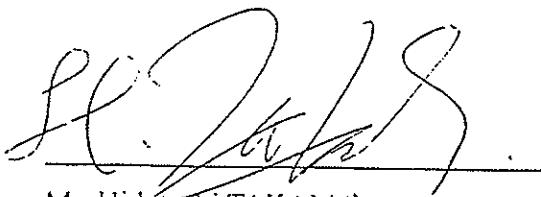


3. 合同評価レポート

JOINT FINAL EVALUATION REPORT
ON
PASTURE SEED PRODUCTION DEVELOPMENT PROJECT
IN
NORTH-EAST THAILAND

BANGKOK
MARCH 23, 2004

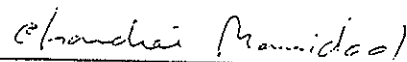
JAPAN - THAILAND
JOINT EVALUATION COMMITTEE



Mr. Hidetoshi TAKAMA

Team Leader

Japanese Final Evaluation Team



Mr. Chanchai MANIDOOL

Team Leader

Thai Final Evaluation Team

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Abbreviation

AND	Animal Nutrition Division
ANRDC	Animal Nutrition Research and Development Center
C/P	Counterpart
DLD	Department of Livestock Development
DTEC	Department of Technical and Economic Cooperation
ISTA	International Seed Testing Association
JGFFSAA	Japan Grassland Farming Forage Seed Association
JICA	Japan International Cooperation Agency
KKANRDC	Khon Kaen Animal Nutrition Research and Development Center
NARO	National Agriculture and Bio-oriented Research Organization
NLBC	National Livestock Breeding Center
NRANRDC	Nakorn Ratchasima Animal Nutrition Research and Development Center
OECD	Organization for Economic Cooperation and Development
PDM	Project Design Matrix
PO	Plan of Operation
R/D	Record of Discussions

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I. INTRODUCTION

In line with the 9th National Socio-economic Development Plan (2002-2006), the Government of Thailand has set up the Livestock Promotion Plan, in order to promote the livestock products to meet the domestic and international demand for agricultural products.

In the Livestock Promotion Plan, the Government of Thailand has identified the importance of increasing high quality forage production in order to respond to the cattle population increase as well as to reduce production costs of livestock products.

The Government of Thailand has built a basic system for the purpose of supporting forage seed production for developing livestock industry. This system allocates a quota to seed production farmers for purchasing seeds and provision of seeds at free of charge to the dairy farmers who newly start cattle rearing and cooperate with the government's project. Especially in Khon Kaen area of Northeast Thailand, the seed production farmers produce the 97% of the total forage seed production in Thailand, supported by the Government. The seed production farmers are eager to produce forage seeds because of its high profitability compared with rice production.

However, there were several problems faced in forage seeds production: appropriate seed varieties are not developed in Thailand; cultivation management, inspection and the system for maintaining the quality of seed technique are not well developed; and seeds market is limited.

In order to resolve such problems, the Government of Thailand requested Japan for the technical cooperation to promote the livestock development through improvement of the forage production and utilization techniques.

In response, JICA dispatched an implementation study team to Thailand in March 1999, and started the Project-type Technical Cooperation over a five-year plan on August 14, 1999. A mutual consultation team was dispatched in June 2000 to work out the Plan of Operation (hereinafter referred to as "PO") and Project Design Matrix (hereinafter referred to as "PDM"). In March 2002, a mid-term evaluation team was dispatched for the purpose of evaluating the progress of the project activities, and recommended measures that should be taken for the smooth implementation of the Project in the remaining cooperation period.

In this time, with about five months remaining in the cooperation period, the Joint Evaluation Committee, made up of Japanese and Thai teams, has been formed for the final evaluation of the Project. The purpose of the Committee is to evaluate the degree of the achievement of the Project's objectives, to identify remaining problems, and to recommend necessary measures to be taken by the both governments.

II. OUTLINE OF THE PROJECT

1. Objectives of the Project

(1) Overall Goal

Appropriate forage is secured for the development of cattle raising in Thailand.

(2) Project Purpose

The techniques on production, processing, and utilization of pasture seed and appropriate forage are developed for small-scale livestock and pasture seed farmers in Northeast Thailand.

2. Outputs of the Project

(1) Techniques on evaluation and selection of appropriate varieties of pasture are developed.

(2) Techniques on pasture seed production and post-harvest processing for registered and commercial seeds are developed.

(3) Techniques on pasture seed inspection and quality control are developed.

(4) Techniques on production, processing and utilization of appropriate forage are developed.

3. Activities of the Project

To transfer the following techniques to the counterparts:

(1) Development of evaluation and selection techniques of appropriate pasture varieties.

