資料14. National Rice R & D Program (PhilRice)

Department of Agriculture
PHILIPPINE RICE RESEARCH INSTITUTE
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NATIONAL RICE R&D PROGRAM

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II. **IMPLEMENTING AGENCIES** : **Philippine Rice Research Institute (PhilRice)**
University of the Philippines Los Baños (UPLB)

III. **COOPERATING AGENCIES** : Member-agencies of the National Rice R&D Network
12 - Regional Research Centers
37 - Cooperating and Testing Stations

IV. **COORDINATING AGENCIES** : Philippine Rice Research Institute (PhilRice)
Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD)

V. **DURATION** : 1997-2001

VI. **RATIONALE :**

Rice is considered as the major commodity in the country. It is the staple food of 80% of our people while 70% is directly dependent on rice farming and marketing for livelihood.

Although rice is the "bread of life" of our people, production has not been able to consistently meet their needs. Thus, importation was resorted to except in few instances in the past where sizeable volume had been exported.

This supply-demand situation does not imply that production has not been increasing in spite of the fact that several problems beset the local rice industry. Among others, the yearly production increases of 1.3% in recent years are far less than the 2.5% population growth rate, the highest in Southeast Asia. With the growing population, it is expected that the per capita rice consumption will further increase from 91 kg in 1992 to 100 kg in 1998.

While the priority areas under the DA's Gintong Ani Program (formerly GPEP) are the irrigated areas in rice producing provinces, the Key production area (KPA) approach of IRDP for rice research and technology promotion will cover not only the suitable sites but also the marginal areas in the major rice-producing provinces.

Environmental and economic issues are considered in giving priority to research in adverse areas. Although the irrigated areas may be sufficient resource base to supply the country's rice demand, the degrading condition of the country's watershed areas is expected to limit the expansion of potential irrigable areas. This problem is likely to create uncertainties in relying on the country's irrigation resources. This scenario will bring about possible shortfall in the target increases in rice production.

Experiences also suggest that farmers in rainfed lowland and other marginal areas who have been using traditional farming methods for years would make an abrupt shift to plant high value crops. Therefore, rainfed lowland remains as an important resource base with social and economic significance.

The success of these R&D activities would certainly need strong and sustained technical and financial support, coupled with a favorable policy environment designed to promote a globally competitive rice farmer.

VII. PROBLEMS OF THE RICE INDUSTRY

1. Declining production

Rice production growth gradually declined after the mid-80s owing to the continued emergence of biological and socioeconomic problems. For instance, new strains and biotypes of rice pests have developed. Palay prices failed to catch up with the soaring costs of production. . Reduced hectarage, due to urbanization and industrialization, poor maintenance of irrigation facilities, and post harvest losses contributed to this decline in production growth rate. Burgeoning population and regular occurrence of natural calamities such as floods and droughts compounded these problems.

2. Problem soils

There are 1.2 million hectares classified as problem soils; this is about one-third of the national rice harvested hectarage. Of this problem soils, 600,000 hectares have adverse water and nutrient conditions, 100,000 hectares are saline-prone, 10,000 hectares are alkaline, 15,000 hectares have peat soil, and 500,00 hectares have acid sulfate soil.

3. Declining hectarage

Urbanization in major rice-producing areas has been leading to an increasing conversion of agricultural lands into industrial and residential areas. This trend leads to an increasing decline in hectarage planted to rice. The recent technological breakthroughs in production remain insufficient to assure a steady rice supply, partly because of a reduced rice hectarageUrban bias pricing policy

4. Urban bias pricing policy

While government rice programs have been successful in increasing rice productivity, it is ironic that the majority of small Filipino farmers remain below the poverty line. A critical factor behind the shrinking income of small farmers is the inadequate marketing support for rice, especially the government's pricing policy. While it has been an avowed policy of government to maintain an equitable rice price for both producers and consumers, it has only been successful in favor of the latter, especially the Metro Manila residents. The increase in rice prices has been much slower than that of the Consumer Price Index.

VIII. TECHNOLOGY STATUS/NEEDS ASSESSMENT

1. Varietal Development

There are already 60 rice varieties approved by the National Seed Industry Council (formerly the Philippine Seed Board) from 1974 to 1995. Out of these, 51 are adopted for irrigated lowland, 7 for the upland, and 2 for the rainfed (dry-seeded) areas.

Despite the availability of several high-yielding varieties (HYVs), there is still a need to enrich our rice germplasm collection to serve as the genepool from which plant breeders can draw desirable traits/genes needed in the national rice-varietal improvement program. So far, a total of 4,000 germplasm materials obtained both locally and from abroad are now being maintained at the PhilRice Central Experiment Station.

Continuous effort in the development of superior varieties suited to both favorable and unfavorable environments must be done to counteract biological pressures and natural calamities which have almost negated the gains achieved in rice production.

The emerging world economic environment is also exerting upon us to be more efficient and globally competitive in our rice production system. In addition to seeking higher yield, there is a need then to develop rice varieties that can be used for other purposes (against biological pressures and natural calamities) and which have also high export potential.

2. Planting and Fertilizer Management

Fertilizers have so far accounted for 50% of the increase in crop yields. Several general recommendations for organic and inorganic fertilization for rice are already available. However, location-specific fertilizer recommendations must be accurately established. Among others, this can be achieved through the conduct of studies that correlate and calibrate analytical test value with rice yields.

A complete soil taxonomic classification in the country at the family level is also an important tool for correlating and predicting the adaptability of the soil not only for rice but also for various crops grown after rice in different locations. Soils with similar taxonomic classes would have high probability of giving similar responses to management and production potential.

The high cost and poor agronomic efficiency of fertilizers are also major constraints to rice production. Only about 40% of applied nitrogen (N) is actually used by rice because of losses through volatilization, leaching, and run-off. It is therefore necessary to develop varieties with high N-utilization efficiency as well as continue researches to improve the existing cultural practices.

Intensive cropping has increased rice production but later on resulted in a gradual decline in the soil's essential micronutrients and grain yields. Thus, the use of organic fertilizers is advocated for rice production so that the combination of inorganic and organic fertilizers or the transition from inorganic to organic fertilizers will improve the quantity and quality of crop yields.

3. Integrated Pest Management (IPM)

The past 10 to 15 years of research and development efforts in pest management have been witness to the development of rapid, although often incoherent, changing and even conflicting concepts of IPM in the Philippines. At present, the ecology-based IPM perspective brings with it fresh insights and foresight to an encompassing, enriching, and healthy approach to pest management on the next five years and beyond.

The research agenda should adapt and promote the IPM perspective which: a) views the rice farm as an ecosystem emphasizing the need to understand pests and ecologies in both crop and non-crop areas, b) promotes and maintains the essential role of naturally occurring biological control mechanisms inherent in well-established tropical agroecoystems, c) encourages the healthy blend of host plant resistance and cultural practices that enhance the effectiveness of naturally occurring biological controls, d) adopts a farm-need driven research orientation, e) fosters and adopts an interdisciplinary-oriented approach, f) strengthens farmers' capability for decision-making, and g) promotes and develops community-oriented pest management.

4. Rice-based Farming Systems

A number of technologies have been generated for rice-based farming systems. The bulk of these technologies deal with cropping patterns and crop combinations such as in sequence cropping and relay cropping. A serious effort to gather all these data nationwide and further evaluate the adaptability of technologies in other areas should be considered in order to develop sustainable cropping systems and increase total productivity.

5. Grain Quality Evaluation/Assessment and Product Development

Grain quality evaluation is one of the major factors considered in recommending rice lines as rice varieties. This includes physical and physicochemical analyses, determining cooking parameters, and sensory evaluation in place of a consumer panel. All these activities have contributed to the development of new varieties with good eating qualities and high consumer acceptability.

The continuing and increasing demand for high quality rices necessitates the development of new varieties. Thus, grain quality research has to continue to develop simple and faster methods that will increase screening efficiency. In addition, more sensitive methods of detecting the differences in grain quality characteristics among rice cultivars will also be given due consideration.

To maximize the benefits derived from rice, equal attention should be given to product development. Grain qualities of rice suitable for processing into rice food products should be established. Consequently, processing of the products will not only generate additional employment but also increase competitiveness of rice in the local and export market.

6. Production and Postharvest Losses and Farm Mechanization

Rice production is becoming expensive as a result of high labor requirement, and increasing farm wage and costs of other inputs. In addition, high postharvest losses also result because of inefficient and traditional methods that have not changed very much for decades.

The use of farm equipment makes labor utilization more efficient and more productive while minimizing the drudgery involved in critical operations such as land preparation, crop establishment, and harvesting. Because labor is difficult to find during peak periods of operation, mechanization offers the conduct of field operations in a timely and efficient manner.

The use of postharvest and processing equipment also enhances the quality of farm produce; this results in minimum losses while also increasing the value of the product.

It is therefore necessary that research and development dealing on production and postharvest losses will lead to the provision of improved methods and equipment designs that will make rice production and postharvest easier, more efficient, and more pleasant for Filipino farmers.

7. Social Science and Policy Research

While much socioeconomic research on rice has been done in the past, research efforts and output have trickled in recent years. Recent efforts have been too spotty

to provide comprehensive understanding of deeper socioeconomic issues in the rice economy.

PhilRice in collaboration with BAS have so far accomplished the gathering and preliminary processing of farm-level data on all of the identified rice KPAs in the country. These data and information sets are now available for utilization by rice researchers and policy makers.

Several policy studies and initiatives have also been conducted toward the evolution of a policy advocacy program for the rice sector, particularly on issues such as local palay prices, supply, government buffer stocking and market-intervention operations, implication of the GATT and expanded VAT on the industry.

At present, there is a need to comprehensively evaluate the rice processing/marketing/distribution in the country particularly in terms of costs efficiency and level of competitiveness in view of the GATT. The efficiency and opportunities on the off- and non-farm agribusiness sectors as well as the technology demand and requirements should be studied. Similarly, consumer preferences need to be integrated into the whole R & D process to attain an efficiently market-oriented economy.

8. Technology Promotion

With the devolution of the extensionists of the Department of Agriculture to the local government units, majority of whom are biased towards short-term and impact-generating programs/projects (usually outside of agriculture), a gap between the research institutes to farmers have been unintentionally created. The technicians themselves have been severed of information and updated technologies as a result of the new orientation, LGU priorities, and organization/management. This has resulted to reduced quality of extension and technology promotion. While R&D units/institutes have been continually active in generating and improving technologies for farmer application and adoption, LGU technicians are simply not ready in promoting these because of lack of/limited access to the technologies and to the Department of Agriculture's research units, inadequate support from their mother LGUs, or lack of mechanisms between the LGU and the R&D units for a sustainable technology promotion.

Thus, there is an urgent need for integrating and demonstrating sound, acceptable, and viable technologies in partnerships with both farmers and LGUs.

Feedbacks to the rice research and development system on the strengths and constraints to the adoption of recommended rice-based technologies have to be gathered and systematized. Technologies developed and practiced by farmers have to be documented and validated.

Training as a promotion strategy have to place emphasis on a) designing, evaluating, and developing appropriate training modules, methodologies, materials, and curricula; b) training a critical mass of subject matter specialists, researchers, and extension workers from the LGUs, and farmer-leaders, and c) strengthening a network of trainers that can respond to local needs and provide feedback.

Promotion through communication shall focus on: a) communicating rice-based information and technologies to farmers, b) developing appropriate media-based educational/learning strategies and materials, and c) designing feedback mechanisms to the rice research and development system.

Seeds, the center of these promotional activities, shall also be strengthened, through a focus on the seed production and health. Breeder and foundation seeds shall be produced, seed processing and distribution shall also be improved, while a seed health unit shall be established to ensure that the seed for distribution will be of high quality.

IX. R AND D GOALS/OBJECTIVES

General Objective

To promote/enhance and sustain rice production as well as improve the livelihood of rice farmers in the country.

Specific Goal and Implementation Strategies of each Program

1. RICE VARIETAL IMPROVEMENT (RVI)

GOAL: Developed stable, high-yielding, and pest resistant varieties for irrigated lowland and fragile ecosystems.

SPECIFIC OBJECTIVES	STRATEGIES
• Irrigated Lowland Ecosystem	• Interdisciplinary approach

⇒ 7.5 t/ha
⇒ 15% higher for hybrid rice

- Fragile Rice Ecosystem
  ⇒ Location specific release of varieties
  ⇒ Rainfed lowland rice - 4 t/ha
  ⇒ Upland rice - 3.5 t/ha
  ⇒ Adverse soil conditions - 3 t/ha
  ⇒ Cool elevated areas - 3.5 t/ha
  ⇒ collaboration with other disciplines
  ⇒ specialization on breeding for specific breeding targets
- Utilize biotechnology
  ⇒ marker-aided selection and backcrossing
  ⇒ rapid generation of breeding lines
  ⇒ gene transfer from wild species
- Mobilize network members
  ⇒ tackle location-specific problems
  ⇒ location-specific recommendation/ release of varieties

2. PLANTING AND FERTILIZER MANAGEMENT (PFM)

GOAL: Developed resource-use efficient and environment-friendly technologies that will improve yields in less productive environments and sustain yields in high-yielding environments

STRATEGIES

- Identify soil and crop management constraints to high yields
- Formulate location-specific crop establishment and fertilizer recommendations
- Generate more information on intensive cropping technology
- Assess impact of developed technologies on environmental quality
- Integrate and package appropriate technologies for high productivity

3. INTEGRATED PEST MANAGEMENT (IPM)

GOAL: Validated, demonstrated, and fine-tuned appropriate location-specific pest management approaches that will improve and sustain rice yields

while maintaining a reasonable level of environmental stability and public health and safety.

STRATEGIES

- farm-driven research orientation
  ⇒ emphasis on the rice farm as an ecosystem
  ⇒ understanding pest ecologies in both crop and non-crop areas
- maintaining the role of naturally-occurring biological control mechanisms
- encouraging healthy blend of host plant resistance and cultural practices and enhance the effectiveness of biological control mechanisms
- interdisciplinary approach
- strengthening farmer capability of decision-making
- developing and promoting community-oriented, participatory pest management approaches

4. RICE-BASED FARMING SYSTEMS (RBFS)

GOAL: Developed sustainable cropping systems and low cost management practices to expand income opportunities from rice and rice-based crops.

STRATEGIES

- Identifying opportunities and constraints in the improvement of rice farming systems
  ⇒ partially irrigated rice growing areas
  ⇒ rainfed rice growing areas
  ⇒ upland rice growing areas
- Undertaking research and development strategies to overcome identified constraints
- Identify, develop, and package suitable cropping systems to increase and sustain production of resource-limited rice and rice-based agro-ecosystem

5. RICE CHEMISTRY AND FOOD SCIENCE (RCFS)

GOAL: Undertake grain quality evaluation for table rice and food products, enhanced market potential of rice, rice food products, and by-products

through the establishment of data base for rice and potential products, consumer market research, and technology development/adaptation with industry linkage.

STRATEGIES:

- Networking for information
- Adoption of multidisciplinary or team approach in collaboration with the breeders in the development of improved rice varieties and with the industry in technology commercialization
- Strengthening of manpower development program
- Engaging of services of multisectoral advisory group (industry, academia, government, consumers) to provide technical directions and periodic assessment of the program
- Collaborative studies with other institutions

6. RICE ENGINEERING AND MECHANIZATION (REM)

GOALS: Developed technologies that reduce postharvest losses and equipment for processing rice and its by-products, and low-cost, appropriate and indigenous farm equipment that increase the efficiency of the use of labor and other inputs

STRATEGIES

- Developing/improving equipment through:
  - ⇒ consultative and participatory machine design
  - ⇒ interdisciplinary and interagency approach to development and testing
  - ⇒ exchange of designs/prototypes with other national/international agencies
- Strengthening CPRIME to facilitate popularization of new technologies
- Linking with farmers' foundations and cooperatives for verification and/or immediate adoption of technologies
- Training and technical assistance to cooperating manufacturers

7. SOCIAL SCIENCE AND POLICY RESEARCH (SSPR)

GOAL: Contributed to the development of the rice industry characterized by efficiency, competitiveness, and sustainability, nurtured by a sound policy environment through pro-active social science research and policy advocacy.

STRATEGIES

- Evaluation for efficiency and opportunities: the off- and non-farm agribusiness sectors in view of the GATT
- Provide for a rationalized, integrative and multidisciplinary framework for rice R&D prioritization
- Exert efforts to influence public policy on rice at national and local government levels
- Publication, dissemination, and/or popularization of research findings

8. TECHNOLOGY PROMOTION PROGRAM

GOAL: Improved competence of the rice industry's manpower through training and on-farm technology demonstration; promoted sustainable and location specific rice farming technologies developed in partnership with farmers; increased farmers' access to information and sustainable technologies; and involved farmers in setting rice R&D agenda.

