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CAAS/IRRI TEAM REPORT
ON A
NATIONAL RICE RESEARCH INSTITUTE
FOR
THE PEOPLE'S REPUBLIC OF CHINA

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REPORT OF THE JOINT CAAS/IRRI STUDY TEAM ON A NATIONAL RICE RESEARCH INSTITUTE FOR THE PEOPLE'S REPUBLIC OF CHINA

I. INTRODUCTION

The desirability of a National Rice Research center for China has long been recognized. The idea was first conceived by the distinguished rice scientist the late Dr. Ding Yin, former President of the Chinese Academy of Agricultural Sciences (CAAS). Circumstances in the country did not allow the idea to progress, but the need for such an institute still continues. Development of a definitive plan is the next concrete step in realizing China's determination to establish the national research institute.

In January 1979, in Beijing, while formalizing the cooperation between the International Rice Research Institute (IRRI) and the Chinese Academy of Agricultural Sciences, CAAS officials asked about the possibility of obtaining IRRI's help to establish a National Rice Research Institute (NRRI) for China. IRRI officials were receptive to the idea.

A formal request to join in developing a plan for the NRRI was made by the Vice-President of CAAS to IRRI in October 1979. It was agreed that a team composed

of CAAS and IRRI scientists be formed to make an evaluation of the status and the needs for rice research in China and to develop a definitive plan for a KPRI. A grant obtained from the United Nations Development Programme to IRRI financed part of the cost of IRRI's participation. CAAS underwrote the cost of the participation of its scientists plus the expenses of the IRRI scientists while in China.

The members of the study team are listed in Appendix 1. The team visited three major rice growing provinces in China -- Guangdong, Hunan and Zhejiang. Prior to the visits background data/information on rice production and rice research in each province were prepared and made available to team members. In each province the team visited the provincial Academy of Agricultural Sciences and the College/University of Agriculture. Visits to laboratories and discussions with scientists and administrators about their rice research work were part of the team's itinerary at each visit. In each provincial academy three institutes were usually visited -- the Rice Research Institute, the Plant Protection Institute and the Soils and Fertilizer Institute. The scientists and administrators the team met and/or had discussions with in each

province are listed in Appendix 2. Field trip(s) to communes and state farms involved in rice production were also made in each province. At the end of the team's visit to a province a discussion relative to the establishment of a National Rice Research Institute was held between the team and scientists/professors/administrators of the provincial academy and the College of Agriculture. The discussion focused on three issues:

1. The need for a national rice research institute for China.
2. The role(s) of a national rice research institute.
3. The location for the national rice research institute.

The ideas expressed and the comments and suggestions made during these discussions were most helpful to the team during its deliberations and preparation of this plan for a NRRI for China.

The team carried out its assignment from February 24 to March 23, 1980. February 24 to March 11 were spent in the three provinces and March 12 to 23 in Beijing for discussions and preparation of the report.

II. IMPORTANCE OF THE INSTITUTE

China is the world's largest producer and consumer of rice. About 30 percent of her food crop area is devoted to rice which provides over 40 percent of her total grain consumption. Remarkable production increases have been made since liberation. Rice output increased from 80 million metric tons (mmt) in 1961 to 105 mmt in 1970 and to 117 mmt in 1976 (FAO estimates). Scientists have successfully developed semi-dwarf varieties, hybrid rice, and high-yielding cultivation techniques. Land and water control improvements have permitted a maximization of China's world-famous intensive cultivation practices. The best known production techniques have been successfully spread to many thousands of people's communes and state farms In these activities China is as advanced as any nation in the world.

2.1 Need for the Institute

A continuation of this progress is needed to feed China's growing population over the coming decades, but drastic changes in the research and education system during the late 1960's and early 1970's seriously interrupted the development of the new technical ideas needed to provide the potential for future production increases.

A revitalized rice research system is needed to make the discoveries that will provide future sources of growth.

China has an extensive system of rice research agencies at the provincial and prefectural level, but no national rice research institute. Research forces are fragmented and research is duplicated. Basic research is weak and methodology development is neglected. The best way to correct these problems and strengthen coordination is through a new National Rice Research Institute. The new institute is needed to provide a center of excellence, to improve national coordination, to improve the professional training of rice researchers and to serve as a link to the rest of the world.

China needs a center of excellence for basic research on rice where a limited amount of sophisticated equipment can be concentrated with the highly trained scientists needed to make the discoveries on which future gains will be based. Concentrating the equipment and scientists will provide complementarities not possible if they are scattered. Provincial academies focus their research on short-run problems. A center is needed that could devote substantial attention to long-run problems.

China also needs to strengthen her ability to organize and coordinate the rice technology develop- activities that will lead the way toward the modernization of China's agriculture. This modernization will require the full cooperation of national and provincial research agencies. A national rice germ plasm bank to collect, evaluate, catalog, preserve, and utilize China's vast treasure of rice genetic resources at the NRRI will provide the provincial agencies with a much broader range of genetic materials than they now have. There is a need to develop a standardized scoring system for the evaluation of rice traits for nationwide use. There is a need for a center of information about rice improvement and production that would facilitate the exchange of information among provincial and other research agencies.

China needs to examine the experience of other rice growing countries and of IRRI and take advantage of knowledge already available, as well as use the educational facilities available in other countries in order to rapidly augment her research capacity. A national institute would facilitate the exchange of information and scholars that would meet that need.