(2) Development of pasture seed production and post-harvest processing technique for registered and commercial seeds.

(3) Development of pasture seed inspection and control techniques.

(4) Improvement of useful techniques for forage production, processing and utilization.

III. OBJECTIVES OF THE EVALUATION

Evaluation study was conducted with the following purposes.

(1) To evaluate the level of achievement, overall effects and strategies based on the Record of Discussion (R/D), the Plan of Operation (PO) and Project Design Matrix (PDM),

(2) To evaluate the Project in terms of five criteria that are shown below, and

(3) To discuss the problems to be solved in order to secure the sustainability of the Project activities, and make recommendations to both Japanese and Thai governments.

IV. METHOD OF THE EVALUATION

1. Items of the Evaluation

The Project will be evaluated by the Joint Evaluation Committee, which is composed of the



Japanese Evaluation Team and the Thai Evaluation Team, in accordance with the R/D, PO and PDM. These activities includes report analysis, field survey, and discussions with concerned officials and staff members based on the five evaluation criteria described below.

(1) Relevance

Relevance refers to the validity of the project's purpose and the overall goal in connection with the development policy of the recipient government as well the needs of beneficiaries.

(2) Effectiveness

Effectiveness refers to the extent to which the expected benefits of the project have been achieved as planned, and examines if the benefit was brought about as a result of the project (not of external factors).

(3) Efficiency

Efficiency refers to the productivity of the implementation process, examining if the input of the project was efficiently convert into the output.

(4) Impact

Impact refers to direct and indirect, positive and negative impact caused by implementing the project, including the extent to which the overall goal has been attained

(5) Sustainability

Sustainability refers to the extent to which the recipient country can further develop the project, and the benefits generated by the project can be sustained under the recipient country's policies, technology, systems and financial state.

2. Members of the Joint Evaluation Committee

2-1. Japanese side

(1) Mr. Hidetoshi TAKAMA (Team Leader)

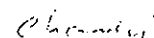
Director, Livestock and Horticulture Division, Agricultural Development Cooperation Department, JICA

(2) Dr. Eihide MONMA (Evaluation and Selection of Pasture Varieties)

Associate Director for Research, Department of Forage Crop Breeding, National Institute of Livestock and Grassland Science, National Agriculture and Bio-oriented Research Organization (NARO)

(3) Mr. Takemasa YAMATOKI (Pasture Seed Production / Forage Production and Utilization)

Director of Seeds Testing Division, Nagano Station, National Livestock Breeding Center



(NLBC)

(4) Mr. Muneo TAKASAKA (Planning and Evaluation)

Staff, Livestock and Horticulture Division, Agricultural Development Cooperation
Department, JICA

(5) Mr. Izumi SAKAYA (Evaluation and Analysis)

Senior Consultant, Global Group 21 Japan, Inc.

2-2. Thai side

(1) Mr. Chanchai MANIDOO (Team Leader / Pasture Seed Production)

DLD Advisor (Forage), Chief of Evaluation Team

(2) Dr. Worapong SURIYAPAT (Pasture Seed Inspection and Quality Control / Forage
Production and Utilization)

Dean, Faculty of Agriculture, Ubon Ratchathani University

(3) Mr. Werapon PONRAGDEE (Evaluation and Selection of Pasture Varieties)

Researcher, Khon Kaen Field Crops Research Center

(4) Mr. Wattanawit GAJASENI (Planning Evaluation and Analysis)

Programme Officer, External Cooperation Division, Department of Technical and Economic
Cooperation (DTEC)



3. Schedule of the Evaluation

Day	Activities
Mar. 16 (Tue)	Discuss with Director of Khon Kaen Center 1 st Joint Evaluation Committee Meeting (Discussion of the Evaluation Method) Project Promotion Video Report from C/P (Monitoring sheet and Project Activities) Presentation of the Future Plan by C/P
Mar. 17 (Wed)	Discuss with C/P and Experts Presentation of the Pasture Breeding Development Project by C/P Field survey of the project site
Mar. 18 (Thu)	Visit Mahasarakham Station Observation of a model farm Meeting with Forage Seed Producer Club
Mar. 19 (Fri)	Move to Nakhonratchasima Center Discuss with Director of Nakhonratchasima Center Observation of project site
Mar. 20 (Sat)	Move to Bangkok from Pak Chong
Mar. 21 (Sun)	Preparation of the draft of the Joint Evaluation Report
Mar. 22 (Mon)	Preparation of Joint Evaluation Report 2 nd Joint Evaluation Committee Meeting (Discussion on the draft of the report)
Mar. 23 (Tue)	3 rd Joint Evaluation Committee Meeting (Signing of the Joint Evaluation Report)
Mar. 24 (Wed)	Joint Coordinating Committee Meeting (Presentation of the Report in Joint Evaluation Team, Signing of the Minutes)

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V. PROJECT DESIGN MATRIX FOR EVALUATION

Project Design Matrix for evaluation (hereinafter referred to as "PDMe") was prepared based on the PÔ by the Joint Evaluation Committee.