STRATEGIES

- Involving of GOs, LGUs, and NGOs in disseminating information and technology to farmers, particularly organized beneficiary groups
- Developing working linkages with other development agencies such as TLRC, DBP, DA, SCUs, LGUs, and other organized groups
- Emphasizing development or capacity enhancement of clients through training
- Using multi-media channels of communication

X. PROGRAM ORGANIZATION AND MANAGEMENT

- PhilRice to be fully responsible in the implementation and funding of rice researches in the Philippines
- PCARRD to assist in the coordination and monitoring activities and also in the provision of a reasonable amount of budget for the implementation of some projects on rice
- The National R&D Network to assist in implementing the activities of the rice researches in the localities to answer local needs and problems.

NATIONAL RICE R&D PROGRAM
(1997-2001)

Title of Program		Budget (P'000)		
		1997	1998-2001	TOTAL
Prog. 1.	RICE VARIETAL IMPROVEMENT PROGRAM	26,980	195,152	222,132
Prog. 2.	PLANTING AND FERTILIZER MANAGEMENT PROGRAM	12,715	121,847	134,562
Prog. 3.	INTEGRATED PEST MANAGEMENT PROGRAM	16,538	71,793	88,331
Prog. 4.	RICE-BASED FARMING SYSTEM	3,692	25,160	28,852
Prog. 5	RICE CHEMISTRY AND FOOD SCIENCE	6,339	37,897	44,236
Prog. 6.	RICE ENGINEERING AND MECHANIZATION	14,238	83,691	97,929
Prog. 7.	SOCIAL SCIENCE AND POLICY RESEARCH	6,253	31,070	37,323
Prog. 8.	TECHNOLOGY PROMOTION PROGRAM -	23,151	246,523	269,674
Prog. 9	SEED PRODUCTION AND HEALTH PROGRAM	10,356	54,224	64,580
	GRAND TOTAL	120,262	867,357	987,619

SUMMARY OF INTEGRATED RICE R & D PROGRAM

Table 1. Summary of Integrated Rice R and D Program

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
Prog. 1. Rice Varietal Improvement Program			
Proj. 1.1 Rice germplasm collection, evaluation, conservation and documentation	PL Sanchez TH Borromeo	Rice breeding materials are being collected both locally and abroad to serve as genepool whereby desirable traits/genes needed in the rice varietal improvement program can be drawn.	Breeding materials collected, documented, utilized, and conserved.
1.2 Development of irrigated lowland rice varieties	E Redona TF Padolina	Irrigated lowland rice varieties that would contribute towards an attainable stable yield of 7.5 tons, with excellent grain quality and stable pest resistance are being developed.	High stable yield, excellent quality, and pest resistance
1.3 Development of new plant type	LS Sebastian D Tabanao	The project is determining the genotypic variations in nitrogen uptake among indica x japonica lines, and evaluating the nitrogen use efficiency of each line/variety in terms of rough rice yield, spikelet density and leaf area index.	Improved rice
1.4 Development of F1 hybrids and related technologies	JC de Leon IA dela Cruz	The development of F1 hybrids that have a yield advantage of at least 15% over the best pure lines (by maturity class); and the development/introduction of technologies that will make hybrid rice production commercially profitable are being undertaken.	F1 hybrids and its technologies developed
1.5 Development of rice varieties for special purposes	NM Tepora ER Corpuz	Rice varieties that are glutinous or aromatic with special characteristics for various purposes like traditional food products are being developed.	Improved rice for special purpose
1.6 Development of rainfed lowland rice varieties	VC Andaya TG Alvaran	Rice cultivars adapted to rainfed lowland and drought-prone environment are being developed.	Improved rice varieties for rainfed areas
1.7 Development of location specific upland rice varieties	VC Andaya L Sta. Ines	Upland rice observation nurseries hybridization, and selection and preliminary yield trials are being established to evaluate promising rice selections to upland culture.	Improved rice varieties for upland areas
1.8 Development of lowland rice varieties adapted to adverse soil conditions	P Bonilla B Gamiao	The development of varieties that are tolerant to certain range of adverse soil condition (e.g. saline), have a yield of 3 tons/ha with medium plant height, and early maturing are being considered.	Rice varieties tolerant to saline areas
1.9 Development of rice varieties for the	TF Padolina	Breeding materials that are adapted to cool elevated areas and	Rice varieties for cool

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
cool elevated areas	HG dela Cruz Jr.	are suitable for planting during the dry season (tolerant to low temperature at seedling stage) and wet season (tolerant to low temperature at the reproductive stage) with good characteristics are being evaluated.	elevated areas
1.10 Utilization of molecular marker technology for rice improvement	LS Sebastian D Tabanao	Marker aided selection techniques are being developed to hasten the transfer of agronomically important traits in rice. The project is using molecular markers to map: 1) genes conferring resistance to rice tungro spherical virus and rice tungro bacilliform virus in different donor varieties, 2) quantitative traits affecting yield and develop, and 3) genes affecting seedling vigor. PCR-based marker aided selection in transferring resistance genes are also being developed and applied.	Mapped RTD resistance genes, QTLs, seedling vigor genes, PCR-based MAS
1.11 Utilization of in-vitro techniques for rice improvement	N Desamero CB Andaya	Double haploid lines are being produced from heterozygous materials for cold tolerance, salt tolerance, and good grain quality. Optimizing anther culture parameters, determining genetic variability and stability among and between double haploid lines, and seed increase and observational nursery for anther culture are being conducted.	DH lines for testing in saline and cool elevated areas
1.12 Transfer of desirable rice genes from wild species through wide hybridization	AA Alfonso	The transfer of resistance genes (tungro, sheathblight, stemborer) to cultivated backgrounds are being done.	Transfer of desirable traits from wild to cultivated species
1.13 Genetic transformation for crop improvement	RR Aldemita	The project will develop an *agrobacterium*-mediated transformation-mediated system at PhilRice; develop rice varieties with resistance to fungal diseases; and will analyze the genetic of mutant lines derived from NMY treated IR22 for green leafhopper resistance.	Rice varieties resistant to fungal diseases developed
1.14 Generation of genetic variability using physical mutagenesis	CB Andaya TF Padolina	The physical mutagenesis needed in the development of varieties/lines with improved resistance to pests (stemborer, tungro, sheath blight, blast) are being generated.	Genetic variations of varieties/lines generated
1.15 National cooperative test for rice - yield trial		Major activities being done include testing, evaluation, and recommendation to the National Seed Industry Council (NSIC)	NSIC approved varieties

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
1.51 Coordination 1.52 Yield	AM Galvez TF Padolina	of improved rice selections as varieties for cultivation; produce and maintain breeder seeds of approved varieties.	
1.16 Development of breeding lines for tungro resistance	LS Sebastian GV Maramara	Rice lines/varieties that are resistant to rice tungro spherical virus (RTSV) and to green leafhopper (GLH) are being developed and studied.	Tungro resistant varieties developed
1.17 bacterial leaf blight and blast resistance	LS Sebastian G Maramara	Screening of early and advanced generations of lines derived from crosses between bacterial leaf blight and blast resistance are being done to produce outstanding rice cultivars.	Breeding lines with resistance to leaf blight and blast
1.18 Screening of lines or selections for resistance to major insect pest	CD Adalla	The reaction of introductions, collections, potential parents, and uniform lines to brown planthoppers (biotypes 1, 2, and 3), stemborers and green leafhoppers are being evaluated.	Reactions of the collections, potential parents to major pests evaluated

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
Prog. 2. Planting and Fertilizer Management Program			
Proj. 2.1 Rice-soil resources inventory and evaluation	TM Corton RB Badayos	The project is undertaking the ff: 1) establishment of soil data base, productivity map, and rice-farm resources information data bank; 2) validation of the modified Roger's Productivity Model for nationwide application/adoption; 3) characterization and classification of pedons representing major soil series and its variants grown to rice; 4) characterization of climatic parameters important to the growth of rice; and 5) description of common farming activities in selected farms.	Soil map; rice farm resources data bank; and productivity map
2.2 Crop establishment for direct seeded and transplanted rice (Cultural practices for efficient and high yield production)	RT Cruz EF Javier	Combination of variety and agronomic management which are efficient and can give high yield are being studied.	Package of soil and crop management technologies for increased yields and efficiency
2.3 Integrated nutrient management in irrigated lowland rice	WN Obcemea	Economically viable and environmentally sound technologies are being packaged to sustain yield target through efficient and improved nutrient management (through nutrient cycling, intensified cropping, and correct timing of N application). New fertilizer formulation are also being explored.	Nutrient management technology to: 1) increase yield in intensively cropped areas 2) sustain yield in high yielding areas; 3) combination of organic and inorganic fertilizer to have nutrient cycling
2.4 Systems analysis and simulation	RT Cruz RR Pamplona	The project is involving management, plant and weather parameters as inputs in the ORYZA1 models to predict potential rice yields. This aims to 1) establish potential yields of some PSB rice varieties and advanced breeding lines; 2) identify plant traits which are associated to increasing the rice potential yield using the ORYZA1 crop simulation model; 3) gather data inputs for the model; and 4) evaluate and test the results of the model.	Simulated potential yields of rice varieties and breeding lines in different test environments; plant traits associated with potential yields identified

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
2.5 Reversing trends of declining productivity in intensive irrigated rice systems	PC Sta Cruz SR Serrano	A new approach is being developed to help farmers adjust the amount of applied nutrient inputs; and to provide a baseline data on Soil Nutrient Supplying Capacity (SNSC) and Total Factor Productivity (TFP) achieved by farmers. This can be used to evaluate the relationship between TFP and soil quantity, and quantify trends in productivity and soil quality in future years.	Baseline data on SNSC and TFP and trends in productivity quantified
2.6 Rainfed lowland rice research consortium	PC Sta Cruz SR Francisco	Appropriate nutrient management are being developed and generated for rainfed lowland rice under different crop sequences; accompanying or additional cultural management practices are being identified to synergistically contribute to efficient nutrient utilization for high crop productivity.	Appropriate nutrient management for rainfed lowland, additional cultural management practices generated or developed
2.7 Methane emission from irrigated rice	TM Corton JB Bajita	Methane fluxes in irrigated rice fields is being determined at Maligaya as affected by current and advanced cultivation technologies; the processes that control methane formation, oxidation, transport are being evaluated in irrigated rice fields in the Philippines; and the mitigation measures are being identified to reduce methane emission in irrigated rice fields and maintain high yield targets.	Methane emission data in continuously irrigated Maligaya clay under different crop management; technologies on reduced methane emission while maintaining target yield generated
2.8 Improvement of efficiency and environmental impact of N fertilizers in irrigated rice cropping (Efficiency and environmental impact of nitrogen fertilizers)	TM Corton W Obcemea	The project is currently undertaking the studies to increase the nitrogen fertilizer use efficiency in cropping systems in Asia, particularly on rice, reduced environmental degradation; and sustainable improvement in crop production, through efficient management of plant nutrition.	Nitrogen balance sheet; technology that will increase nitrogen use efficiency and will reduce losses of nitrogen as N_2O, NH_3, N_2 and NO_3^{-1}, leaching in groundwater
2.9 Management of rainfed lowland rice (Rainfed lowland rice research in Tarlac and Nueva Ecija)	RT Cruz JP Quilang	Interaction of genotypes and management with the environment of specific growing site are being carried on in this which aim to: 1) quantify variation in indigenous nutrient supply; 2) understand the relative importance of nutrients and	Location-specific soil and crop (variety) management technologies

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
		water as limitations in the rainfed lowlands; and 3) examine the potential of using strategic application of nutrients to buffer water limitation and stabilize yield.	
2.10 Physical and chemical analysis of soil and plant	RT Cruz TM Corton	The amount and release patterns of available N in soils by incubation method are being determined; Simple chemical method of determining the total available N that the soil can supply are being developed; Fast and economical method for determining N in the rice tissue are being established; Also, the possibility of using leaf color chart as basis for fertilizer application is being evaluated and the result of soil analysis by STK with the laboratory method is being compared.	Easiest method in assessing nutrient supplying capacity of soil in major rice areas; method that will assess nutrient requirement of rice plants
2.11 Water management for increasing rice production	E Punzalan	The project will: 1) assess water management practices in the research stations; 2) understand and quantify influence of field hydrology and soil physical and hydraulic properties on percolation rate; 3) quantify the relationship between grain yield and water use efficiency; and 4) compare the effects of intermittent irrigation techniques with the conventional irrigation yield and performance of transplanted lowland rice under different fertilization at Maligaya condition.	Influence of field hydrology and soil physical and hydraulic properties quantified
2.12 Identifying constraints other than nitrogen availability limiting yield in major rice soils within SRAs	TM Corton	The soil constraints such as nutrient deficiencies of P, K, Zn, that limits yield will be determined even with nitrogen application; the areas with corresponding nutrient deficiencies will be mapped out. The appropriate P, K, and Zn recommendations for the established nitrogen level and target yield; and the soil physical constraints to root development are being determined.	Soil constraints and appropriate recommendations for P, K, and Zn identified
2.13 Investigating effect of seed quality and seedling vigor to yield	RT Cruz W Collado	The germinating index of different varieties, relating germination index to seedling growth under seedbed management; and the influence of different and N fertilizer rates on growth and yield of seedlings in seedbed will be determined.	Germinating index of different varieties and its relation to seedling growth
2.14 Assessment and amelioration of problem soils	W Obcemea TM Corton	The nature and characteristics of problem soils particularly acidity, P deficiency, alkalinity; Zn and S deficiencies,	Tools to diagnose nutrient (P,K,S, Zn)

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
		salinity, and mine tailings affected soils are being assessed and determined; and the management technologies to improve productivity of these problem soils are also being developed.	deficiency and cultural management to increase yield in problem soils
2.15 Packaging of component technologies	E Punzalan J de Dios	A review and analysis of results of past experiments will be conducted so that component technologies for improvement in rice production can be identified and subsequently packaged. A strategy will also be developed in order to establish a mechanism wherein the packaged technology can be transferred to the farmer, implying that researchers would be fully involved with farmers to understand their production constraints, technological needs and socioeconomic conditions.	Set of component technologies for integration; Institute and inter-agency policy recommendation
2.16 Characterization of technology extrapolation domain	E Punzalan W Collado	Considering the complexity of the production environment, characterization of climatic, soil and socioeconomic conditions is essential in order to a) verify and quantify seasonal variations; b) explain crop responses to drought, field heterogeneity, changes in soil physical and chemical properties and soil water and nutrient dynamics; and c) deal with the socioeconomic concerns of the target environment . Simulation models will be used as an integral component of this activity.	Area-based technology package - matched with recommendation domain
2.17 Identification of functional network and strategies for technology evaluation and verification	E Punzalan L Javier	On the basis of the characteristics of the extrapolation domain, it is important to identify members of the Research and Development (R&D) network, involving a team of biological and social scientists together with extension workers. The network members will undergo a series of training workshops that will focus on identifying strategies so that package of technologies generated could be evaluated and verified.	Team of scientists from R&D Network organized and evaluated package of technologies
2.18 Technology evaluation and verification	E Punzalan L Javier	On-farm adaptation studies will be implemented in the different domains based on the environmental and socioeconomic characterization (described in 2.17) to evaluate	Improved location-specific technology package

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
		and verify the package of technology generated. When an appropriate technology is identified for a given environment, location-specific decision support systems, and diagnostic tools will also be developed.	
Prog. 3. Integrated Pest Management			
Proj. 3.1 Profile of rice pest problems and farmers' practices in Luzon and Visayas	LM Sanchez/ PhilRice	Collection of historical records of rice pest problems and incidences (1990-95) from the Department of Agriculture. The kind of pests, their incidence (%), and area and varieties affected are to be encoded in Database III and to be analyzed using Geographic Information Systems.	Identification of rice pests in hot spot areas and development of comprehensive profile of rice pest problems in Luzon and Visayas.
3.2 Arthropod community structure and trophic relationships and their annual successional changes in rice-based cropping sytems, covering crop stem bases, ground level and aquatic regimes	VP Gapud LC Raros R Garcia/ PhilRice	Assessment of dynamics and stability of arthropod community structure throughout dry and wet season crops including fallow periods on vegetation and in soil and water regions.	Add information on dynamics of arthropods between crops in cropping systems and pest control practices.
3.3 Trophic relationships of insect pest-complexes and their natural enemy-complexes in irrigated lowland rice	VP Gapud GS Rillon GC Santiago/ PhilRice	Assessment of complementary balances in pest-complexes and their natural-enemy complexes at different stages of crop growth.	Add information on interactions between pests and their natural enemies at different stages of crop growth for sustainable pest management..
3.4 Diversity of natural enemies of rice stemborers under lowland condition	VP Gapud HD Justo VP Justo/ PhilRice	Assessment of diversity and relative abundance of natural enemies of yellow rice stemborer under lowland condition and enhancement of natural enemy activity by habitat manipulation.	Development of a primer on the biological control of yellow stemborer under lowland condition.

