# 附　属　資　料

① 合同評価報告書

# REPORT OF THE JOINT EVALUATION TEAM ON THE JAPANESE TECHNICAL COOPERATION FOR THE STRENGTHENING OF PIONEERING RESEARCH FOR PALAWIJA CROP PRODUCTION PROJECT IN INDONESIA

With about three months left before the termination of the Project, March 31, 1991, the Japanese Evaluation Team organized by Japan International Cooperation Agency (hereinafter referred to as JICA) and led by Dr. Toshihiko Nishio, Former Director General, Agriculture, Forestry and Fisheries Research Council Secretariat, the Ministry of Agriculture, Forestry and Fisheries, visited Indonesia from December 11 through December 21, 1990.

The objective of the visit was to conduct an overall evaluation of the performance of the Strengthening of Pioneering Research for Palawija Crop Production Project in Indonesia (hereinafter referred to as the Project). The evaluation was conducted jointly with the Indonesian Evaluation Team led by Dr. Soetatwo Hadiwigeno, Director General, Agency for Agricultural Research and Development, the Ministry of Agriculture.

The teams interviewed the Japanese experts and Indonesian counterparts assigned to the Project, had a series of discussions with Indonesian authorities concerned, made field surveys and exchanged views and ideas.

As a result, both teams agreed to forward to their respective Governments the summary of the evaluation and recommendation which is referred to in the document attached hereto.

Bogor, December 20, 1990

Dr. Toshihiko Nishio

Leader
Japanese Evaluation Team
Japan International
Cooperation Agency

Dr. Soetatwo Hadiwigeno

Leader
Indonesian Evaluation Team
Agency for Agricultural
Research and Development
Ministry of Agriculture

# 1. INTRODUCTION

Based upon the Record of Discussions (hereinafter referred to as R/D) signed on January 31, 1986, the Government of Japan and the Government of the Republic of Indonesia have implemented the technical cooperation project for Strengthening of Pioneering Research for Palawija Crop Production Project over the past five years, succeeding the former projects which took place from 1970 to 1985.

The former projects can be briefly outlined as follows:

As Phase I, Japan-Indonesia Joint Food Crop Research Program, emphasizing researches on pathology and physiology of paddy, started in October 23, 1970 and lasted for eight years.

As Phase II, Strengthening of Legumes in Relation to Cropping System Research Project, emphasizing cropping system research for paddy and soybean succeeded the above project in October 23, 1978 and lasted for seven years.

The Project aims at developing appropriate technology for palawija crop production, such as soybean, peanuts, maize and sweet potatoes, through pioneering research in the field of seed quality improvement, crop production system and crop nutrition technology, thus contributing to increase of palawija crop production in Indonesia.

The Project was carried out at the Bogor Research Institute for Food Crops (hereinafter referred to as BORIF), which has the mandate to carry out pioneering research on food crops. BORIF is one of the six Research Institutes for Food Crops under the direction and coordination of Central Research Institute for Food Crops (hereinafter referred to as CRIFC, see Appendix 1).

To achieve the above-mentioned goal, the Project has been particularly implemented in the field of basic research and development for soybean.

With remaining three months before its termination, the Government of Japan and the Government of Indonesia agreed to carry out a joint evaluation on the results of the Project.

## 2. MEMBERS OF THE JOINT EVALUATION TEAM

### 2.1. The Japanese Evaluation Team

(1) Dr. Toshihiko Nishio: Leader, Former Director General Agriculture, Forestry and Fisheries Research Council Secretariat, the Ministry of Agriculture, Forestry and Fisheries (MAFF).

(2) Dr. Takeo Yamaguchi: Research Administration /Disease & Pest, Director of Second Research Department, Tropical Agricultural Research Center, MAFF.

(3) Dr. Akira Nishimune: Agronomy, Chief of Upland Soil Laboratory, Department of Upland Farming Technology, Hokkaido National Agricultural Experiment Station, MAFF.

(4) Mr. Hiroshi Nishimura: Cooperation Administration, Cooperation Planning Official, International Cooperation Division, Economic Affairs Bureau, MAFF.

(5) Mr. Jiro Iida: Project Development, Staff, Development Planning Division, Agriculture, Forestry & Fisheries Planning and Survey Department, JICA.

### 2.2. The Indonesian Evaluation Team

(1) Dr. Soetatwo Hadiwigeno: Leader, Director General, Agency for Agricultural Research and Development (AARD), the Ministry of Agriculture (MOA).

(2) Dr. Budiman Notoatmodjo: Member, Head of Foreign Cooperation Division, Center for Agricultural Research Programming (CARP), AARD, MOA.

(3) Mr. Mahyuddin Syam: Member, Head of Research Communication Division, CRIFC, AARD, MOA.

(4) Dr. Ahmad Dimyati: Member, Head of Research Programming, CRIFC, AARD, MOA.

(5) Mr. Rismansyah Danasaputra: Member, Head of Asia and Pacific Sub-Division, Bureau of International Cooperation, MOA.

(6) Ms. Banun Harpini: Member, Head of Foreign Cooperation Sub Division, CARP, AARD, MOA.

## 3. OBJECTIVES OF THE EVALUATION

(1) To make a comprehensive evaluation on the achievements, in line with the work plan of the Project.

(2) To make suggestions and recommendations related to the necessary measures to the authorities concerned of the two governments (after the end of the Project).

(3) To feedback evaluation results for the improvement of planning and implementation of future cooperation project.

## 4. STUDY ITEMS OF THE EVALUATION

The list of items evaluated by the Joint Evaluation Team was:

(1) Input of Supporting Activities
  1) Contribution of the Government of Japan
    a) Dispatch of Japanese Experts
    b) Provision of Machinery and Equipment
    c) Training of Indonesian Counterparts in Japan
    d) Others

2) Measures taken by the Government of Indonesia

a) Provision of Land, Buildings and Facilities

b) Assignment of Counterparts and other Personnel

c) Counter Budget Allocation

(2) Research Activities

1) Seed Quality Improvement

2) Improvement of palawija crop production techniques under diversified cultivation conditions

3) Improvement of palawija crop production by biological techniques

(3) Overall Effects of the Project

(4) Administration of the Project

(5) Conclusion and Recommendation

## 5. INPUT OF SUPPORTING ACTIVITIES

### 5.1. Contribution of the Government of Japan

#### A. Dispatch of Japanese Experts

Twelve long-term experts in the six fields specified in the R/D were dispatched. In addition, 18 short-term experts in five fields were sent when necessity arose, and two more in the fields of bacteriology and soil nutrition are planned to be dispatched by March 31, 1991. The average assignment period of short-term experts is 1.6 man-month.

The dispatch of experts was made almost on schedule, but that of the plant physiology field was delayed, and it occured eight -month absence a the expert (see Appendix 2 ).

#### B. Provision of Machinery and Equipment

Various laboratory apparatus for both CRIFC and five (5) research divisions in BORIF were provided by Japan, amounting to approximately 200 million yen.

Equipment and other materials generally satisfied the needs for the implementation of the Project, and most of them have been well maintained and used effectively and efficiently (see Appendix 3).

#### C. Training of Indonesian Counterparts in Japan

Twenty Indonesian counterparts received trainings in Japan, of which, one received twice. Four more are planned to be sent by March 31, 1991.

Fifteen out of the twenty counterparts were trained through JICA at several national agricultural research institutes, and four participated in study tours. As a result of training. One counterpart obtained a doctoral degree from the Hokkaido University in 1990.

In addition, four counterparts in the fields of plant physiology and pathology are trained at universities in Japan through graduate course scholarship of the Ministry of Education, Science and Culture (Monbushou).

One of them obtained a doctoral degree. The remaining three counterparts are preparing doctoral theses and are planned to leave for Japan through the scholarship (see Appendix 4).

Nineteen out of the twenty ex-trainees are still involved with the Agency for Agricultural Research and Development. Four of them work in the activities, not related to the Project directly and are in the master courses or doctor courses at domestic and foregin universties.

D. Others

(1) JICA took the following special measures to supplement the local cost, amounting to 47 million yen:

Firstly, a fund amounting to 3 million yen was provided to the Project for improving the laboratory door of the plant pathology division, consolidating electricity stabilizer of the pioneering research laboratory and improving the constant temperature room of entomology division.

Secondly, a fund amounting to 1.4 million yen was provided to publish 3,000 copies of an illustrated manual of pests and insects for soybean. In addition, with a fund of 142 thousand yen, a leaflet was published for introducing the Project activities with a fund of 142 thousand yen.

Thirdly, a fund of 970 thousand yen was extended for dispatching an agronomy expert and two counterparts to Agricultural Development Research Project in North-east Thailand in order to exchange valuable informations.

Fourthly, a fund of 600 thousand yen was supplied to hold a seminar on Progress in Plant Pathology during 20 yeras of Japan - Indonesia Joint Research Program and Strategies for the Future

Research, with 80 participants from both sides, November 22, 1989.

As this year is the fifth year to the terminated cooperation period, reports on research highlights as well as reviews should be completed and final seminar should be held by the termination of the Project.

(2) Five JICA missions were dispatched to the Project to give technical guidance, to review and to discuss technical issues which arose in the course of the implementation of the Project (see Appendix 5).

## 5.2. Measures taken by the Government of Indonesia

### A. Provision of Land, Buildings and Facilities

Land, buildings and facilities necessary for the implementation of the Project at BORIF were provided by Indonesia.

Pioneering Research Laboratory for Palawija Crops was additionally constructed in November, 1988 under the general grant aid program by the government of Japan amounting to 387 million yen.

### B. Assignment of Counterparts and Administrative Personnel

The number of staffs in BORIF is in upward trend and amounted to 585 staffs in 1990. The number of technical staffs, which occupies approximately 60 percent of all, increased aparently from 284 staffs in 1985 to 331 in 1990.

As for technical staffs, plant physiology division grows the most largely, amounting to 78 staffs in 1990, in comparison with 51 in 1985 (see Appendix 6 and 7).

Regarding to academic career, twenty-two (22) staffs obtained doctoral degrees, while thirty-seven (37) master degrees.

Assigned counterparts consist of not only forty-seven (47) researchers, but also ten (10) administrative executives in CRIFC and BORIF. In this connection, twelve (12) counterpart researchers have doctoral degrees, while three (3) master degrees.

C. Counter Budget Allocation

The Government of Indonesia provided operational research expenses such as labor wages, travel, subsistence and communications. The budget is divided into routine and development budget. The total amount of research fund allocated to BORIF and CRIFC in 1990/91 fiscal year was 12,361 million rupiah (see Appendix 9). Part of that amount was allocated to support the Project.

Routine budget comes from national budget and development budget comes from both domestic and foreign assistance. Besides the cooperation with the Japanese government, CRIFC and BORIF received financial assistance from foreign donor agencies such as Ford Foundation, FAO/UNDP, IDRC (Canada), USAID, and ACIAR (Australia) (see Appendix 10).

## 6. RESULTS OF THE RESEARCH ACTIVITIES

According to the Tentative Schedule of Implementation (TSI), research activities were carried out along with three main research subjects such as 1) seed quality improvement, 2) improvement of palawija crop production under diversified cultural condition, and 3) improvement of palawija crop production by biological techniques.

### 6.1. Seed quality improvement

#### 6.1.1. Production techniques for high quality seeds

A. Results

Basic technology for high quality seeds production was developed from experiments concerning on sowing time, harvest timing and seed processing.
The summary of results are as follows:

(1) Research on soybean cultivation

To obtain high quality seed, proper sowing time is during the periods of April and May. Sowing in October resulted in low quality seeds production, since the number of pods decreased, due to the influence of high rainfall in rainy season.

(2) Research on crop physiology and plant nutrition

The process of soybean seeds ripening was made clear. It will become possible to establish practical index to determined proper harvesting time to get variable seeds, based on the number of days after flowering or series of color photographs showing pods at each growth period.

(3) Research on seed processing

Soybean seeds should be sufficiently dried after harvest to maintain satisfactory viability of seeds. Moisture content of seeds decreased below 8% by drying them under the sun for totally 10

hours, and it become lower than 8% which guarantee good germination rate.

B. Future aspects

The above mentioned results should be extended among the administrators and the extention workers, together with the basic information obtained from the studies on "Improvement of palawija crops production teqnique under diversified cultivation condition".

6.1.2. Techniques for maintaining high quality and viability of seeds

A. Results

Required condition to maintain viability of seeds was made clear, and low cost techniques for seeds storage were developed.
The summary of results are as follows:

(1) Research on high viability

Required the temperature and the moisture conditions in seeds storage were 25 ℃ and 8% respectively.

The results of packing experiments on seeds storage under the natural condition showed that tightly sealed containers or bags are necessary in order to prevent increasing seed moisture contents.

Utility of limestone caves, dry wells and high altitude lands as alternative as a seeds storage was found effective, because they can keep the temperature below 25℃ during storage periods.

(2) Research on physiological and biological changes of stored seeds

The method of analysis on organic matter contents in soybean seeds was introduced. Therefore counterparts clarified protein and fat contents in Indonesian soybean seeds.

The estimation of seed viability is possible by the measurement of electric conductivity of seed leakage.

B. Future aspects

The methods for maintenance of seed viability and information concerning to the appropriate storage conditions should be difused promptly. In addition, the experiment at demonstrate pilot field should be conducted to difuse above mentioned results, as well as, to establish the system to supply soybean seeds.

1 1

6.1.3 Diseases and Pests Management

A. Results

With some exceptions, the research activities regarding to this research subject have been conducted successfully and many useful results were generated by cooperative research with Indonesian and Japanese researchers. In accordance with TSI, the research subjects were as follows:

(1) Diagnosis and Identification of Causal Agents of Diseases.

Two research programs were conducted in this research subject and the research programs which research goal will be achieved at the termination of the Project are as follows:

1) Virus diseases of soybean in Indonesia, especially on seed-bornviruses.
2) Bacterial diseases of soybean

A valuable results obtained in this research subject are as follows:

In the survey related to occurrences of virus diseases in main soybean producing areas in Indonesia, it was observed that 7 kinds of virus diseases, such as soybean stunt virus (SSV), soybean mosaic virus (SMV), cowpea mild mottle virus (CMMV), Indonesian soybean dwarf virus (ISDV), soybean yellow mosaic virus (SYMV), bean yellow mosaic virus (BYMV) and peanut stripe virus (PSV), and one unknown virus disease(blister symptom) occurred in Java and Sumatra.

Among these virus diseases, SSV, SMV and CMMV were known as seed-borne one. During the last five years, SSV was the most important disease. Using enzyme-linked immunosorbent assay (ELISA) method, SSV was detected rapidly and highly sensitive even from diseased seeds.Indonesian soybean stunt virus was different from any Japanese SSV strains. There were some resistant varieties to SSV in Indonesian soybeans. It is recommended that seeds and plants for soybean seed production should be checked the occurrence of SSS using by ELISA method.