The PDMe is attached as ANNEX 1.

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VI. RESULTS OF THE EVALUATION WITH FIVE CRITERIA

Based on the evaluation survey regarding the achievement of the Project, the Project was evaluated in terms of the five criteria as follows.

1. Relevance

(1) Consistency with the policy of the government of Thailand

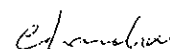
Within the national agriculture policy of Thailand, the northeastern region has been regarded as a production area of field crops and livestock. Recently, the government has a policy to reduce planting areas of crops, such as rice and cassava, since the prices of those crops have been fluctuated and tended to decrease according to the world market prices. On the other hand, the government has set up a Beef Cattle Production Plan in order to meet domestic demand and to reduce the poverty in the region.

The Overall Goal of this project is to secure appropriate forage, which plays an important role to improve the cattle productivity in Thailand. As a part of the livestock promotion policy, the government of Thailand has implemented a strategy to reduce the cost of cattle production. The development of the appropriate pasture varieties and the utilization of the seeds are essential for securing high quality forage. In other words, to increase seed production of the appropriate pasture varieties and utilization of the seeds are very important in livestock promotion in Thailand.

In this Project, the activities are focused on the improvement of the techniques on production, processing, and utilization of pasture seed and appropriate forage for small-scale livestock and pasture seed farmers in Northeast Thailand. Thus, it can be concluded that the Project Purpose and the Overall Goal are highly consistent with the present policy of the government of Thailand.

(2) Consistency with the beneficiary's needs

Utilization of appropriate pasture seeds will result in expanded seed production, and also improved productivity is expected to increase the income of pasture seed production farmers in Northeast Thailand. And also, the project was planned to develop excellent pasture seeds to meet the demand of livestock farmers as well. Therefore, the project is valid in terms of consistency with the needs of the beneficiaries.



2. Effectiveness

2-1. Effectiveness in terms of Project Purpose

According to the evaluation, it is judged that the Project Purpose will be achieved as planned by the end of the Project period in August 2004, with achievement of Project Outputs and Activities examined below. The current condition of the six indicators, which had been set in the PDM to measure the extent of achievement of Project Purpose, verifies the effectiveness of the Project.

2-2. Major Achievements of Project Activities

The major achievements of activities as of March, 2004, are summarized below and the detailed explanations are shown in ANNEX 2

2-2-1. Evaluation and Selection of Appropriate Pasture Varieties

(1) Survey of present situations

Evaluation, selection and breeding techniques have been introduced to develop appropriate pasture varieties. The final goal of the improvement of seed production techniques is to maintain the character of pasture variety. Therefore the development of the Thai-original pasture varieties is important to the seed production techniques.

Five species from six target species have been selected to establish a new cultivar by using selection and evaluation technique and standard strains have been already fixed. In three species, two Stylos and Ruzi grass, good strains have been developed which would become good varieties in the near future. But *Centrosema pascuorum* were damaged by severe diseases and sexual plant of *Panicum maximum* could not be found, so breeding their new strains could not be continued. However, it is a remarkable output that the possibility of development of pasture varieties in three species was shown during the period of five years term. It is necessary that Thailand continue to develop breeding systematically after the project is terminated as well.

(2) Development of evaluation and selection techniques of appropriate pasture varieties

a. Development of selection technique for appropriate pasture varieties

Manuals of local adaptability test and specific characters test in English version have been published for breeding new cultivars.

b. Development of evaluation techniques for appropriate pasture varieties

Manuals of evaluation techniques for tropical grass and legume have been published to

evaluate genetic resources of forage crops.

b-1. *Panicum maximum*: TD58

Panicum maximum is recognized as apomixis grass. A counterpart has trained the determination techniques of apomixis by microscopic examination in Japan. A final target is to be set for the selection of syngensis strains and preservation of seeds for breeding and foundation seed production. Some morphological character showed the variation but verdict could not be done due to uneven field. Since embryo analysis has not found the syngensis strains, breeding of this grass has been stopped.

b-2. *Burachiarua ruziziensis*

A large variation of various characters was observed and allogamy was confirmed. Good mother plants were selected by the space planting test and progeny test. This grass is the most promising in developing varieties some time in the near future and the work should be steadily continued after the Project terminates.

b-3. *Stylosanthes guianensis*: CIAT184

Evaluation of the ecological and morphological characteristics was made by space-planting test. Wide variations in first flowering day and plant types were observed. Disease tolerance test has been carried out and the counterpart studied an evaluation method for disease tolerance under the JICA training program.