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
3.5 Seasonal fluctuations of populations of major rice pests under lowland condition	GC Santiago/ PhilRice	Weekly light trap collections of stemborer moths and other aerial arthropods in Munoz, Nueva Ecija.	Information on abundance and seasonal fluctuations of stemborer moths and other arthropods.
3.6 Responses of rice stemborer populations to cultural management practices	HD Justo EG Rubia GC Santiago/ PhilRice	Determination of deadhearts and whiteheads resulting from natural infestations of yellow stemborer in late-planted cultivars and the relationship among whiteheads, yield and yield components using different cultivars and varying levels of nitrogen application.	Add information on severity of yellow stemborer injury in late-planted cultivars at varying levels of nitrogen application.
3.7 Biological control studies for yellow rice stemborers using egg parasitoids: standardization of mass rearing techniques and field releases	HD Justo GS Rillon	Development of techniques for rearing yellow stemborer using artificial diet and to prolong shelf-life of natural/alternate hosts of egg parasitoids of yellow stemborer, rice black bug, etc.	Development of efficient mass rearing techniques to ensure availability of materials for researchers on biological control and for strategic releases of egg parasitoids in stemborer hot spot areas.
3.8 Microbial control of major rice insect pests	BP Gabriel AB Estoy CD Juanillo/ PhilRice	Measurement of field incidence of pathogens at varying environmental conditions and detailed study on host-pathogen relationships of selected and promising pathogens for possible mass production and field tests.	Basic information on epizoology and pathogenesis, rice pest management, and pictorial guide/manual on microbial pathogens.
3.9 Management of rice planthoppers by manipulation of common predators through cultivar selection	LB Flor VP Gapud/ PhilRice	Understanding responses of natural enemies of rice planthoppers to varietal differences.	Basic information on possible influence of rice varieties on activities of parasitoids of rice hoppers in efforts to help build up natural enemy activity in rice systems.

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
3.10 Ecology and management of the black bug *Scotinophara coarctata* in hot spot areas	HD Justo AB Estoy EH Batay-an/ PhilRice	Conduct researches on the bio-ecology of rice black bug in hot spot areas, microbial control and screening of popular varieties and rice lines for resistance against this pest.	Rice black bug management strategies and standard production techniques for pathogens and parasitoids of the black bug.
3.11 Responses of natural enemies of rice insect pests and other beneficial insects to pesticides	MC dela Cruz GS Rillon	Determination of impact of commonly-used insecticides on populations of rice pests and their natural enemies.	Chemical control strategies and options
3.12 Weed management in dry seeded rice	SR Obien HD Justo VP Gapud/ PhilRice	Conduct researches on weed control methods, rice-weed competition, herbicide efficacy/selectivity, and allelopathy.	Effective weed management technology
3.13 Farmers' perception, knowledge and practices on pests and diseases management	GA Abrigo RD Cosio AB Estoy HX Troung/ PhilRice	Analysis of socioeconomic factors contributing to tungro infestations in certain areas and formulation of recommendations on how to allocate budget for research and development activities for a more efficient management of tungro.	Paper on socioeconomics related to tungro management
3.14 Communal farmers' management of rice tungro in hot spot areas of the Philippines	HX Troung LM Sanchez EH Batay-an/ PhilRice	Campaign for a community-wide approach to pest management with emphasis on tungro.	Pest management strategy at the village level.
3.15 Regular monitoring and forecasting of tungro incidence and green leafhopper	LM Sanchez HX Troung/ PhilRice	Survey of abundance of tungro viruses and other rice viruses on commonly used varieties in hot spot areas for tungro.	Determination of varieties that are suitable for cultivation in hot spot areas for tungro.

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
3.16 Biological control of sheath blight of rice by flourescent and non-flourescent Pseudomonads and Bacillus sp.	D Lapis A Ayo R Ayo/ PhilRice	The project is undertaking isolation of flourescent and non-flourescent pseudomonas and Bacillus sp. in lowland rice culture, evaluating biological control agents (BCA) as possible approaches in sheath blight control, and mass production of BCA.	Mass production of BCA for sheath blight control
3.17 Formulation and evaluation of selected plants against golden snail (Pomacea spp.)	BM Rejesus/ PhilRice	Formulation of an effective and stable products from volatile oil(s) and crude extracts of the selected plants for field application to control golden snail and evaluation of the fish toxicity of the volatile oils and its formulated products are being done.	Generation of formulated products for bioassay for possible utilization, identification of promising formulated products, management of golden snail, rural development and employment generation
3.18 Profile of rice pest problems and farmers' practices in Mindanao	HD Justo VP Gapud HX Troung/ PhilRice	Collection of historical records of rice pest problems and incidences (1989-93) from the Department of Agriculture. The kind of pests, their incidence (%), and area and varieties affected are to be encoded in Database III and to be analyzed using Geographic Information Systems.	Identification of rice pests in hot spot areas and development of comprehensive profile of rice pest problems in Mindanao.
3.19 Chemical control of stemborer populations in late-planted rice	GS Rillon HD Justo/ PhilRice	Application of commonly-used insecticides against stemborers based on the number of stemborer egg masses per unit area.	Timing of insecticide applications.
3.20 Dispersal/migration patterns of *Leptocorisa oratorius (Fabricus)* and their natural enemies	GF Estoy VP Gapud	Identification of the range of host plants of rice bug in Nueva Ecija, determination of the role of host plants in the population build-up and behavioral movement of this pest, and determination of weather conditions that may favor rice bug dispersal/movement.	Additional information on the dispersal behavior of rice bug.
3.21 Population dynamics of rice bug, *Leptocorisa oratorius (Fabricus)* and their management in Region 8	T Villacarlos RA Paningbatan BT Mandras	Comparison of population fluctuations of rice bugs in irrigated lowland and upland rice fields. Determination of important mortality factors of rice bugs in Region 8	Additional information on population dynamics of rice bug.

Program/Project Components	*Proponent/ Agency	Brief Description	Expected Output
3.22 Project on detection, monitoring and evaluation of RSTV strains in tungro "hot spot" areas (ARBN)	HX Troung ER Tiongco PhilRice	Collection and isolation of RTSV variants from hot spot areas and subsequent evaluation of their impact on tungro severity.	Tungro management recommendations and options.
3.23 Biological control agents against migratory locust	D Santiago/ UPLB-NCPC	Existing strains of entomopathogenic fungi and viruses for pathogenocity to locust will be screened. After identifying the most effective microbial, parasitic and predatory organisms against locust, the development of strategies for its long-term control will follow.	Entomopathogenic fungi and viruses against locust
3.24 Field ecology studies on migratory locust	B Cayabyab/ UPLB-NCPC	Rates of development of different life stages of locust in the field are being observed and measured. Its aggregation process, warm formation and flight pattern and the ecology of breeding sites is also being determined.	Information related to the ultimate cause of the shift from solitary to gregarious and, finally, to migratory behavior
3.25 Bionomics and development of selected control strategies for migratory locusts	R Rejesus/ UPLB-NCPC	Information on the biology and behavior of locust is being generated to be used in developing behavioral control tactics and formulating compounds that are safe to non-target organisms and effective for ground and possible aircraft application.	Formulated bio-compounds against locust
3.26 Database retrieval and information dissemination system	M Cariaso/ UPLB-NCPC	Factual and numerical database incorporating information regarding prevalence and distribution of locust is being created.	Database on locust; leaflets, posters, audio-visuals
3.27 Population dynamics and damage assessment of migratory locusts	E Benigno/ UPLB-NCPC	Remote sensing and aerial photocopying are being applied in determining extent of damage or size of swarms over wide ground area. Relationship of locust population dynamics with changing vegetation cover, land use, weather, and crop yield is being studied with the use of Geographic Information Systems (GIS).	Population growth, dispersion and yield loss model

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
3.28 Development of bioherbicides against paddy weeds using Indigenous fungi	RG Bayot GL Magsino/ UPLB-NCPC	Mycoherbicides utilizing naturally occurring plant pathogens for the control of major weeds in lowland rice fields and in rice-based cropping systems will be developed to support long-term sustainable rice production.	Mycoherbicides to control paddy weeds
3.29 Malayan black bug biocontrol technology development and transfer	LRI Velasco DR Santiago/ UPLB-NCPC	.The project aims to undertake the ff: 1) develop a mass rearing technique for the black bug egg parasitoid, *T. triptus*; 2) develop *M. anisopliae* as a microbial biopesticide against black bug; 3) train state agricultural and university personnel on the mass rearing production/integration of *T. triptus* and *M. anisopliae* with other pest management practices for control of black bug; and 4) develop the capability of farmers to control black bug through the use of the above natural enemies.	• Mass rearing technique for the egg parasitoid *T. triptus* • Effective microbial bioinsecticide *(M. anisopliae)* developed • Protocols for field release of *T. triptus* and application of *M. anisopliae* in conjunction of other pest management practices • Manuals for mass rearing/production of entomopathogenic insects and fungi

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
Prog.4. Rice-based Farming Systems Program			
4.1 Technology demonstration through on-farm demonstration	RO Retales RG Corales/ PhilRice Maligaya	On-farm research methodology appropriate to the unique requirements and circumstances under consideration will be institutionalized.	Package site specific technologies
4.1.1 Field verification and technology packaging	RO Retales	A technology adaptation of selected vegetables are being conducted to determine the cost-benefit analysis of production. The multiplication of seeds of promising AVNET varieties for distribution to farmers will be done. Also, the agronomic performance of three promising soybean lines from IITA will be evaluated.	Rice -vegetables technology site specific technoguide; adaptable soybean lines identified
4.1.2 On-farm trial on rice-soybean pattern	RG Corales/ PhilRice Maligaya	On-farm soybean variety trial, on-farm soil fertility management in soybean and on-farm IPM trial on soybean are being conducted.	INM and IPM technology for soybean site specific varieties
4.2 Documentation of existing rice-based cropping and farming systems (Data management of rice-based farming systems technologies)	RO Retales/ PhilRice Maligaya	The project involves documentation and compilation of existing rice-based farming systems in the Philippines.	Database/ compilation or technoguide
4.3 Evaluation and adaptation of rice-based production technologies (Integrated rice-based farming systems model in different agro-ecosystem)	RO Retales RG Corales/ PhilRice	The project is being carried out to develop and validate the rice-based farming systems models in the different agro-ecosystem.	Production technologies evaluated; models
4.4 Characterization and delineation of rice-based farming systems areas in the Philippines rice based production technologies (Crop productivity and soil management in rainfed lowland rice-based cropping system	RO Retales	Package of technology of the different rice-based production systems are being developed; crop productivity and soil fertility changes of the different cropping patterns with varying fertilizer levels are being assessed with emphasis on crop residue management; identification of favorable factors related to the production system, and collection of minimum data sets for evaluation of existing crop simulation models will be done.	Rainfed lowland rice-based cropping system technologies, technobulletin or technoguide

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
Prog. 5 Rice Chemistry and Food Science Program			
5.1 Grain quality and sensory evaluation of new breeding lines/selections (Grain quality test of rice lines/varieties	AM del Mundo/ PhilRice	In collaboration with the plant breeders, the project deals in developing high grain quality rice for table rice and for the food industry through grain quality analysis and setting of standards to be used as basis for the recommendation of selection.	Varieties with superior eating quality and with specific uses aside from being table rice identified; database on grain quality profiles of varieties
5.2 Modern rice varieties for traditional food products (Selection of rice varieties for food products	AM del Mundo/ PhilRice	The project involves the characterization of traditional and miscellaneous rice food products, standardization of procedure for the production of selected traditional food products utilizing improved rice varieties, and determination of nutrient composition of products produced using standardized procedures.	Database on selected traditional food products; standardized procedures using modern varieties; determined nutrient composition; add variety to existing dishes made of rice
5.3 Development of new rice food products	JA Patindol JNB Ayap/ PhilRice	Standardization of recipes of rice food products, determination of the acceptability, nutrient composition and shelf-life of the products, and cost analysis are being done.	Determined nutrient composition and shelf-life of food products; standardized recipes
5.4 Mobilizing the analytical and service laboratory	JA Patindol NV Zulueta/ PhilRice	Calibrates and tests the Perten Near Infrared Reflectance (NIR) Spectrophotometer and other equipment using different samples and materials.	Perten NIR calibrated
5.5 Rationalization of screening for rice grain quality in the PhilRice breeding program	BO Juliano/ PhilRice	The project rationalizes the current screening methods by verifying the breeding objectives for grain quality, reviewing the effectiveness of current screening methods and propose improvements if any, developing additional simple, rapid screening methods for grain quality in the program and undertaking basic studies for the purpose of identifying grain quality parameters for boiled rice (and rice products).	Chemometrics of grain quality; rapid techniques/methods for testing grain quality; determined amylopectin properties that contribute to varietal differences in amylopectin staling
5.6 Enhancement of quality for rice food	BO Juliano/	Verify the variety type and the combination of grain	Produced dry-milled rice

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
products	PhilRice	properties that is most suitable for the manufacture of selected, economically feasible traditional and new rice food products.	that simulate wet-milled flour properties; hydrophobic starch as fat substitutes
5.7 Chemical and sensory analysis of rice aroma	AM del Mundo/ PhilRice	Establish and interrelate the chemical and sensory parameters for aroma evaluation of rice.	Identified major chemical compounds responsible for rice aroma; established method for rice aroma quantification
5.8 Assessment, transfer, and adoption studies on rice wine technology	PC Sanchez/ UPLB & PhilRice	Existing rice wine producers and possible market; fabrication of equipment and production of starter culture for pilot-scale output; and training/transfer of technology are being evaluated.	Survey of existing rice wine market; available gadgets and starter culture; trained producers and entrepreneurs
5.9 Optimizing rice flour properties and utilization in food products	EV Carpio/ UPLB	Preparation of rice flour by various mills and determination of damaged starch and cooking properties; improvement of whiteness and quality of rice flours; evaluation of flours for major food products; and determination of the effect of variety and blending of varieties on flour and food products properties	Improved and optimized quality of rice flours

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
Prog. 6. Rice Engineering & Mechanization Program			
6.1 Development and improvement of rice machinery and equipment	EU Bautista MC Regalado/ PhilRice	Farm machinery and equipment and related technologies are being developed to improve efficiency of the use of inputs such as labor, fertilizer, seeds, etc.; maximize product and by-product utilization; and minimize postharvest losses.	• Lightweight tillage equipment, fertilizer applicator, seed transplanter, reaper-stripper, combine harvester, thresher, and other village level equipment for rice products developed • Technical papers and posters
6.2 Technical verification and socioeconomic assessment of rice machinery and equipment	EU Bautista EC Gagelonia/ PhilRice	Testing and evaluation of rice machinery and equipment developed by PhilRice and other agencies with emphasis on technical performance and socio-economic feasibility and acceptability are being done.	• Rice machinery, equipment test and socioeconomic data and reports • Socially acceptable and economically feasible mechanization technologies for developed machineries identified and verified • Technical papers and posters
6.3 Field studies /experiments on improved rice machinery and equipment (Special studies on rice mechanization	EU Bautista EB Sibayan/ PhilRice	The project is investigating the effects on agronomic and soil parameters of field operation of improved machinery and equipment, including the establishment of optimum field machinery operational methods or systems.	• Package of field machinery operational methods/techniques

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
			• Experimental data to prove increased efficiency of input use with the use of improved machines • Technical papers and posters
6.4 Promotion of rice mechanization technologies (Collaborative projects on rice mechanization)	EU Bautista MJC Regalado/ PhilRice	Strong linkages among farmers, farm machinery manufacturers and R & D institutions are being established and sustained. Enhancing the adoption of rice mechanization technologies and promoting the quality manufacturing of appropriate farm equipment and likewise being done by the project.	• Technical assistance in manufacturing and promotion of farm machinery and equipment • Farm machinery manufacturer data base compiled
6.5 Assistance to farm equipment manufacturers in the Philippines	EU Bautista MJC Regalado/ PhilRice	Quality improvement of locally-manufactured farm equipment through individual assistance packages are being made for manufacturers on aspects related to machinery design, and production. Technical information on production economics and finance, marketing and promotion strategies are also being done.	• Improved quality of machines being manufactured and promoted • Established an aftersales services by manufacturers • Information materials for manufacturers service and repair shops made available
6.6 Evaluation of gasifier-engine system for shallow tubewell irrigation	EU Bautista RE Aldas/ PhilRice	Pilot testing and evaluation of a rice hull gasifier-IC engine system based on the UC Davis design will be done to run an irrigation pump for shallow tube well irrigation.	• Viable gasifier-engine pump system for 5 hp and 12 hp gasoline engine • Technical and economic data on the

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
			use of the system • Appropriate techno-dessimination strategy • Technical bulletins operating manuals; technical papers and posters
6.7 Center for rice engineering and mechanization	EU Bautista MJC Regalado/ PhilRice	A center that will spearhead the research and development on rice engineering and increase the mechanization level for rice and rice-based crops will be established at PhilRice.	Center for rice engineering and mechanization. • Upgraded design, fabrication, testing, and training facilities • Viable package of mechanization technologies established • Network of engineering agencies sharing expertise/resources organized • Regular training courses on machinery operation R&M offered for LGU/NGO technicians
6.8 Development of local engine	EU Bautista AR Maglinao/ PhilRice	This is a project which will be jointly implemented with the private sector to develop a single cylinder gasoline engine with about 85% locally manufactured parts and 15% imported components.	Single cylinder IC engine (16 hp) with at least 85% local content developed.