DRAFT BUDGET FOR COLLABORATION WITH CHINESE ACADEMY OF AGRICULTURE SCIENCES FOR PLANNING CHINESE NATIONAL RICE RESEARCH INSTITUTE

Activity	1981	1982
1. Soil Survey and Site Development		
2 men travel/per diem/mo.	7,000	
2 men salary (150 x 2)	9,000	
1 man x 3 mo. (Site Dev.)	24,000	
2. Architect	80,000	80,000
3. Clerk of the Works		
2 years	50,000	50,000
4. Short term consultants (6 man months)	30,000	20,000
	270,000	150,000
Indirect costs (10%)	20,000	15,000
	220,000	165,000

In all cases the above are assumed to have Chinese counterparts who would take major responsibility for the mechanical preparation and implementation of mutually agreed upon plans (e.g. architectural plans, field layout, etc.)

2.2 Role of the Institute

To meet the needs and make the best use of scarce research scientists and facilities the national institute should complement the existing system by carrying out activities it cannot, and by not duplicating research already underway. This will require the new institute to perform four roles:

2.2.1. Conduct high quality research on problems that have national significance, or that require sophisticated equipment or facilities, or that can only be solved over the long run.

2.2.2. Design and conduct problem-oriented, multi-disciplinary research programs to develop new technology and needed research methodology in all areas affecting rice production.

2.2.3. Organize coordinated programs among the provincial rice research agencies to achieve a better sharing of knowledge, techniques, and methodologies among all the rice research agencies of the country.

2.2.4 Operate a training program to improve the knowledge and research capability of the nation's researchers and to provide formal educational opportunities for postgraduate studies for researchers both within China and abroad.

III. RESEARCH PROGRAMS

Experience in China and other countries suggests that the research program of the NRRI should be defined by identifying the broad rice research problems that need to be solved. In most cases, successful solution of these problems will be achieved faster with multidisciplinary teams of scientists working together. Therefore, this document recommends such an organization. The relationship between the research programs and the departmental structure (see under Organization of the Institute) is shown in Appendix 3. Each of the broad, multidisciplinary research program areas may involve some aspects of long-term basic research, technology development, and research coordination. It is recognized that there are fundamental differences between these three activities, but it is emphasized that the NRRI must maintain a balance among the three. The institute will fail if it neglects any one of the three activities. The research program areas will focus on the problems that are discussed in the following sections.

3.1. Genetic Evaluation and Utilization

The objectives of this program area are to collect, conserve and utilize the rice genetic resources of China and the rest of the world to produce a basis for continuing progress in developing improved rice varieties for China. There are six main subareas in this problem area: genetic resources, varietal improvement, breeding methods, varietal testing, basic research, and seed technology.

3.1.1. Genetic Resources

China has a vast diversity of varietal types, some of which have already been collected and stored, but in inadequate provincial facilities. Some effort has been made to evaluate and catalog this germ plasm but rice scientists of the country are not fully aware of its genetic potential. The NRRI would collect, evaluate, catalog, preserve and use these germ plasm resources as follows:

(i) Consolidate in one collection the estimated 30,000 varieties now being maintained in the provincial academies; organize collection of old varieties still grown in remote areas; introduce donor parents for rice improvement from abroad; assemble a collection of wild relatives of rice from within China and from abroad.

(ii) Evaluate the collection for obvious duplicates and for agro-morphological traits; screen for resistance to diseases and insects and for tolerance to environmental stresses such as high and low temperatures, adverse soils and drought; undertake studies on the cyto-taxonomy of the genus Oryza.

(iii) Catalog the information obtained in the evaluation along with origin, varietal group, etc.; make the catalog available to all the concerned rice scientists of the country.

(iv) Preserve seed samples of each entry in long term cold storage; store larger samples in short term air conditioned storage to meet the seed requests of scientists.

(v) Use and encourage use of the germ plasm by rice scientists of the country for varietal improvement and other research projects.

3.1.2. Varietal Improvement

China has made remarkable progress in developing high yielding varieties that have been widely accepted. However, continuous efforts in varietal improvement are required to meet the existing and future problems. Varietal improvement research will give immediate attention to host resistance to major diseases like blast, bacterial blight, sheath blight, rice dwarf, yellow stunt, stripe, and insects such as brown plant hopper, green leafhopper, gall midge, yellow and striped borers. Efforts to develop varieties with higher yield potential, earlier growth duration, higher levels of tolerance to low and high temperature and problem soils and better grain quality will also be made.

NRRI will develop a dynamic breeding program that is complementary and supplementary to the provincial breeding programs. It would emphasize the development of breeding materials having different genes for resistance which could be utilized by the provincial rice improvement programs.

3.1.3 Breeding Methods

China has utilized conventional breeding methods and innovative techniques such as tissue culture, polyploid breeding, radiation breeding, wide crosses, and has developed the first successful hybrid rice varieties

which were planted to five million hectares in 1979. Continuous research in increasing the efficiency of these methods and in developing new breeding techniques will be made. Information and techniques will be shared with provincial breeding programs.

3.1.4. Varietal Testing

Coordinated national trials of the best international, national, and provincial breeding materials is the main mechanism for exchanging breeding materials between various provinces to help identify suitable varieties. The institute will take responsibility for organizing national coordinated trials, analyzing and reporting the data, and holding annual rice research workshops to discuss the results and prepare plans. It will coordinate international tests such as IRTP nurseries, in the various provinces.

3.1.5. Basic Research

Basic research is the backbone of any crop improvement program. For rapid progress in developing varieties with multiple disease and insect resistance the institute will investigate the genetics of host-parasite interactions to identify diverse genes for resistance to major diseases and insects; develop isogenic lines to be used as differentials in studying the variation in disease and insect organisms; study the mechanisms of

variability in disease and insect organisms; and continue to develop efficient screening techniques for rapid evaluation of breeding materials.