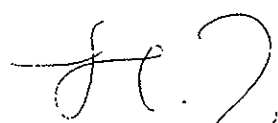
It was found that pure line breeding for self-propagation crops was unsuitable and a top cross in a genetic heterogeneous group having a certain range of variation would be a more suitable breeding method for *Stylosanthes*. Excellent mother plants by the space planting and progeny test were selected. This legume is also the most promising in developing varieties and the work should be steadily continued after the Project terminates.

b-4. *Stylosanthes hamata*

With severe termite damage, persistency was not evaluated, but mother plants with disease resistance, good productivity and stay green character were selected. It is judged that the possibility of the development of a new variety is quite high and the work should be steadily continued after the project terminates.

b-5. *Centrosema pascuorum*

Cavalcade, an existing variety, has small variation in disease tolerance and productivity even though minor differences in seed color and pubescence were observed. Progeny test and the preliminary performance test have been severely damaged year by year by viral disease which was identified to be Peanut Strip Mosaic Virus by a short term expert of the Project. Evaluation and selection were not conducted and breeding of this legume has stopped.



b-6. *Alysicarpus vaginalis*

Evaluation of the primary characters in various ecotypes in Alys clover was done in accordance with the Japanese evaluation manual and the ecotype was classified into small and large plant groups. Since this grass was not cultivated as cutting use, breeding was not planned.

c Evaluation of disease resistance

S. guianensis was almost finished on Anthracnose disease, but *C. pascuorum* was not done on Rhizoctonia and Virus disease, because they were too severe to establish the evaluation method. Training for virus inoculation technique was finished.

(3) Training of technical personnel

The transfer of technology regarding evaluation and selection has been achieved sufficiently, judging from the fact that the counterparts are able to carry out selecting better pastures, making the test design and blocking the field for the test by themselves.

2-2-2. Pasture Seed Production and Post-harvest Processing for Registered and Commercial Seeds

(1) Survey of present situations

Collection of literature about pasture seed production in Thailand for the past 20 years, soil and meteorological data at the project site for the last ten years, and seed production costs and selling prices, has been made. Four seed production farmers were selected for interview survey and their work process from cultivation to seed cleaning was examined. Work diaries of two seed production farmers were collected in order to examine their work process and conditions. The data about cultivation technology such as "cutting date and planting date" were also obtained by the survey of *S. guianensis*. Cultivation technology was studied using the rack of *C. pascuorum*.

The technical level of seed harvest of farmers were examined for *P. maximum*, *B. ruziziensis* and *S. hamata*. And the concrete improvement point was clarified by experiencing the work of farmers.

A machine called "Tiger" was developed as a tool for pasture grass seed harvest. As a tool for legume seed harvest, "Sweeper" was improved to pick up the seed on the ground, after introduced from Japan. As machines for pasture seed processing, manual and electric "Tomi", "Hamata separator", "Sieave machine" with motor power and "Clod break machine". "Electric Tomi" and "Sieave machine" were manufactured for the

demonstrations to farmers in 2004.

It was found that because farmers dry and sell seeds to ANRDC immediately after harvest there is no need for storage. The needs for low-temperature seed storage in KKANRDC and NRANRDC were assessed for storage of the important seeds such as breeder's seeds. Based on the assessment, a storehouse was installed in KKANRDC in 2002.

(2) Development of techniques on pasture seed production and post-harvest processing for registered and commercial seeds

This activity aims to increase efficiency of techniques on pasture seed production and improve quality of seed production at the Centers and Stations, and the commercial seed production at the farmer's level. The project carried out the various examinations on cultivation techniques for the seed production at the Centers and the Stations. The examination will be expected to contribute to improving the registered seed production in future. Design and installation of a seed processing line were implemented to improve processing techniques for legume seeds at Mahasarakam Station.

Furthermore, the project also carried out the study on seed storage in KKANRDC. This study was done as a principal stage and data on the seed storage were obtained and can be used to improve post-harvest processing and storage of seed in farmer's level.

Since farmers had spent a lot of time and labors with traditional way to clean seeds, Tomi was introduced from Japan. At present, Tomi, modified in Thailand, have been developed and widely promoted to farmers for utilization.