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
6.9 Synthesis, evaluation and promotion of evaporation suppressants for reservoirs (including ricefields and fishponds)	MW Baradas M Peralta/ PhilRice	The recurring problem on the insufficiency of irrigation water will be dealt on this project. A promising solution to this problem is the reduction of evaporation from ricefields and reservoirs using monolayer, possibly with local oil crops and animal fats as sources of raw materials.	• Synthesized 2 more effective and cheaper evaporation suppressants from locally available materials • Reduced the evaporation of water from reservoirs by up to 80% • Increased yield by at least 20 cavan/ha • Produced bulletin and poster to promote the use of evaporation suppressants

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
Prog. 7. Social Science and Policy Research Program			
7.1 Monitoring of rice-based farm households in strategic rice areas	SR Francisco	The regular monitoring is basically a survey of rice-based farm households in the country's current and potential major rice producing areas. The study aims to generate a national as well as location specific data bases crucially important in the determination of rice farm households' technology base and needs, the impact of technological change on their welfare, as well as provide a solid grassroots basis for the Institute's policy advocacy program for the rice sector.	Organized location specific databases of rice-based farm households.
7.2 Statistical series on the rice economy	SR Serrano AM Briones RG Gacilos	The project involves the formulation of responsive and location specific policies and in implementing local rice production programs. Thus data series (provincial based statistics) and other information needs are being formulated for the Rice R&D Network and Local Government Units (LGUs).	Updated edition of the Provincial Rice Statistics and Provincial Data Series on Fertilizer Use in Rice
7.3 Socioeconomic evaluation of rice-based farming in the Philippines	SR Francisco GA Abrigo	The financial profitability and level of cost efficiency of rice farming by Strategic Rice Areas (SRA) and by ecosystem are being evaluated. The technical and resource use efficiencies of rice farms by ecosystems in the SRAs and the socioeconomic and technical factors that influence technical efficiency of rice farms are being determined. Also the alternative policy directions towards enhancing technical efficiency and competitiveness of rice farming in the country will be evaluated.	Published industry papers
7.4 Socioeconomic dimensions of PhilRice R&D programs	SR Francisco	The project is evaluating the socioeconomic bases as well as welfare implications of technological innovations developed and currently under development by the Institute's various R&D programs; determine apparent demand, social desirability and welfare implications of such innovations; and develop a framework for R&D prioritization consistent with the needs and prospects of the rice industry.	Published industry papers
7.5 Government policy and the rice economy	SR Serrano	Government intervention in the rice economy has centered on	Published policy papers

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
	JF Fabiosa	trade and price policies. The NFA has been the key implementing arm of these policies, such as import restriction, minimum access volume, farm support price, and ceiling price (if activated), among others. Analysis of the financial cost of NFA operations, and its welfare impact is being done whereby economic surplus (i.e., consumer and producer) is being used to estimate the later. Also, welfare impacts of alternative policy scenarios (e.g., liberalization) will be analyzed through simulation analysis.	are the main outputs of this project.
7.6 Economic evaluation of rice-based agri-business industries	JF Fabiosa AM Briones	The viability of the entire rice economy depends on whether the sub-sectors (e.g., input supply and output distribution) are well coordinated and are mutually re-enforcing. This project examines the seed and machinery industries in the input side of the rice economy, and the processing and distribution industries in the output side. Initial focus of the seed industry study is on the seed quality control component of the industry. The comparative advantage of alternative drying technologies is being estimated, demand for drying technologies by farmers and traders are being characterized, and the status of rice processing and distribution is also being regularly monitored.	Published industry papers
7.7 Basic grains and livestock model for policy analysis	JF Fabiosa AM Briones	The rice sector is closely related to other grains and livestock, either through production or consumption. This project intends to develop a database for basic grains and livestock. Also, a policy model will be developed to allow ex ante analysis of policy initiatives.	Database and policy model.
7.8 Safeguarding and preservation of the biodiversity of the rice genepool	SR Francisco GA Abrigo	This project is more on rice varietal improvement program. Studies on survey under this project is being conducted by SSPR.	
7.9 Economic impact of IPM practices in the rice-vegetable system	SR Francisco	Partial budgets are being developed for current and alternative pest management practices. Changes in the cropping system is being assessed to determine on farm household income with and without specific IPM practices. Information generated on cost changes per unit output will be combined with	Data on the economic impact of various IPM alternatives in rice-vegetable system.

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
		projections of the level and timing of adoption of the IPM practices and economic surplus analysis through the use of project aggregate social benefits.	
7.11 Knowledge intensive insect pest management: absorption, transmission, and impacts	SR Francisco GA Abrigo	This project is being carried out to address two issues: 1) how knowledge is absorbed, acted upon and transferred on a farmer-to-farmer basis; 2) measure the economic impact of IPM in rice production	Data/information on the economic impact of IPM in rice production.

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
Prog. 8. Technology Promotions Program			
8.1 Rice seed production technology for seed growers	P Rebuelta A Antonio	A training to update prospective seed growers on the latest rice seed production technologies, seed certification procedures, and variety maintenance.	250 participants trained
8.2 Gintong Ani Rice R&D Training/Technical Briefing. (GPEP Training)	Z Macasieb M Puerto	This training enables the Gintong Ani Project implementors to conduct technodemo farms, technical meetings, field days, and monitoring and to enable them with administrative/fiscal arrangements.	3000 participants trained
8.3 Rice production and technology promotion training course (PhilRice-JICA Technical Cooperation	Z Macasieb M Puerto	Updates trainers from ATI, DA, SUCs and LGUs on latest breakthroughs on rice production and promotion; develop a relevant training curriculum for agricultural extension workers; designs a strategy in massive training of extension workers; and identifies standard set of knowledge and skills for extension workers.	60 participants trained
8.4 DECS-PhilRice collaborative training course for agricultural-vocational teachers	A Antonio O Balgos	Training modules are being developed and training programs are being conducted for teachers, elementary and high school students, highlighting rice production. Establishes a linkage with DECS setting up IPM program for students; and awakes the awareness of students on the importance of rice production technology.	30 participants trained
8.5 Teachers' training on rice conservation and environmental awareness	Z Macasieb O Balgos D Ramos	This is a training for elementary and high school teachers to hasten their awareness on rice conservation and environmental effect.	30 participants trained
8.6 One month training on rice production for LGU technicians	P Rebuelta D Ramos	Updates latest breakthroughs on rice production and promotion; and designs strategy in massive training of farmers.	30 participants trained
8.7 Documentation of RSTC-IPM training	Z Macasieb A Antonio	The project processes results of participatory demo farms during the training period; and packages information on rice production technology, training processes and experiences in farmers field schools.	1 handbook

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
8.8 Training on rice by-products	O Balgos M Puerto	Promotes of techniques/technologies in the production and commercialization of products made out of rice.	15 participants trained
8.9 Season-long rice specialists training course on integrated pest management	RB Miranda AV Antonio	A training for rice specialists on the complete spectrum of rice production and extension with emphasis on IPM through hands-on training in the experiment station and farmers' field school.	60 participants trained
8.10 Demonstration of hybrid rice technology	RJ Lara LC Javier	Demonstrates hybrid rice seed production technology and advantage of using F1 hybrids, and training of F1 hybrid seed growers are being conducted.	60 demo sites; 30 seed growers trained
8.11 TTP demonstration and training farm	RJ Lara RB Miranda	Technology demonstration farms are being established to showcase the rice and rice-based production technologies .	Demo farms established
8.12 GPEP R&D projects	SR Serrano LC Javier	The project showcases rice production technology package in irrigated areas to produce 5-7 t/ha of palay during the wet season and 7-10 t/ha during the dry season; evaluates 10 varieties under three fertilizer levels per cropping season; demonstrates farm machinery and implements; and establishes community level techno demo.	2400 sites for 2 seasons established; the best fertilizer level and varieties for specific locations determined; operation of farm machinery demonstrated; and used community as model
8.13 Development projects for special environments	LC Javier O Malonzo	Demonstrates rice production technology for rainfed lowland areas and direct seeding method of crop establishment.	250 sites for rainfed lowland areas; 100 sites for direct seeding
8.14 Ilocos-Cagayan high yield rice production and rice-based farm business project	LC Javier O Malonzo	The project provides assistance to cooperatives in increasing the productivity of members.	10 coops assisted
8.15 Promotion of rice science and technology (Promotion of rice production technologies through communication media)	RF Barroga KT Baroga	Popularizes research and technical information into promotional, educational, and institutional materials; tap the mass media in the promotion of rice science and technology; informs and educates rice farmers of innovations in rice farming; and raises farmers' technical efficiency through access to scientific information, media and interpersonal	Constraints in adopting farming innovations within-farmer identified; distortions in transfer of scientific concepts among farmers measured; and

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
		channels.	measures to maintain fidelity of information recommended; and communication linkage improved
8.16 Communication studies in technology promotion	LR Abaoag ARE Baclit	Studies audience characteristics, use of media and their combination, setting, message development and treatment, and communication approaches in the promotion of technologies.	Farmers' cognitive blocks in IPM and conceptual blocks in fertilizer management documented; 1 set of recommendations to improve transfer of scientific principles along an information chain and propose 2 studies; joint media conference implemented; 16-17 print evaluated; 16-17 radio broadcast materials prepared
8.17 Rice technology and knowledge resource base	KT Barroga TO Pedro	Assembles available rice and rice-based technologies for easy access and retrieval by farmers, extension and development workers.	Database of 50 rice-based materials technologies; document farming practices of outstanding farmers and 5 practices of local tribes; database of media resources with 1500 arts and graphics, 4000 photos and slides; and 600 hours of file footage
8.19 Media advocacy and public relations	CT Briones OO Matchoc	Promotes the services of the Institute to the public, shares its research findings and development efforts, maintains positive	50 print and photo releases in broadsheets;

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
		external relations.	produce 6000 copies of PhilRice brochure and 6000 copies of Q&A on Rice, and update
8.19 Network communication	OO Matchoc CT Briones	Updates network members about important events, policies, and programs of the Institute; improve organizational communication and coordination.	Produce 4 regular and 2 special issues of PhilRice Newsletter at 6,000 copies per issue and PhilRice R&D Annual report at 3,000 copies
8.20 Technical publications	RF Barroga CT Briones	Publishes research results into technical and semi-technical formats on various disciplines related to rice, for researchers and extension workers.	1 issue at 2,000 copies of Rice R&D Highlights and PhilRice Technical Bulletin; 3 volumes at 1,500 copies per volume of Workshop Proceedings; 3,000 copies of learning manual, 1,500 copies of technical manual, and 2,000 copies of 1 book
8.21 Institutional support communication	ARE Baclit TO Pedro	Provides in-house services to all units of the Institute such as desktop publishing, audiovisuals, photography, graphics and illustration, printing , and circulation.	100 sets of certificates, programs, invitations, and handouts; 100 sets of cover designs, maps, signs, illustrations, manuals; equipment maintenance, lending 50 sets of video documentation, dubbing, editing and souvenirs to visitors; 50 sets of photos documentation, contact

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
			printing, blowups, mounts; 65 job printing requests, and circulating publications to 1,500 readers
8.22 Acquisition of library materials		Builds a comprehensive collection of rice science literature, including allied subjects, in support of technical staff and development workers; tap worldwide databases on rice science literature through electronic means to augment existing limited collections; initiate a book exchange program with universities and libraries nationwide ; and increase its collections and encourage networking.	Increase collections of literature, books and other references

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
Prog. 9. Seed Production and Health Program			
9.1 Breeder seed production	FM Malabanan RP Limuaco	Breeder seeds are being produced for the production of Foundation seeds to supply the seed requirement of PhilRice Stations, National Seed Production Network, and other collaborative agencies, colleges, and universities.	Yearly production of 10 tons breeder seeds
9.2 Foundation seed production	FM Malabanan RP Limuaco	High quality Foundation seeds are being produced for distribution to the members of the National Rice Seed Production Network and selected foundation seed growers.	Yearly production of 100 tons foundation seeds
9.3 Maintenance seed production	FM Malabanan EV Santiago	Seeds of all recommended rice varieties in the country are being produced and maintained in small quantity. The seeds are being used for research, initial seed multiplication, and other purposes.	Yearly production of 20 kg seeds per variety
9.4 Special quality rice seed production	FM Malabanan RE Irang	High quality seeds of special quality rice (fancy, glutinous, japonica) are being produced for distribution and initial production in selected farmer members of cooperatives.	Yearly production of 10 tons seeds
9.5 Hybrid rice seed production	FM Malabanan RE Irang	Parentals of the Foundation seeds of hybrids and some amount of F1 seeds are being produced.	Yearly production of 2 tons seeds of the parentals
9.6 Seed processing, storage, and distribution	FM Malabanan RP Limuaco MN dela Cruz	Processes breeder, foundation, and registered seeds of all recommended and special quality rice varieties; properly stores all classes of rice seeds to maintain the viability and vigor and ensuring seed availability at all times; and distributes enough high quality seeds at the right time.	Distributed the breeder and foundation seed requirement of the country
9.7 Seed health testing	FM Malabanan MN dela Cruz	The project is maintaining and ensuring that the seeds for distribution are of high quality (healthy and vigorous).	Distributed healthy and vigorous seeds
9.8 National seed production network	FM Malabanan MN dela Cruz	The project aims to ensure the availability of registered and certified seeds for seed growers and farmers in all strategic rice areas.	Distributed foundation seed requirement to produce the registered seeds needed across the country
9.9 Comparative yield performance of high-	FM Malabanan	The significant yield differences using different classes of	Determined yield

Program/Project Components	Proponent/ Agency	Brief Description	Expected Output
yielding rice varieties using different classes of seeds	EV Santiago	seeds are being determined in this project.	difference of the different classes of seeds
9.10 Effect of organic and inorganic fertilizers on seed yield of high-yielding rice varieties	FM Malabanan EV Santiago	The effect of organic and inorganic fertilizer on seed yield of high yielding rice cultivars is being determined.	Determined the effect of organic and inorganic fertilizer on seed yield
9.11 Rat and bird control	EV Santiago	Avoids or minimizes the damage of birds and rats by controlling its population using manual, mechanical, and chemical means.	Minimized the damage of birds and rats in the experimental station