3.1.6. Seed Technology

The availability of high quality pure seed at the right time and in sufficient quantities is essential if maximum advantage is to be derived from the new varieties. The NRRI would conduct research on techniques of seed production, certification and distribution; investigate problems of identification of seed impurities through new techniques such as gel electrophoresis; conduct research on problems of seed viability to enhance their knowledge of ideal conditions for storage and maintenance of stock seed; investigate seed pathology to determine the potential seed treatment may have in controlling certain seed borne rice diseases.

3.2. Integrated Pest Management (IPM)

Diseases, insects, birds, rodents, and weed pests can cause significant crop losses and therefore require sustained, concerted control efforts. Studies on development, evaluation, and implementation of the following important pest management programs should be emphasized.

3.2.1. Integrated Disease Management

This program should include the following strategies and studies:

(i) Use of disease-resistant varieties;

(ii) Ecology of rice pathogens, their pathotypes and physiological races;

(iii) Epidemiology of rice diseases and development of good disease surveillance and forecasting systems that take into consideration the role of weather, cultural practices, cropping pattern, etc.;

(iv) Cultural control involving cultivation practices, cropping pattern, etc.;

(v) Biological control involving identification and evaluation of biological control agents or their derivatives (e.g., antibiotics), their conservation, augmentation, and manipulation for control purposes;

(vi) Chemical control involving screening of pesticides, evaluation of formulations, methods and timing of application, pesticide residue analysis, and environmental safety criteria.

The integrated disease control should be based on a sound understanding of the disease problem and on an

appropriate combination of control strategies based on optimum economic considerations.

3.2.2 Integrated Insect Pest Management

This program should cover the following important aspects of pest management:

(i) Identification and study of bionomics of key insect pests in important rice-growing areas;

(ii) Use of insect pest-resistant varieties and their effects on pest populations;

(iii) Biological control involving identification, importation, augmentation, conservation and manipulation of natural enemies (parasites, predators, and microbial agents) for practical control of insect pests, use of kairomones for attracting natural enemies into rice fields;

(iv) Cultural control involving use of trap crops, effects of cultivation practices, cropping pattern, etc.;

(v) Chemical control involving screening of insecticides, evaluation of formulations, methods and timing of application, economic thresholds, pest resurgence due to

use of improper insecticides, pest resistance to insecticides, residue analysis, environmental safety and considerations of cost-benefit ratio;

(vi) Biorational control involving use of attractants, repellents, antifeedants, juvenile hormone analogs and other allelochemicals of plant origin;

(vii) Isolation, identification, synthesis, and use of sex pheromones for monitoring pest populations and for use in control of pests by disrupting their mating behavior;

(viii) Sterile male release technique for control of dipterous and lepidopterous pests;

(ix) Development and evaluation of appropriate pest sampling and monitoring techniques, and refinement of pest surveillance and early warning systems;

(x) Studies of insect pest migration, field colonization and life table analysis.

Insect pest management thus should be based on a good understanding of the pest ecology and behavior and rely

on a combination of strategies to keep the pest populations below the economic injury level.

3.3 Soil Improvement Program

The soil improvement program should focus on studies of the causes of low soil fertility for rice production, with a view to amending and enhancing productivity. A number of research problems have been identified within the five subareas of soil-crop relationships, organic fertilizers, azolla, fertilizer management and basic studies.

3.3.1. Soil-crop Relationships

The general objectives of research in this subarea are to obtain a better understanding of the relationships between soil properties, rice yields and the potential for increasing rice yields. The NRRI will:

(i) Characterize representative rice soils and determine the relationship of soil characteristics and fertility to rice yields;

(ii) Conduct surveys of present soil fertility practices on rice cropping systems in representative areas; summarize soil test results as benchmark data on present practices;

(iii) Cooperate with other agencies conducting ongoing soil surveys to insure that data useful for characterizing rice growing soils is obtained.

3.3.2. Organic Fertilizers

The objectives of this subarea are to evaluate the yield effect of presently available organic fertilizers and to develop improved sources of fertilizer for rice from biological and organic sources. The research studies will:

(i) Quantify the typical rice yield increase from oilseed cake, rice straw, animal manures, "night soil," crop residues, silts, and legume green manures;

(ii) Determine the influence of handling practices, timing and mixing of the various organic materials;

(iii) Determine the increased yields that can be obtained from more efficient varieties of green manure crops, especially the possible addition of an annual grass to the legume crop;

(iv) Evaluate the use of alternative strains of inoculants to improve nitrogen fixing ability of legumes;

(v) Explore the possibility of a breeding program to increase bulk production of the legume *Astragalus sinicus* and evaluate other genera and species as green manures for specific regions;

(vi) Study the problems of seed production for green manure crops, including the potential of specialized seed production in certain parts of the country outside the main rice areas.

3.3.3. Azolla and Blue Green Algae

The objectives of this subarea are to understand the Azolla-blue green algae complex and optimize the contribution it can make to improving rice yields. Research will:

(i) Investigate the symbiotic relationships of Azolla with nitrogen fixing algae;

(ii) Determine what Azolla strains are best suited to withstand the environmental stresses of extreme hot and cold weather;

(iii) Develop more efficient management of Azolla for maximizing nitrogen contribution to the rice crop.

3.3.4. Basic Studies

The goals of the basic studies in this area are to understand the processes by which nutrients are made available to plants from various sources in order to suggest ways of improving the efficiency of those processes. Research may take many directions, depending on the insights of the scientists. Problems that may be undertaken will:

(i) Measure the fate of nitrogen (uptake vs losses) of different forms in different types of soils and suggest ways to improve the efficiency of use;

(ii) Study the nitrogen fixing micro-organizms in rice soils to understand the mechanism of nitrogen fixation in rice soils and in the rice rhizosphere.