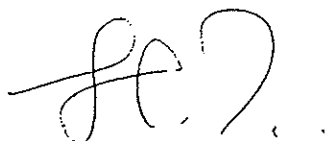
(3) Training of technical personnel

Training which used the "seed production manual" during the production of foundation seeds and registered seeds was carried out for the counterparts and the technician of Centers in 2003. The instruction of seed processing line and training to counterparts were implemented to improve processing techniques for legume seeds at Mahasarakam Station.

2-2-3. Pasture Seed Inspection and Quality Control

(1) Survey of present situations

This survey was conducted by 2000. According to the result, inspection apparatus was too old to give high level technology and the knowledge to inspectors at KKANRDC. For this reason, inspection based on the rule of ISTA (International Seed Testing Association: International rules for Seed Testing) using these inspection apparatus cannot perform.



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Then, a new inspection apparatus was introduced. The "seed inspection manual" based on the rule of ISTA was completed by March 2003. And it was distributed to responsible person and the organization of pasture seed inspection. Five seed inspection laboratories were checked in 2004 based on the "seed inspection manual".

The "Field inspection manual" of Thailand based on "OECD Seed Scheme" (OECD Schemes for the Varietal Certification or the Control of Seed Moving in International Trade) was completed by October 2002. The outline of the manual was 80% completed in March 2004, because the breeding of new variety is not developed, not been completed.

(2) Development of techniques on pasture seed inspection and quality control

This activity aims to develop the techniques to manage the pasture seed inspection and quality control by international standards. Manuals of seed and field inspection based on the OECD and ISTA were made and training programs on seed inspectors and field inspectors were conducted for the responsible staff of the seed production Centers and Stations of all over the country.

Moreover, "Pasture Seed Production Field Standard" and "Seed Quality Standard" on the appropriate seed production were decided to start in Thailand under the Project, in accordance with the improvement of the inspection technology. Improvement of pasture seed production and quality techniques in farmer's level has been transferred through those activities mentioned above. For seed inspection techniques, the Counterparts have already learned and are expected to utilize them in the future.

For the rest of the Project period, considerable is scheduled to transfer knowledge and techniques to all technicians, to make it possible that technicians will permeate down techniques direct to farm level.

(3) Training of technical personnel

In order to maintain genetic purity of main pasture seed, it was decided to introduce following three inspections based on an international rule (OECD Seed Scheme: field inspection, seed inspection, post control test). Therefore, in order that the Counterparts fully understand the meaning and the purpose of inspection, a lecture on "OECD Seed Scheme Introduction" was given in 2000 and 2001.

Field inspector training was held twice in 2002, under which 42 researchers and technicians were trained.

Technology of method of post control test was transferred to the Counterparts from a

short term expert in 2002 and 2003.

2-2-4. Production, Processing and Utilization of Appropriate Forage

(1) Survey of present situations

In order to check the pasture production techniques at farmer's level, survey of present situation of two dairy cattle farmers and one beef cattle farmer was conducted. Survey of present situation of 67 dairy cattle farmers in Khon Kaen area was conducted and the questionnaire about forage production and utilization was circulated to livestock farmers who participated in the technical training programs for farmers.

The "useful techniques for forage production manual" and "hay-making and silage-making techniques manual" for livestock farmers and technical officers were completed in 2004.

(2) Development of techniques on production, processing and utilization of appropriate forage

This activity aims to improve and extend forage production, processing and utilization techniques which will be very beneficial for small-scale livestock farmers in Northeast Thailand. The Project has carried out activities for the technological improvement of high quality hay making techniques, grazing management and silage making techniques.

According to the report on the actual condition of dairy farmers in Northeast Thailand, most of farmers used rice straws to feed their dairy cattle, so the condition of utilization of high quality forage was not good enough. Then the Project worked hard for extension of forage crops utilization through the technical training and demonstration of forage production at Mahasalakam Station for farmers and model farms. The production expansion of high quality forage crops is an important subject for the livestock promotion. Steady extension and enlightenment of activities are essential needed to be continued by Thai side.

(3) Training of technical personnel

At first, four dairy farmers were selected as model farmers. But, one dairy farmer gave up farming in 2003. The Counterparts and the technicians are giving them instructions on pasture management techniques, silage-making techniques, etc.

The forage production, processing and utilization training which utilized the grazing field and model farmer were held. The hay making technique using bamboo solar house was



transferred to four forage production farmers group.

3. Efficiency

3-1. Inputs

It is observed that the Project inputs have been mostly appropriate and timely, as discussed below. The list of main inputs from the Japanese and Thai sides is attached in ANNEX 3 to 7.