Note: All the projects under Program 9 are being implemented by PhilRice

ANNUAL PROJECT BUDGET
1997-2001

Table 2 Summary of Annual Project Budget of Rice R and D Program

	Title of Program/Project/Activity	Yearly budget (P'000)					Source of Fund	TOTAL
		1997	1998	1999	2000	2001		
Prog. 1.	RICE VARIETAL IMPROVEMENT PROGRAM	26,980	40,924	44,414	51,076	58,738		222,132
Proj. 1.1	RICE GERMPLASM COLLECTION, EVALUATION, CONSERVATION AND DOCUMENTATION	1,908	2,208	2,539	2,920	3,358	NG Subsidy	12,933
1.2	DEVELOPMENT OF IRRIGATED LOWLAND RICE VARIETIES	2,198	5,079	4,704	5,409	6,220	NG Subsidy	23,608
1.3	DEVELOPMENT OF NEW PLANT TYPE	720	720	828	952	1,095	NG Subsidy	4,315
1.4	DEVELOPMENT OF F1 HYBRIDS AND RELATED TECHNOLOGIES	2,418	4,298	4,253	4,891	5,624	NG Subsidy	21,484
1.5	DEVELOPMENT OF RICE VARIETIES FOR SPECIAL PURPOSES	743	743	854	983	1,130	NG Subsidy	4,453
1.6	DEVELOPMENT OF RAINFED LOWLAND RICE VARIETIES	2,124	2,216	2,548	2,931	3,370	NG Subsidy	13,189
1.7	DEVELOPMENT OF LOCATION SPECIFIC UPLAND RICE VARIETIES	729	1,371	1,577	1,813	2,085	NG Subsidy	7,575
1.8	DEVELOPMENT OF LOWLAND VARIETIES ADAPTED TO ADVERSE SOIL CONDITIONS	1,130	1,230	1,415	1,627	1,871	NG Subsidy	6,672
1.9	DEVELOPMENT OF RICE VARIETIES FOR THE COOL ELEVATED AREAS	765	1,012	1,164	1,338	1,539	NG Subsidy	5,818
1.10	UTILIZATION OF MOLECULAR MARKER TECHNOLOGY FOR RICE IMPROVEMENT	738	2,402	3,091	3,555	4,088	NG Subsidy	14,874
1.11	UTILIZATION OF IN-VITRO TECHNIQUES FOR RICE IMPROVEMENT	1,968	3,068	3,526	4,055	4,663	NG Subsidy	17,276
1.12	TRANSFER OF DESIRABLE RICE GENES FROM WILD SPECIES THROUGH WIDE HYBRIDIZATION	500	370	425	489	563	NG Subsidy	2,348
1.13	GENETIC TRANSFORMATION	1,009	1,609	1,850	2,128	2,447	NG Subsidy	9,043
1.14	GENERATION OF GENETIC VARIABILITY USING PHYSICAL MUTAGENESIS	504	504	580	667	767	NG Subsidy	3,021
1.15	NATIONAL COOPERATIVE TEST - YIELD TRIAL	6,844	9,522	10,950	12,593	14,482	NG Subsidy	28,584
	1.15.1 NATIONAL COOPERATIVE TEST-YIELD TRIAL	3,103	5,103	5,868	6,749	7,761		
	1.15.2 NATIONAL COOPERATIVE TEST-DISEASE RESISTANCE	2,095	2,603	2,993	3,442	3,959	NG Subsidy	15,093
	1.15.3 NATIONAL COOPERATIVE TEST-INSECT RESISTANCE	800	870	1,000	1,151	1,323	NG Subsidy	5,144
	1.15.4 NATIONAL COOPERATIVE TEST-GRAIN QUALITY TEST	846	946	1,088	1,251	1,439	NG Subsidy	5,570
1.16	BASIC SEED PRODUCTION (Basic seed production of recommended/popular rice varieties)	1,441	1,541	1,772	2,038	2,344	NG Subsidy	9,136
1.17	DEVELOPMENT OF BREEDING LINES FOR TUNGRO RESISTANCE	1,052	1,152	1,325	1,524	1,752	NG Subsidy	6,804

Title of Program/Project/Activity	Year's Budget (P'000)					Source of Fund	TOTAL
	1997	1998	1999	2000	2001		
1.18 DEVELOPMENT OF BREEDING LINES FOR BACTERIAL LEAF BLIGHT AND BLAST RESISTANCE	431	551	633	727	836	NG Subsidy	3,237
1.19 SCREENING OF LINES OR SELECTIONS FOR RESISTANCE TO MAJOR INSECT PEST	302		331	436	503	NG Subsidy	1,955
Prog. 2. PLANTING AND FERTILIZER MANAGEMENT PROGRAM	12,715	23,709	28,085	32,259	37,704		134,562
Proj 2.1 RICE-SOIL RESOURCES INVENTORY AND EVALUATION	752	1,632	2,141	2,462	2,832	NG Subsidy	10,050
2.2 CROP ESTABLISHMENT FOR DIRECT SEEDED AND TRANSPLANTED RICE	1,028	1,335	1,535	1,766	2,030	NG Subsidy	7,694
2.3 INTEGRATED NUTRIENT MANAGEMENT IN IRRIGATED LOWLAND RICE	2,120	5,207	5,988	6,886	7,919	NG Subsidy	28,121
2.4 SYSTEMS ANALYSIS AND SIMULATION	1,085	1,500	1,725	1,984	2,281	NG Subsidy	8,575
2.5 REVERSING TRENDS OF DECLINING PRODUCTIVITY IN INTENSIVE IRRIGATED RICE SYSTEMS	370	933	1,073	1,234	1,419	NG Subsidy	5,029
2.6 RAINFED LOWLAND RICE RESEARCH CONSORTIUM	1,463	1,600 *	1,650 *	2,000 *	2,500 *	NG Subsidy	9,413
2.7 METHANE EMISSION FROM IRRIGATED RICE	334					NG Subsidy	334
2.8 IMPROVEMENT OF EFFICIENCY AND ENVIRONMENTAL IMPACT OF N FERTILIZERS	690	1,556	1,789	2,058	2,366	NG Subsidy	8,460
2.9 MANAGEMENT OF RAINFED LOWLAND RICE	397	650	726	804	1,200	NG Subsidy	3,977
2.10 PHYSICAL AND CHEMICAL ANALYSIS OF SOIL AND PLANT	1,083	1,359	1,563	1,797	2,067	NG Subsidy	7,878
2.11 WATER MANAGEMENT FOR INCREASING RICE PRODUCTION	551	878	1,010	1,161	1,335	NG Subsidy	5,238
2.12 IDENTIFYING CONSTRAINTS OTHER THAN NITROGEN AVAILABILITY LIMITING YIELD IN MAJOR RICE SOILS WITHIN BRAs	790	1,382	2,256	2,595	2,984	NG Subsidy	10,587
2.13 INVESTIGATING EFFECT OF SEED QUALITY AND SEEDLING VIGOR ON YIELD	216	370	425	489	563	NG Subsidy	2,064
2.14 ASSESSMENT AND AMELIORATION OF PROBLEM SOILS	170	654	982	1,129	1,299	NG Subsidy	4,434
2.15 PACKAGING OF COMPONENT TECHNOLOGIES	248	665	765	879	1,011	NG Subsidy	3,569
2.16 CHARACTERIZATION OF TECHNOLOGY EXTRAPOLATION DOMAIN	409	510	587	674	776	NG Subsidy	2,956
2.17 IDENTIFICATION OF FUNCTIONAL NETWORK AND STRATEGIES FOR TECHNOLOGY EVALUATION AND VERIFICATION	71	408	469	540	621	NG Subsidy	2,108
2.18 TECHNOLOGY EVALUATION AND VERIFICATION - variety and fertilizer management	426	2,150	3,200	3,800	4,500	NG Subsidy	14,076
Prog. 3. INTEGRATED PEST MANAGEMENT PROGRAM	16,538	16,592	17,312	18,505	19,384		88,331
Proj. 3.1 PROFILE OF RICE PEST PROBLEMS AND FARMERS' PRACTICES IN LUZON AND VISAYAS	459	560 *	700 *	750 *	780 *	NG Subsidy	3,279
3.2 ARTHROPOD COMMUNITY STRUCTURE AND TROPHIC RELATIONSHIPS AND THEIR ANNUAL SUCCESSIONAL CHANGES IN RICE-BASED CROPPING SYSTEMS, COVERING CROP STEM	54	75 *	100 *	180 *	250 *	NG Subsidy	659

Title of Program/Project/Activity	Yearly Budget (P'000)					Source of Fund	TOTAL
	1997	1998	1999	2000	2001		
BASES, GROUND LEVEL AND AQUATIC REGIMES							
3.3 TROPHIC RELATIONSHIPS OF INSECT PEST-COMPLEXES AND THEIR NATURAL ENEMY-COMPLEXES IN IRRIGATED LOWLAND RICE	54	90 *	130 *	160 *	250 *	NG Subsidy	669
3.4 DIVERSITY OF NATURAL ENEMIES OF RICE STEMBORERS UNDER LOWLAND CONDITIONS	557	[illegible] *	730 *	760 *	850 *	NG Subsidy	3,557
3.5 SEASONAL FLUCTUATIONS OF POPULATIONS OF OTHER MAJOR RICE PESTS UNDER LOWLAND CONDITION	308	[illegible] *	470 *	490 *	550 *	NG Subsidy	2,218
3.6 RESPONSES OF RICE STEMBORER POPULATIONS TO CULTURAL MANAGEMENT PRACTICES	323	450 *		550 *	560 *	NG Subsidy	2,383
3.7 BIOLOGICAL CONTROL STUDIES FOR YELLOW RICE STEMBORERS USING EGG PARASITOIDS: STANDARDIZATION OF MASS REARING TECHNIQUES AND FIELD RELEASES	1,401	1,500	1,700 *	1,900 *	2,000 *	NG Subsidy	8,501
3.8 MICROBIAL CONTROL OF MAJOR RICE INSECT PESTS	[illegible]	1,700 *	2,200 *	2,500 *	3,100 *	NG Subsidy	10,961
3.9 MANAGEMENT OF RICE PLANTHOPPERS BY MANIPULATION OF COMMON PREDATORS THROUGH CULTIVAR SELECTION	332	550 *	570 *	660 *	700 *	NG Subsidy	2,812
3.10 ECOLOGY AND MANAGEMENT OF THE BLACK BUG, SCOTINOPHORA COARCTATA IN HOT SPOT AREAS	1,669	1,722	2,100 *	2,500 *	3,000 *	NG Subsidy	10,991
3.11 RESPONSES OF NATURAL ENEMIES OF RICE INSECT PESTS AND OTHER BENEFICIAL INSECTS TO PESTICIDES	730	509	586	674	775	NG Subsidy	3,274
3.12 WEED MANAGEMENT IN DRY-SEEDED RICE	459	560 *	890 *	900 *	960 *	NG Subsidy	3,710
3.13 FARMERS' PERCEPTION, KNOWLEDGE AND PRATICES ON PEST AND DISEASES MANAGEMENT	640	565	627	721	829	NG Subsidy	3,352
3.14 COMMUNAL FARMERS' MANAGEMENT OF RICE TUNGRO IN HOT SPOT AREAS OF THE PHILIPPINES	920	1,043	1,200	1,500 *	1,800 *	NG Subsidy	6,463
3.15 REGULAR MONITORING AND FORECASTING OF TUNGRO INCIDENCE AND GREEN LEAFHOPPER POPULATION IN FARMERS' AND EXPERIMENTAL FIELDS	1,311	1,282	1,800 *	1,900 *	2,000 *	NG Subsidy	8,293
3.16 BIOLOGICAL CONTROL OF SHEATH BLIGHT OF RICE BY FLUORESCENT AND NON-FLUORESCENT PSEUDOMONADS AND BACILLUS SP.	878	858	950 *	-	-	NG Subsidy	2,716
3.17 FORMULATION AND EVALUATION OF SELECTED PLANTS AGAINSTA GOLDEN SNAIL (POMACEA SPP.)	706	850 *	-	-	-	NG Subsidy	1,556
3.18 RICE TUNGRO DISEASE MANAGEMENT	1,125	1,174	1,350 *	1,500 *	-	NG Subsidy	5,149
3.19 PROJECT ON DETECTION, MONITORING AND EVALUATION OF RTSV STRAINS IN TUNGRO "HOT SPOT" AREAS (ARSN)	495	569	750 *	800 *	980 *	NG Subsidy	3,654
3.20 BIOLOGICAL CONTROL AGENTS AGAINST MIGRATORY LOCUST	535	365	-	-	-	PCARRD-NCPC	900
3.21 FIELD ECOLOGY STUDIES ON MIGRATORY LOCUST	585	365	-	-	-	PCARRD-NCPC	950
3.22 BIONOMICS AND DEVELOPMENT OF	515	386	-	-	-	PCARRD-	901

Title of Program/Project/Activity	Yearly budget (P'000)					Source of Fund	TOTAL
	1997	1998	1999	2000	2001		
SELECTED CONTROL STRATEGIES FOR MIGRATORY LOCUSTS						NCPC	
3.23 DATABASE RETRIEVAL AND INFORMATION DISSEMINATION SYSTEM	485	151	-	-	-	PCARRD-NCPC	636
3.24 POPULATION DYNAMICS AND DAMAGE ASSESSMENT OF MIGRATORY LOCUSTS	535	212	-	-	-	PCARRD-NCPC	747
3.25 TECHNO-CLINIC ON LOCUST MANAGEMENT	528	795	800	-	-	PCARRD	2,123
3.26 DEVELOPMENT OF BIOHERBICIDES AGAIN PADDY WEEDS USING INDIGENOUS FUN	415	347	312	-	-	DOST	1,074
3.27 MALAYAN BLACK BUG BIOCONTROL TECHNOL DEVELOPMENT AND TRANSFER	561	-	-	-	-	PCARRD	561
Prog. 4. RICE-BASED FARMING SYSTEM	3,692	5,135	6,632	6,299	7,094		28,852
Proj. 4.1 TECHNOLOGY DEMONSTRATION THROUGH ON FARM DEMONSTRATION	1,438	1,903	2,466	2,517	2,894	NG Subsidy	10,940
4.2 DOCUMENTATION OF EXISTING RICE-BASED CROPPING AND FARMING SYSTEMS T (Data management of rice based farming systems technologies)	694	994	1,143	1,315	1,512	NG Subsidy	5,657
4.3 EVALUATION AND ADAPTATION OF RICE-BASED PRODUCTION TECHNOLOGIES (Integrated rice based farming systems model in different agro-ecosystem)	810	1,110	1,800	2,468	2,668	NG Subsidy	8,876
4.4 CHARACTERIZATION AND DELINEATION OF RICE-BASED FARMING SYSTEMS AREAS IN THE PHILIPPINES RICE-BASED PRODUCTION TECHNOLOGIES	750	1,128	1,500	-	-	NG Subsidy	3,378
Prog. 5 RICE CHEMISTRY AND FOOD SCIENCE	6,339	6,283	6,715	9,650	11,049		44,235
Proj. 5.1 GRAIN QUALITY AND SENSORY EVALUATION OF NEW BREEDING LINES/SELECTIONS	1,625	1,775	1,837	1,922	1,935	NG Subsidy	9,094
5.2 MODERN RICE VARIETIES FOR TRADITIONAL FOOD PRODUCTS	200	350 *	400 *	440 *	480 *	NG Subsidy	1,960
5.3 DEVELOPMENT OF NEW RICE FOOD PRODUCTS	1,754	1,935	2,284	2,627	3,021	NG Subsidy	11,671
5.4 MOBILIZING THE ANALYTICAL AND SERVICE LABORATORY	458	444	510	587	675	NG Subsidy	2,675
5.5 RATIONALIZATION OF SCREENING FOR RICE GRAIN QUALITY IN THE PHILRICE BREEDING PROGRAM	918	1,100 *	1,200 *	1,280 *	1,350 *	NG Subsidy	5,848
5.6 ENHANCEMENT OF QUALITY FOR RICE FOOD PRODUCTS	141	162	185 *	210 *	250 *	NG Subsidy	948
5.7 CHEMICAL AND SENSORY ANALYSIS OF RICE AROMA	130	160 *	170 *	185 *	200 *	NG Subsidy	845
5.8 ASSESSMENT, TRANSFER AND ADOPTION STUDIES ON RICE WINE TECHNOLOGY	508	584	-	-	-	NG Subsidy	1,092
5.9 OPTIMIZING RICE FLOUR PROPERTIES AND UTILIZATION IN FOOD PRODUCTS	515	1,721	2,129	2,509	3,138	NG Subsidy	10,102
Prog. 6. RICE ENGINEERING AND MECHANIZATION	14,238	17,227	19,083	22,045	25,338		97,930
Proj. 6.1 DEVELOPMENT AND IMPROVEMENT OF FARM MACHINERY AND EQUIPMENT	3,651	3,935	4,525	5,204	5,985	NG Subsidy	23,300