1 2

(2) Bionomics of causal agents of diseases affecting crop yield.

Two research programs were conducted in this research subject and the research programs which research goal will be achieved at the termination of the Project are as follows:

1) Identification and ecobiology of anthracnose of soybean.
2) Identification and ecobiology of frog-eye leaf spot.

A valuable results obtained in this research subject are as follows:

The causal agent of soybean anthracnose was Colletotricum dematium. It was one of the most common seed-born disease in Indonesia, especially during rainy season. Sporulation and infection were very often in humid condition and at least it takes only 8-16hrs. The best growing stage of soybean for inoculation was 15-20 days after sowing. Some isolates collected from Lampung, West Java and South Kalimantan showed a very strong pathogenicity to soybean. It was observed that there were varietal differences in resistance to the disease. For example, soybean variety of Shakti was the most sucseptible, while Wilis and Ringgit were less sucseptible.

It was found that a spot disease on leaf, stem and pod of soybean was "frog-eye leaf spot" caused by Cercospora sojina. The disease caused a serious damage on seed quality. When pods with the lesions of the disease were exposed to high humid condition after the maturity, the number of rotted and discolored seeds increased markedly. Artificial inoculation method was established.

(3) Ecology and bionomics of major pests.

Two research programs were conducted in this research subjectand the research program which research goal will be achieved at the termination of the Project is: Occurrences and identifications of soybean pod insect pests

(4) Analysis of injury caused by insect pests.

Two research programs were conducted in this research subject and the research program which research goal will be achieved at the termination of the Project is: Influence of the damaged seeds caused by sucking bugs at their germination.

(5) Transmission of plant viruses by insects and mites.

One research program was conducted in this research subject and the research program which research goal will be achieved at the termination of the Project is: Biological control of soybean pest, whitefly.

A valuable results obtained in this research subject are as follows:

It was observed that only one species of parasitoid, Encarsia sp. (Hymenoptera) was parasited on soybean whitefly, Bemisia tabaci. The percentage of parasitism was not so high, 22.6% on the average. The spiraling whitefly Aleurodicus dispersus Russel. was recognized as a new insect pest invaded from other countries and already spread over in Indonesia. The spiraling whitefly can infest 22 species of plants, such as vegetables, fruits, ornamentals and shade trees. Eight species of predators were observed to attack A. dispersus on guava trees. All predators seemed to be not effective as a biological control agents.

(6) Research on pests and diseases of stored seeds and products.

Three research programs were conducted in this research subject and the research programs which research goal will be achieved at the termination of the Project are as follows:

1) Occurrences of stored legume pests and their control using plastic vinyl film bags.
2) Control effect of diatomaceous earth formulated to storage pests.
3) Control effect of ash of rice husk, ash of wood and lime to storage pests.

A valuable results obtained in this research subject are as follows:

Ash of rice husk and diatomaceous earth were effective to control of soybean storage pest, Callosobrochus analis F. The necessary amount of ash of rice husk mixed with seeds was 10g per 1 kg seeds of soybean (1%). The preventing method of storage pests using ash of rice husk could be difuse to farmer through extention office.

B. Future aspects

Identification and bioecological studies on major soybean pests and diseases such as pod boreres and blister symptom virus disease, will be necessary to conduct for establishment of biological control method to those pests and diseases.

## 6.2. Improvement of palawija crops production technique under diversified cultivation conditions

### 6.2.1. Improvement of the crop adaptability and productibility

A. Results

Collection of native soybean varieties, introduction of foregin varieties, varietal selection for multiple cropping, effectiveness of water supply to the plant and hilling up for the yield were studied. Regarding to breeding, evaluation of the collected seeds has not been done. The summary of the results are as follows:

(1) Collection and evaluation of the soybean varieties
(Germplasm collection and utilization of legumes,
Breeding and selection on acid soil, and
Introduction and cultivation trials of new varieties)

One hundred and fifty native varieties were collected from main soybean processing areas. Their growth response was examined depending on the geological classification. Some of the native varieties produced higher yeilds than modern recommended varieties. The foreign varieties showed more vigorous growth at initial stage than the native ones, but the yield was lower because of lodging of the plants, insects and desease damages during their long growth duration.

(2) Maintenance of the soil moisture and hilling-up
(Studies on potential productivities of palawija crops and
Component technologies in cropping systems)

Hilling-up resulted in a remarkable yield increase; weed growth were inhibited, it prevented the plant from lodging, grain weight increased and damaged grain decreased. Otherwise, irrigation effects was also ensured, especially, shortage of moisture at reproductive stage severely decreases grain yield. The above mentioned techniques help high yield production, and they deserve high evaluation.

(3) Multiple cropping
(Crop interactions in cropping system)

A short term expert introduced the usage of portable infrared carbondioxide analyzer. As a result, comparison of photosynthetic ability among crops, which supplies a basic information on cropping system, had been initiated.

B. Future aspect

The most important points of these studies are breeding and selection of suitable varieties for each region. Excellent varieties should be selected from the native varieties collected, and cultivation experiments in different area should be done.

The hilling-up technique is expected to extend to the farmers located on Latosol.

6.2.2. Plant nutrient improvement technology

A. Results

Although research on soil physics insufficient, characterization of nutrient uptake of main food crops and improvement of problem soils' fertility were studied.
The summary of results are as follows:

(1) Diagnosis techniques of nutritional problems

The characteristics of nutrient absorptions on main crops were clarified and the results obtained suggest to improve fertilization application.

(2) Improvement of problem soils and fertilization techniques

The results showed that the application of lime or green manure alone slightly affected soybean growth, and that the application of both materails remarkably increased yield. Regarding to lime application, coarse lime was more effective than fine one.

As a results of the surveying physical characteristics in the continuous cropping fields, the long period one, where the yield was low, showed water holding capacity and organic material content were lower than short period one.

Fused magnesium phosphate (FMP) was more effective for soybean growth than tri-superphosphate (TSP) in weak acid soil, and a combination of FMP and green manure was the most effective soybean growth. Especially, large amount of FMP application enhanced plant and nodule growth due to increase the soil pH.

B. Future plan

Clarification of growth limiting factors in problem soils and establishment of soil management in individual soil type are essential for soybean production. Reviews of published works will help complete these studies efficiently.
It is necessary to conduct following researches:

1) Residual effect of large amount application of FMP should be confirmed. This experiment have to carry out with budget provided by BORIF.

2) Organic material which is effective for long period should be searched in consideration for adaptable soil and climatic conditions Indonesia.

3) Study on soil physics, which may innovate in field management techniques, should be developed.

(3) Studies on potential productivities of palawija crops

A. Results

Ten research programs were conducted in this research subject and the research programs which goal will be achieved at the termination of the Project are as follows:

1) Kind of soil-born diseases of soybean and their pathogens, especially on damping-off, stem rot and root rot diseases of soybean.
2) Rhizoctonia pod rot of soybean.
3) Biology of soil-born diseases of soybean
4) Ecology of beanfly Ophiomyia phaseoli.
5) Varietal resistances to beanfly of soybean.
6) Some ecological studies on soybean leaf feeders.
7) Varietal resistances to soybean leaf feeders.
8) Timing of insecticide application for control of pod boreres, Etiella spp.
9) Insecticide resistance of the common cutworm, Spodoptera litura.
10) Biological characteristics of the Etiella pod boreres in tropical district

A valuable results obtained in this research subject are as follows: Survey on soil-borne diseases of soybean in main producing areas in Indonesia, such as East, Central and West Java, Lampung and Ache. Damping-off disease was not so severe in each area. Sclerotium rolfsii, Rhizoctonia spp., Pythium spp. and Fusarium spp. were isolated from the diseased plants. In Java island, many root rot symptoms were observed during the period fron one month after planting to harvesting. The symptoms of the root rot were brown or darkish brown colored lesions on hypocotyls and tap roots.

Many isolates dominantly obtained from the diseased roots were belonged to either Rhizoctonia spp. or Fusarium spp. Red stem rot symptom following the foliage yellowing was found at the experimental station of Pacet. It was clear that the disease was caused by Cylindrocladium sp. and this is a first report in Indonesia.It is concluded from the results of analysing test of yield loss that the

root rot caused a big loss on the yield of soybean.

The experiments were conducted for the screenings of resistan t varieties of soybean against to attack by beanfly, leaf feederes an d whitefly. Soybean varieties considered to be resistant to insec t pests were as follows:

Beanfly - No.29, Kerinci and some other breeding lines.
Spodoptera sp. - Himeshirazu, Soden daizu, Lokon and some other breeding lines.
Plusiinea sp. - Wilis and Kerinci.
Whitefly(Bemisia tabaci) - Srogel, Krinci and Lampung 3112.

6.3. Improvement of palawija crop production by biological techniques

6.3.1. Utilization technique of microorganism agent including biological N-fixation technique

A. Results

Collection of useful rhyzobia and study on soybean growth under their inoculation were done. Characterization of the collected rhyzobia is not enough and field trials to ensure their effectiveness are not done yet.
The summary of results are as follows:

(1) Collection, isolation, identification and selection of the useful rhyzobia

Almost all rhyzobia collected from main soybean cultivation areas belonged to Bradyrhyzobium. Soybean plants inoculated by Indonesian rhyzobia had larger shoots, roots and accumulated nitrogen than the plants inoculated by Japanese ones. Some of the rhyzobia had higher nitrogen fixation ability than the commercial ones.

Three kinds of aluminium tolerant strains were isolated. A determination technique of nitrogen fixation ability was introduced in process of selection.

(2) Effect of cultural practices experiments on Rhyzobium development and crop productivity

Application of rice husks carbonizer or fused magnesium phosphate increased soybean nodules and grain yield. Increased soil pH by their application was one of the reasons for the vigorous growth. BORIF has budgeted for continuation of this experiment.

B. Future aspects

Basic techniques introduced through these studies should be mastered, and the research should be steadily proceeded too.
It is expected that the control of soil microorganisms is difficult in a tropical region. Effect of nodulation on soybean growth and on its yield should be studied under different soil, cropping and climatic conditions.

The experiment on "Effectiveness of some amelioration materials on soybean growth" have to carry out with budget provided by BORIF.

6.3.2 Use of tissue culture and other biological techniques.

A. Results

Some research activities were carried out in this research subject and the techniques on tissue culture and biological control for insect pest were transferred to Indonesian counterparts.

1) Improvement of tissue culture techniques for main food crops.
2) Biological control of soybean sucking bugs.
3) Alternative control method of soybean sucking bugs by using trap crops.

One Indonesian counterpart was trained in Japan for tissue culture techniques and a short term expert from Japan introduced the techniques of anther culture, embryo culture and tissue culture for obtaining virus free plants.

Eight species of egg-parasitoides were found on eggs of sucking bugs. But the practical utilizing method have not yet been established. Sesbania rostrate was the most attractive against sucking bugs of soybean. From the results it was suggested that the using of Sesbania rostrate as a trap crop of soybean sucking bugs was a good practical and one of the biological control method.

## 7. OVERALL EFFECTS OF THE PROJECT

The effects written below have been brought about from the Project.

### A. Counterpart researchers and assistants level

Through this Project, technical transfer has been made within the cooperation period.

Capability of the counterpart researchers in designing, implementing and developing researches as well as in interpreting and reporting research result has been improved considerably. The Project has also helped improve the skills of counterpart assistants in the use of equipment and in the management of experiments.

### B. Institutional level for soybean research

In this Project, 55 research subjects were studied and as a whole generated good research results.

Of which, 13 results above-mentioned are outstanding research highlights, which are first discovery and extremely valuable in soybean research of Indonesia and can contribute to substantial expansion of soybean production.

45 seminars and demonstration of the developed technology were conducted for researchers of BORIF and other research instutites, extension officers and so on, for technical application to the next stage of researchers.

Research findings were published in various publications including scientific journals, annual reports, technical bulletins, and special issues. These publications have been distributed to various audiences such as scientists, lecturers, policy makers and extension officers.

### C. Farmers level

Three research results below-mentioned, out of the above-mentioned 13, are directly disseminatable technology to farmers through extension.

1. Hilling -up effect on soybean yield
2. Tin container use for high viability soybean seed
3. Rice husk ash effect on storage pest, Callosobruchus analis

However, most of research results remained at basic research level and need to be further studied with the involvement of other research institutes under CRIFC. The existing network of the six research institutes needs to be strengthened. This also must be considered in the case of the linkage between research and extension.

## 8. MANAGEMENT OF THE PROJECT

The joint meeting at the visit of Japanese survey team and Joint Committee meeting were held once a year respectively during the cooperation period. The function of the meetings were effective to guide the implementation plan of the Project. However, regular technical meetings between Indonesian counterpart researchers and Japanese experts should be held for further smooth implementation of the Project.

Sufficient number of counterpart researchers and assistants, who receive technical transfer, were assigned at the initial stage of the Project. However, with the progress of the Project stage, frequent changes and the delay of replacement should have been anticipated to minimize the problems, which occurred in some research divisions and caused the delay in research implementation.

In 1989/90 and 1990/91 fiscal years, the overall budget allocation from the Government of Indonesia was reduced. This has affected the implementation of research operations of the Project. To make the Project successful, it is necessary for the Indonesian Government to make every effort in securing appropriate and stable counter budget allocation.

## 9. CONCLUSION AND RECOMMENDATION

During five-year implementation, in general, the Project satisfactorily made technical transfer to Indonesian counterparts. It can be obviously concluded that with some exceptions, the Project has been successfully implemented, produced considerable many research results in respect of basic research and improved the capability of counterpart in planning, implementing and conducting research works.

Therefore, as planned on the R/D, it is appropriate that the Project should be terminated on 31st March, 1991. However, there still remains prompt necessities to conduct large-scale on-farm research and to diffuse the practical integrated technologies developed by the Project at farm level, in cooperation with extension officers, farmers' groups or agricultural cooperatives. In addition, a comprehensive applied research is urgently needed. This includes research on biological control for soybean pests and diseases, including appropriate cropping pattern, resistant varieties, trapping crop of insect pests and natural enemy, for the improvement of soybean production.

To implement the above-mentioned activities, it is appropriate to dispatch two Japanese long-term experts for two years and to provide necessary training. In this context, it is also necessary for the Government of Indonesia to supply counter budget.