3-1-1. Inputs from Japanese side

(1) Dispatch of Japanese Experts

Seven long term experts have been dispatched from Japan. Although an expert in some activities was absent for the period of six months, the Project operation was recovered, with follow-up by other experts, to keep up with the Plan of Operation. In addition, 16 short term experts have been dispatched to support activities of the long term experts, contributing to efficient Project operation.

(2) Acceptance of counterpart personnel for training in Japan

Till date, thirteen Thai counterparts have been dispatched to Japan for training. The training has caused positive effects on the Project as all trainees improved their skills and awareness through the training in Japan. Results of the counterpart training were widely announced and extended to other staff members through staff meetings and Project newsletters. Furthermore, their newly attained knowledge and skills were disseminated to farmers through farmer training.

(3) Provision of equipment

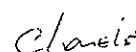
Equipment costing 100 million yen has been provided to the Project in total. Although there was slight delay in arrival of equipment in certain fiscal years, the introduction of the equipment was carried out mostly as planned for the Project as a whole. Almost all the equipment is in use, indicating good efficiency.

3-1-2. Inputs from Thai side

(1) Assignment of the counterpart personnel

The Project has more than twenty counterparts because the Project sites are situated in three different locations and staff from Bangkok are also involved the activities. The Project has been efficiently operated as almost all the counterparts have stayed within the Project up to now. Meanwhile, it is the fact that most of the counterparts have other assignments besides the Project, causing delays in some activities though such delays were not serious.

(2) Budget allocation for the Project operation



Budget was allocated to experimental fields, buildings and facilities, salaries and allowances for the counterparts, wages for workers, and public utilities. Wages for secretaries and drivers and fuel expenses for Japanese experts were provided by the Thai side as well. Although some delays in payment took place in some occasions, the efficiency of the Project operation was never hampered by them.

3-2. Project Activities and Outputs

As for the linkage between project activities and the Project outputs, the activities have successfully produced the expected outputs, even though some delays have been observed in some activities.

4. Impact

4-1. Achievement of the Overall Goal

At the moment it is difficult to assess the extent to which the Overall Goal of the Project, "appropriate forage is secured for the development of cattle raising in Thailand" will be achieved in the future, as it takes some more years for Thailand to develop a new cultivar of its own, or in other words, appropriate forage for Thailand, which will decisively contribute to the achievement of the Overall Goal. However, considering the fact that technical transfer has been mostly conducted as planned, it is expected that with the condition that sustainability of the Project is secured, the Overall Goal will be achieved not in the distant future.

4-2. Institutional Impact

(1) Establishment of multiplication system

Through the Project activities, Thai government has established clear demarcation of multiplication system: breeder seeds, foundation seeds and registered seeds are produced by the government, and commercial seeds by farmers.

(2) Establishment of the Seed Producing Farmers Club

For the purpose of expand production of pasture seed and forage, Thai government has, since the middle of 1970s, adopted quota system where the government purchases seeds from farmers in pre-determined volume at pre-determined price. Since it became obvious that the quota system discouraged independency or sustainability of farmers, the DLD has started to develop a new system for pasture seed distribution. The DLD guided to farmers to establish The Seed Producer Farmers Club in 2003, where volume and price of the seed production are set in the Club meeting, based on the market situation, and the role of the government is



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limited to supporting functions such as supplying registered seeds and inspecting and certifying seeds produced by farmers. The JICA Project had, since its beginning, pointed out the problems associated with the quota system and suggested its reform.

4-3. Economic and Financial Impact

At the moment the Project has not had significant economic or financial impact on the region or country as a whole. However, it is reasonably expected that if the quality of Thai-produced pasture seed is further improved, seeds will be prominent export goods in the future. A recent event that one Mexican private company placed an order to purchase Thai pasture seeds in a large amount indicates the prospect.

As mentioned earlier, the Overall Goal of the Project is likely to be achieved in the future. With the achievement of the Overall Goal, livestock industry of Thailand would prosper, making significant impact on the regional and national economies.

4-4. Environmental and Social Impact

Several numbers of machine and equipment were improved, developed, and introduced by the Project, some of which are already extensively utilized by seed producing farmers. The machines have brought such positive impacts as: i) saving of hard labor required for traditional method, ii) reduction of dust pollution that was associated with operation of old-model machines. Meanwhile, the farmers improved the quality of their seed production through the farmer training programs conducted by the Project, resulting in an increase in their income level.