Title of Program/Project/Activity	Yearly budget (P'000) 1997	1998	1999	2000	2001	Source of Fund	TOTAL
6.2 TECHNICAL VERIFICATION AND SOCIO-ECONOMIC ASSESSMENT OF RICE MACHINERY AND EQUIPMENT	2,429	2,846	3,273	3,764	4,328	NG Subsidy	16,640
6.3 FIELD STUDIES/EXPERIMENTS ON IMPROVED RICE MACHINERY AND EQUIPMENT (SPECIAL STUDIES ON RICE MECHANIZATION)	822	769	864	1,017	1,170	NG Subsidy	4,662
6.4 PROMOTION OF RICE MECHANIZATION TECHNOLOGIES (COLLABORATIVE PROJECTS ON RICE MECHANIZATION)	1,092	2,370	2,875	3,457	4,125	NG Subsidy	13,919
6.5 ASSISTANCE TO FARM EQUIPMENT MANUFACTURERS IN THE PHILIPPINES	731	841	90	1,112	1,279	NG Subsidy	4,929
6.6 EVALUATION AND IMPROVEMENT OF GASIFIER-ENGINE SYSTEM FOR SHALLOW TUBEWELL IRRIGATION	707	813	965 *	1,200 *	1,350 *	NG Subsidy	5,035
6.7 DEVELOPMENT OF THE CENTER FOR RICE ENGINEERING AND MECHANIZATION	2,230	2,565	2,949	3,392	3,900	NG Subsidy	15,036
6.8 DEVELOPMENT AND ADOPTION OF LOCAL ENGINE	2,000	2,300	2,645	2,900 *	3,200 *	NG Subsidy	13,045
6.9 SYNTHESIS, EVALUATION AND PROMOTION OF EVAPORATION SUPPRESSANTS FOR RESERVOIRS (including ricefields and fishponds)	576	789	-	-	-	NG Subsidy	1,365
Prog. 7. SOCIAL SCIENCE AND POLICY RESEARCH	6,253	7,486	8,496	7,024	8,064		37,323
Proj 7.1 MONITORING OF RICE-BASED FARM HOUSEHOLDS IN STRATEGIC RICE AREAS	1,349	1,551	1,784	2,052	2,359	NG Subsidy	9,095
7.2 STATISTICAL SERIES ON THE RICE ECONOMY	414	476	548	630	724	NG Subsidy	2,791
7.3 SOCIOECONOMIC EVALUATION OF RICE-BASED FARMING IN THE PHILIPPINES	1,146	1,318	1,516	1,743	2,004	NG Subsidy	7,727
7.4 SOCIOECONOMIC DIMENSIONS OF PHILRICE R&D PROGRAMS	450	518	595	684	787	NG Subsidy	3,034
7.5 GOVERNMENT POLICY AND THE RICE ECONOMY	937	1,078	1,239	1,425	1,639	NG Subsidy	6,318
7.6 ECONOMIC EVALUATION OF RICE-BASED AGRIBUSINESS INDUSTRIES	832	1,200 *	1,300 *	-	-	NG Subsidy	3,332
7.7 BASIC GRAINS AND LIVESTOCK MODEL FOR POLICY ANALYSIS	390	500 *	580 *	-	-	NG Subsidy	1,470
7.8 SAFEGUARDING AND PRESERVATION OF THE BIODIVERSITY OF THE RICE GENEPOOL	382	439	450 *	-	-	NG Subsidy	1,271
7.9 ECONOMIC IMPACT OF IPM PRACTICES IN THE RICE-VEGETABLE SYSTEM	353	406	485 *	490 *	550 *	NG Subsidy	2,284
Prog. 8. TECHNOLOGY PROMOTION PROGRAM	23,151	53,624	57,857	64,811	70,231		269,674
Proj 8.1 RICE SEED PRODUCTION TECHNOLOGY FOR SEED GROWERS	804	925	1,063	1,223	1,406	NG Subsidy	5,421
8.2 GINTONG ANI RICE R&D TRAINING/TECHNICAL BRIEFING (GPEP TRAINING AND RICE PRODUCTION TRAINING COURSE FOR MEMBERS OF FARMERS COOPERATIVES AND NON-GOVERNMENT ORGANIZATIONS)	902	1,200 *	1,500 *	2,000 *	2,500 *	NG Subsidy NG Subsidy	8,102 0
8.3 RICE PRODUCTION AND TECHNOLOGY PROMOTION TRAINING COURSE (PhilRice-JICA TECHNICAL COOPERATION)	1,111	1,300 *	-	-	-	NG Subsidy	2,411

Title of Program/Project/Activity	Yearly budget (P'000)					Source of Fund	TOTAL
	1997	1998	1999	2000	2001		
8.4 DECS-PHILRICE COLLABORATIVE TRAINING COURSE FOR AGRICULTURAL-VOCATIONAL TEACHERS	509	650 *	685 *	-	-	NG Subsidy	1,844
8.5 TEACHERS' TRAINING ON RICE CONSERVATION AND ENVIRONMENTAL AWARENESS	328	450 *	600 *	670 *	850 *	NG Subsidy	2,898
8.6 ONE MONTH TRAINING ON RICE PRODUCTION FOR LGU TECHNICIANS	810	1,100 *	1,250 *	1,400 *	1,800 *	NG Subsidy	6,410
8.7 DOCUMENTATION OF RSTC-IPM TRAINING	237	260 *	300 *	360 *	390 *	NG Subsidy	1,547
8.8 TRAINING ON RICE BY-PRODUCTS	210	250 *	270 *	330 *	350 *	NG Subsidy	1,410
8.9 SEASON-LONG SPECIALISTS TRAINING COURSE ON INTEGRATED PEST MANAGEMENT	1,950	2,243	2,579	2,966	3,411	NG Subsidy	13,148
8.10 DEMONSTRATION OF HYBRID RICE TECHNOLOGY	640	820	943	1,084	1,247	NG Subsidy	4,741
8.11 TECHNOLOGY PROMOTION THROUGH ON-FARM DEMONSTRATION AND TRAINING	1,090	25,582 *	22,000 *	30,000 *	30,000 *	NG Subsidy	113,672
8.12 DEVELOPMENT PROJECTS FOR SPECIAL ENVIRONMENTS	2,172	4,550	5,233	6,017	6,920	NG Subsidy	24,892
8.13 ILOCOS-CAGAYAN HIGH YIELD RICE PRODUCTION AND RICE-BASED FARM BUSINESS PROJECT	1,092	1,230 *	1,360 *	1,450 *	1,550 *	NG Subsidy	6,682
8.14 PROMOTION OF RICE SCIENCE AND TECHNOLOGY	2,232	2,567	2,952	3,395	3,904	NG Subsidy	15,049
8.15 COMMUNICATION STUDIES IN TECHNOLOGY PROMOTION	269	309	356	409	470	NG Subsidy	1,814
8.16 RICE TECHNOLOGY AND KNOWLEDGE RESOURCE BASE	1,443	1,101	1,266	1,455	1,674	NG Subsidy	6,940
8.17 MEDIA ADVOCACY AND PUBLIC RELATIONS	706	915	1,053	1,211	1,392	NG Subsidy	5,367
8.18 NETWORK COMMUNICATION	1,502	1,727	1,986	2,284	2,627	NG Subsidy	10,127
8.19 TECHNICAL PUBLICATIONS	1,036	1,191	1,370	1,576	1,812	NG Subsidy	6,985
8.20 INSTITUTIONAL SUPPORT COMMUNICATION	1,960	2,254	2,592	2,981	3,428	NG Subsidy	13,215
8.21 ACQUISITION OF LIBRARY MATERIALS	2,000	3,000	3,500	4,000	4,500	NG Subsidy	17,000
Prog. 9 SEED PRODUCTION AND HEALTH PROGRAM	10,356	10,871	12,499	14,357	16,497		64,579
Proj. 9.1 BREEDER SEED PRODUCTION	1,708	708	814	936	1,077	NG Subsidy	5,243
9.2 FOUNDATION SEED PRODUCTION	2,565	3,665	4,215	4,847	5,574	NG Subsidy	20,906
9.3 MAINTENANCE SEED PRODUCTION	336	336	386	444	511	NG Subsidy	2,014
9.4 SPECIAL QUALITY RICE SEED PRODUCTION	478	478	550	632	727	NG Subsidy	2,865
9.5 HYBRID RICE SEED PRODUCTION	1,492	2,283	2,625	3,019	3,472	NG Subsidy	12,892
9.6 SEED PROCESSING, STORAGE, AND DISTRIBUTION	844	844	971	1,116	1,284	NG Subsidy	5,058
9.7 SEED HEALTH TESTING	936	1,436	1,651	1,899	2,184	NG Subsidy	8,106
9.8 NATIONAL RICE SEED PRODUCTION NETWORK	1,739	918	1,053	1,211	1,393	NG Subsidy	6,313
9.9 COMPARATIVE YIELD PERFORMANCE OF HIGH-YIELDING RICE VARIETIES USING DIFFERENT CLASSES OF SEEDS	51	75 *	80 *	85 *	95 *	NG Subsidy	387
9.10 EFFECT OF ORGANIC AND INORGANIC	52	60 *	68 *	75 *	85 *	NG Subsidy	340

Title of Program/Project/Activity	Yearly budget (P'000)					Source of Fund	TOTAL
	1997	1998	1999	2000	2001		
FERTILIZERS ON SEED YIELD OF HIGH-YIELDING RICE VARIETIES							
9.11 RAT AND BIRD CONTROL	55	70 *	85 *	90 *	95 *	NG Subsidy	395
GRAND TOTAL	120,262	183,940	203,024	226,226	254,006		987,618

* - Spin-off Projects
** - Expansion of Technology Demonstration Farm

APPENDICES

Appendix 1

THE NATIONAL RICE RESEARCH AND DEVELOPMENT (R&D) NETWORK

The national rice program is implemented through the National Rice R&D Network, composed of 56 member agencies.

Table 3. Composition of the National Rice R&D Network.

NETWORK CATEGORY	NUMBER	COMPOSITION
National Centers	2	PhilRice Maligaya, UP Los Baños
Branch Stations	5	PhilRice San Mateo, PhilRice Midsayap, PhilRice Agusan, DA-BIARC (Bicol), DA-WESVIARC (Iloilo)
Regional Research Centers	12	State Colleges and Universities (SCUs), DA Stations in each region
Cooperating and Testing Stations	37	SCUs, DA Stations, and other national agencies
	56	

MEMBERS OF THE NATIONAL RICE R AND D NETWORK

NATIONAL STATIONS

Philippine Rice Research Institute (PhilRice Maligaya)
Maligaya, Muñoz, Nueva Ecija

University of the Philippines Los Baños (UPLB)
College, Laguna

BRANCH STATIONS

1. Philippine Rice Research Institute (PhilRice San Mateo)
   San Mateo, Isabela

2. Philippine Rice Research Institute (PhilRice Midsayap)
   Midsayap, North Cotabato

3. Philippine Rice Research Institute (PhilRice Agusan)
   RTR, Agusan del Norte

4. Department of Agriculture
   Bicol Integrated Agricultural Research Center (DA-BIARC)
   Pili, Camarines Sur

5. Department of Agriculture - Western Visayas Integrated Agricultural Research Center (DA-WESVIARC)
   Hamungaya, Jaro, Iloilo City

REGIONAL STATIONS

1. Benguet State University (BSU) *
   La Trinidad, Benguet

2. Mariano Marcos State University (MMSU) *
   Batac, Ilocos Norte

3. Department of Agriculture - Ilocos Integrated Agricultural Research Center - Research Outreach Station for Lowland Irrigated (DA-ILIARC)
   Dingras, Ilocos Norte

4. Department of Agriculture - Cagayan Valley Lowland Marine Research Outreach Station (DA - CVLMROS)
   Iguig, Cagayan

5. Central Luzon State University (CLSU) *
   Muñoz, Nueva Ecija

6. Department of Agriculture - Central Visayas Integrated Agricultural Research Center - Research Outreach Station for Lowland/Irrigated (DA-CENVIARC)
   Tagbilaran City, Bohol

7. Visayas State College of Agriculture (ViSCA) *
   Baybay, Leyte

8. University of Eastern Philippines (UEP) *
   Catarman, Northern Samar

9. Western Mindanao State University (WMSU) *
   San Jose, Zamboanga City

10. Central Mindanao University (CMU) *
    Musuan, Bukidnon

11. University of Southern Mindanao (USM) *
    Kabacan, North Cotabato

12. Mindanao State University (MSU) *
    Marawi City, Lanao del Sur

COOPERATING STATIONS

1. Department of Agriculture-Cordillera Integrated Agricultural Research Center (DA-CIARC)
   Rizal, Kalinga Apayao

2. Abra State Institute of Sciences and Technology (ASIST) *
   Lagangilang, Abra

3. Don Mariano Marcos Memorial State University (DMMMSU) *
   Bacnotan, La Union

4. Pangasinan State University (PSU) *
   Sta. Maria, Pangasinan

5. *Ilocos Sur State Polytechnic College (ISSPC)
   Sta. Maria, Ilocos Sur

6. Department of Agriculture-Experimental Farm for Crops (DA-EFC)
   Abulug, Cagayan

7. Department of Agriculture-Cagayan Valley Integrated Agricultural Research Center (DA - CVIARC)
   San Felipe, Ilagan, Isabela

8. Isabela State University (ISU) *
   Echague, Isabela

9. Nueva Vizcaya State Institute of Technology (NVSIT) *
   Bayombong, Nueva Vizcaya

10. Quirino State College (QSC) *
    Diffun, Quirino

11. Tarlac College of Agriculture (TCA) *
    Camiling, Tarlac

12. Western Luzon Agricultural College (WLAC) *
    San Marcelino, Zambales

13. Pampanga Agricultural College (PAC)
    Magalang, Pampanga

14. Bulacan National Agricultural School (BNAS) *
    San Ildefonso, Bulacan

15. National Post Harvest Institute for Research and Extension (NAPHIRE)
    Muñoz, Nueva Ecija

16. Department of Agriculture-Central Luzon Integrated Agricultural Research Center - Research Outreach Station for Lowland Rainfed/Irrigated (DA-CLIARC)
    San Miguel, Tarlac

17. Department of Agriculture-Central Luzon Integrated Agricultural Research Center-Research Outreach Station for Lowland (DA-CLIARC)
    Magalang, Pampanga

18. Department of Agriculture-Experimental Farm for Crops (DA-EFC)
    Barcenaga, Naujan, Mindoro

19. State Polytechnic College of Palawan (SPCP), formerly Palawan National Agricultural College (PNAC) *
    Aborlan, Palawan

20.Dr. Emilio B. Espinosa, Sr. Memorial State College of Agriculture and Technology (DEBESMSCAT) *
Mandaon, Masbate

21.Central Philippines University (CPU) *
Jaro, Iloilo City

22.Aklan State College of Agriculture (ASCA) *
Banga, Aklan

23. Department of Agriculture-Bureau of Plant Industry La Granja Research Center (DA-BPI-LGRC)
La Carlota City, Negros Occidental

24.Panay State Polytechnic College (PSPC) *
Mambusao, Capiz

25.Department of Agriculture-Experimental Farm for Upland Crops
Astorga, Dumarao, Capiz

26.Department of Agriculture-Central Visayas Integrated Agricultural Research Center (DA -CENVIARC)
Gabi, Ubay, Bohol

27.Eastern Samar State College (ESSC)
Borongan, Eastern Samar

28.Department of Agriculture-Eastern Visayas Integrated Agricultural Research Center - Research Outreach Station for Upland Development (DA-EVIARC)
Babatngon, Leyte

29.Department of Agriculture-Eastern Visayas Integrated Agricultural Research Center - Research Outreach Station for Postharvest and Technology Development (DA-EVIARC)
San Jorge, Western Samar

30.Department of Agriculture-Eastern Visayas Integrated Agricultural Research Center - Research Outreach Station for Lowland Development (DA-EVIARC)
Irawahan Catubig, Northern Samar

31.Department of Agriculture-Western Mindanao Integrated Agricultural Research Center (DA - WESMIARC)
Ipil, Zamboanga del Sur

32. Department of Agriculture-Western Mindanao Integrated Agricultural Research Center - Research Outreach Station for Upland/Lowland Development (DA-WESMIARC)
Betinan, San Miguel, Zamboanga del Sur