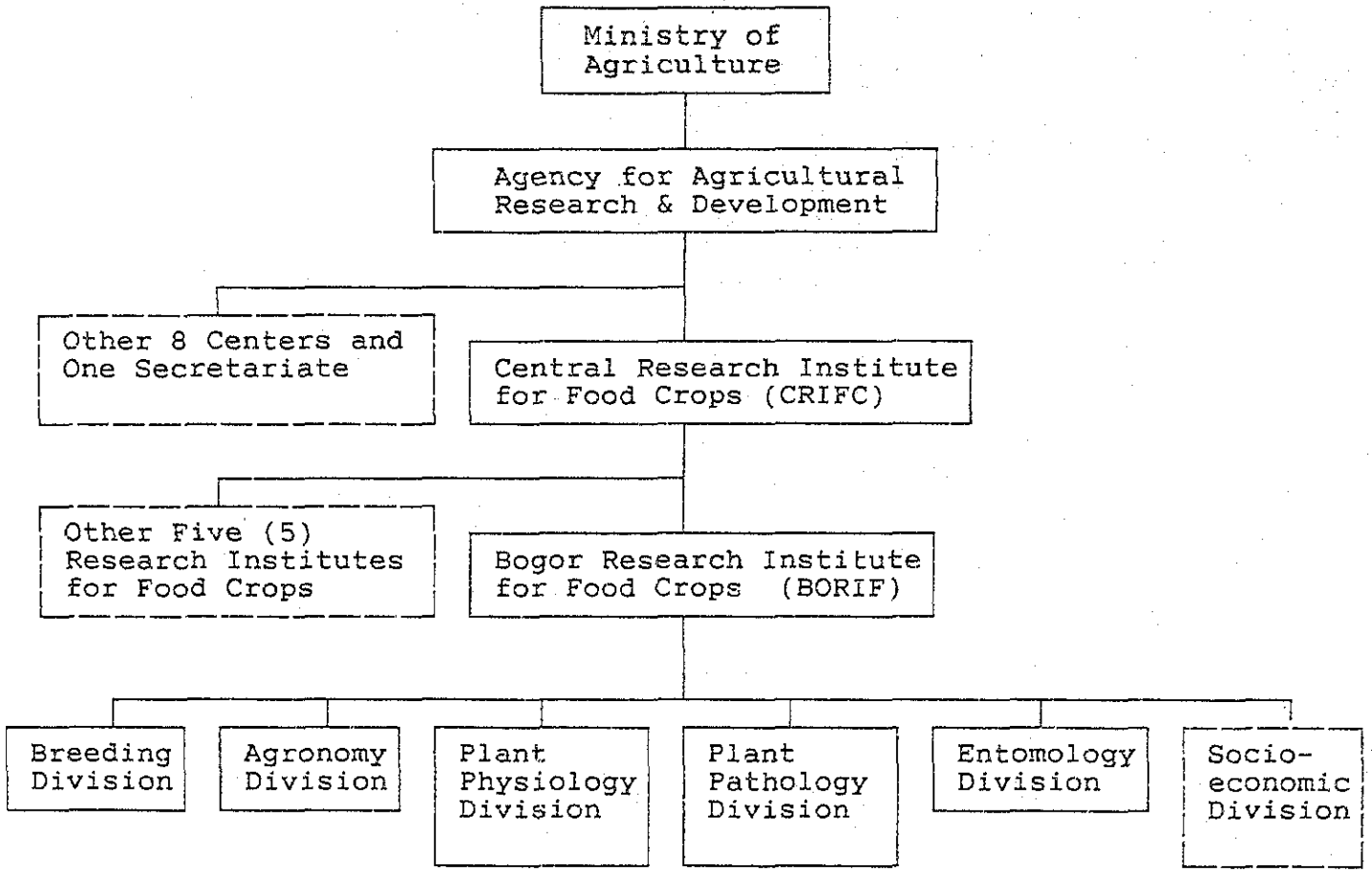
To improve the utilization of the research outputs by farmers, the linkage between research and extension needs to be strengthened.

In the future, for this kind of research cooperation, it is necessary, at the initial stage, to consider vigorously the ultimate users for the output of the cooperation; how research results should be delivered to the users to improve their production, income and welfare. To support this, the following should be considered:

1) Information exchange at regular basis of agricultural research with other research institutes.

2) Regular meetings, consisting of researchers, extention workers and policy makers for establishing appropriate research subjects.

Appendix 1 ORGANIZATIONAL STRUCTURE OF THE PROJECT



Appendix 2

LIST OF JAPANESE EXPERTS

(LONG - TERM EXPERTS)

| NAME | FIELD | PERIOD |
|---|---|---|
| Dr. Torao Gotoh | Leader | 29 Apr.1986 - 28 Apr.1988 |
| Dr. Takanori Igarashi | ditto | 12 May.1988 - 31 Mar.1991 |
| Mr. Saneyuki Okuda | Coordinator | 1 Apr.1986 - 31 Mar.1988 |
| Mr. Sakanori Nishiyama | ditto | 21 Apr.1988 - 31 Mar.1991 |
| Dr. Hisashi Yarimizu | Agronomy | 29 Apr.1986 - 28 Apr.1988 |
| Dr. Haruo Mikoshiba | ditto | 3 Sep.1988 - 31 Mar.1991 |
| Mr. Harunobu Inoue | Plant Physiology | 30 Jul.1986 - 29 Jul.1989 |
| Dr. Kiyoko Hitsuda | ditto | 29 Mar.1990 - 31 Mar.1991 |
| Dr. Shigeo Takaya | Plant Pathology | 30 Jul.1986 - 29 Mar.1989 |
| Dr. Shigeo Naitoh | ditto | 25 Mar.1989 - 24 Mar.1991 |
| Mr. Tadatora Okada | Entomology | 29 Oct.1986 - 13 Dec.1988 |
| Dr. Atsushi Naitoh | ditto | 7 Oct.1988 - 31 Mar.1991 |

(SHORT - TERM EXPERTS)

| NAME | FIELD | PERIOD |
|---|---|---|
| Dr. Youhachiroh Honda | Plant Viruses | 3 Feb.1987 - 14 Mar.1987 |
| Mr. Takaharu Iizuka | Soil Physics | 13 Feb.1987 - 29 Mar.1987 |
| Mr. Takeo Kawaide | Field Management | 3 Mar.1987 - 31 May.1987 |
| Prof. Dr. Yoshimi Hirose | Entomology | 5 Aug.1987 - 4 Oct.1987 |
| Prof.Dr. Atsuhiko Kumura | Agronomy | 18 Nov.1987 - 2 Dec.1987 |
| Dr. Shuichi Asanuma | Micro-organism | 11 Jan.1988 - 18 Mar.1988 |
| Dr. Youhachiroh Honda | Plant Viruses | 15 Mar.1988 - 22 Apr.1988 |
| Mr. Shohzoh Endoh | Entomology | 6 Apr.1988 - 26 Jun.1988 |
| Dr. Tomio Usugi | Plant Pathology | 20 Jan.1989 - 21 Mar.1989 |
| Dr. Hiroshi Nakano | Photosynthesis activity | 1 Feb.1989 - 14 Mar.1989 |
| Mr. Masayoshi Saitoh | Seed Physiology | 31 Mar.1989 - 10 Jul.1989 |
| Dr. Hiroshi Kajita | Entomology | 15 Jul.1989 - 14 Sep.1989 |
| Dr. Masaki Hara | Agronomy | 1 Nov.1989 - 30 Nov.1989 |
| Mr. Hideki Jyutori | Tissue Culture | 9 Jan.1990 - 29 Mar.1990 |
| Mr. Shinji Sakai | Soybean Breeding | 14 Feb.1990 - 15 Mar.1990 |
| Prof. Dr. Kenjiroh Saio | Agronomy | 22 Aug.1990 - 1 Sep.1990 |
| Dr. Satoshi Takeda | Entomology | 30 Aug.1990 - 12 Oct.1990 |
| Mr. Akinori Okabe | Soybean Breeding | 10 Dec.1990 - 9 Feb.1991 |

Appendix 3

## LIST OF EQUIPMENT PROVIDED BY JAPAN

| Fiscal Year 1986 | 1987 | 1988 | 1989 | 1990 |
|---|---|---|---|---|
| Amount 1 (million yen) | 75 | 43 | 51 | 30 (estimate) total 200 |
| (Main Equipment) Gas filling machine. Heart sealer. Body tube of microscope. Slide projector. | Trencher. Grain counter. Gas filter. Micro reader. Washer for microplate. Plant growth cabinet. Automatic weather system. Microdrop dispenser. Muti shaking incubator. Vacum freezing dryer. Automatic recording tension meter. Double beam spectro-photo meter. | Gas chromato-graphy. Seed finish dryer. Germination test oven. Photosynthesis experimental apparatus. Seed storage rack. Cold storage. Humid hood. Freeze dryer. Spectrophoto meter. chamber. Densito meter. Deep freezer. Liquid chromato-graphy. Rotary microtome. Incubator. | Mini jar fermenter. Large microtome. Plant moisture tensiometer. Fluorescence microscope. Gas chromato-graphy. Laboratory Car. Double beam Spectrophotometer. | Autostill. Clean bench. Ice maker. Biological microscope. Phermacial refrigerator. Oven. Water bath. Tractor. |

Appendix 4 LIST OF INDONESIAN PERSONNEL TRAINED IN JAPAN

(1) Individual training course held by JICA

| NAME | ASSIGNMENT | PERIOD |
|---|---|---|
| Ms. RASTI SARASWATI (Researcher of Plant physiology division) | Microbiology of legume root nodules | 11 Feb.1987 - 13 Oct.1987 |
| Mr. MUHAMMAD MUHSIN (Researcher of Plant pathology division) | Research technique of legume viruses | 11 Feb.1987 - 12 Sep.1987 |
| Ms. SRI HUTAMI (Researcher of Agronomy division) | Relationship of soybean growth and soil moisture | 11 Feb.1987 - 12 Sep.1987 |
| Mr. M. ARIFIN (Researcher of Entomology division) | Economic injury level of insect pest & pathology | 16 Jul.1987 - 22 Dec.1987 |
| Mr. DJUBER PASARIBU (Researcher of Agronomy division) | Crop and soil management of soybean intercropping | 31 Aug.1987 - 14 Feb.1988 |
| Mr. HAFID (Technician of Plant physiology division) | Analytical techniques of organic substance in plant | 31 Aug.1987 - 1 Mar.1988 |
| Mr. SOETJIPTO PH. (Head of Agronomy division) | Fertilizer manegement for upland rice | 8 Sep. 1987 - 15 Dec.1987 |

| | | |
|---|---|---|
| Prof. Dr. GUNAWAN SATARI (Director of AARD) | Research Management | 9 Nov.1987 - 18 Nov.1987 |
| Dr. BUDIHARDJO S. (Researcher of Entomology division) | Population dinamics of feeder insects on soybean plant | 29 Feb.1988 - 3 Nov.1988 |
| Dr. MUKELAR AMIR (Head of Plant pathology division) | Plant pathology in Japan and the world particularly those related to biotechonology | 15 Aug.1988 - 8 Sep.1988 |
| Dr. IBRAHIM MANWAN (Director of CRIFC) | Research Management | 9 Oct.1988 - 25 Oct.1988 |
| Mr. SUKARMAN (Researcher of Plant physiology division) | Seed physiology | 5 Dec.1988 - 11 Jul.1989 |
| Ms. WEDANIMBI TENGKANO (Research of Entomology division) | Ecobiology of legume insect pests and their natural enemies | 19 Mar.1989 - 15 Aug.1989 |
| Mr. SAPTOWO J. PARDAL (Researcher of Plant physiology division) | Tissue culture | 13 Mar.1989 - 11 Nov.1989 |
| Mr. MUHAMMAD DJAENI (Researcher of Plant pathology division) | Research technique on plant diseases | 12 Jun.1989 - 22 Dec.1989 |
| Ms. ZAINAB NUNUNG (Researcher of Plant physiology division) | Biological nitrogen fixation on legume plants | 12 Jun.1989 - 22 Dec.1989 |

| | | |
|---|---|---|
| Ms. ENDANG SUHARTATIK (Researcher of Agronomy division) | Photosynthesis activity of soybean | 12 Jun.1989 - 23 Nov.1989 |
| Dr. SYARIFUDDIN KARAMA (Director of BORIF) | Research Management | 11 Mar.1990 - 25 Mar.1990 |
| Mr. NONO SUYONO (Resercher of Entomology division) | Physiological aspects insect in accordance to the insect and host relationship | 31 Mar.1990 - 21 Sep.1990 |
| Mr.SOETJIPTO PH. * (Head of Agronomy division) | Fertilizer management for upland rice | 25 Mar.1990 - 2 May.1990 |
| Dr. JUSTINUS SOEJITNO (Head of Entomology division) | Study on modern entomological aspect in Japan | 12 Nov.1990 - 4 Dec.1990 |

Remarks : * obtained a doctoral degree at Hokkaido University.

(2) Graduated Course scholarship by Ministry of Education, Science & Culture ( Mombushou)

| NAME | ASSIGNMENT | UNIVERSITY & PERIOD |
|---|---|---|
| Mr. MUHAMMAD DJAZULI * (Doctor course) | Plant Physiologist | Hokkaido University, Dept. of Agricultural Chemistry (October 1986 - September 1990) |

| | | |
|---|---|---|
| Mr. DJUMANJTO H.<br>(Doctor course) | Plant Pathologist | Hokkaido University, Dept. of Agricultural Biology<br>(April 1987 - March 1991) |
| Ms. RASTI SARASWATI<br>(Doctor course) | Plant Physiologist | Kyoto University, Dept. of Agricultural Chemistry<br>(April 1989 - ) |
| Ms. HAENI PURWANTI<br>(Master course) | Plant Pathologist | Hokkaido University, Dept. of Agricultural Biology<br>(April 1990 - ) |

Remarks : * obtained a doctoral degree.

