests and diseases.

They know transplanting from CAI, the Japanese experts and from the Agricultural Fair held in Florida by the CAI, the Rice Group of Camaguey University, INCA and ETIA.

When cultivating through transplanting, producers almost do not apply herbicides (only 1.25% of the surveyed producers use herbicides).

Weeding is then carried out manually by 90% of the surveyed producers applying transplantation.

Basic agricultural practices are carried out as follows:

Practices	Rainy season		Dry season	
	Month	Average number of days	Month	Average number of days
Direct seeding	June	7	December	7
Nursery planting	June	10	December	9
Transplanting	July	6	December	7
Harvest	November	7	March	7

Seeds

Certified seeds are used by 78.33% of total producers, which they buy from CAI (100% of the surveyed producers buy from 12 to 40 qq at an average price of 26 $ / qq). Other producers (6%) produce seeds by themselves.

On average, rice seeds are renewed every year and 73% of producers can use certified seeds every year.

Other producers (21%) do not use certified seeds because they do not have any contract with CAI, or they do not know the procedures required. They buy non-certified seed from CAI (7 qq at an average price of 180 $/qq) or they produce the seeds by themselves. The varieties most commonly used are Reforma, J 104, Perla, IACuba 30, IACuba 29, LP5.

Chemical fertilizers

83.33% of the surveyed producers apply chemicals but there is shortage of these products.

Type of fertilizer	Dosage ton \ Cab	Total amount kg
Phosphorus	1,2	12740
Potassium	1	6319
Urea	4	10871

Organic fertilizers

Only 7.14% of the surveyed producers apply organic fertilizers which basically they produce by themselves. They affirm that the amount applied is enough. These fertilizers are dry and semi-dry.

Herbicides

83.33% of the surveyed producers apply herbicides (Propanil and hormonal types)

Insecticides

57 % of the surveyed producers apply herbicides (Ciperrmetrina y Tamaron)

Fungicides

Only 21% of the surveyed producers apply fungicides.

Fuel

92% of the surveyed producers get the fuel from:

- Non-specialized contract: 6028 lts in total at an average price of 3,65 pesos/litter.
- Contract with CCS: 1185 lts in total at an average price of 1.05 pesos/litter.
- Contract for other crops other than rice: 19300 lts in total at an average price of 1.05 pesos/litter.

Use of agro-machines, animal power and labor force.

Use of agro-machines

Practices	Agro-machine					
	Name of the machine	Fuel consumption (total average)	Productivity cab/day	Form of ownership	Renting organization	Price Peso/h
Weeding	Tractor	100 litters	2,06	Rent	UBPC CAI CCS	73 /h
Dry preparation	Tractor	1758 litters	0,8		UBPC CAI CCS	
Puddling preparation	Tractor	705 litters	1.3		UBPC CAI CCS	
Chemical fertilizer application	Airplane Sprayer machine	Unknown 150	High 1,4	Rent Contract basis	CAI CCS	900 /Cab 225
Organic manure application	They just affirm they use the tractor but do not provide any data about.					
Direct seeding	Seeding machine	45 litters	1	Self rent	UBPC CAI CCS	180 / h
irrigation	pump			Self rent	UBPC CAI CCS	29/h
weeding	Hand sprayer	Unknown	0.5	Rent	UBPC CAI CCS	182 /8h
Pesticide application	airplane	Unknown	High	Contract	Agricultural airplane	900 / Cab.
reaping	harvester	1415 litters	200 qq	Rent	UBPC CAI CCS	626 /h
transportation	Tractor	856 litters		Self rent	UBPC CAI CCS	120 /h
threshing	thresher	30 litters	Unknown	Self rent	CCS	170 /h
Drying	No machine used; no fuel consumption					
milling						125 /h

Use of animal power

Practices	Agro-machine					
	Name of the machine	Fuel consumption	Productivity	Form of ownership	Renting organization	Price
Dry preparation	No machine is used, but animal power		1 ha / 10 h	oneself		
Direct seeding	No machine is used, but animal power		1 ha / 10 h	oneself		
Transportation	No machine is used, but animal power			oneself		

Use of labor force

Practices	Family labor (person / day)	Contracted labor force		
		Contract with individual labor	Contract with groups	Unit Price Peso/ha or Peso h
Chapea	1,95	3,25	9,4	260
Dry preparation	1,83	1	0	10
Puddling preparation	0,5	5	0	0
Chemical fertilizers application	2,24	2,8	22	40,45
Organic manure application	1,25	1,4	1	23,33
Direct seeding	5,06	8	0,75	39,34
Transplant	8,5	1,2	0,5	60,54
Water management	1,66	2,3	0	89,89
Weeding	1,96	2,8	0	33,2
Pesticides application	2	2,8	0	47,3
Reaping	2,87	1,8	0	201,72
Threshing	4,25	3,5	0	65
Drying	5,83	3,5	0	90,7
Others		1	0	0

Post harvest

From the moment of reaping

Wet paddy rice is stored in bulk during 45.5 days on average. In case of storing wet paddy rice in bags, the length of time is 30 days on average.