33. Misamis Oriental State College of Agriulture & Technology (MOSCAT) *
Claveria, Misamis Oriental

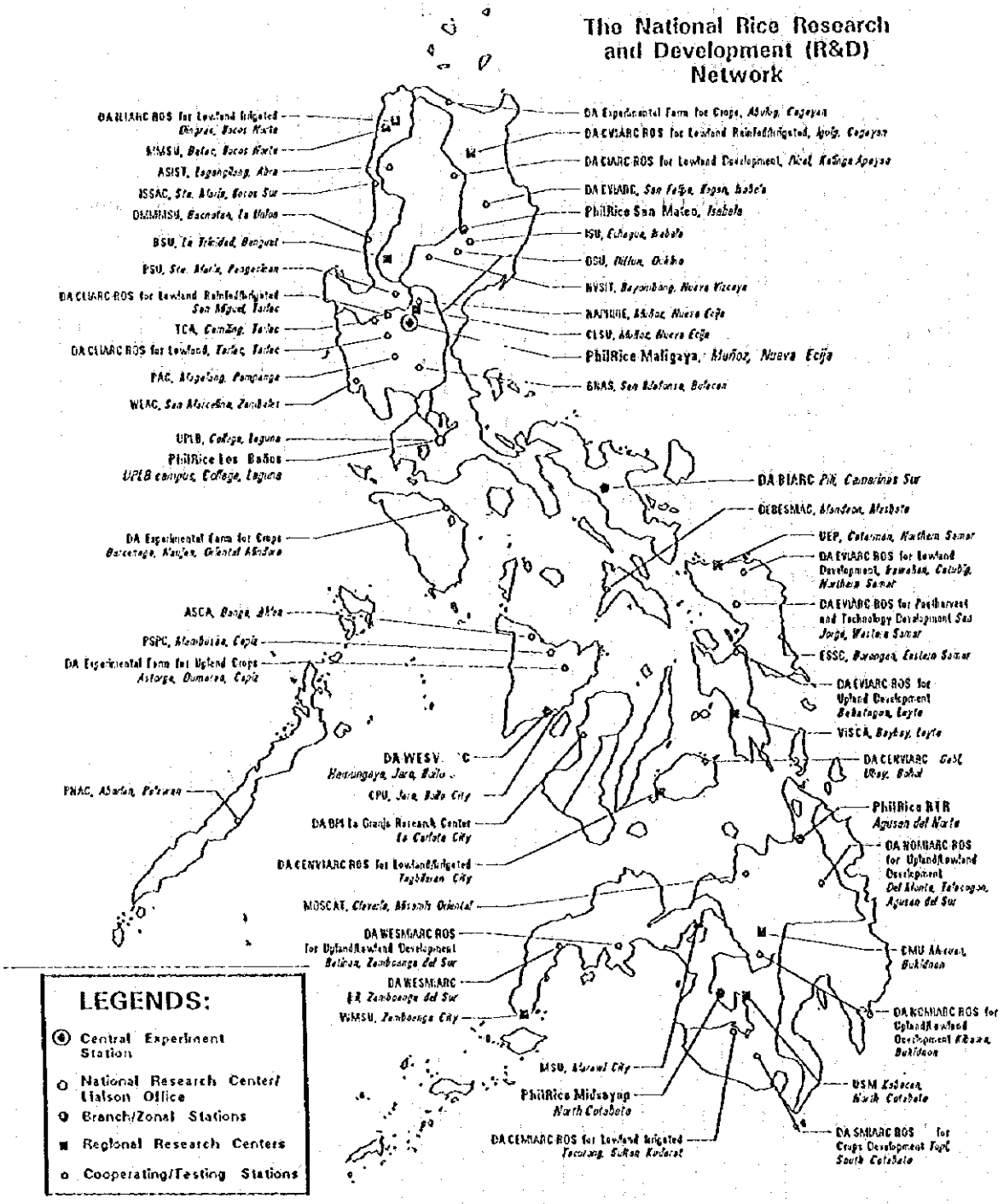
34. Department of Agriculture-Northern Mindanao Integrated Agricultural Research Center - Research Outreach Station for Upland/Lowland Development (DA-NOMIARC)
Del Monte, Talacogon, Agusan del Sur

35. Department of Agriculture-Northern Mindanao Integrated Agricultural Research Center - Research Outreach Station for Upland/Lowland Development (DA-NOMIARC)
Kibawe, Bukidnon

36. Department of Agriculture-Southern Mindanao Integrated Agricultural Research Center - Research Outreach Station for Crops Development (DA-SMIARC)
Tupi, South Cotabato

37. Department of Agriculture-Central Mindanao Integrated Agricultural Research Center - Research Outreach Station for Lowland Irrigated (DA-CEMIARC)
Tacurong, Sultan Kudarat

Appendix 2 Map of the National Rice Research and Development (R&D) Network



Appendix 3. RICE RESEARCH AND DEVELOPMENT PROGRAMS ACCOMPLISHMENTS AND FUTURE TARGETS

1. RICE VARIETAL IMPROVEMENT (RVI)

PAST ACCOMPLISHMENTS	FUTURE TARGETS
• 5 new varieties for irrigated lowland • 8 selections including one from traditional varieties released for rainfed lowland • 2 new varieties for cool- elevated areas • 2 promising lines for upland • 2 lines released for saline-prone areas • promising lines recommended in Mt. Pinatubo affected areas • 1 commercial hybrid rice developed and released for commercial planting in Cagayan and Isabela	• varieties with 7.5 tons/ha by 2000, 10 tons/ha by 2005 • rice varieties for upland, saline-prone, and cool-elevated conditions • varieties suited for mechanized methods of rice cultivation • genetically engineer rice varieties with various agronomically important traits, i.e., pest resistance • new hybrid varieties that will give 15% higher yield over the best inbred

2. PLANTING AND FERTILIZER MANAGEMENT (PFM)

PAST ACCOMPLISHMENTS	FUTURE TARGETS
• recommended anaerobic broadcast wet seeding, management method of 45-55 days-old transplanted seedlings and incorporation of rice straw (RS) for 25%N substitution from inorganic fertilizer • offered soil management methods in volcanic ash-laden soil for rice with proper N rate/application and green manure incorporation • established the best planting time for maximum yield effects of climatic factors, i.e. July/ January for Nueva Ecija • established nitrogen management for 7-8 t/ha DS and 4-5 t/ha WS yield • tested biological method to assess soil N & chlorophyll meter to assess leaf N • found out that the addition of 50 kg P/ha & 100 kg K/ha with 210 kg N/ha increased grain yield from 3.0 to 8.3 t/ha in continuously cropped lowland soil • methane emission in rice fields decreased by: ⇒ 39% with compost vs. uncomposted rice straw ⇒ 37% with ammonium sulfate vs. urea ⇒ 74% with phosphogypsum & urea vs. urea alone	• identify soil/crop management constraints to increase rice crop productivity for major rice soils; establish optimum planting time for major rice areas; and map out areas with nutrient deficiencies • modify location-specific fertilizer recommendations; develop appropriate field guides for recognizing location-specific problems; diagnostic-tools for recommending technologies • develop agronomic technologies to sustain high yields and test transferability of high yielding technologies to other sites • on farm development of leaf color chart to assess leaf N status • evaluate potential yield (for varieties) & manage N models (for N application) in different testing sites • develop environment-friendly rice production technologies • integrate and help in packaging of component technologies

3. INTEGRATED PEST MANAGEMENT (IPM)

PAST ACCOMPLISHMENTS	FUTURE TARGETS
• recommended an integrated approach for yellow stemborer management (without insecticide use) • reduced 90% insecticide inputs (no reduction in yield) with the barangay-based IPM strategy • completed the Mindanao pest profile - tungro as most serious - white stemborer - Malayan black bug • determined the effectiveness of cultural management of tungro - use of GLH resistant varieties - proper planting time	• develop primers on - rearing parasitoids of the rice black bug - mass culture of entomopathogens - tungro management • develop IPM approaches on rice-vegetable systems and continue to support farmer IPM promotion • conduct pest profiling in Luzon and Visayas • enhance of natural control mechanisms in rice-based ecosystems • develop pest damage-yield assessment research on methodologies for pest damage assessment and compensation behavior

4. RICE-BASED FARMING SYSTEMS (RBFS)

PAST ACCOMPLISHMENTS	FUTURE TARGETS
• Established the profitability of dry season crops after rice: ⇒ *wet seeded rice - sweet potato* ⇒ *transplanted rice- mungbean* ⇒ *upland rice+cowpea -yellow corn* ⇒ *upland fancy rice - corn* • Helped controlled erosion by 50-75% in sloping upland areas through contour hedgerows of forage grasses and improved soil organic matter by 3.05% when contour crop is spread as mulch or organic fertilizer along the alleyways compared to only 1.99% in alleys with no hedgerow	• Intensify cropping systems and increase profitability in the rainfed and upland rice areas through the promotion and introduction of dry season crops after rice • Document existing rice-based cropping systems production practices and identify positive factors and potential constraints to productivity in these systems • Establish a functional rice-based farming systems R&D network to strategize promotion activities Apply decision-support systems and diagnostic tools for location-specific recommendations in delineated areas • Conduct strategic and applied researches in various collaborative projects

5. RICE ENGINEERING AND MECHANIZATION (REM)

PAST ACCOMPLISHMENTS	FUTURE TARGETS
• Developed a set of farm machinery and postharvest equipment to ease rice farmers in the drudgery of farm operation, help reduce postharvest losses, and utilize by-products for domestic energy needs: ⇒ *improved drum seeder* ⇒ *stripper harvester* ⇒ *rice micromill* ⇒ *120 cav. flatbed dryer* ⇒ *multi-crop flour mill* ⇒ *rice hull stove* • Popularized the adaptation of improved farm equipment through adoption of strategic methods and intensification of participatory approach in machine development • Coordinated rice engineering R&D among six national centers with better linkages, promoting skill enhancement, and sharing of resources and expertise	• Continue developing engineering technologies that will enhance productivity of inputs and commercializing improved technologies that aimed to reduce postharvest losses and increase product value and farmer's income: ⇒ *engine-driven transplanter* ⇒ *Maligaya reaper* ⇒ *harvester-thresher combine* ⇒ *food processing equipment* Develop capabilities to train and enhance skills of R&D manpower in engineering, extensionists (LGUs), and manufacturers • Intensify mechanization of small irrigated and rainfed rice farms with the introduction and commercialization of appropriate and locally-produced farm equipment

6. RICE CHEMISTRY AND FOOD SCIENCE (RCFS)

PAST ACCOMPLISHMENTS	FUTURE TARGETS
• developed/standardized method for ⇒ extruded rice food products ⇒ rice-based beverages (rice wine, rice vinegar, rice milk) ⇒ baked food stuffs (chiffon cake, brownies, waffles) • developed tempering as pre-treatment to rice flour processing • characterized the regional popular traditional rice food products & improved the shelf-life of four traditional products (*sinukmane, tamales, puto, sapin-sapin*)	• grain quality and sensory evaluation of new breeding lines/selections for varietal development and rice aroma • selection of rice varieties for food products establish better laboratory methods for testing rice quality and rice aroma and physico-chemical analyses • introduce tempering as pre-treatment in rice flour processing • develop/improve and commercialize new rice food products • document the nutrient composition of selected traditional & new rice food products • document and transfer the technology for rice wine production to entrepreneurs

7. SOCIAL SCIENCE AND POLICY RESEARCH (SSPR)

PAST ACCOMPLISHMENTS	FUTURE TARGETS
• Completed the rice-based farm household data base in 1992 WS - 1993 DS (pre-GPEP year) • Published with BAS the following: ⇒ "Regional Rice Statistics Handbook, 1970-1992" ⇒ "Provincial Rice Statistics 1970-1994" • Identified the country's strategic rice areas and profiled their rice economies • Participated in the national debate on rice policy before various relevant fora • Determined the levels of technical efficiency of the Filipino rice farmers and factors influencing such efficiency level	• Update socioeconomic and technological profiles of the strategic rice areas • Monitor the rice economy, its sectors and industries to quickly respond to R&D demands • Refine developmental methodologies in specific rice-based farming systems consistent with environmental sustainability, social desirability, economic efficiency, and technical feasibility • Formulate medium- and long-term blueprint for the country's rice economy with defined policy and program directions for the coming century • Develop workable farm management models/programs for the Filipino rice farmer in the 21st century • Collaborative projects ⇒ socioeconomic dimensions of rice technology R&D ⇒ monitoring/evaluation of GPEP R&D projects ⇒ megaproject for reversing yield decline

8. TECHNOLOGY PROMOTION PROGRAM

PAST ACCOMPLISHMENTS	FUTURE TARGETS
• Identified appropriate varieties, fertilizer recommendations and promoting technology packages for location-specific areas, i.e. IR1314 rice line for rice black bug control in Palawan • Established a core of local trainers (incl. LGUs and NGOs) which enabled PhilRice to train > 50,000 trainees • Improved farmers' access to seeds through the establishment of the National Seed Production Network • Linked and assisted integrated people's livelihood coops and support agencies in their training/technology needs • Promoted IPM through the BIPM and KASAKALIKASAN programs for reduced insecticide use and better profitability • Assembled, synthesized and packaged available rice technologies/information into various media formats/prototypes • Launched information and educational campaign on rice production and conducted impact studies on training	• Establish a national training and promotion center to improve the competencies of rice specialists, researchers, trainers, technicians and farmers and enable them to implement localized training and rice production programs • Strengthen the national rice seed production network ensure availability of seeds to seed growers and farmers, hasten spread of new rice varieties, and increase local capacity to produce seeds • Intensify on-farm demonstration of latest recommended rice varieties, and environment friendly crop management practices such as IPM, INM, crop diversification, and farm mechanization. • Establish knowledge databases on rice to make rice science and technology accessible to all rice workers of the country through an information network linking strategic rice R&D centers and institutions. • Tap the mass media and other alternative communication channels for mass information and education campaign on rice science and technology • Strengthen linkages with LGUs, NGOs, POs, cooperatives and other organized groups in the development and dissemination of rice production technologies

PROPOSALS

PROJECT TITLE	:	Techno Clinic on Locust Management
PROPONENTS	:	Dr. B. F. Cayabyab Mr. D.R. Santiago Mr. D.N. Canlas Ms. M.R. Cariaso
IMPLEMENTING AGENCY	:	National Crop Protection Center (NCPC) UP Los Banos, Laguna
COOPERATING AGENCIES :		Local Government Units (LGUs) People's Organizations (POs) Non-Government Organizations (NGOs) DA-Regional Offices
DURATION	:	January 1997-December 1999
SIGNIFICANCE	:	

Locust infestation has dramatically increased during the last three years. Aside from Central Luzon, Southern Tagalog, Northern Luzon,and Occidental Mindoro are now invaded.

As expected, the confusion and disorganized response to locust infestation in Central Luzon is now being repeated in the abovementioned areas.

Therefore, there is a need to immediately inform the residents of affected areas on the nature of locusts and the management tools that are available. Conduct of trainings/techno-clinic is deemed necessary to evolve a community-wide effort to suppress locust infestation.

OBJECTIVES:

1. To provide information about locust and its control in affected and threatened areas
2. To provide practical techno tips in managing locust
3. To create awareness on the menace of locust infestation
4. To provide rapid response to queries related to locust.

METHODOLOGY

A. **Preparation of training materials**

Training module, flip charts, leaflets/pamphlets, and videos will be prepared to adequately carryout trainings/seminars in locust invaded areas including the threatened areas.

B. **Coordination of trainings and campaign against locust**

Farmers, farmer-leaders, technicians, and concerned individuals will be gathered for the training. Coordination will be done through LGUs,and DA Regional and local DA offices. NGOs and people's organizations will likewise be tapped to reach a greater number of the populace.

C. **Conduct of training proper**

During the training, a module will be provided to explain the following:

- biology and management of locusts
- role of people's organizations and NGOs in the campaign against locusts
- inventory and preparation of logistics
- effective utilization of local resources

Field monitoring of locust will be taught. Drills on locust management and preparedness including administrative capabilities will be done.

D. **Ex-ante evaluation of the trainings conducted**

Every training activity will be documented. Experiences in the process of implementing the techno-clinic on locust will likewise be recorded for probable improvement in the future and to provide insights that can be used for policy guidelines related to techno-clinics.

SCHEDULE OF ACTIVITIES:

Activity	Months 1 2 3 4 5 6 7 8 9 10 11 12
Preparation of training materials	xx
Training/seminar in affected and threatened areas	xxxxxxxxxx
Information campaign	xxxxxxxxxxx
Adaptation of a pilot area to showcase locust management	xxxx
Asmxssment of techno-clinic	- after every training -
Writing and publication of reports	- after every training -

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PROJECT TITLE : Techno Clinic on Locust Management

IMPLEMENTING AGENCY : University of the Philippines Los Banos

DURATION : January 1997-December 1999

SOURCE OF FUND : PCARRD

	PARTICULARS	ANNUAL BUDGETARY REQUIREMENT Y1	Y2	Y3	TOTAL
I.	Personal Services				
	Honoraria (for resource per during trainings)	50,000	50,000	50,000	150,000
	Sub-total	50,000	50,000	50,000	150,000
II.	Maintenance and Operating E				
	Direct Cost				
	Supplies and Materials	71,445	139,535	144,186	355,166
	Printing of extension materials and production of video	150,000	300,000	300,000	750,000
	Fuel and Oil	50,000	50,000	150,000	250,000
	Travel (4 persons x 5 trips/province/affected and threatened area in 10 provinces)	100,000	200,000	500,000	800,000
	Indirect Cost				
	Implementing Agency (7.5%)	31,607	55,465	55,814	142,886
	Sub-total	403,052	745,000	1,150,000	2,298,052
III.	Equipment Outlay				
	Sound system	15,000	-	-	15,000
	Slide projector	30,000	-	-	30,000
	Colored TV and Video player	30,000	-	-	30,000
	Sub-total	75,000	-	-	75,000
	TOTAL	528,052	795,000	1,200,000	2,523,052

\locust.wk1

PROJECT TITLE: Development of Bioherbicides against Paddy Weeds using Indigenous Fungi

PROPONENTS : Dr. Rizaldo G. Bayot
Dr. Gil L. Magsino

IMPLEMENTING AGENCY : National Crop Protection Center (NCPC)
U.P. Los Baños

DURATION : Three years (July 1997-June 2000)

SIGNIFICANCE :

Weeds are major limiting factors in rice production. Depending on the kind of weeds present, their degree of abundance, type of rice culture, and time of competition, yield losses ranging from 16 to 100% have been observed (Lubigan and Vega, 1971; Madrid, et al., 1972; Mercado and Talatala, 1977; Sarkar and Moody, 1981).