Appendix 5 PERFORMANCE OF MISSIONS DISPATCHED BY JICA

| | |
|---|---|
| 1. Implemetation Study for signing of Record of Discussion | 22 Jan. 1986 - 2 Feb. 1986 |
| 2. Consultation Study for preparing annual programs | 14 Dec. 1986 - 25 Dec. 1986 |
| 3. Technical Guidance Team for discussing Progress and Future Plan of Research & Training Activities | 12 Dec. 1987 - 3 Dec. 1987 |
| 4. Technical Guidance Team for discussing Progress and Future Plan of Research & Training Activities | 21 Nov. 1988 - 3 Dec. 1988 |
| 5. Technical Guidance Team for discussing Progress and Future Plan of Research & Training Activities | 13 Nov. 1989 - 26 Nov. 1989 |

Appendix 6 CHANGE IN NUMBER OF PERSONNELS OF THE PROJECT (BORIF)

| No. of staff | 1985/86 | 1986/87 | 1987/88 | 1988/89 | 1989/90 | 1990/91 |
|---|---|---|---|---|---|---|
| Administrative * staff | 98 | 98 | 102 | 73 | 113 | 101 |
| Technical ** staff | 284 | 284 | 282 | 325 | 343 | 331 |
| Supporting *** staff | 166 | 166 | 160 | 156 | 150 | 153 |
| Total | 548 | 548 | 544 | 554 | 606 | 585 |

* All staff members of secretariat of BORIF

** All staff members of six departments of BORIF

*** All staff members of 5 experimental farms

Appendix 7 CHANGE IN NUMBER OF TECHNICAL STAFFS OF EACH DIVISION

| No. of staff | 1985/86 | 1986/87 | 1987/88 | 1988/89 | 1989/90 | 1990/91 |
|---|---|---|---|---|---|---|
| Agronomy division | 68 | 68 | 66 | 82 | 86 | 74 |
| Breeding division | 61 | 61 | 58 | 63 | 63 | 65 |
| Plant physiology division | 51 | 51 | 52 | 67 | 79 | 78 |
| Entomology division | 52 | 52 | 56 | 62 | 59 | 57 |
| Plant pathology division | 27 | 27 | 26 | 29 | 29 | 34 |
| Socio economic division | 25 | 25 | 24 | 22 | 27 | 23 |
| Total | 284 | 284 | 282 | 325 | 343 | 331 |

Appendix 8 NUMBER OF STAFFS CLASSIFIED BY ACADEMIC CAREER (BORIF)

| Degree | Division Head Office | Agronomy | Breeding | Entomology | Plant Pathology | Plant Physiology | Socio-economic | Total |
|---|---|---|---|---|---|---|---|---|
| Doctoral Degree | 1 | 4 | 6 | 7 | 6 | 7 | 1 | 32 |
| Master Degree | 0 | 9 | 9 | 6 | 1 | 5 | 7 | 37 |
| Bachelor Degree | 10 | 4 | 4 | 5 | 3 | 2 | 4 | 32 |
| Total | 11 | 17 | 18 | 16 | 9 | 8 | 12 | 101 |

Appendix 9 BUDGET ALLOCATION BY INDONESIA FOR CRIFC AND BORIF RESEARCH PROGRAM

(unit: thousand rupiah)

| | 1986/87 | 1987/88 | 1988/89 | 1989/90 | 1990/91 | Total |
|---|---|---|---|---|---|---|
| Routine budget | | | | | | |
| CRIFC | 376,350 | 343,350 | 361,100 | 400,516 | 477,517 | 1,958,833 |
| BORIF | 1,080,118 | 1,030,868 | 1,090,800 | 1,207,902 | 1,372,789 | 5,782,477 |
| Development budget | | | | | | |
| CRIFC | 160,000 | 194,100 | 219,000 | 367,000 | 470,000 | 1,410,100 |
| BORIF | 370,000 | 818,000 | 672,730 | 759,000 | 590,000 | 3,209,730 |
| * | ( 0) | (680,000) | (568,730) | (759,000) | (590,000) | (2,597,730) |
| Sub total | | | | | | |
| CRIFC | 536,350 | 537,450 | 580,100 | 767,516 | 947,517 | 3,368,933 |
| BORIF | 1,450,118 | 1,848,868 | 1,763,530 | 1,966,902 | 1,962,789 | 8,992,207 |
| Total | 1,986,468 | 2,386,318 | 2,343,630 | 2,734,418 | 2,910,306 | 12,361,140 |

*Remarks: ( ) The budget which comes from donors' loan such as IBRD and OECF, and is directly allocated from BAPPENAS to AARD.

Appendix 10 THE FOREIGN ASSISTANCE TO CRIFC AND BORIF SINCE 1986

| Title of project | Donor | Duration | Cost |
|---|---|---|---|
| (1) CRIFC | | | |
| Agroecosystem network | Ford Foundation | 1984-1986 (Phase I ) | US$ 105,800 |
| | | 1985-1987 (Phase II ) | US$ 270,000 |
| (2) BORIF | | | |
| Food, lagume and coarse grain | FAO/UNDP | 1982-1987 | US$ 754,000 |
| Legume cultivar selection for condition after low-land rice and acid soil | Canada | 1984-1987 | CA$ 213,200 |
| Farming system development in Asia | FAO/UNDP | 1984-1992 | US$ 1,310,000 |
| Crop livestock system research | Canada | 1985-1988 | CA$ 383,000 |
| Phosphorus and sulphur efficiency in tropical cropping system | Australia | 1985-1988 | US$ 296,700 |
| Preliminary studies on bacterial wilt in South East Asia | Australia | 1985-1989 | AU$ 49,450 |
| Applied Agricultural Research Project | USAID/IBRD | - Sep. 1992 | US$ 7,500,000 |
| Rice Biotechnology Research Program | USAID /Rockfeller Foundation | Jun.-Sep. 1990 | US$ 150,000 |

THE FINANCIAL CONTRIBUTION BY OTHER DONORS

(unit: thousand rupiah)

| | 1985/86 | 1986/87 | 1987/88 | 1988/89 | 1989/90 | 1990/91 |
|---|---|---|---|---|---|---|
| Research Operation Cost from Canada, Australia & IRRI | - | - | 115,489 | 71,962 | 178,545 | 32,000 |

## ② 事前送付した質問票

QUESTIONNAIRE ON STRENGTHENING OF PIONEERING RESEARCH FOR PALAWIJA CROP PRODUCTION PROJECT IN INDONESIA

1. The operating cost of the Project.

1.1. Budget allocation for the Project by the government of Indonesia since 1985.

(Unit: Rp )

fiscal year

| | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | Total |
|---|---|---|---|---|---|---|---|
| Routine budget | | | | | | | |
| Development budget | | | | | | | |
| Others | | | | | | | |
| Total budget | | | | | | | |

1.2. Main reasons why the budget has increased (or decreased).

1.3. Sufficiency of the budget allocation for implementing the activity.

Any items of the budget necessary to be increased in particular reason.

1.4. Any assistance to the Project by other countries or organizations excluding Japan.

If yes above,discribe the donor,the duration and the achievement.

2. The personnel of the Project.

2.1. Change in number of personnels of the project since 1985, classifying them into administrative personnels, technical personnels and supporting staffs.

fiscal year

| No.of staff | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | Total |
|---|---|---|---|---|---|---|---|
| administra-tive | | | | | | | |
| technical | | | | | | | |
| supporting staff | | | | | | | |
| Total | | | | | | | |

2.2. Present institutions and positions of ex-counterpart personnels. (Please prepare the List of Indonesian personnel trained in Japan.)

Also the reason for the change of positions or the promotion.

3. The achievement of each acivity.
(Please prepare the List of research activities, according to the Tentative Schedule of Implementation.)

3.1. Evaluation of sustainability, viability of each acivity, and impact of the project, by classifying into three categories shown in the table below:

Mark one of three to each items in the TSI.

| | sustainability,viability | impact |
|---|---|---|
| A | High achievement of the implementation schedule. | High achievement of accomplishing technology transfer to farmers. |
| B | Good performances and on the way to achievement. | On the way to application. |
| C | Far from achieving the schedule. | Preparing for application. |

3.2. Main causes why the achievement of activity is ranked "A".

3.3. Main causes why the achievement of activity is ranked "C".

3.4. Any requests of technical assistance for further promotion of the activities.

4. The facilities and the equipment supplied by the Japanese technical cooperation.(Please prepare the List of equipment provided by Japan.)

4.1. Evaluation of the utilizing and maintainig conditions of the facilities and the equipment supplied by the Japanese cooperation, by classifying into three categories shown in the table below:

Mark one of three to each items in the List of equipment.

| | conditions of utilization | conditions of maintenance |
|---|---|---|
| A | Use often | Always under best conditions |
| B | Use once in a while | Under almost good conditions |
| C | Out of use | Out of order |

4.2. Main causes why the condition of the facilities is ranked "A".

4.3. Main causes why the condition of the facilities is ranked "C".

4.4. Any requests to repair or to supply the spareparts of the facilities which condition is ranked "C".

4.5. List of the equipment or facilities procured by Indonesia since 1985.

| fiscal year | cost(unit ) | name of facilities |
|---|---|---|
| 1985 | | |
| 1986 | | |
| 1987 | | |
| 1988 | | |
| 1989 | | |
| 1990 | | |

5. The plan to promote the Project more effectively.

5.1. Please prepare the agricultural statistics of Palawija crops in order to grasp impact of the Project.

5.2. Degree of sustainability on the effect of the Japanese cooperation.

The respects in which the sustainability can be seen.

5.3. Activity which receives the highest priority from now on.

5.4. Any requests for future Japanese technical cooperation.

December 5, 1990

Additional questionnaire in the field of cooperation management

I. Position of this Project in the central government's agricultural development plan (Is there any change in the development plan since this Project's commencement ?)

II. Effect of the Project

Implementation effects of the Project are needed to be determined by the below-written 4 beneficiaries.

Therefore, Please descrive 20 implementation effects quantitatively and qualitatively.

1. Implementation effects of the Project

(1) The content of effects

1) Technical impact
2) Institutional impact
3) Economic impact
4) Social and cultural impact
5) Environmental impact

(2) The spread of effects and scope of beneficiaries

1) Impact at Project level (counterpart personnel)
2) Impact at sector level (Indonesian agricultural research)
3) Impact to regions (covered regions by this Project)
4) Impact at macro level (Indonesian agriculture)

Ⅲ. Prospect on self-support (independent) Development of this Project by Indonesian side after termination of Japanese assistance as the project-type technical cooperation to this Project

1. Prospect on organizational self-support development
   (1) Implementing organization (System)
   (2) Managerial and operational system
   (3) Organizational change (changed or abolition)

2. Prospect on financial self-support development
   (1) Prospect on procurement of necessary costs
   (2) Prospect on Indonesian gonernment's support (Subsidy) to the Project and its stability
   (3) Current situation of Indonesian government's payment of project costs by its own source of revenue
   (4) Necessity and appropriateness for bearing recurrent costs by Japanese side

3. Prospect on self-support development in material and technical aspects
   (1) Technological content transfered by this Project and appropriateness of its technical level
   (2) Stationing of counterpart personnel to the Project
   (3) Extent in technology transfer to counterpart personnel
   (4) Training plan to educate and foster counterpart successors

4. Other managerial operational restricting factors

Ⅳ. Important experience obtained through this Project's activities and suggestions

1. Planning in the Project
2. Implementation and management of the Project
3. Evaluation activity at the project evaluation time

Ⅴ. Managerial and operational system of this project

1. Position of this Project's operational organization in the administrative organization in Indonesia
2. Administrative and finantial performance(ability) of this Project's operational organization
3. Stationing state of necessary staffs for Project implementation
4. Mechanism and activity of committees such as the joint committee for project operation

③ 質問票に対する回答

# STRENGTHENING OF PIONEERING RESEARCH FOR PALAWIJA CROP PRODUCTION PROJECT (ATA-378)

1 April 1986 - 31 March 1991

Republic of Indonesia
Ministry of Agriculture
Agency for Agricultural Research and Development (AARD)
Central Research Institute for food Crops (CRIFC)
Bogor Research Institute for Food Crops (BORIF)

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
March 1991

# OUT LINE

1. Aim of the project

To develop appropriate technology for palawija crops mainly soybean and peanut, corn, sweet potato production through pioneering research in the fields of (1) seed quality improvement, (2) crop production system, (3) crop production nutrition technology and thereby at contributing to increase palawija crop production in Indonesia.

2. Past history

1st phase: The Indonesia-Japan Joint Food Crop Research Program (23 October 1970 - 22 October 1978)

2nd phase: The Strengthening of Legumes in Relation to Cropping System Research Project (23 October 1978 - 31 March 1986)

3. Record of Discussion (R/D)

31 January 1986

4. Cooperation period

1 April 1986 - 31 March 1991 (5 years)

5. Institution

Bogor Research Institute for Food Crops (BORIF)
Central Research Institute for Food Crops (CRIFC)
under the supervision of
Agency of Agricultural Research and Development (AARD)
Ministry of Agriculture

6. Grant-aid (cost ≈ ¥ 380 million)

Pioneering research laboratory for palawija crops was officially inaugurated by Ministry of Agriculture, Ir. Wardoyo and Ambassador of Japan, Mr. S. Edamura on 21 November 1988.

7. Dispatch of experts

Long-term experts = 12
Short-term experts = 20

8. C/P training

Individual training = 24
Monbushou scholarship = 6

* three researchers have taken their own PH.D. degree, other eight researchers are still on going.

9. Grant-equipment

The equipment which equivalents to ¥ 200 million were provided.