After milling

After milling, rice is stored in bulk during 50 days or in bags during 30 days on average.

The main problems affecting these activities are listed bellow:

- Shortage of bags.
- Shortage of products
- Constraints in the capacity of the existing milling machines.
- Shortage of drying facilities.

Technical assistance and capacitation

Among the surveyed producers, 47% participated at least in one training course.

Forms of technical assistance and capacity building	Number	Institution
Courses	2	IIA,UC
Workshops	4	CAI, IIA, INCA, UC
Variety collection	1	INCA;UC;CAI;EEA
Providing materials	3	CAI, INCA,UC
Field days	4	EEA,CAI, UC, INCA
Others	4	EEA,CAI,extension officer

The most pressing necessities in technical assistance and capacity building are:

- New varieties, pests and diseases, plant nutrition, water use, transplanting and mechanization.

A number of 89% of the surveyed producers wish to increase rice production in order to improve their economy and keep the family tradition.

25,5% intend to make future investments in rice production because of the following reasons:

- It is necessary to improve the irrigation system.
- To expand the areas for rice cultivation.
- To purchase irrigation pumps and other implements.

These investments will allow them to improve their family economy and to increase rice production.

The main problems are related to:

1. Insufficient inputs.
2. Shortage of agro-machines and implements.
3. Shortage of materials, mainly fuel.

6.2 UBPC and CPA

This diagnosis was carried out in the municipality of Vertientes, Camaguey province, Cuba, in order to characterize rice production. The questionnaire survey was applied in several Popular Councils in Vertientes municipality. The surveyed persons (20 in total) work in the administration of different forms of organization of land tenure in the following proportion: 75% presidents, 15% chief of economic section and 10% managers.

Basic data:

Regarding the type of organization of the production, 64% corresponds to CPA, while the remaining 36% are UBPC. Of these forms of production, 73% belong to the MINAG, while 27% belong to the MINAZ. The date of establishment of these organizations is shown bellow:

- 46% were established between 1971-1980
- 18% were established between 1981-1990
- 27% were established between 1991-2000
- 9% were established between after 2000

It can be concluded that 50% of these forms of production have experience in agriculture in general.

These organizations cover a physic area of 1625.69 ha in total, of which 1228.78 ha are arable lands. Rice cultivation is carried out in 326. 80 ha, while animal husbandry covers 901.28 ha.

Administration:

On average, the agricultural organizations are integrated by 18.81 persons: 53% of these persons are directly related to the agricultural production, while the remaining 19.13% cultivates popular rice. 73.03% work in the management sector, services, etc.

Agricultural management

Agricultural management is carried out both as monoculture of rice (63% of the producers) and cultivation combined with cattle, roots, grains and vegetables.

Crop rotation is made by 55% of the producers, mainly with roots (1), grains (2, maize), vegetables (3) and pastures (4). 65% of the producers carry out crop rotation in the dry season (Nov.-April), while the remaining percent prefer the rainy season (May-Oct.). Those producers who do not follow crop rotation every year prefer to carry out this practice once 2 to 5 years.

Land renting for popular rice production.

Only 10% of the organizations offer part of their areas as land renting for popular rice production, during 0.5 years, with areas ranging in size from 2 to 30 ha. The form of payment is based on the 10% of the production (payment in kind). The number of members ranges from 4 to 36 persons and the number of contracts is from 2 to 6. The average rented areas cover from 2 to 14 ha.

82% of the members get rented lands from the organization (from 14 to 40 ha during a period of 6 months to 1 year). The form of payment is in kind (5 to 15% of the production).

The cultivation area ranges from 1 to 3 cab (13, 42 -40, 26 ha); other crops, mainly roots, vegetables, grains and pastures are cultivated in other areas. During the rainy season, seeding takes place in May and reaping in November, while seeding in the dry season takes place in November and reaping in May.

Agricultural production

The amount of rice harvested in the rainy season is 12 000 qq reaching a yield of 4000 qq/cab, while in the dry season the amount is 13 800 qq at a yield of 4 600 qq/cab. The average production of grains is 1800 qq at a yield of 600 qq/cab. The average production of roots is 12 000 qq at a yield of 4 000 qq/cab.

Destiny of rice production

The amount of rice fixed for non-specialized contract (CAI) is 4 644 qqs (paddy) at a price of 120 pesos MN/qq. A total amount of 9 546 qq of white rice is used for the organization's consumption at a price of 1.20 pesos MN / pound.