3.3.5. Fertility Practices

The goals of studies in this area are to determine the fertility practices best suited to newly developed and promising rices under various soil conditions. Research will:

(i) Determine, by screening trials located throughout the country under specific environmental conditions, the yield response to fertility of promising lines;

(ii) Determine the management requirements of new varieties and their adaptation to problem soils;

(iii) Screen varieties, under field and greenhouse conditions, for their tolerance to high and/or low levels of N, P, K, Fe, Si, Zn, salinity, alkalinity, etc.;

(iv) Determine the effects on nitrogen conservation of "wet" vs "dry" plowing and the one-day "yellow-black-green" turnaround practices.

3.4. Crop Management and Cropping Systems

Rice is produced from 18° to 50° N latitude under a wide range of soil and topographic conditions. A systematic approach is needed to solve the problems of optimizing rice yields and identifying cropping systems that will most efficiently utilize present knowledge to produce the greatest returns per mu per year while maintaining the land resource. The NRRI would not be able to directly work in all the many environments in the nation, but through its crop management and cropping systems program it can evolve principles and concepts that can be used by provincial agencies to reach that goal in their areas.

3.4.1. Crop Management

The objective of crop management research is to develop systems of cultural practices for the rice crop that will optimize performance of the improved varieties in the areas for which they are most suitable. Specialists in agronomy, plant physiology, soils, engineering, crop protection, and economics will work together to optimize practices such as:

(i) Irrigation and drainage;

(ii) Tillage practices;

(iii) Seedling management and stand establishment (direct seeding, transplanting, ratooning);

(iv) Plant spacing and plant population;

(v) Fertilizer timing and placement.

3.4.2. Cropping Systems

The objective of cropping systems research is to use all existing knowledge on sets of crops to combine into cropping systems that will obtain maximum returns per mu per year. This research will be done on farms, in cooperation with commune or state farm managers. The systems should be ecologically stable so they do not encourage the excessive build-up of plant pests and so they maintain soil fertility. Researchers will:

(i) Select a limited number of sites throughout the country to serve as field laboratories for the development of concepts and principles to be used in cooperative and collaborative research with provincial agencies;

(ii) Conduct periodic workshops on cropping systems research methodology;

(iii) Assess the currently used cropping systems for their biological and economic productivity as a base for comparison of improved practices;

(iv) Evaluate the possibilities for improved systems that could be obtained from dramatic changes in rice variety duration or temperature tolerance and suggest the most productive activities to the breeders;

(v) Evaluate the role of animal power in the cropping systems where animals absorb a significant part of the output, and suggest mechanized alternatives;

(vi) Explore the role of rice-grassland-animal systems in areas where that combination is needed for soil conservation.

If properly done cropping systems research is the means whereby the maximum economic returns from the best adapted variety or varieties can be obtained providing the best known management is applied. Hence this information is most valuable to the farmer as well as to the national policy and decision makers as they would project programs for meeting potential production targets of the future.

3.5 ECONOMIC EVALUATION

The primary objective of this research program area should be to evaluate potential new technologies and cropping systems for their impact on production, resource use and income. The evaluation will compare new technological ideas with existing practices. This kind of information should be developed before decisions are taken to recommend technologies to the people's communes and state farms and to provide this information to the scientists as well as to the leaders who are responsible for encouraging the adoption of new technologies. Specific research sub-areas include:

3.5.1 Systems Economics

This sub-area will describe the present production systems in order to provide a firm basis for comparison for potential new technologies. The economic descriptions should include the complete farming systems and could be organized into:

(i) Studies of costs and returns of rice farming systems:

(ii) Studies of the pattern of labor use and cash flow through the year;

(iii) Investigation and identification of farm economic problems.

3.5.2. Technology Evaluation

The new technologies developed by institute scientists in pest management, soil improvement, crop management, cropping systems, and machinery development will be evaluated in terms of the impact they would have if adopted by the people's communes and state farms. The evaluation will include the impact of the new technology on production of rice and other food, use and cost of purchased inputs, use of labor and other farm supplied inputs (manure), and net income. Studies will include research on:

(i) Economics of new pest management technologies;

(ii) Economics of new soil improvement technologies;

(iii) Economics of new crop management and cropping systems;

(iv) Economics of new mechanization technologies.

Where the people's communes or state farms are reluctant to adopt new technologies that appear to increase yields and income it may be useful to conduct:

(v) Studies on the constraints to high yields.

3.5.3. Rice Data Series

Data cropping systems, prices and input use will be needed by economists for evaluating proposed new technologies. Data on area planted to rice varieties, rice production and related information will be needed by the administration of the institute in planning research programs and by national economic planners for evaluating the progress of the rice sector. To provide these services a limited set of data will be collected and maintained. This set will include:

(i) Area, production and yield of rice, by province;

(ii) Area planted to the main varieties and area in the main rotations, by province;

(iii) Use of chemical fertilizers, tractors, insecticides, other chemicals and the prices of these inputs, by province;

(iv) Prices received by people's communes for various types of rice;

(v) Other selected data such as world rice production, international rice trade data, selected weather data for rice producing areas, etc.

3.6. Rice Machinery Development and Evaluation

Agricultural mechanization is a very important link in the process of agricultural modernization. The establishment of new Chinese machines for land preparation even in deep water have been successfully developed. However, other operations, especially transplanting and harvesting still are manual. Machines for direct seeding are needed.