4-5. Other Impact

Whereas the Japan Grassland Farming Forage Seed Association (JGFFSA) and the AND have made a contract that Thai seeds are produced and provided to the JGFFSA, the amount of seed had not met the contracted demand. However, with technical guidance through the Project activities, the demanded amount requested by the JGFFSA was fully provided in 2003. Consequently the JGFFSA has requested for other species in 2004 and the more seed production based on the overseas contract will be highly expected.

5. Sustainability

The observations on sustainability of the Project, based on the evaluation, are presented below.

5-1. Policy and Institutional Aspects

From the viewpoint of the broader policy context, it is obvious that Thai government now

has policy to encourage production of beef cattle and dairy products. The government set up a plan to increase beef cattle production, in response with its increasing demand and the price hike. On the other hand the government has health promotion policy where school children are provided with a bottle of milk for every school day, causing heavy demand of dairy products. Because these policy measures are expected to be continuous, the Project Purpose and the Overall Goal are considered relevant, supporting the sustainability of the Project activities.

5-2. Organizational and Financial Aspects

The AND has prepared a draft of comprehensive future plan of pasture breeding to secure sustainability of the Project, presenting detailed activities and resources required. However, a program for strengthening of organizational structure, which may be necessary in order to fully continue pasture research and breeding, is not clearly mentioned in the plan. Meanwhile, although proposed budget for the breeding program in 2005, around 800 thousand Baht, might be sufficient, it is not clear in the plan that stable and continuous budget will be provided by the government in the long term.

5-3. Technical Aspects

(1) Development of evaluation and selection techniques of appropriate pasture varieties

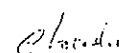
The project is producing manuals related to pasture breeding for the future plan and the manuals of development of new cultivar. Therefore, the breeding activity will be continued by Thai side, even after the project terminated.

On the other hand, in Thailand, where there is a large climate variation by year, especially in rainy season, such as uneven amount of rain, it is quite difficult to handle the breeding activity under such circumstances, being guided by the manuals only.

However, there will be a large possibility that Thai-original pasture varieties will be developed in the near future, if the local adaptability and specific characteristic tests are carried out properly for more two or three years.

(2) The pasture seed production and inspection

After the project started, the multiplication of pasture seed and the reform of the inspection system have been implemented in Thailand. Therefore, it is believed that developed technology and implements provided in the Project can be utilized for that system.



(3) The expansion of high quality forage crop production and utilization

The expansion of using high quality forage crops is an important factor to reduce the cost of livestock production, at which the Government of Thailand aims. It is also crucial for the expansion to make livestock farmers understand the importance of high quality forage crop utilization. In this connection, if the importance is emphasized and enlightenment activities are carried out continuously by the DLD and other organizations concerned, the high quality forage crop production and utilization will be expanded.



VII. CONCLUSION

Through the activities conducted during the Final Evaluation such as report analysis, field survey, and discussions with officials and staff members concerned, the Joint Evaluation Committee has found that the Project has almost achieved the Project Purpose due to both Japanese and Thai side's endeavors. In terms of five evaluation criteria, the Project was satisfactorily evaluated in each criterion. Therefore, the Project will be terminated as planned in August 2004. The Committee believes that the AND is already self-reliant enough to manage the activities, which have been carried out by the Project and the Overall Goal will be attained by the Thai side in the near future, if the several conditions mentioned in 5. Sustainability in the Chapter VI are fulfilled.

VIII. RECOMMENDATIONS

The following issues and measures are recommended by the Committee to both Governments in order to further develop and sustain the Project activities.

- (1) Although the AND has prepared a draft of the future forage breeding plan, the further strengthening of organizational structure is encouraged. From viewpoint of institutional setting and human resource utilization, it is recommended that Forage Breeding Unit be established within the AND. The Unit would be under the Forage Research Section and be responsible for an integral part of forage breeding program. From the viewpoint of the financial resources, the DLD should establish the system where the AND is in the future able to collect fees covering cost plus some margins from the beneficiaries for the services provided to them, and spend it by its own decision. This would enable the AND to be self-sustainable and to expand its capacity in the future.
- (2) The DLD should coordinate its own activities within the Department and with other organizations. The activities of the AND should have very close contact not only with Animal Husbandry Division, and Extension Work and Provincial Offices, but also with other organizations, e.g. Department of Cooperative Promotion, and Dairy Promotion Organization.
- (3) Through the Project activities, a large number of manuals have been produced for various usages. It is recommended that the AND convert them in an electronic form for wider and more convenient utilization, and revise them as and when necessary.
- (4) Since diffusion of the Project outputs are essential, the AND should continuously and increasingly organize various activities for the purpose of expansion of quality forage management. It is recommended that the AND organize the country-wide seminars and workshops jointly with JICA to share the outputs of the Project before its termination.
- (5) The budget for the maintenance of the heavy equipment provided under the Project, such as seed processing machines, should be specifically secured in order to keep them in smooth operation and functioning after the termination of the Project.