1. LONG-TERM EXPERT

| | | | MM*/subtotal (% achievement) |
|---|---|---|---|
| **TEAM LEADER** | | | |
| 01. GOTO, T. | : | 1986.04.29 - 1988.04.28 | 24.0 |
| 02. IGARASHI, T. | : | 1988.05.12 - 1991.03.31 | 34.6/58.6 (97.6 %) |
| **COORDINATOR** | | | |
| 03. OKUDA, S. | : | 1986.04.01 - 1988.03.31 | 24.0 |
| 04. NISHIYAMA, S. | : | 1988.04.21 - 1991.03.31 | 35.4/59.6 (99.3 %) |
| **AGRONOMIST** | | | |
| 05. YARIMIZU, H. | : | 1986.04.29 - 1988.04.28 | 24.0 |
| 06. MIKOSHIBA, H. | : | 1988.09.03 - 1991.03.31 | 30.9/54.9 (91.5 %) |
| **PLANT PHYSIOLOGIST** | | | |
| 07. INOUE, H. | : | 1986.07.30 - 1989.07.29 | 36.0 |
| 08. HITSUDA, K. | : | 1990.03.29 - 1991.03.31 | 12.1/48.1 (80.2 %) |
| **PLANT PATHOLOGIST** | | | |
| 09. TAKAYA, S. | : | 1986.07.30 - 1989.03.29 | 32.0 |
| 10. NAITO, S. | : | 1989.03.25 - 1991.03.24 | 24.0/56.0 (93.3 %) |
| **ENTOMOLOGIST** | | | |
| 11. OKADA, T. | : | 1986.10.29 - 1988.12.13 | 25.5 |
| 12. NAITO, A. | : | 1988.10.07 - 1991.03.31 | 29.8/53.3 (92.2 %) |
| | | Total ..... | 332.3** (92.3 %) |

* Man month

** Planning: 60.0 x 6 = 360.0

2. SHORT-TERM EXPERT

(MM)

1st YEAR, 1986/1987

| | | | | |
|---|---|---|---|---|
| 01. | Plant pathologist (Virologist) | : HONDA, Y. | 1987.02.03-1987.03.14 | (1.4) |
| 02. | Plant physiologist: (Soil physics) | IIZUKA, T. | 1987.02.13-1987.03.30 | (1.6) |
| 03. | Agronomist (Farm Management) | : KAWAIDE, T. | 1987.03.03-1987.05.31 | (2.9) |

2nd YEAR, 1987/1988

| | | | | |
|---|---|---|---|---|
| 04. | Entomologist (Biological control) | : HIROSE, Y. | 1987.08.05-1987.10.04 | (2.0) |
| 05. | Agronomist (Research advice on agronomy aspects) | : KUMURA, A. | 1987.11.18-1987.12.02 | (0.5) |
| 06. | Plant physiologist: | ASANUMA, S. | 1988.01.11-1988.03.18 | (2.3) |
| 07. | Plant pathologist | : HONDA, Y. | 1988.03.15-1988.04.22 | (1.3) |

3rd YEAR, 1988/1989

| | | | | |
|---|---|---|---|---|
| 08. | Entomologist (Insect pest resistance to insecticide) | : ENDO, S. | 1988.04.06-1988.06.26 | (2.7) |
| 09. | Plant pathologist (Plant pathology) | : USUGI, T. | 1989.01.20-1989.03.21 | (2.0) |
| 10. | Agronomist (Ecophysiologist) | : NAKANO, H. | 1989.02.01-1989.03.14 | (1.5) |
| 11. | Plant physiologist: (Seed physiology) | SAITO, M. | 1989.03.31-1989.07.11 | (3.4) |

4th YEAR, 1989/1990

| | | | | |
|---|---|---|---|---|
| 12. | Entomologist (Biological control) | : KAJITA, H. | 1989.07.15-1989.09.14 | (2.0) |
| 13. | Agronomist (Upland crops cultivation) | : HARA, M. | 1989.11.01-1989.11.30 | (1.0) |
| 14. | Plant physiologist: (Tissue culture) | JYUTORI, H. | 1990.01.09-1990.03.29 | (2.7) |
| 15. | Plant breeding (Soybean breeding) | : SAKAI, S. | 1990.02.14-1990.03.15 | (1.0) |

5th YEAR, 1990/1991

| | | | | |
|---|---|---|---|---|
| 16. | Agronomist (Cropping system) | : SAID, K. | 1990.08.22-1990.09.01 | (0.4) |
| 17. | Entomologist (Physiological entomology) | : TAKEDA, S. | 1990.08.30-1990.10.12 | (1.5) |
| 18. | | | | |
| 19. | | | | |
| 20. | | | | |

Summary

| | No. of expert | cummulative MM | average MM |
|---|---|---|---|
| Agronomy | 5 | 6.3 | 1.3 |
| Entomology | 4 | 8.2 | 2.1 |
| Plant physiology | 5 | | |
| Plant pathology | 4 | | |
| Plant breeding | 2 | | |
| Total | 20 | | |

Answer sheet for the evaluation on strengthening of pioneering research for palawija crop production project in Indonesia

1.

1.1. See Table 1

1.2. Budget for research activities by CRIFC comes from National Plan for Income and Expenditures (APBN) and from international financial assistance (loan and grant).

a. Budget from APBN for routine activities has increased steadily to meet the need from new recruitment, salary raise, increase in service changes (electricity, water and telephone), and increase in prices of material and supplies. In 1987/88 fiscal year the routine budget slightly declined due to national budget limitations.

b. Development budget in the last five year has not increased significantly despite of the increase in price of material and services, International assistance has contributed significantly to the sustainability of research activities during the last four year period. The amount of fund originated from domestic source decline sharply.

1.3. Since 1985 the unit cost of research activities has increased steadily. With the slow increase in the funds available not all of the program could be implemented.

Items of the budget need to be increased include:

- Building and equipment because the budget needed for building and appropriate equipment is very far under the budget available.
- Technical assistance because all the specialists we contract have to be continued.
- Operational fund since the improved personal and facilities should be utilized efficiently.

1.4. Yes, see Table 2

2.

2.1. See Table 3

2.2. See Table 4

Nothing particular

3.

3.1. See Table 5

3.2. Because of their good performance

3.3. Because of long blank of both Indonesian and Japanese researchers

3.4. Technical assistance for further promotion of the activities:

a. By follow up-phase of the current project, and/or

b. By new projects will be developed through new proposals

- Conservation and utilization of food crops germplasm
- Biotechnology
- Improvement of technology transfer activities
- Strengthening research activities in Eastern Indonesia

4.

4.1. See Table 6

4.2. Because of their good use

4.3. They could not be repaired in Indonesia

4.4. The dispatch of equipment repairing team is expectable

4.5. See Table 7

5.

5.1. See Table 8

5.2. The cooperation has strengthened research capability of the Indonesia scientists through various aspects: technical assistant, research facilities, training of Indonesian scientists in Japan (short-term and degree training). The cooperation has also strengthened research programs on pests and diseases identification and control, plant physiology and seed production/technology. A number of Indonesian researchers have increased their skill and knowledge and have more convenience in doing research. Those, and new finding resulted from them, will sustainable support Indonesian's food crops research and productivity.

5.3. In term of crop, research on soybean is having highest priority from now on. Research on pests and diseases management, breeding for high yield and pest/diseases resistant will have highest priority both through conventional research activities and through more fundamental research including biotechnology.

5.4. Through long cooperation between Japanese and Indonesian scientists, also of information and technology have been generated. Many of these have not been transferred appropriately to a number of users including other scientists,

extension workers, and farmers. In the future, therefore, aside from research activities, technology transfer will be given some emphasis. The activities can be implemented through training, field days, publications, and national workshops. Since research on food crops, especially soybean, is also carried out in all six research institutes under CRIFC, it is proposed that the cooperation also cover other research institutes outside Bogor.

Table 1. Budget allocation for the project by the government of Indonesia

(unit: thousand rupiah)

| | 1985/1986 | 1986/198 | 1987/198 | 1988/198 | 1989/199 | 1990/199 |
|---|---|---|---|---|---|---|
| Routine budget | | | | | | |
| - C R I F C | 350,610 | 376,350 | 343,350 | 361,100 | 400,516 | 477,517 |
| - B O R I F | 768,510 | 1,080,118 | 1,030,868 | 1,090,800 | 1,207,902 | 1,372,789 |
| Development budget | | | | | | |
| - C R I F C | 658,400 | 160,000 | 194,100 | 219,000 | 367,000 | 470,000 |
| - B O R I F | 630,000 | 370,000 | 818,000 | 672,730 | 759,000 | 590,000 |
| Sub total | | | | | | |
| - C R I F C | 1,009,010 | 536,350 | 537,450 | 580,100 | 767,516 | 947,517 |
| - B O R I F | 1,399,510 | 1,450,118 | 1,848,868 | 1,763,530 | 1,966,902 | 1,962,789 |
| Total | 2,408,520 | 1,986,468 | 2,386,318 | 2,343,630 | 2,734,418 | 2,910,306 |

Table 2. The foreign assistance to CRIFC/BORIF (April 1986 - March 1991)

| | Name of project | Title of project | Donor | Duration | Cost |
|---|---|---|---|---|---|
| I. | CRIFC | | | | |
| 1) | KEPAS | Agroecosystem network | Ford Foundation | 1984-1986 (Phase I) | US$ 105,800 |
| | | | | 1985-1987 (Phase II) | US$ 270,000 |
| I. | BORIF | | | | |
| 1) | | Food, legume and coarse grain | FAO/UNDP | 1982-1987 | US$ 754,000 |
| 2) | IDRC | Legume cultivar selection for condition after lowland rice and acid soil | Canada | 1984-1987 | CA$ 213,200 |
| 3) | RAS/81/044/01 | Farming system development in Asia | FAO/UNDP | 1984-1992 | US$ 1,310,000 |
| 4) | | Facility development for research in seed technology and microorganism | Grant-aid | 1985-1987 | US$ 1,803,000 |
| 5) | IDRC | Crop livestock system research | Canada | 1985-1988 | CA$ 383,000 |
| 6) | ACIAR ATA-382 | Phosphorus and sulphur efficiency in tropical cropping system | Australia | 1985-1988 | US$ 296,700 |
| 7) | ACIAR | Preliminary studies on bacterial wilt in South East Asia | Australia | 1985-1989 | AU$ 49,450 |
| 8) | JICA ATA-378 | The strengthening of pioneering research for palawija crop production | Japan | 1986-1991 | US$ 5,053,000 |

Table 3-1. Change in number of personals of the project (BORIF)

| No. of staff | 1985/86 | 1986/87 | 1987/88 | 1988/89 | 1989/90 | 1990/91 |
|---|---|---|---|---|---|---|
| Administrative* staff | 98 | 98 | 102 | 73 | 113 | 101 |
| Technical** staff | 284 | 284 | 282 | 325 | 343 | 356 |
| Supporting*** staff | 166 | 166 | 160 | 156 | 150 | 153 |
| Total | 548 | 548 | 544 | 554 | 606 | 610 |

* All staff members of secretariat of BORIF
** All staff members of six departments of BORIF
*** All staff members of 5 experimental farms

Table 3-2. Change in number of personals of each department

| No. of staff | 1985/86 | 1986/87 | 1987/88 | 1988/89 | 1989/90 | 1990/91 |
|---|---|---|---|---|---|---|
| Agronomy division | 68 | 68 | 66 | 82 | 86 | 74 |
| Breeding division | 61 | 61 | 58 | 63 | 63 | 65 |
| Plant physiology division | 51 | 51 | 52 | 67 | 79 | 78 |
| Entomology division | 52 | 52 | 56 | 62 | 59 | 57 |
| Plant pathology division | 27 | 27 | 26 | 29 | 29 | 34 |
| Socio economic division | 25 | 25 | 24 | 22 | 27 | 23 |
| Total* | 284 | 284 | 282 | 325 | 343 | 331 |

* : Technical staff shown in Table 3-1

Table 4. List of Indonesian personnel trained in Japan

(1) JICA Individual training

1st YEAR, 1986/1987

| | | | |
|---|---|---|---|
| 01. | RASTI SARASWATI (Researcher of Plant physiology division) | '87.02.11-'87.10.13 (8.1) | Microbiology of legume root nodules |
| 02. | MUHAMMAD MUHSIN (Researcher of Plant pathology division) | '87.02.11-'87.09.12 (7.1) | Research technique of legume viruses |
| 03. | SRI HUTAMI (Researcher of Agronomy division) | '87.02.11-'87.09.12 (7.1) | Relationship of soybean growth and soil moisture |

2nd YEAR, 1987/1988

| | | | |
|---|---|---|---|
| 04. | M. ARIFIN (Researcher of Entomology division) | '87.07.16-'87.12.22 (5.2) | Economic injury level of insect pest & pathology |
| 05. | DJUBER PASARIBU (Researcher of Agronomy division) | '87.08.31-'88.02.14 | Crop and soil management of soybean intercropping |
| 06. | HAFID (Technician of Plant physiology division) | '87.08.31-'88.03.01 (8.1) | Analytical techniques of organic substance in plant |
| 07. | SOETJIPTO PH. (Head of Agronomy division) | '88.03.15 -'88.04.33 (1.3) | Fertilizer management for upland rice |

| | | | |
|---|---|---|---|
| 08. | GUNAWAN SATARI (Director of AARD) | '87.11.09-'87.11.18 (0.3) | Research Management |
| 09. | BUDIHARDJO S. (Researcher of Entomology division | '88.02.29-'88.11.03 (8.1) | Population dinamics of feeder insects on soybean plant |

3rd YEAR, 1988/1989

| | | | |
|---|---|---|---|
| 10. | MUKELAR AMIR (Head of Plant pathologist division) | '88.08.15-'88.09.08 (0.8) | Plant pathology in Japan and the world particularly those related to biotechnology |
| 11. | IBRAHIM MANWAN (Director of CRIFC) | '88.10.09-'88.10.25 (0.6) | Research Management |
| 12. | SUKARMAN (Researcher of Plant physiology division) | '88.12.05-'89.07.11 (3.9) | Seed physiology |
| 13. | WEDANIMBI TENGKANO (Researcher of Entomology division) | '89.03.19-'89.08.15 (4.9) | Ecobiology of legume insect pests and their natural enemies |
| 14. | SAPTOWO J. PARDAL (Researcher of Plant physiology division) | '89.03.13-'89.11.11 (7.9) | Tissue culture |

4th YEAR, 1989/1990

| | | | |
|---|---|---|---|
| 15. | MUHAMMAD DJAENI (Researcher of Plant pathology division) | '89.06.12-'89.12.22 (6.4) | Research technique on plant diseases |
| 16. | ZAINAB NUNUNG (Researcher of Plant physiology division) | '89.06.12-'89.12.22 (5.4) | Biological nitrogen fixation on legume plants |

| | | | |
|---|---|---|---|
| 17. | ENDANG SUHARTATIK (Researcher of Agronomy division) | '89.06.12-'89.11.23 (5.4) | Photosynthesis activity of soybean |
| 18. | SYARIFUDDIN KARAMA (Director of BORIF) | '90.03.11-'90.03.25 (5.5) | Research Management |
| 19. | NONO SUYONO (Resercher of Entomology division) | '90.03.31-'90.09.21 (6.4) | Physiological aspects insect in accordance to the insect and host relationship |
| 20. | SOETJIPTO PH. (Head of Agronomy division) | '90.03.25-'90.05.02 (1.6) | Fertilizer management for upland rice |

5th YEAR, 1990/1991

| | | | |
|---|---|---|---|
| 21. | JUSTINUS SOEJITNO (Head of Entomology division) | '90.11.12-'90.12.04 (0.8) | Study on modern entomological aspect in Japan |
| 22. | | | |
| 23. | | | |
| 24. | | | |
| 25. | | | |

(2) Monbushou-scholarship (graduated course)

| | | | |
|---|---|---|---|
| 01. | MUHAMMAD DJAZULI<br>(Doctor course) | Plant Physiologist | Hokkaido University, Dept. of Agricultural Chemistry<br>(October 1986 - September 1990) |
| 02. | DJUMANJTO H.<br>(Doctor course) | Plant Pathologist | Hokkaido University, Dept. of Agricultural Biology<br>(April 1987 - March 1991) |
| 03. | RASTI SARASWATI<br>(Doctor course) | Plant Physiologist | Kyoto University, Dept. of Agricultural Chemistry<br>(April 1989 - ) |
| 04. | HAENI PURWANTI<br>(Master course) | Plant Pathologist | Hokkaido University, Dept. of Agricultural Biology<br>(April 1990 - ) |
| 05. | | | |
| 06. | | | |