Commonly used weed control strategies are water management, hand weeding, mechanical weeding, and chemical herbicides. Water management can control certain weed species in irrigated lowland rice. However, only 52% of the total area planted to rice is irrigated. Hand weeding is time-consuming, and it is becoming expensive, while chemical herbicides are not only becoming more expensive but also contribute to environmental pollution. Continuous use of certain chemical herbicides may result in the development of herbicide-tolerant weed population. There are indications that certain populations of *Sphenoclea zeylanica* in the Philippines have developed tolerance to 2, 4-D (Sy and Mercado, 1983; Migo, et al., 1986; Mercado, et al., 1990). These shortenings or limitations of the existing weed control strategies have rekindled interest in biocontrol using indigenous control agents.

Plant pathogens are among the biological control agents with great potential to control weeds because of the maxim in Plant Pathology that "each and every plant species is potentially subject to its particular diseases" and based on the general observation that some plant pathogens are host-specific. In fact, Australia and the U.S.A. have already established and proven beyond reasonable doubt that certain fungal pathogens can effectively control certain weed species when used properly following either the classical or mycoherbicide strategy. Two mycoherbicides, DeVine and COLLEGO, are commercially available in the U.S.A. to control certain weed species in citrus groves and rice and soybean fields.

The advantages of mycoherbicides over chemical herbicides are: (1) they can be specific to the weed; (2) residue and toxicity problem would be reduced or eliminated altogether; (3) and there would be no accumulation of the herbicide in the soil and underground water.

OBJECTIVES:

General

To develop mycoherbicides utilizing naturally occurring plant pathogens for the control of major weeds in lowland rice fields and in rice-based cropping systems to support long-term sustainable rice production

Specific

1. To isolate and test the pathogenicity of pathogens on their respective weed hosts
2. To determine the optimum conditions for spore production
3. To determine the optimum conditions for disease development in the weed host
4. To determine the host range or specificity of the potential biocontrol agent
5. To determine the nutritional and physical requirements for maximum yields of uniform inocula of the potential mycoherbicide in submerge fermentation
6. To determine the effectiveness of potential mycoherbicide under field conditions

METHODOLOGY:

A. Survey and Isolation of weed pathogens

Major paddy weeds such as jungle rice (*Echinochloa colona* (L.) Link), barnyard grass (*E. crusgalli* (L.) P. Beauv.), pickerel weed (*Monochoria vaginalis* (Burn, f.) Kunth), small flower umbrella sedge (*Cyperus diffonnis* L.), rice flatsedge (*C. iria* L.) gooseweed (*Sphenoclea zeylanica* Gaertn.), and globe fingerush (*Fimbristylis miliacea* (L.) Vahl) growing in their natural or undisturbed habitat and in rice paddies will be observed for disease symptoms. Infected weeds will be collected, brought to the laboratory, examined microscopically, and the pathogens will be isolated using appropriate media and isolation technique. Pure cultures of the isolates will be maintained in the refrigerator.

B. Pathogenicity testing of isolates

Weed species where pathogens were isolated will be grown in pots and maintained in the greenhouse. Ten test plants at four- to five-leaf stage will be inoculated by spraying with the spore suspension (approximately 10^7 spores per ml) of the isolates using a hand atomizer. Inoculated weeds will be incubated in a moist chamber for 24 hours. Plants will be observed for symptom development. Potential weed pathogens will be maintained and used in subsequent tests. All inoculation tests will be done in a containment facility.

C. **Determination of factors affecting disease development**

Optimum spore concentration. Different spore concentrations of virulent isolate (10^3, 10^4, 10^5, 10^6, 10^7) will be prepared with the aid of hemacytometer. Each concentration will be sprayed to ten test plants using a hand atomizer. Control plants will be sprayed with sterile water. Plants will be incubated in a moist chamber for 24 hours. Disease severity will be assessed 5, 10, and 15 days after inoculation.

Vulnerable growth stage of weeds. Weeds at different growth stages (seedling up to early flowering) will be inoculated using the optimum spore concentration found in earlier study. Inoculated plants will be incubated in a moist chamber for 24 hours. Disease severity will be assessed following the procedure described previously.

Effect of relative humidity. Weeds at the most vulnerable growth stage will be inoculated using optimum spore concentration of the pathogen. Inoculated plants will be incubated in the moist chamber for 4, 6, 8, 10, 12, 14, 16, and 24 hours. The plants will then be placed in the greenhouse and observed for symptom development. Disease severity will be assessed following the procedure described previously.

Effect of adjuvants. Adjuvants or wetting agents such as Tween 80, gelatin solution, mineral oil, Agral, etc. will be tested for their possible effects on spore germination, penetration, and phytotoxicity. The lowest concentration of the adjuvants that gives good wetting/sticking ability on the leaf surface of the weed will be used in the study. The adjuvant will be mixed with the optimum spore concentration of the pathogen. Control plants will be sprayed with water and adjuvant solution. Disease severity will be assessed following the procedure described previously.

D. **Determination of host range or specificity**

Potential weed biocontrol agents will be inoculated to selected economic crops at different growth stages in the greenhouse using appropriate inoculation techniques. Inoculated plants will be incubated under conditions favorable for disease development. Weed pathogens that would infect economic crops will be eliminated and disposed of properly. Those that will not infect crops will be maintained for further tests.

E. **Mass production**

Large scale production of the biocontrol agents is necessary to provide sufficient quantity of viable spores needed for field testing. Nutrient requirements (carbon and nitrogen sources, minerals, growth factors) as well as physical conditions of culture (temperature, pH, agitation, aeration) for maximum yields of uniform inocula will be established. Less expensive sources of carbon and nitrogen (molasses, rice bran, corn meal, fish meal, etc.) will be tested as substrate for fermentation.

F. **Field testing**

Paddy field with high population of weeds to be tested will be selected as test site. Different spore concentrations (10^4 to 10^7 spores per ml) of the pathogen will be inoculated using a hand sprayer. Inoculation will be done in the afternoon to minimize

rapid drying of inoculum. Disease severity will be assessed 7 and 14 days after inoculation.

EXPECTED OUTPUT:

Identified promising mycoherbicides against major weeds in lowland rice fields

PROJECT TITLE : Development of Bioherbicides against Paddy Weeds Indigenous Fungi
IMPLEMENTING AGENCY: NCPC-UPLB
DURATION : July 1997-June 2000
SOURCE OF FUND : DOST

ANNUAL BUDGETARY REQUIREMENT

	PARTICULARS	Y1	Y2	Y3	TOTAL
I.	Personal Services				
	Salaries				
	One (1) Univ. Res. Assoc. at				
	P9,668/mo + 20%	139,219	139,219	139,219	417,657
	Year-end bonus and Cash gift	12,602	12,602	12,602	37,806
	Honoraria				
	One (1) Project Leader at P3,000/mo	36,000	36,000	36,000	108,000
	One (1) Project Staff at P2,000/mo	24,000	24,000	24,000	72,000
	Sub-total	211,821	211,821	211,821	635,463
II.	Maintenance and Operating Expenses				
	Direct Cost				
	Supplies and Materials	65,000	60,000	40,000	165,000
	Travel	30,000	20,000	10,000	60,000
	Sundries	10,000	10,000	10,000	30,000
	Indirect cost				
	Implementing Agency (7.5%)	23,762	22,637	20,387	66,786
	Management Cost				
	PCARRD (7.5%)	23,762	22,637	20,387	66,786
	Sub-total	152,524	135,274	100,774	388,572
III.	Equipment				
	1 Laminar flowhood	50,000	-	-	50,000
	TOTAL	414,345	347,095	312,595	1,074,035

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PROJECT TITLE : Malayan Black Bug Biocontrol Technology Development and Transfer

PROPONENTS : Dr. Luis Rey I. Velasco
Mr. Dante R. Santiago
Ms. Valerlana P. Justo

IMPLEMENTING AGENCY : National Crop Pro. ction Center (NCPC)
U.P. Los Banos

DURATION : One year (April 199 -March 1998)

SIGNIFICANCE:

The Malayan black bug, *Scotinophora co rcta* (Fab) is now a major yield constraint of rice in Southern Mindanao. The insect attacks rice pla ts from seedling stage up to the time of harvest and causes damage by sucking the plant juice from tillers, leaves, and panicles. Heavy feeding results in stunting, deadheart, whitehead, or bug burn depending on the plant stage attacked. Severe infestation results in up to 80% ield loss.

Following its first appearance in Southern Palawan in 1979, the black bug spread rapidly to the northern parts of the island damaging more than 4 000 hectares of rice field. Inadvertently introduced in Zamboanga City in 1992, the pest became est blished over wide areas in both Zamboanga provinces and Basilan. It is now strewing at an alarming speed to other parts of Mindanao, particularly Regions XI and XII with the prospect of extensive destruction of rice crops.

Recent efforts to suppress the black bug in Palawan and Mindanao with chemical methods ended up to a total failure.

Past experiences with other rice pests show that integrated pest management, instead of heavy reliance on chemical control is the best approach to the pest problem. The Philippine Rice Research Institute (PhilRice) has published a bulletin on "Integrated Pest Management of the Malayan Black Bug" which recommends, among others, the use of host plant resistance, conservation of natural enemies, and sanitation. The IPM scheme,
however, depends largely on the mass production and field release of select biocontrol agents that would best regulate black bug populations at economic levels. The egg parasitoid, *Telenomus triptus* (Nixon) and the entomopathogenic fungus, *Metarhizium anisopliae* (Metsch.) Sor. are the prime biocontrol agents against the black bug on the basis of effectiveness, amenability to mass culturing, and ease of dispersal. The NCPC has the competitive advantage in developing and transferring the technology for the use of these agents in Mindanao.

The action research, herein proposed, addresses the technology gaps for a more successful integrated management of black bug. At the same time, it will serve as a focus for closer collaboration between NCPC, units of the Department of Agriculture, and the state universities in Mindanao. Moreover, it will demonstrate the advantages of multi-agency approach in dealing with specific common problems.

OBJECTIVES:

General

1. To develop *M. anisopliae* as a microbial biopesticide against black bug
2. To develop a novel mass rearing technique for the black bug egg parasitoid, *T. triptus*
3. To train state agricultural and university personnel on the mass rearing production of *T. triptus* and *M. anisopliae* and their integration with other pest management practices for control of black bug
4. To develop the capability of Mindanao farmers to control black bug through the use of the above natural enemies

Activity 1. Use of the entomopathogen, *Metarhizium anisopliae*, for control of Malayan black bug (MBB)

Specific Objectives

1. To isolate the strain of *Metarhizium anisopliae* infecting the MBB
2. To develop the mass production procedures and formulation of the fungus
3. To develop appropriate field application technique for the fungus
4. To train cooperators from RCPC, USM, and WMSU on the production, formulation, and application of the fungus

Methodology

1. Development of fungal biopesticides

The strain of *Metarhizium anisopliae* infecting black bug will be obtained in Palawan. The fungus will be isolated from diseased insects and maintained at NCPC. The fungus will be initially mass produced at NCPC in order to determine the growth and sporulation rates, yield per kilogram of solid substrate, pathogenicity, and median lethal concentration. The fungal spores will be formulated as wettable powder and tested for spray efficiency and preservation of pathogenicity.

2. Training of cooperators

A hands-on training on the production, formulation, and application of the fungal biopesticide will be conducted tentatively at USM to be participated in by researchers from RCPC, USM, and WMSU. The subject matter will be as follows:

a. Bioassay of strains of *M. anisopliae* against black bug
b. Mass production of *M. anisopliae*
c. Standardization and storage of conidia
d. Field application, efficacy determination, and black bug population monitoring
e. Integration of *M. anisopliae* with other pest management tactics

3. Mass production and application of *M. anisopliae* in Mindanao

The fungal biopesticide will be mass produced by the cooperating agencies using the standard procedures developed by NCPC. The continuous production would ensure the steady supply of the fungal biopesticides. The cooperating researchers are also expected to conduct training of farmers on a limited scale on the use of the biopesticide in the field.

Schedule of Activities

Activity	Year 1 1 2 3 4 5 6 7 8 9 10 11 12
o Development of fungal biopesticide	xxxxxxx
o Training of cooperating researchers	xxxxxxx
o Periodic visit/monitoring	xxxxxxxxxxxxxxxxxxx
o Mass production of fungal biopesticide in Mindanao	xxxxxxxxxxxxxxx
o Training of farmers on use of biopesticides	xxxxxxxxxxx
o Application of biopesticides	xxxxxxxxxxxx

Activity 2. Mass rearing and field release of *Telonomus triptus*, an egg parasitoid of black bug

Specific Objectives

1. To survey natural enemies of Malayan black bug (MBB) in infested areas of Mindanao
2. To develop laboratory mass rearing technique of MBB and its egg parasitoid, *T. triptus*
3. To field release and monitor efficiency of *T. triptus*
4. To train field technicians, researchers, and farmers on rearing and conservation of *T. triptus*

Methodology

1. Survey MBB natural enemies in infested areas of Mindanao
2. Develop mass rearing technique for MBB using alternate hosts
3. Mass rear *T. triptus* using laboratory-reared MBB eggs
4. Determine egg parasitism in the laboratory
5. Release *T. triptus* in the field and determine field parasitism
6. Conduct training of technicians, researchers, and farmers on mass rearing and conservation of *T. triptus*

Schedule of Activities

Activity	Year 1 1 2 3 4 5 6 7 8 9 10 11 12
o Survey of natural enemies with emphasis on egg parasitoids in Mindanao	xxxxx
o Development of mass rearing techniques	xxxxx
o Training of local researchers/technicians on the rearing of egg parasitoids and on field releases	xxxxx
o Training of selected farmers	xxxxxxxxxxxxx
o Field release campaign	xxxxxxxxxxxxx

EXPECTED OUTPUTS:

1. A mass rearing technique for the egg parasitoid *T. triplus* using a more manageable alternate insect host

2. A microbial bioinsecticide (*M. anisopliae)* effective against nymphs and adults of black bug

3. Protocols for field release of *T. triplus* and application of *M. anisopliae* in conjunction with other pest management practices

4. Instructive manuals for mass rearing/production of entomophagous insects and entomopathogenic fungi

5. Trained stage agricultural and academic personnel able to implement IPM together with farmers

6. Trained farmers able to implement black bug in IPM

PROJECT TITLE : Malayan Black Bug Biocontrol Technology Development and Transfer
IMPLEMENTING AGENCY: NCPC-UPLB
DURATION : April 1997-March 1998
SOURCE OF FUND : PCARRD

	PARTICULARS	Q1	Q2	Q3	Q4	TOTAL
I.	Personal Services					
	Salaries					
	One (1) Univ. Res. Assoc. at P9,668/mo. + 20%	34,805	34,805	34,805	34,805	139,220
	Year-end bonus and Cash gift	-	-	12,602	-	12,602
	Honoraria					
	One (1) Project Leader at P3,000/mo	9,000	9,000	9,000	9,000	36,000
	One (1) Project Staff at P2,000/mo	6,000	6,000	6,000	6,000	24,000
	Sub-total	49,805	49,805	62,407	49,805	211,822
II.	Maintenance and Operating Expenses					
	Direct Cost					
	Supplies and Materials	50,000	30,000	-	-	80,000
	Travel	75,000	25,000	25,000	25,000	150,000
	Sundries (includes communication, trainings)	30,000	20,000	15,000	15,000	80,000
	Indirect cost					
	Implementing Agency (7.5%)	15,360	9,360	7,681	6,735	39,136
	Sub-total	170,360	84,360	47,681	46,735	349,136
	TOTAL	220,165	134,165	110,088	96,540	560,958

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