The objective of this program area is to do the research necessary for rapid and efficient transformation of rice production from a manual to a mechanized production process. The transformation will be successful and efficient only if the machinery available to the people's communes and state farms accomplishes the various production operations at a cost that the farmers believe is reasonable compared to the benefits obtained. Research should compare the increased output or labor saved by various machines to the cost of such mechanization, and determine the most appropriate method of operation for alternative conditions. If no available mechanized

method is superior to existing manual methods further design and development research is needed. The specific research subareas include:

3.6.1. Studies of the Whole Process of Rice Production

This research will examine the physical operations used in rice production and determine whether they are excessively time consuming or exhausting. Those which are, for example seedling pulling, will be the focus of mechanization efforts.

3.6.2. Testing of Available Machinery

This research will involve the measurement of the technical aspects of machine performance under various physical conditions.

3.6.3. Design and Modification

To reduce the cost or improve the technical performance characteristics some design and modification of existing equipment will be carried out. Some design research will be needed to produce machines for rice experimental fields to improve the accuracy and efficiency of experimental field work.

3.6.4. Economic Evaluation and Recommendations

Equipment that has good technical performance will be evaluated for cost and benefits in various economic environments in order to determine the expected benefits of such equipment to the people's communes or state farms.

IV. TRAINING PROGRAMS

The availability of properly trained and highly motivated scientists is essential to strong and effective national rice research and extension programs. To meet this need the National Rice Research Institute should organize and implement a resident training program in which scientists, technicians, extension workers, and administrators from the rice growing areas can participate and gain experience in rice research and in the various aspects of rice culture and production. The Institute should also coordinate an overseas training program for rice scientists. This will be done by directly sponsoring appropriate individuals and identifying and recommending to CAAS scientists to participate in educational opportunities abroad. The training programs should include the following.

4.1. Short Term Group Training in Research

These training programs would be designed to improve research skills in particular research programs. An example is short term group training in the Genetic Evaluation and Utilization (GEU) program. A GEU training program combining lectures and laboratory/greenhouse/field work and practice of techniques and methodologies used in rice breeding should emphasize the need for a multi-disciplinary team approach to the development of varieties. Likewise it should emphasize the importance

of the collection, cataloging, evaluation and utilization of rice genetic resources. Short term training programs could be a few weeks to six months in duration.

4.2. Short Term Individualized Non-degree Training

Selected scientists from the provinces could be brought to the Institute to work alongside Institute scientists in specific research projects. In selecting participants priority should be given to scientists involved or who will soon participate in research programs coordinated by the NRRI. Such experience will not only improve the research capabilities of the participant but will enhance the successful implementation of NRRI coordinated research programs. Duration of such individualized research training programs could be for a few weeks (e.g. to learn technique of screening for resistance to bacterial leaf blight) or up to a year (e.g. plan, carry out the experiment and write a report on the effect of different temperature regimes on the sporulation of various species of Azolla).

4.3. Short Term Group Training for Administrators

Certain administrators at the county, prefectural and provincial levels play an important part in the country's effort to produce more rice through their role in the popularization of new rice varieties and new technologies. In order to maintain and improve their effectiveness the

NRRI should organize short term group training programs for these administrators. The training program should include information on basic rice production and newly developed technologies.

4.4. Masters and Doctoral Degree Oriented Programs

The maintenance of high quality research at the NRRI and in the research institutes and colleges of agriculture in the provinces requires a continuous upgrading of research personnel. Rice scientists who retire or move to assume other responsibilities need to be replaced. Masters and Doctoral degree programs are research oriented educational opportunities that have in general proven to be an effective means of training scientists capable of independent research and/or of research leadership.

The NRRI should initiate cooperative arrangements with universities whereby the graduate student completes the course requirements for the degree at the university and the thesis research at the NRRI. The degree could be conferred either by the university or the CAAS.

The NRRI must have specific funds in its budget for the implementation of its resident training programs. The funds will be needed not only to operate the programs but also to provide scholarships to deserving young rice scientists.

4.5 Coordination of Overseas Training

The NRRI will play a coordinating role in its overseas training program. Educational opportunities for rice scientists are available in many research and educational institutions abroad. Such opportunities include:

(i) Short term group training in research program areas;

(ii) Short term individualized non-degree research training;

(iii) Masters and Doctoral degree program;

(iv) Participation in scientific conferences, symposia, and workshops.

The NRRI should be aware of these educational opportunities abroad. In addition to coordinating the participation of Chinese scientists in such opportunities, the NRRI should actually sponsor participants through scholarships to these educational opportunities. Of particular concern to Chinese scientists going abroad for training is the language problem. The NRRI should seriously consider making arrangements for intensive language training for scientists before they go for training.

V. ORGANIZATION OF THE INSTITUTE

The highest responsible officer of the Institute is the Director. Four Deputy Directors assist him and provide guidance for the administrative, research, training, and coordination functions. The research programs, as discussed in Section III, are defined by major problem areas. The scientists to carry out the research programs are organized into disciplinary research departments for the purposes of budgeting, office space assignments, and other administrative functions. This two-way organization of departments and problem areas will facilitate adjustment of resources to meet new program needs as they arise. Administrative and service functions will be provided by departments grouped under Deputy Directors. A number of operating committees will give guidance and achieve co-operation on multi-departmental training programs and service functions.

Under the overall guidance of the Institute Director, the Deputy Directors will have administrative responsibility for the offices indicated below:

<u>Deputy Director, Executive Office</u>

General Services (Accounting, Food and Dormitory, Buildings and Properties, Purchasing, Vehicles, etc.)

Personnel

Medical Services

Security Services

Deputy Director, Research

Genetics and Genetic Resources	Plant Breeding
Plant Pathology	Entomology
Plant Physiology	Cereal Chemistry
Agronomy	Soil Science
Agricultural Economics	Agricultural Engineering

Plus two service departments: Experimental Farm, and Statistical and Computer Services.