Agro-machinery

Fifteen producers use agro-machine; the number of tractors and the capacity is as follows: 16 tractors of light capacity, 1 tractor of middle capacity and 10 tractors of heavy capacity. These machines have been used for the following periods:

- light tractors have been used for 10 to 25 years

- middle tractors have been used for 12 years
- heavy periods have been used for 20 to 25 years

Agro-machines are only used inside the production unit.

- 73 % have agro-machine for rice production, of which 54% have plow, 63% harrows, 36 % land plane, 30 % ditchers and 36 % other implements.
- Harvesters (54 %) have been used for 27 years. Only 9% of the organizations hire the harvester from producers from outside the organization and 18% rent the harvester to outside producers.
- The existing tracks and vans (69%) have been used for 20 years. Only 18% rent these machines to outside producers.
- Irrigation pumps: 9% are electrical pumps, while 18% require diesel. These equipments have been used for 22 years. Only 18% are exclusively for the organization.
- Other equipments. Milling machines (9%) used for 15 years.
- Workshops. 46 % of the organizations hold their own workshops, but without machine tools.
    - 19 % of the workshop's personnel are mechanicians.
    - Workshops do not offer any service to other producers.
    - The shortage of tools is one of the main constraints in the workshops.

Irrigation and drainage

Irrigation in rice cultivation is practiced by 73% of rice producers, of whom 63% use surface water (27% of these producers get the irrigation water from Jimaguayu dam).

As for the energy sources, 47% use gravity system, 27% use diesel pumps, and 9% use electric pumps. The capacity of the pumps ranges from 8 inches to 12 inches.

The irrigation area in 2003 covered 702.16 ha: 400 ha in the dry season and 302.16 ha in the rainy season. Regarding the upland areas (secano), the administrative personnel have not provided the data.

There are 400.2 ha with enough irrigation. However, there is shortage of the water volume, mainly due to the long drought.

Drainage: 67% of the administrative personnel affirmed that drainage is available in their rice areas; 9% affirmed that there are problems with drainage (400.2 ha in total) such as lack of maintenance in the systems, which hinder the use of agro-machines.

Soils

Soils: 47.82 % of the areas are located in light soils, while 13.04 % in light-heavy and 39.14 % in heavy soils.

Agricultural practices of rice

The cultivation area in the rainy season is 135 ha, while in the dry season it is 428 ha.

Double-rice cropping is not practiced. 36% of the surveyed producers intend to introduce double-rice cropping. However, 18% of the surveyed producers do not cultivate rice in the dry season because of the shortage of water, fuel, agro-machines and other inputs.

Direct seeding is applied in 483 ha. In the dry season, 443 ha are cultivated, while 80.6 ha are cultivated in the rainy season. 28% of the seeding is made manually and 72% by using agro-machines, from which 18% using airplane.

Soil preparation is practiced as follows:

- 63% by using dry-dry technology
- 18% by using the dry-puddling technology
- 9% by using the dry-disinfection technology

The method of broadcasting with pre-germinated seeds is used by 9% of the surveyed producers, and the rest of them apply jet direct seeding (chorrillo).

18% of the surveyed producers will continue with the seeding method used at present due to the following reasons:

- They have experience in this agricultural practice.
- It is easier, more convenient.
- They think this method is more effective.

They know this technique from CAI (9%) and from other producers (45%).

Those intending to change their method to transplanting consider that rice production can be increased through this technique, though they think that the demand of labor force will be a constraint.

9% of the surveyed producers know about transplanting from CAI. The main problems to change to other technologies are related to the following aspects: lack of knowledge, shortage of material and human resources.

Regarding the use of fertilizers and herbicides:

Chemical herbicides are used by 63% of the surveyed producers.

27 % of them do not weed manually. Herbicides are applied as follows: through the irrigation water, by using terrestrial agro-machines, by airplane.

45 % apply fertilizers before seeding, while 55% apply fertilizers during the growth of the crop.

Transplanting

16% of the surveyed producers do not apply herbicides, 9% weed manually, 9% do not apply fertilizers neither before transplanting, nor during any other stage of the crop.

Agricultural practices

Agricultural practices of direct seeding take place during 3 to 12 days from March to July.

Seeding in winter lasts for 10 to 12 days (December-Feb.).

Concerning nursery planting and transplanting, the surveyed producers were not able to provide data about the intervals between the different agricultural practices, mainly due to water availability.

The harvest corresponding to the spring crop takes place between July and November during 3 to 6 days. On the other hand, the harvest corresponding to the dry season (winter) takes place between May and August during 5 to 30 days.

Seeds

72% of the surveyed producers use certified seeds. Among them, 72% do not produce the seeds. 81% buy rice seeds from CAI (168 qq per producer on average) at an average price of 23.7 pesos / quintal.

73% get certified seeds every year, which is renewed yearly.

18% uses non-certified seeds. 9% is self-produced and 9% buys from CAI at an average price of 20 pesos/qq (30 qq/producer).