Table 5. Summary of relation between tentative schedule of implementation (TSI) and research activities

| TSI (Evaluation)‡ | RESEARCH ACTIVITIES |
|---|---|
| I. SEED QUALITY IMPROVEMENT | |
| 1. Production techniques for high quality seeds | |
| 1) Research on cultural practices (A: 80) | (01) Environmental influence on quality and yield of soybean seeds<br>- Mikoshiba, H., Sri Hutami |
| 2) Research on crop physiology & nutrition (A: 70) | (02) Growth analysis on ripping process of soybean seeds<br>- Mikoshiba, H., Sutoro |
| 3) Research on seed processing (A: 90) | (03) Influence to the seed germination of different drying method on germination of soybean seed<br>- Mikoshiba, H., Djuber P., I.V. Sutarto, Inoue, H., Sukarman |
| 2. Techniques for maintaining high quality & high viability of seeds | |
| 1) Research on high viability (A: 90) | (04) Basic study on maintenance of high quality soybean seed<br>- Mikoshiba, H., Djuber P., Sutoro<br>(05) Influence of different storage on the germination ability of soybean<br>- Mikoshiba, H., Djuber P., Sutoro, Inoue, H., Sukarman, Endang Y.H.<br>(06) Seed condition and germination ability of the bean for preparation of field planting after get out storage<br>- Mikoshiba, H., Sutoro<br>(07) Survey on soybean storage methods by farmers<br>- Inoue, H., Fathan M., Sukarman, Endang Y.H.<br>(08) Development of a low cost technique for soybean storage<br>- Mikoshiba, H., Djuber P., I.V. Sutarto, Inoue, H., Fathan M., Sukarman, Endang Y.H. |

N.B.) Temporary, put Japanese expert's name first, Indonesian C/P's name second.

| TSI (Evaluation)‡ | RESEARCH ACTIVITIES |
|---|---|
| 2) Research on physiological & biochemical changes of stored seeds (A: 80) | (09) Analysis of soybean seeds in Indonesia<br>- Nikoshiba, H., I.V. Sutarto, Djuber P., Saito, M., Inoue, H., Sukarman<br>(10) Evaluation method by the electric conductivity of extract from soybean seeds<br>- Hara, M., Nikoshiba, H., I.V. Sutarto, Djuber P. |
| 3. Disease & pest management | |
| 1) Diagnosis & identification of casual agents of diseases<br>- Studies on serological techniques (B: 49) | (11) Virus diseases of soybean in Indonesia, especially seed-borne viruses<br>- Honda, Y., Takaya, S., M. Muhsin, Nasir S., Jumanto H.<br>(12) Virus diseases of soybean in Indonesia, especially a blister symptom<br>- Usugi, T., Takaya, S., M. Muhsin<br>(13) Kinds of soil-borne disease of soybean and their pathogen<br>- Naito, S., M. Djaeni, Anggiani N., Mukelar A., Kosim K., Sutoyo, Haeni P.<br>(14) Bacterial diseases of soybean<br>- Naito, S., short-term expert, Hartini R.H., Nunung H.A., Ace S. |
| 2) Bionomics of causal agents of diseases affecting crop yield<br>- Studies on biology & ecology of serious diseases<br>- Disease & insector vertors inter-relationships (A: 80) | (15) Identification and ecobiology of anthracnose of soybean<br>- Takaya, S., M. Djaeni, Anggiani N.<br>(16) Identification and ecobiology of frogeye leaf spot of soybean<br>- Takaya, S., M. Djaeni, Anggiani N.<br>(17) Rhizoctonia pod rot of soybean<br>- Takaya, S., Kosim K., M. Djaeni, Anggiani N.<br>(18) Biology of soil-borne diseases of soybean<br>- Naito, S., Anggiani N., Sutoyo, Haeni P., Kosim K., M. Djaeni |
| 3) Ecology and bionomics of major pests<br>- Population dynamics of major pests<br>- Ecology and bionomics of major pests (A: 69) | (19) Some ecological studies on the beanfly Ophiomyia phaseoli<br>- Okada, T., Toto D., Wedanimbi T., Budihardjo S., Suyono<br>(20) Varietal resistance of soybean to beanfly;<br>- Naito, A., Toto D.<br>(21) Some ecological studies on soybean insect pests attacking leaf and stem<br>- Okada, T., Budihardjo S., Toto D., Wedanimbi T., Suyono, M. Arifin<br>(22) Varietal resistance of soybean to leaf feeders<br>- Naito, A., Budihardjo S. |

4) Analysis of injury caused by insect pests
   - Economics injury level of podsucking insects
   - Analysis on injury caused by soybean pod borers
   (A: 75)

5) Transmission of plant viruses by insects & mites
   - Study on natural enemies of insects
   - Chemical control of insects
   - Side & residual effects of pesticide application
   - Study on insect resistance
   (A: 80)

6) Research on pests & diseases of stored seeds & products
   (A: 83)

(23) Some ecological studies and pest fauna of soybean
   - Okada, T., Wedanimbi T., Toto D., Budihardjo S., Suyono

(24) Biological characteristics of soybean podborers in tropical district
   - Naito, A., Toto D., Takeda, S., J. Soejitno

(25) Biological control of soybean's sucking bugs - survey on their egg parasites
   - Hirose, Y., Okada, T., Wedanimbi T.

(26) Establishment of alternative control of soybean using trapping crops - soybean sucking bugs
   - Naito, A., Wedanimbi T.

(27) Influence of the damaged soybean seeds caused by the sucking bugs on their germination
   - Okada, T., Wedanimbi T.

(28) Analysis of pod damage caused by Etiella podborers
   - Naito, A., Toto D.

(29) Biological control of soybean pests; whitefly
   - Kajita, H., Naito, A., I.M. Samudra

(30) Timing of insecticide spraying to control Etiella podborers
   - Naito, A., Harnoto

(31) Insecticide resistance of the common cutworm Spodoptera litura
   - Endo, S., Okada, T., Sutrisno, I.M. Samudra, J. Sujitno

(32) Occurrence of stored legume pests and their control using vinyl bag
   - Okada, T., Suyono

(33) Effect of dialomaceous earth formulated on three bruchid attacking legume seeds
   - Naito, A., Suyono

(34) Effect of ash and lime on soybean stored pest C. analis
   - Naito, A., Suyono

| TSI (Evaluation)* | RESEARCH ACTIVITIES |
|---|---|
| **II. IMPROVEMENT OF PALAWIJA CROP PRODUCTION TECHNIQUES UNDER DIVERSIFIED CULTIVATION CONDITIONS** | |
| **1. Improvement of crop adaptablity & productivity** | |
| 1) Germplasm collection & utilization of legumes (B: 60) | (35) Collection and evaluation of local varieties in Indonesia<br>- Mikoshiba, H., Djuber P., I.V. Sutarto |
| 2) Breeding & selection on acid soil (C: 10) | (36) Resistant varieties against to heavy acid soil of soybean<br>- Yarimizu, H., Djuber P. |
| 3) Studies on potential productivities of palawija crops (A: 80) | (37) Effects by the ridgging up of soil to hill and soil moisture to soybean yield<br>- Yarimizu, H., Djuber P., I.V. Sutarto |
| | (38) Effects on the soybean yield by the ridgging up of soil to hill<br>- Mikoshiba, H., Djuber P., I.V. Sutarto |
| | (39) *Growth response of different soybean type on the regional maize*<br>- Yarimizu, H., Djuber P., I.V. Sutarto |
| 4) Introduction & trial cultivation of new varieties (A: 80) | (40) Evaluation on the newly introduced varieties of soybean<br>- Mikoshiba, H., Djuber P., S. Hutami |
| 5) Crop interactions in cropping system (A: 73) | (41) Growth response of soybean varieties at mix-planting with maize plants<br>- Yarimizu, H., Djuber P., I.V. Sutarto |
| | (42) *Measurement of photosynthetic activity by the portable apparatus*<br>- Nakano, H., Mikoshiba, H., Endang S. |
| | (43) Photosynthetic activity under the shade condition of soybean plants<br>- Mikoshiba, H., Endang S. |
| 6) Component technologies in cropping systems (A: 80) | (44) Growth response by the different moisture content in the soil on soybean plant<br>- Mikoshiba, H., S. Hutami |
| **2. Plant nutrition improvement technology** | |
| 1) Diagnosis techniques of nutritional problems<br>- Research on nutrition interaction<br>- Research on micronutrients<br>(A: 100) | (45) Comparison of nutrient uptake among main food crops<br>- Inoue, H., A. Karim M., Irwan N., Mono R., Hidayat, Murtado |

2) Improvement of problem soils and fertilization techniques
- Amelioration and fertilization of acid soils
(B$_1$: 55)

(46) Technique of soil improvement at heavy acid soil with lime
- Yamaizu, H., Mikoshiba, H., Djuber P., I.V. Sutarto

(47) Effect of soil physical characteristics on soybean growth
- Iizuka, N., Inoue, H., Fathan M., A. Karim M., Irwan N., Mono R., A. Choliluddin

(48) Effect of fused magnesium phosphate application on soybean growth
- Igarashi, T., Hitsuda, K., Irwan N., Rahmat S., Ratih D.H.)

(49) Effectiveness of some amelioration materials on soybean growth
- Hitsuda, K., Irwan N., Ratih D.H., Rahmat S., A. Karim M., A. Choliluddin

| TSI (Evaluation)↕ | RESEARCH ACTIVITIES |
|---|---|
| **III. IMPROVEMENT OF PALAWIJA CROP PRODUCTION BY BIOLOGICAL TECHNIQUES** | |
| 1. Utilization techniques of microorganism agent including biological N-fixation technology | |
| 1) Collection, isolation, identification & selection of effective Rhizobium strain (A: 65) | (50) Collection of soybean rhyzobia and their characterization<br>- Inoue, H., Z. Nunung, Rasti S., Selly S.<br>(51) Selection of aluminium tolerant rhyzobia strains<br>- Asanuma, S., Inoue, H., Z. Nunung, Selly S. |
| 2) Research on production of Rhizobium inoculants (C: 0) | |
| 3) Effect of cultural practices on Rhizobium development & crop productivity (B: 63) | (52) Effect of rhyzobium, mycorhiza, rice husks carbonizer and/or phosphorous fertilizers on soybean growth<br>- Igarashi, T., Hitsuda, K., Ratih D.H., R.D.M. Simanungkalit, Sutaryo, Diah N.<br>(53) Effect of rice husks carbonizer and/or fused magnesium phosphate application on soybean growth<br>- Igarashi, T., Hitsuda, K., Ratih D.H., Z. Nunung<br>(54) Effect of rice husks carbonizer on rhyzobium growth under different soil pH<br>- Hitsuda, K., Ratih D.H., Z. Nunung |
| 2. Use of tissue culture & other biological techniques | (55) Improvement of tissue culture technique of main food crops<br>- Jyutori, H., Fathan M., Fatchurrochim, Ida H., Saptowo J.P., Dinar A., Buang A., Budiarto |
| 1) Use of tissue culture for breeding (C: 10) | |
| 2) Use of tissue culture for obtaining virus free plants (C: 0) | |

↕: rank
A: 100-65 The point beside rank shown is based on self evaluation
B: -30 which has been already sent to JICA HQ in Japanese
C: - 0 (an average, if activities are plural)

Table 6. Utilizing and maintaining conditions of the major equipment (unit price is over ¥ 100,000) provided by Japan

1. 1986/1987

(thousand Yen)

| NO. | EQUIPMENT | PROVIDED NUMBER | DISPOSAL NUMBER | PRESENT NUMBER | UTILIZING CONDITION | MAINTAINING CONDITION | PRICE | REMARK |
|---|---|---|---|---|---|---|---|---|
| (01) | Gas filling machine (UFO-500) | 1 | - | 1 | B | A | 600 | Ag |
| (02) | Heart sealer (SS-C) | 1 | - | 1 | A | A | 250 | Ag |
| (03) | Camera (NIKON NEW FM2) | 1 | 1 | - | C | C | 117 | Pa |
| (04) | Body tube of microscope (NIKON) | 1 | - | 1 | A | A | 167 | En |
| (05) | Word processor (TOSHIBA JW-R10) | 1 | 1 | - | C | C | 168 | TL |
| (06) | Slide projector (CABIN AF-2500) | 1 | - | 1 | B | A | 114 | Ag |

2. 1987/1988

(thousand Yen)

| NO. | EQUIPMENT | PROVIDED NUMBER | DISPOSAL NUMBER | PRESENT NUMBER | UTILIZING CONDITION | MAINTAINING CONDITION | PRICE | REMARK |
|---|---|---|---|---|---|---|---|---|
| (01) | Quadred sampling soybean thresher (KIYA ST) | 1 | - | 1 | A | A | 270 | Ag |
| (02) | Trencher (TMCIW3) | 1 | - | 1 | B | A | 1,590 | Ag |
| (03) | Quadrat sampling winnower | 1 | - | 1 | B | A | 400 | Ag |
| (04) | Auger tripod | 1 | - | 1 | B | A | 259 | Ag |
| (05) | Plant root system samplers (large) | 2 | - | 2 | B | A | 148 | Ag |
| (06) | Plant root system samplers (small) | 2 | - | 2 | B | A | 115 | Ag |
| (07) | Soil hardness tester | 1 | - | 1 | B | A | 300 | Ag |
| (08) | Soil three phases metre | 1 | - | 1 | B | A | 600 | Ag |
| (09) | Grain counter | 1 | - | 1 | A | A | 825 | Ag |
| (10) | Maize moisture tester | 1 | - | 1 | A | A | 176 | Ag |
| (11) | Soxhlet extractor | 4 | - | 4 | B | A | 249 | Ag |
| (12) | Gas filter | 1 | - | 1 | B | A | 1,290 | Ag |
| (13) | Multi-point luxmeters | 6 | - | 6 | B | A | 130 | Ag |
| (14) | Quadrat sampling grains dryer | 1 | - | 1 | A | A | 640 | Ag |
| (15) | Power supply for EM | 1 | - | 1 | B | A | 140 | Pa |
| (16) | Hygro thermometer, Humidex (China) | 2 | - | 2 | A | A | 166 | Ag |
| (17) | pH meter (HORIBA) | 1 | - | 1 | A | A | 150 | Ag |
| (18) | AC current stabilizer | 1 | - | 1 | A | A | 540 | Pa |
| (19) | Maize moisture meter | 1 | - | 1 | A | A | 152 | Ag |
| (20) | Angle rotor for high speed centrifuge | 1 | - | 1 | B | A | 480 | Pa |
| (21) | ELISA microreader | 1 | - | 1 | B | A | 950 | Pa |