This Deputy Director will be chairman of the Phytotron Committee.

Deputy Director, Training

Training Staff

This Deputy Director will be chairman of the Training Committee.

Deputy Director, International and Provincial Relations

Foreign Affairs

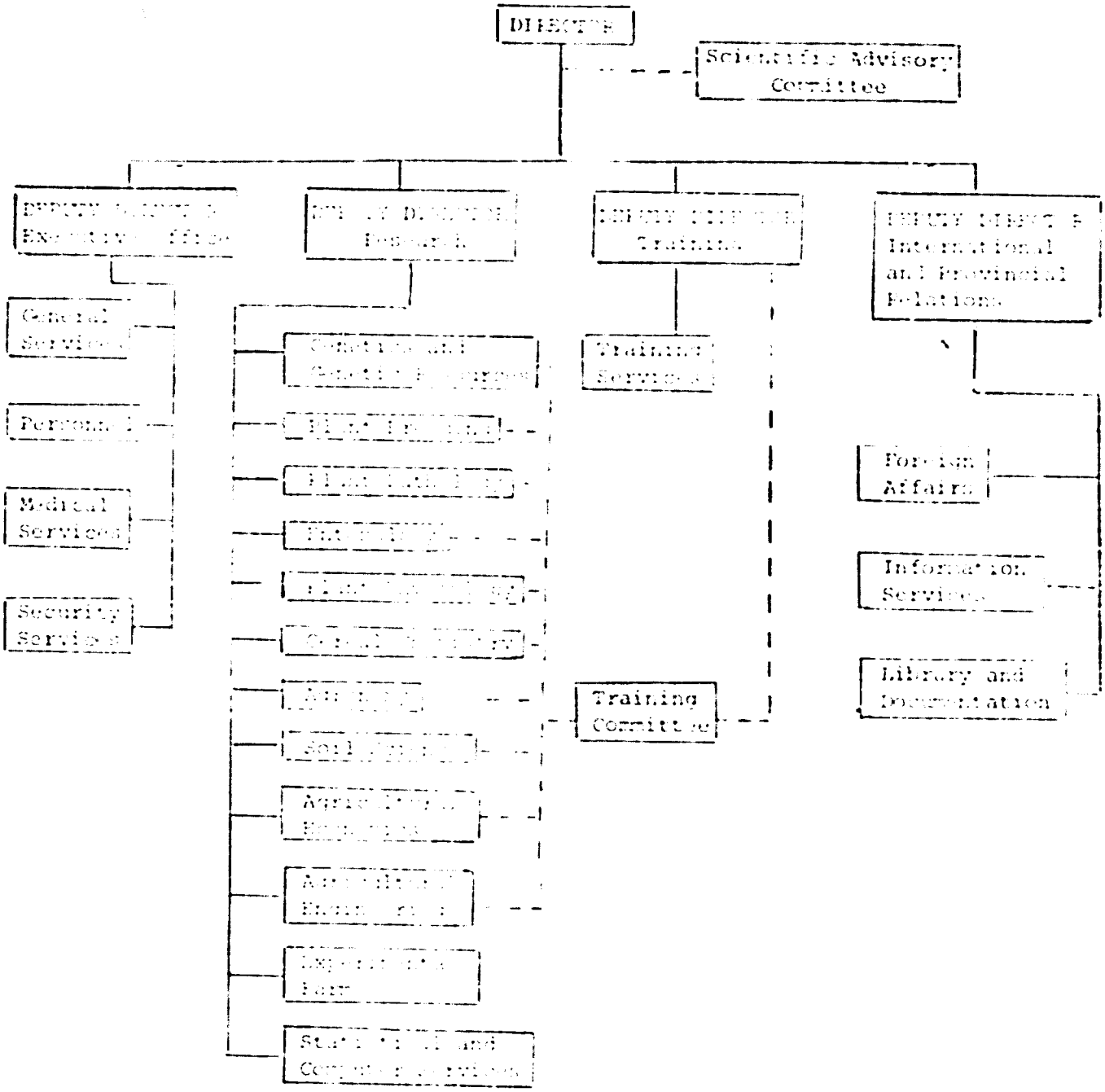
Information Services (Including subject matter specialists)

Library and Documentation Center

This Deputy Director will be chairman of the Editorial Committee.

ORGANIZATIONAL CHART

NATIONAL RICE RESEARCH INSTITUTE



VI. LOCATION OF THE INSTITUTE

The study committee was asked to examine possible sites for the institute in the provinces of Guangdong, Hunan and Zhejiang. In considering the possible sites the committee compared them to a number of criteria. The ideal site would fully meet each of the criteria, but none of the sites do. Therefore, the recommendation is necessarily conditional on meeting certain additional requirements.

The criteria against which the possible sites were measured are:

1. The soils of the farm on which the Institute is located should be representative of a large area of China's rice production;
2. The climatic environment should be representative of a major rice growing area;
3. The major insect pests and major rice diseases should occur in the area;
4. A land area of approximately 400 hectares should be available;

5. Adequate irrigation and drainage should be available for the farm;
6. The location should have good transportation links with China's main rice producing areas and with other rice growing countries;
7. The location should be relatively close to a big city or town with an agricultural college or university and in a location that would be relatively attractive to scientific researchers and their families.

Keeping in mind these criteria the study team recommends the following options. It is emphasized that the recommendations are arranged in order of priority.

Priority No. 1. The Huang Tien Pan State Farm in Fu Yang County of Hangzhou City. This state farm with 350 hectares of riceland is the first choice for the site of the Institute provided that the 40 hectares of land that originally belonged to Huang Tien Pan State Farm and was given to the adjacent state farm can be returned. The possibility of negotiating an exchange

of land with the commune farm adjacent to the Huang Tien Fan State Farm should be considered in order to provide the new Institute with a more rectangular shaped experimental area.