Rice varieties used:

- Reforma,
- Perla,
- IACuba- 25
- J-104.

Fertilizers for rice:

64% of the surveyed producers apply chemical fertilizers (urea, phosphorus, potassium) at a dosage ranging from 89 to 164 kg/ha (total amount 36 000 kg). On the other hand, 81% do not apply organic fertilizers. From the 19% applying organic fertilizers, 9% do not produce by themselves; they think that the amount is not enough.

Herbicides

The types of herbicides applied are Propanil and hormonal herbicides. 45% of the surveyed producers do not apply any herbicides.

Insecticides for rice

88% of the surveyed producers do not apply insecticides, while the remaining 12% apply Cipermetrina and Tamaron.

Only 10% of the surveyed producers apply fungicides.

Fuel

54% of the surveyed producers do not get any fuel; 46% of them get 8025 litters at a price of 0.29 pesos/litter.

Use of agro-machine

For weeding, a tractor (Jum-6 type) is used, requiring 240 litters of fuel / working day and bearing a productivity of 2.63 ha/h.

For dry-preparation, the same type (Jum-6) and another tractor (T-150) are used, requiring an average of 1476 litters of fuel /working day and bearing a productivity of 4.6 ha/h. Some machines belong to the producers themselves, while other implements must be hired.

For the harrow, Jum-6 type tractor is used, requiring 58 litters /cab and bearing a productivity of 0.7 Cab / day.

Chemical fertilizers are applied by airplane at a cost of 1700 pesos/cab.

Direct seeding is done by airplane at a cost of 1700 pesos/cab. Seeding machines and tractors are also used, requiring 204 litters of fuel and bearing 0.6 ha/h; some of these equipments belong to producers themselves.

Irrigation is carried out by using diesel pumps. The data on fuel consumption and productivity are not available.

Weeding is carried out by using tractors, requiring 100 litters of fuel and bearing a productivity of 1.2 ha/h. Airplanes are also used at a cost of 1700 pesos/cab.

Pesticides are applied by airplane at a cost of 1700 pesos/cab. Tractors are also used, applying 32kg/cab and bearing a productivity of 2.63 ha/h.

Reaping is carried out by harvesters, requiring 4592 litters and bearing a productivity of 5.5 ha/h.

Tractors are used for transportation, requiring 250 litters of fuel.

Threshing is carried out by using harvesters and milling machines, requiring 450 litters of fuel.

Drying is practiced manually.

Milling is carried out by using mills.

Manual labor force

For dry preparation, 18 individual laborers are contracted per day, with an average wage of 20 pesos/h.

For chemical fertilizers application, airplane is used as equipment, while the labor force is 21 laborers /day on average, with a wage of 250 pesos/h.

For the application of organic fertilizers, airplanes are used too, while the number of laborers is 10/day on average.

For direct seeding, which is carried out by airplane, seeding machine and tractors, the number of laborers required is 10/day, with a wage of 15 pesos/h.

For transplanting, there is no data about the use of labor force.

For water management, the number of laborers is 4/day, with a wage of 11 pesos/h.

For weeding, which is practiced by using airplanes and tractors, the number of laborers is 8/day (4 laborers for the airplane and 4 for the tractors), with a wage of 250 pesos/h.

For pesticides application, practiced by airplane, the number of laborers is 4/day, with a wage of 250 pesos/h.

For reaping, the number of laborers is 14/day, with a wage of 50 pesos/ha.

In case of manual reaping, the number of laborers for threshing is 6 / day, with a wage of 8 pesos/h.

For drying, in case of using mills, the number of laborers is 20/day on average, with a wage of 12 pesos/h.

Post-harvest

After reaping, wet paddy rice is stored in bags during 90 days on average; in case of storing in bulk, the length of time is one year.

After milling, white rice is stored in bags for 2 months.

For the control of pests and diseases, 55% of the surveyed producers apply chemicals to control insects and rodents. Mechanical control is also practiced by using hand-made traps and baits.

Technical assistance and capacity building

In 2003, 18% of the surveyed producers were trained during short courses offered by CAI Ruta Invasora.

The most urgent aspects that require technical assistance and capacity building are listed bellow:

1. Pests and diseases
2. Irrigation and drainage
3. Agro-machines
4. Transplanting technology.

As for the future plans in rice production, 37% of the surveyed producers intend to increase rice production, mainly in order to improve the economical condition of the family.

Future investments: 50% of the surveyed producers consider the necessity of investing in water management (water storage, distribution and water supply), as well as infrastructure and agro-machines for expanding the cultivation area.

The most critical problems for producers in rice cultivation are as follows:

1. Insuffient water volume.
2. Shortage of fuel.
3. Agro-machines for land preparation, reaping, threshing and drying.
4. Inputs.
5. Equipments for rice cleaning and storage.