(thousand Yen)

| NO. | EQUIPMENT | PROVIDED NUMBER | DISPOSAL NUMBER | PRESENT NUMBER | UTILIZING CONDITION | MAINTAINING CONDITION | PRICE | REMARK |
|---|---|---|---|---|---|---|---|---|
| (22) | Washer for microplate | 1 | - | 1 | B | A | 950 | Pa |
| (23) | Spore collecting apparatus | 3 | - | 3 | A | A | 200 | Pa |
| (24) | Plant growth cabinet (KIYA) | 1 | - | 1 | A | A | 825 | Pa |
| (25) | Automatic weather system | 2 | - | 2 | A | A | 3,900 | Ph |
| (26) | Infrared thermometer | 4 | - | 4 | B | A | 670 | Ph |
| (27) | pH meter | 1 | - | 1 | A | A | 187 | Ph |
| (28) | Grain dockage sieves | 1 | - | 1 | B | A | 119 | Ph |
| (29) | High speed mill | 1 | - | 1 | B | A | 520 | Ph |
| (30) | Turbidimeter | 1 | - | 1 | A | A | 700 | Ph |
| (31) | Cool aspirator (YAMATO BP-36) | 1 | - | 1 | A | A | 360 | Ph |
| (32) | ELISA Microdrop dispenser | 1 | - | 1 | A | A | 1,979 | Pa |
| (33) | Multi shaking incubator (KIYA) | 1 | - | 1 | A | A | 1,970 | Ph |
| (34) | Vacuum-freezing dryer (NITAKURA) | 1 | - | 1 | B | A | 1,775 | Pa |
| (35) | Automatic recording tension meter (V - 6) | 1 | - | 1 | A | A | 2,458 | Ph |
| (36) | Electric stabilizer for computer | 11 | - | 11 | A | A | 178 | Ag |
| (37) | Autoclave (HIRAYAMA) | 1 | - | 1 | A | A | 435 | Ag |
| (38) | Camera (NIKON F3HE) | 1 | - | 1 | A | A | 150 | En |
| (39) | Side table | 1 | - | 1 | A | A | 140 | Ag |
| (40) | Cooled incubator (SANYO) | 1 | - | 1 | A | A | 735 | Pa |
| (41) | Hand tractor (KUBOTA) | 4 | - | 4 | A | A | 583 | Ag |
| (42) | Microscope (NIKON YS-H) | 2 | - | 2 | A | A | 330 | Pa |
| (43) | Rack for chemical (A) | 1 | - | 1 | A | A | 130 | Ag |
| (44) | Rack for chemical (B) | 1 | - | 1 | A | A | 218 | Ag |
| (45) | Rack for chemical (C) | 1 | - | 1 | A | A | 108 | Ag |

(thousand Yen)

| NO. | EQUIPMENT | PROVIDED NUMBER | DISPOSAL NUMBER | PRESENT NUMBER | UTILIZING CONDITION | MAINTAINING CONDITION | PRICE | REMARK |
|---|---|---|---|---|---|---|---|---|
| (46) | ·Rack for chemical (D) | 1 | - | 1 | A | A | 267 | Ag |
| (47) | Ultrasonic cleaner | 1 | - | 1 | A | A | 243 | Ag |
| (48) | Stereoscopic microscope (NIKON SMZ-10TP) | 1 | - | 1 | A | A | 659 | En |
| (49) | Microscope for culture observation | 1 | - | 1 | A | A | 345 | Pa |
| (50) | Double beam spectrophotometer (HITACHI 150/20) | 1 | - | 1 | A | A | 1,439 | Ph |
| (51) | Top-pan, electric balance | 1 | - | 1 | A | A | 331 | Ag |
| (52) | Personal computer (NEC APC-IV) | 1 | - | 1 | A | A | 765 | En |
| (53) | Inoculation misto box | 1 | - | 1 | A | A | 125 | Pa |
| (54) | Rack for incubator | 1 | - | 1 | A | A | 253 | Pa |
| (55) | Refrigerator (NATIONAL) | 3 | - | 3 | A | A | 132 | En |
| (56) | Portable leaf area meter (IL-cor LI-3000) | 1 | - | 1 | A | A | 563 | En |
| (57) | Motive power sprayer (YL22HP-1) | 2 | - | 2 | A | A | 111 | Ag |
| (58) | Auto constant-humidity cabinet (ISUZU DNS-135) | 1 | - | 1 | A | A | 368 | Pa |
| (59) | Ballance (SHIMADZU EB-3200D) | 1 | - | 1 | A | A | 331 | Ph |

3. 1988/1989

(thousand Yen)

| NO. | EQUIPMENT | PROVIDED NUMBER | DISPOSAL NUMBER | PRESENT NUMBER | UTILIZING CONDITION | MAINTAINING CONDITION | PRICE | REMARK |
|---|---|---|---|---|---|---|---|---|
| (01) | Green leaf meter (SPAD-501) | 1 | - | 1 | A | A | 158 | Ag |
| (02) | Word processor (CANON alpha-25) | 2 | - | 2 | A | A | 150 | En Pa |
| (03) | Word processor (CANON CW-4000) | 1 | - | 1 | A | A | 348 | TL |
| (04) | Micro meter for microscope | 1 | - | 1 | A | A | 155 | En |
| (05) | Camera (NIKON F3) | 1 | - | 1 | A | A | 172 | En |
| (06) | Copy machine (SHARP SF-8101) | 1 | - | 1 | A | A | 479 | TL |
| (07) | Camera (MINOLTA DYNAX 7000i) | 1 | - | 1 | A | A | 107 | Ag |
| (08) | Electronic Balance (Chiyoda JP-300) | 2 | - | 2 | A | A | 249 | En Ag |
| (09) | Electronic Balance (Chiyoda JP-3000) | 1 | - | 1 | A | A | 249 | En |
| (10) | Compressor (HITACHI 0.4P-7S) | 1 | - | 1 | A | A | 120 | Ph |
| (11) | Optical microscope (NIKON XF-21) | 1 | - | 1 | A | A | 964 | Pa |
| (12) | Biological microscope (NIKON YUH - 20N) | 1 | - | 1 | A | A | 1,388 | En |
| (13) | Dryer (YAMATO RF-9D) | 1 | - | 1 | A | A | 286 | PL |
| (14) | Thresher (YANMAR RT300C) | 1 | - | 1 | A | A | 190 | PL |
| (15) | Seed cleaner (YANMAR YBS-500S) | 1 | - | 1 | A | A | 476 | PL |
| (16) | Infrared moisture meter (YAMATO FD-220) | 1 | - | 1 | A | A | 693 | PL |
| (17) | Handy grain moisture meter | 3 | - | 3 | A | A | 107 | PL |
| (18) | Grain counter | 1 | - | 1 | A | A | 1,248 | PL |
| (19) | Semi top-pan balance | 1 | - | 1 | A | A | 269 | PL |
| (20) | Laboratory table (large) | 3 | - | 3 | A | A | 730 | PL |
| (21) | Laboratory table (medium) | 4 | - | 4 | A | A | 575 | PL |

(thousand Yen)

| NO. | EQUIPMENT | PROVIDED NUMBER | DISPOSAL NUMBER | PRESENT NUMBER | UTILIZING CONDITION | MAINTAINING CONDITION | PRICE | REMARK |
|---|---|---|---|---|---|---|---|---|
| (22) | Rack for chemicals | 2 | - | 2 | A | A | 105 | PL |
| (23) | Air-forced drying oven (YAMATO WG75) | 1 | - | 1 | A | A | 483 | PL |
| (24) | Manual analitical balance (CHYOU balance MI-20) | 1 | - | 1 | A | A | 918 | PL |
| (25) | Table for balance | 1 | - | 1 | A | A | 223 | PL |
| (26) | Auto still | 1 | - | 1 | A | A | 1,292 | PL |
| (27) | Autoclave (YAMATO SM-3) | 1 | - | 1 | A | A | 650 | PL |
| (28) | Inverted system microscope | 1 | - | 1 | A | A | 1,350 | PL |
| (29) | Clean bench | 1 | - | 1 | A | A | 1,557 | PL |
| (30) | Rotary cultivator | 1 | - | 1 | A | A | 151 | PL |
| (31) | Hand tractor (KUBOTA K-120) | 1 | - | 1 | A | A | 600 | PL |
| (32) | Crude protein analyzer | 1 | - | 1 | A | A | 280 | PL |
| (33) | Vehicle (TOYOTA SUPER XIJANG) | 2 | - | 2 | A | A | 1,538 | BORIF TL |
| (34) | Auto pipette (N-1) | 1 | - | 1 | A | A | 1,609 | Fa |
| (35) | Gas chromatography (HITACHI 263) | 1 | - | 1 | B | A | 2,763 | PL |
| (36) | Seed finish dryer | 1 | - | 1 | A | A | 8,775 | PL |
| (37) | Constant temperature & humidity germination test oven | 3 | - | 3 | A | A | 4,490 | PL |
| (38) | Photosynthesis experimental apparatus (LCA-2) | 1 | - | 1 | A | A | 6,085 | PL |
| (39) | Seed storage rack (HITACHI I-15) | 1 | - | 1 | A | A | 5,700 | PL |
| (40) | Cold storage (HITACHI II-5) | 1 | - | 1 | A | A | 9,192 | PL |
| (41) | Humid hood (YAMATO FYH-120S) | 1 | - | 1 | A | A | 2,669 | PL |

(thousand Yen)

| NO. | EQUIPMENT | PROVIDED NUMBER | DISPOSAL NUMBER | PRESENT NUMBER | UTILIZING CONDITION | MAINTAINING CONDITION | PRICE | REMARK |
|---|---|---|---|---|---|---|---|---|
| (42) | Freeze dryer | 1 | - | 1 | A | A | 3,474 | PL |
| (43) | Atomic absorption spectrophotometer (HITACHI 170-300) | 1 | - | 1 | A | A | 5,780 | PL |
| (44) | Gas chromatography (HITACHI 263-70) | 1 | - | 1 | B | A | 4,610 | PL |
| (45) | Ultra high-seed centrifuge (HITACHI SCP-85H) | 1 | - | 1 | A | A | 2,342 | PL |
| (46) | Deep freezer | 1 | - | 1 | A | A | 4,567 | PL |
| (47) | High performance liquid chromatography | 1 | - | 1 | A | A | 5,120 | PL |
| (48) | Rotary microtome | 1 | - | 1 | A | A | 2,700 | PL |
| (49) | Incubator | 1 | - | 1 | B | A | 5,053 | PL |
| (50) | Constant temperature & humidity chamber (HERAEUS VTRK) | 2 | - | 2 | A | A | 2,925 | En |
| (51) | Ultra deep freezer (HERAEUS HIT08/300) | 1 | - | 1 | A | A | 2,221 | Pa |
| (52) | Double beam spectrophotometer (HITACHI 150-20) | 1 | - | 1 | A | A | 1,719 | PL |
| (53) | Leaf area meter (HAYASHI AAC400) | 1 | - | 1 | A | A | 2,463 | Ag |
| (54) | Deionnizer (YAMATO S-1500) | 1 | - | 1 | A | A | 369 | Ph |
| (55) | Autoclave (HIRAYAMA HA-300) | 2 | - | 2 | A | A | 399 | Pa |
| (56) | pH meter (TOA, HM-20S) | 2 | - | 2 | A | A | 321 | Ph |
| (57) | Growth chamber (NIR-151) | 2 | - | 2 | A | A | 362 | Pa |
| (58) | Water culture apparatus | 3 | - | 3 | B | A | 834 | Ph |
| (59) | Autostill (YAMATO WA-53) | 1 | - | 1 | A | A | 1,013 | Pa |
| (60) | Autostill (YAMATO WG-25) | 1 | - | 1 | A | A | 528 | Pa |
| (61) | Daylight incubator (NTL-SII-S) | 2 | - | 2 | A | A | 800 | Pa |
| (62) | Printer for data logger (LI-1000-32) | 3 | - | 3 | A | A | 1,272 | Ag |

(thousand Yen)

| NO. | EQUIPMENT | PROVIDED NUMBER | DISPOSAL NUMBER | PRESENT NUMBER | UTILIZING CONDITION | MAINTAINING CONDITION | PRICE | REMARK |
|---|---|---|---|---|---|---|---|---|
| (63) | Clean bench (HITACHI PCV-1303) | 1 | - | 1 | A | A | 1,179 | Pa |
| (64) | Moisture system | 1 | - | 1 | A | A | 1,021 | En |
| (65) | Low constant temperature water bath (BL22) | 1 | - | 1 | A | A | 359 | Ph |
| (66) | Water bath incubator (BT-25) | 1 | - | 1 | A | A | 169 | Pa |
| (67) | Biotron (BT) | 1 | - | 1 | A | A | 270 | Ph |
| (68) | Ventilated oven (BSF-115S) | 2 | - | 2 | A | A | 210 | Ph |
| (69) | Ultrasonic pipette washer (AE-31) | 1 | - | 1 | A | A | 365 | Ph |
| (70) | pH meter (CORNING) | 2 | - | 2 | A | A | 120 | Pa |
| (71) | Double beam spectrophotometer (HITACHI 200-20) | 1 | - | 1 | A | A | 1,584 | Pa |
| (72) | Hand tractor (KUBOTA K-120) | 1 | - | 1 | A | A | 583 | Ag |
| (73) | Ice maker | 1 | - | 1 | A | A | 773 | Ph |
| (74) | Conductivity meter (TOA CM-25E) | 1 | - | 1 | A | A | 280 | Ph |
| (75) | Automatic ice maker (HOSHIZAKI) | 1 | - | 1 | A | A | 189 | Ph |
| (76) | pH meter (TOA, HM-20S) | 1 | - | 1 | A | A | 308 | Ph |
| (77) | Balance (ER-182A) | 1 | - | 1 | A | A | 405 | Ph |
| (78) | Stabilizer (MATSUNAGA 100V) | 5 | - | 5 | A | A | 120 | Ph |
| (79) | Stabilizer (MATSUNAGA 220V) | 2 | - | 2 | A | A | 120 | Ph |
| (80) | Ultrasonic washer (VS-100) | 1 | - | 1 | A | A | 118 | Ph |
| (81) | Clean box (IUCHI) | 1 | - | 1 | A | A | 133 | Ph |
| (82) | Cutter mixer (K-35) | 1 | - | 1 | A | A | 287 | Ph |
| (83) | Densito metre (F-808) | 1 | - | 1 | A | A | 2,565 | En |
| (84) | Homogenizer (AM-7) | 1 | - | 1 | A | A | 272 | En |
| (85) | Magnetic stirrer (TOYO) | 1 | - | 1 | A | A | 117 | Ph |