Priority No. 2. Hangzhou, Zhejiang is second choice for the site provided that enough land could be made available in the vicinity of the present site of the Zhejiang Academy of Agricultural Sciences and the Zhejiang Agricultural University.

Priority No. 3. Changsha, Hunan, is the third choice for the site provided sufficient land could be made available in the vicinity of the present site of the Hunan Academy of Agricultural Sciences and the Hunan Agricultural College.

VII. SOURCE AND TRAINING OF STAFF

Scientists having the highest qualifications are required if the NRRI is to effectively carry out its mandate and become a center of excellence. However it must be emphasized that the selection of scientists should not be limited to those available in the province in which the Institute is located. The scientists must

be selected on a nationwide basis; this is extremely important if the Institute is to be a truly National Institute and not merely a provincial institute with a national label.

The team recommends that nationally/internationally recognized rice scientists working in the different research institutions and universities in the provinces be encouraged and attracted to work in the new Institute. In this connection, at least one such senior scientist for each of the discipline departments in the Institute should be attracted. The suggested pattern of staffing is shown on the accompanying table.

Because of the present shortage of trained scientists in the country, it is necessary to begin to train the majority of the research staff required to carry out the functions of the Institute. Even if site preparation and construction of buildings are started soon, it may take three to four years before the buildings are completed and the laboratories are fully equipped and functional and the experimental farm will be ready for use. Thus, the staff should now be employed and sent for training either in China or abroad. They would have completed their programs by the time the laboratories, greenhouses, and experimental fields of the Institute are fully functional.

SUGGESTED PATTERN FOR STAFFING FOR THE NRRI

Department	Senior Scientists	Associate Scientists	Research Assistants	Lab/Field Aides	Secretary - Clerk/Typist
			Research Departments		
Genetics and Genetic Resources	2	4	10	10	1 + 1
Breeding	4	9	24	20	2 + 1
Plant Pathology	3	4	10	10	1 + 1
Entomology	3	4	10	10	1 + 1
Cereal Chemistry	1	2	6	4	1
Plant Physiology	1	3	6	6	1
Soil Science	2	4	8	8	1 + 1
Agronomy	3	7	16	16	1 + 1
Agricultural Engineering	1	2	8	12	1 + 1
Agricultural Economics	2	3	8	8	1
			Non-Research Departments		
Statistical and Computer Services	1	3	5	5	1
Library	1	2	3	5	1
Phytotron	0	1	2	6	0
Analytical Lab	0	1	4	4	0
Experimental Farm	1	1	4	6	1
Information Services	1	3	8	8	1 + 1

Note: Staff for general services and other support staff will also be needed.

VIII. FACILITIES AND EQUIPMENT

Because this institute is going to be a center of excellence in rice research, a high level of efficiency of the research staff should be assured. To this end certain facilities such as heated and air conditioned laboratories and offices are recommended. Controlled temperature in the laboratories is also essential for the proper functioning of sophisticated equipment. For ease of communication within the institute as well as outside, a telephone should be provided in each scientist's office as well as in major laboratories and support facilities. Major equipment and necessary facilities for a self-supporting center are listed below. It is recommended that the services of an architectural consultant with experience in planning agricultural research facilities be retained to consider the overall design of the institute.

EQUIPMENT

Electron microscope and scanning electron microscope

Computer center

Audio visual training equipment

Motor vehicles, and equipment for motor vehicle repair shop

Farm machinery and equipment

Photocopying machines

Equipment for photography, drafting and illustrations

Typewriters and office furniture

Threshers and cleaners

Equipment for dry laboratories

Equipment for wet laboratories

Incubators and refrigerators

Gas chromatographs, gas liquid chromatographs and automatic amino acid analyzer

Stoves and equipment for cafeteria

Equipment for medical clinic

Equipment for agricultural engineering workshop

Equipment for carpentary, plumbing, electrical, refrigeration and instrument repair shops

Shelves for seed storage facilities

Library furniture and equipment for bindery

Equipment for analytical laboratory

Communication equipment such as telephones and intercoms

Emergency electricity generators for phytotron and long term seed storage room.

FACILITIES

Laboratory and office buildings

Administration building

Conference and training centers

Genetic resources laboratory including facilities for long term and short term seed storage

Library and bindery shop

Phytotron

Central analytical laboratory

Service buildings for carpentry, electrical, plumbing, refrigeration services, instruments repair shop, vehicle and farm machinery workshop, storage and supplies

Agricultural engineering drafting and workshop

Greenhouses, screen houses and insectaries

Houses for staff and employees

Guest house

Post office, bank, general stores, and security office

Dormitories and cafeteria for students and trainees

Recreational facilities

Educational facilities for primary school children

Medical clinic and ambulance

Printing and publication facilities

Photo developing and printing facilities

Seed drying and cleaning facilities

Chemical storage room

Radiation source

Supplies stock room

Fire fighting facility with appropriate equipment

IX. BUDGET

In the best interest of meeting China's current and future rice production research needs it is important to have the NRRI in full operation at an early date. To achieve the level of excellence desired it will require some time to build the physical plant, develop the experimental farm and to identify and train the core scientific staff. Outside financial assistance will be needed. Appendix 4 reflects a possible distribution of these funding sources in major categories. The budget schedule should be designed so that all initial major capitol expenditures can be made within three or four years.

The basis for the budget preparation has been concisely set forth in this document. However to build the budget many more facts, details and data are needed. It is necessary to have a decision on the location before detailed budget planning can be completed. Extensive staff work is needed by professional planners, fiscal officers and appropriate administrators. Appropriate CAAS and IPRI staff could collaborate on developing a comprehensive preliminary budget. It is the recommendation of this team that such staff work proceed immediately.

It is further recommended that by November 1980 an appropriate group be convened to examine this budget. At that time the budget should be carefully studied and modified and put in final form. It could then be made an integral part of this document for purpose of seeking funding for the establishment of a NRRI.

Appendix 1

Members of the Joint CAAS/IRRI Study Team

FANG Tsua-lung
Director of the Research Admonistration
CAAS
Agronomist, Team Co-chairman

ZHANG Yi-hua
Deputy Director of the Research Administration
CAAS
Plant Pathologist

LIN Shi-cheng
Rice Breeder
CAAS

SHAEN Jin-hua
Rice Breeder
CAAS

ZHAO WEI-zhun
Interpreter
CAAS

LU Guang-shu
Interpreter
CAAS

FAN Ming-xiang*
Vice President
Guangdong Agricultural Academy

FU Shing-geng*
Vice President
Hunan Agricultural Academy

YAN Ji-zhong*
Vice President
Zhejiang Agricultural Academy

*Participated in discussions during visits to the respective provinces.

Dr. Marcos R. Vega
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Soil Scientist
IRRI

Dr. Robert W. Herdt
Agricultural Economist
IRRI

Dr. Gurdev S. Khush
Plant Breeder
IRRI

Dr. A. I. Mew
Plant Pathologist
Interpreter
IRRI

Dr. Ramesh C. Saxena
Entomologist
IRRI

Appendix 2

Places Visited and Administrators and Scientists Met

Guangdong Province

Guandong Academy of Agricultural Sciences	WU Dou Jiang, Director
	FANG Ming-xiang, Deputy Director
	LIN Gin, Director, Scientific Research Administration
	LI Shao-qiu, Deputy Director Scientific Research Administration
	CHEN Wing-sing, Director, Rice Research Institute
	KOTARO Asai, Geneticist, Rice Research Institute
	WU Shang-zhong, Deputy Director, Plant Protection Institute
	CHAO Liang-yau, Plant Pathologist, Plant Protection Institute
	CHEN Yi-nien, Deputy Director, Soils and Fertilizer Institute
South China Agricultural College	ZHAO San-huan, Deputy Dean, Professor of Entomology
	HWANG Zhao-wu, Professor of Genetics
	ZHENG Xiao-ze, Professor of Genetics
	WU Jung Tsung, Assistant Professor of Entomology

South China Agricultural College	LI Lan Yiu, Lecturer of Soil Science
	WU Zhuo-nian, Head of Agronomy Department

Hunan Province

Hunan Agricultural College	YU Tie-qiao, Vice President, Associate Professor and Agronomist
	DIAO Chao-quan, Deputy Director, Agronomy Department
	HU Duo-jin, Director, Plant Physiology Laboratory
	PEI Shin-su, Director, Genetics Research Laboratory
	KAN Chuan-lin, Deputy Director, Agronomy Department
	CHEN Zhen, Director, Plant Pathology Laboratory
Hunan Academy of Agricultural Science	HO Shian-chu, Director
	FU Sheng-gen, Deputy Director
	SHIA Shong-yun, Entomologist
	HUANG Fa-shong, Plant Breeder
	REI Huei-chi, Entomologist
	SHIAO Zhe Hong, Soil Scientist

Zhejiang Province

Academy of Agricultural Science	JIN Meng-jia, Vice President
	WU Ben-zhong, Vice President, Agronomist
	YAN Ji-zong, Vice President
	MIN Shao-kai, Deputy Director, Rice Institute, Rice Breeder
	LI Shi-ye, Deputy Director, Soil and Fertilizer Research Institute, Soil Scientist
	GAO Wen-bin, Deputy Director, Plant Protection Research Institute, Entomologist
Zhejiang Agricultural University	CHU Tsu-siang, Vice President, Professor of Soil Chemistry
	CHEN Xi-chen, Vice President, Professor of Crop Cultivation
	CHEN Zi-yuan, Vice President, Professor of Radio Chemistry
	YOU Xiu-ling, Director of Library, Associate Professor of Agronomy
	SHEN Zong-tan, Associate Professor of Genetics and Breeding
	SUN Xi, Dean of Soil Chemistry Department
	YU Zhen-yu, Professor of Soil Science
	CHEN Hong-kuo, Professor of Plant Pathology
	DU Xin-chang, Dean of Agricultural Economic Department and Professor of Agricultural Economics

Appendix 3

Involvement of the Disciplines in the Research Programs

Discipline	GEM	Pest Management	Crop Improvement	Crop Management & Cropping Systems	Economic Evaluation	Machinery Development and Evaluation
Genetics	X					
Plant Breeding	X			X		
Plant Pathology	X	X		x	x	x
Entomology	X	X		x	x	x
Plant Physiology	x	x		X		
Chemistry	x	X		x		
Agronomy	X	X	X	X	x	x
Soil Science	x		X	X	x	x
Agr. Economics	x	x	x	x	X	x
Agr. Engineering	x	x	x	X		X
Experimental Farm						
Statistics						

Legend: X = Major involvement.

x = Less major involvement.

Appendix 4

PROPOSED SCHEDULE OF SOURCES OF FUNDS FOR MAJOR CAPITOL EXPENDITURES

	CHINA		OUTSIDE DONORS
	Provincial Government	Central Government	
Land	X		
Architectural fees		X	X
Site preparation		X	X
Construction of Buildings (including furniture)		X	X
Equipment (major)		X	X
Transport		X	X
Farm machinery		X	X
Library (books)		X	X
Training		X	X