(thousand Yen)

| NO. | EQUIPMENT | PROVIDED NUMBER | DISPOSAL NUMBER | PRESENT NUMBER | UTILIZING CONDITION | MAINTAINING CONDITION | PRICE | REMARK |
|---|---|---|---|---|---|---|---|---|
| (86) | Electric extraction apparatus | 1 | - | 1 | A | A | 300 | Ph |
| (87) | HPLC packed column (SHODEX PS) | 1 | - | 1 | B | A | 113 | Ph |
| (88) | HPLC packed column (SHODEX CX) | 1 | - | 1 | B | A | 259 | Ph |
| (89) | Uniformity inoculation box | 1 | - | 1 | A | A | 2,077 | Pa |
| (90) | Muffler furnace (FM-37) | 1 | - | 1 | A | A | 354 | Ph |
| (91) | High power freezer (NIHON freezer) | 1 | - | 1 | A | A | 405 | Ph |
| (929) | Steel cabinet | 3 | - | 3 | A | A | 205 | En |

4. 1989/1990

(thousand Yen)

| NO. | EQUIPMENT | PROVIDED NUMBER | DISPOSAL NUMBER | PRESENT NUMBER | UTILIZING CONDITION | MAINTAINING CONDITION | PRICE | REMARK |
|---|---|---|---|---|---|---|---|---|
| (01) | Electronic higrothermometer (E-141-00) | 6 | - | 6 | A | A | 126 | Ag Br |
| (02) | Digital infrared thermometer (M80S) | 1 | - | 1 | A | A | 583 | Ph |
| (03) | Mini jar fermentor (M-100/MDB-2) | 1 | - | 1 | A | A | 2,285 | Ph |
| (04) | Soil moisture tester (JB) | 4 | - | 4 | A | A | 112 | Ag |
| (05) | Large microtome (LR-85) | 1 | - | 1 | A | A | 725 | En |
| (06) | Electronic analytical balance (ER-182A) | 1 | - | 1 | A | A | 395 | Ag |
| (07) | Gel electrophoresis system (KS-182A) | 1 | - | 1 | A | A | 103 | En |
| (08) | Electronic high sensitivity recorder (EA 100-06) | 1 | - | 1 | A | A | 323 | En |
| (09) | Soil profile sampler (KIYA, Itakura-type) | 1 | - | 1 | A | A | 110 | Ag |
| (10) | Plant moisture tensiometer (KIYA PC-40) | 1 | - | 1 | A | A | 850 | Ag |
| (11) | Soil ODR meter | 2 | - | 2 | A | A | 600 | Ag |
| (12) | Soil permeability tester | 1 | - | 1 | A | A | 463 | Ag |
| (13) | 8-channel dispenser (8800) | 1 | - | 1 | A | A | 108 | Ph |
| (14) | Stereo microscope (OLYMPUS SZ-4045) | 1 | - | 1 | A | A | 282 | Pa |
| (15) | Fluorescence microscope (NIKON XF-EFD2) | 1 | - | 1 | A | A | 1,892 | Ph |
| (16) | Camera (NIKON F3) with accessories | 1 | - | 1 | A | A | 416 | En |
| (17) | Photo micrographic apparatus (NIKON FX-2-35 WA) | 1 | - | 1 | A | A | 382 | En |
| (18) | Medical freezer (SANYO MDF-330) | 1 | - | 1 | A | A | 235 | En |
| (19) | Homogenizer (IKEDA HI-25) | 1 | - | 1 | A | A | 147 | En |

(thousand Yen)

| NO. | EQUIPMENT | PROVIDED NUMBER | DISPOSAL NUMBER | PRESENT NUMBER | UTILIZING CONDITION | MAINTAINING CONDITION | PRICE | REMARK |
|---|---|---|---|---|---|---|---|---|
| (20) | Big dry cabinett (IUCHI TDC-230) | 1 | - | 1 | A | A | 242 | Ag |
| (21) | Rotary culture (RRC-100) | 1 | - | 1 | A | A | 253 | Ph |
| (22) | Carbonizer (EBARA) | 1 | - | 1 | A | A | 100 | Ph |
| (23) | Conductivity meter | 1 | - | 1 | A | A | 202 | Ag |
| (24) | Aqua search | 1 | - | 1 | A | A | 135 | Br |
| (25) | Balance (Mettler) | 1 | - | 1 | A | A | 175 | Br |
| (26) | Gaschromatograph (HITACHI 263-50) | 1 | - | 1 | A | A | 2,355 | Ph |
| (27) | Laboratory car (MITSUBISHI colt L-300) | 1 | - | 1 | A | A | 2,683 | Pa |
| (28) | pH meter (HORIBA D-11) | 1 | - | 1 | A | A | 116 | Pa |
| (29) | Autostill (EYELA SA-27A) | 1 | - | 1 | A | A | 480 | En |
| (30) | Double beam spectrophotometer (HITACHI 200-20) | 1 | - | 1 | A | A | 1,248 | Pa |
| (31) | Constant temperature drying oven (EYELA WFO-600ND) | 1 | - | 1 | A | A | 338 | Ag |
| (32) | Fiber optic bifurcated illuminator (NIKON) | 1 | - | 1 | A | A | 192 | En |
| (34) | Electronic analytical balance (SARTORIUS B120S) | 1 | - | 1 | A | A | 293 | Ag |
| (35) | pH meter (HORIBA D-14) | 2 | - | 2 | A | A | 162 | Ag |
| (36) | Copy machine (SHARP SF-8101) | 2 | - | 2 | A | A | 426 | PL En |

5. 1990/1991

(thousand Yen)

| NO. | EQUIPMENT | PROVIDED NUMBER | DISPOSAL NUMBER | PRESENT NUMBER | UTILIZING CONDITION | MAINTAINING CONDITION | PRICE | REMARK |
|---|---|---|---|---|---|---|---|---|
| (01) | Spare part for autostill | 1 | - | 1 | A | A | 190 | Ph |

¥ Exchange rate: Rp. 1 = ¥ 0.075

Abbreviation: Ag = Agronomy division
En = Entomology division
Pa = Plant pathology division
Ph = Plant physiology division
Br = Plant breeding division
TL = Team leader's office
PL = Palawija laboratory

Table 7. The financial contribution by the Government of Indonesia

(unit: thousand rupiah)

| | 1985/86 | 1986/87 | 1987/88 | 1988/89 | 1989/90 | 1990/91 |
|---|---|---|---|---|---|---|
| Research* operational | - | - | 115,489 | 71,962 | 178,545 | 32,000 |
| Equipment | - | - | nil | nil | nil | nil |
| Facilities | - | - | nil | nil | nil | nil |

- : Dada could not be found

* : From IDRC, ACIAR and IRRI

Table 8-1. Planting area, production and productivity of palawija crops (1985 - 1993)

| | PELITA IV | | | | PELITA V (prospect) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
| **PLANTING AREA (thousand ha)** | | | | | | | | | |
| Maize | 2440 | 3143 | 2626 | 3406 | 3182 | 3207 | 3228 | 3261 | 3337 |
| Cassava | 1292 | 1170 | 1222 | 1303 | 1208 | 1210 | 1220 | 1224 | 1232 |
| Sweet potato | 256 | 253 | 229 | 248 | 263 | 264 | 266 | 268 | 270 |
| Soybean | 869 | 1254 | 1101 | 1177 | 1256 | 1269 | 1281 | 1295 | 1309 |
| Peanuts | 510 | 601 | 551 | 608 | 608 | 610 | 612 | 615 | 617 |
| Green pea | 286 | 293 | 227 | - | 333 | 334 | 335 | 337 | 338 |
| **PRODUCTION (thousand ton)** | | | | | | | | | |
| Maize | 4330 | 5920 | 5155 | 6652 | 6415 | 6607 | 6805 | 7008 | 7218 |
| Cassava | 14057 | 13312 | 14356 | 15471 | 15647 | 15879 | 16114 | 16352 | 16593 |
| Sweet potato | 2161 | 2091 | 2013 | 2159 | 2304 | 2336 | 2369 | 2402 | 2436 |
| Soybean | 870 | 1227 | 1161 | 1279 | 1350 | 1406 | 1453 | 1502 | 1552 |
| Peanuts | 528 | 642 | 533 | 589 | 593 | 602 | 611 | 620 | 630 |
| Green pea | 200 | 533 | 204 | - | 263 | 266 | 268 | 271 | 273 |
| **PRODUCTIVITY (hundred kg/ha)** | | | | | | | | | |
| Maize | 17.7 | 18.8 | 19.6 | 19.5 | 20.2 | 20.2 | 21.1 | 21.5 | 21.6 |
| Cassava | 109.0 | 114.0 | 117.0 | 119.0 | 129.5 | 129.6 | 132.1 | 133.6 | 134.7 |
| Sweet potato | 84.0 | 83.0 | 88.0 | 87.0 | 87.6 | 87.6 | 89.1 | 89.6 | 90.2 |
| Soybean | 9.7 | 9.9 | 10.6 | 10.8 | 10.8 | 10.8 | 11.3 | 11.6 | 11.9 |
| Peanuts | 10.4 | 10.6 | 9.7 | 9.7 | 9.3 | 9.8 | 10.0 | 10.1 | 10.2 |
| Green pea | 6.9 | 7.3 | 7.4 | - | 7.9 | 7.9 | 8.0 | 8.0 | 8.1 |

Source: Central Bureau of Statistics
Leaflet made by secretariat of cooperation for promotion of major food crop production program
- : Data could not be found

Table 8-2. Production, consumption, import amounts of soybean in Indonesia (ton)

| | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|
| Production | 869,718 | 1,226,727 | 1,160,963 | 1,270,418 |
| Consumption | 1,171,765 | 1,535,979 | 1,549,525 | 1,779,342 |
| Import | 301,957 | 359,252 | 388,562 | 508,924 |

Source: The Directorate General of Food Crops

# BORIF所長のプロジェクト効果に関する質問状への回答

JICA JET, December 1990

I. The project activities was focused on soybean research. Although soybean was important at the begining of the project, recently it became more important and has been more emphasized in the national development plan. Rice has been the major food crop development program, however, the efforts on rice now is to maintain the status of self sufficiency.

The production program of soybean is being strengthened and accelerated because the demand for soybean increases much faster than the domestic production. Many problems are facing in the production of soybean. This project generates technology for soybean production system. Therefore, the project play very important role in the national development plan.

II. Effect of the project

1. Technical impact

(1) The project clearly improved the capability of counterparts to plan, implement and report research activities. This was done thru formal training or on the job training with Japanese experts in Indonesia as well as in Japan. There were 21 counterparts trained in Japan. Besides, there were about 20 other counterparts and technicians had opportunity to work (on the job training) with Japanese experts in Indonesia.
The research capability also improved thru more available laboratory and field equipment (200 million yen), laboratory building (1800 square

meter) and green house (100 square meter). Many research were conducted and generated new data, information and technologies on soybean production.

(2) The data, information and technology of soybean production generated from the project is being discussed and transfered to our clients such as extension, universities, agricultural schools, key farmers, policy makers and others. Some of the technology is begining to be applied by farmers. It is gaining its momentum to have impact on the soybean production in Indonesia.

(3) Technical impact to regions where soybean is grown and potential extensification area are also gaining its momentum.

(4) Recently, soybean became important focus of agricultural development, the technical impact of the project is begining to be observed.

2. Institutional impact

(1) BORIF become more confident and competent to carry out research on soybean. The research program is being strengthened. Link . with extension universities and farmers are stronger. Capability of BORIF to satisfy it clients' needs is better.

(2) Other Research Institute, also benefited from this project. Because in carrying out the project activities, other research institutes in other regions were involved.

(3) More policy maker are aware and confident for better production of soybean in Indonesia thru the application of the technology generated from the project.

3. Economic impact

The economic impact still cannot be observed because it is just begining to get the momentum in the development plan. However, it is expected to be big on the economy of Indonesia.

4. Social and cultural impact

The impact on social and cultural are similar to those in economic.

5. Environmental impact

Again, the impact or environment is expect to be good, because if more soybean can be grown in rotation with rice, pest damage on rice as well as on soybean will be reduced. The technology also suggest to reduce the use of pestiside in soybean production. Therefore, if pestiside used on rice as well as on soybean is reduced, the environment will be better.

III. 1 (1) Soybean research has been part of the institute program, and strengthened during the project. The research organization system is strong enough to pursue further research activities.

(2) The organizational managerial and operational system is good enough to support it programs.

(3) There is no organizational change, except for better staffing and training of research and supporting personnels.

2 (1) The budget is mainly provided for salary of personnels, electricity, water, communication, and small amount for maintenante, repairing, replacing and operational of equipment. Budget for procurement of laboratory and field equipment and chemicals is not available. Small amount of budget is available for experiments.

(2) For the next 5 year the Indonesian government support to the project is still relatively small and not stable. However, GOI is insisting the contribution of private sector for research cost, because they are also benefited from research activities.

(3) Big part of GOI revenue is spent for repayment of loan. Therefore, it is difficult to expect for the GOI to pay the cost of project.

(4) Based on the above condition, it is necessary and appropriate for bearing recurrent cost by Japanese side, particularly for procurement of new equipment, chemicals, training, and research expenses.

3 (1) Many research approach, methodologies and management have been transfered to Indonesian counterparts thru formal and on the job training.

Many research activities can be carried out by Indonesian counterparts, however, for new approach and methodology, some experts are needed.

(2) In each department, depend on the volume of research activities, 3-5 counterpart personnels plus some field, laboratory and research assistant are assigned to the project.

(3) The counterparts are university graduates or even post graduates backround. Therefore, the transfer of technology is smooth and proceed very well. Research capability of most of counterparts and experts is almost equivalent. Only experts with new approach and methodology of research are required.

(4) Some training of counterpart successors can be carried out in country, except for new approach and methodology of research.

(5) For other managerial operational restricting factors, Indonesian side is capable to support the project.

## IV. Important experience

1. As on the job training, counterpart had experience indeveloping research program and work plan.

2. Thru the same way, counterpart also had experience in implementation of research activities.

3. Counterparts experienced in preparing report for evaluation and realized the important of evaluation.

V. 1. The project is well recognized from lower layer up to the highest administration authorities of Indonesia; from Research Institute administration to Ministry and national administrative level such as Bappenas and Cabinet Secretary.

2. Over all administrative ability of project organizational is fairly good.

3. Staff assignment to the project is sufficient in administration as well as in research activities.

4. Mechanism and activity of committees for project operation is fairly good and no important problem was faced or unsolved.