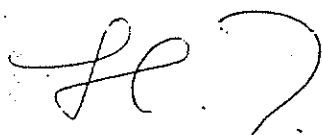


- (6) The system to prevent contamination of pasture seeds, which often occurs in the process of distribution, has improved with such measures as use of new packages specially designed for distribution. However, seed contamination in the process of production of foundation seeds and registered seeds, will consequently damage the production of commercial seeds by farmers, causing the loss of confidence on the quality of pasture seeds. Therefore it is recommended that Thai government frequently provide staff of the Centers and the Stations, where foundation seeds and registered seeds are produced, with training programs on cultivation, harvest and cleaning.
- (7) In order to promote export of pasture seeds, quality improvement such as high germination rate and high purity is crucial. For the purpose, it is recommended that Thai government conduct such activities that techniques to produce seeds of high quality are disseminated to farmers, in an effort to promote orders for pasture seeds from overseas.

IX. LESSONS LEARNED FROM THE PROJECT

The Joint Evaluation Committee has found that there are several points to be learnt from the Project as follows:

- (1) In this project, the activity on the development of evaluation and selection techniques of appropriate pasture varieties has been carried out by staff researchers through close collaboration with the Japanese experts and attending training courses in Japan. Therefore, it can be said that the combination of training in Japan and collaboration with Japanese experts is highly effective for the capacity building of counterparts.
- (2) There are four to five counterparts assigned to each Japanese expert. This system makes it possible for counterparts to share the knowledge among all the counterparts. Moreover, it may help to secure the sustainability of the Project activities in the long run.
- (3) The Project has envisaged its activities up to forage production and utilization i.e. Activity 4. This activity helped every stakeholder understand the final goal of the Project. Therefore, it can be said that embedding lower reaches in the project design is effective for understanding the objectives of the project easily.
- (4) As already mentioned in 1. Relevance in the Chapter VI, the Government Policy toward livestock sector especially forage production was so clear that the Project could be steadily developed along with the policy. Hence, designing a project in accordance with the development policy of the recipient government is a key for a successful project.



4. PDMe

ANNEX I Project Design Matrix for Evaluation

Pasture Seed Production Development Project in Northeast Thailand

Narrative Summary	Objective Verifiable Indicator	Means of Verification	Important Assumption
<p>Overall Goal</p> <p>Appropriate forage is secured for the development of cattle raising in Thailand.</p>	<p>Results after a certain period of the post-project:</p> <ol style="list-style-type: none"> Several appropriate varieties are bred. Cultivated acreage of new varieties are expanded by livestock farmers. Livestock farmers increase production of forage, hay and silage. 	<ol style="list-style-type: none"> Annual report of the AND Survey and monitoring of livestock farmers Survey and monitoring of livestock farmers 	<ol style="list-style-type: none"> Policy of seed production in Thailand is to be maintained or strengthened. Situation of seed market is to be maintained or expanded.
<p>Project purpose</p> <p>The techniques on production, processing and utilization of pasture seed and appropriate forage are developed for small-scale livestock and pasture seed farmers in Northeast Thailand.</p>	<p>Results of final stage of the Project:</p> <ol style="list-style-type: none"> The importance of breeding of new pasture varieties are enlightened to the stakeholder. Several appropriate strains are raised for Northeast Thailand. Seed production of the new strains is started in AND. Registered seed production by AND are delivered to seed production farmers in Thailand. Pasture seed inspection and quality control system in Thailand is established by AND. The importance of quality forage utilization are enlightened to the stakeholder. 	<ol style="list-style-type: none"> Reports of project activities and interviews of stake-holders Reports of project activities Annual report of the AND and Reports of project activities Annual report of the AND and Reports of project activities Annual report of the AND and Reports of project activities Reports of project activities and interviews of stakeholders 	<ol style="list-style-type: none"> Extension services in Northeast Thailand are well operated. Developed technology is to be applied by livestock farmers.
<p>Output</p> <ol style="list-style-type: none"> Techniques on evaluation and selection of appropriate varieties of pasture are developed. Techniques on pasture seed production and post-harvest processing for Registered and Commercial seeds are developed. Techniques on pasture seed inspection and quality control are developed. Techniques on production, processing and utilization of appropriate forage are developed. 	<ol style="list-style-type: none"> 4 kinds of manuals will be published for evaluation and selection. The number of strain which will be selected for new cultivar in the target species of pasture conducted, who will manage these activities, how to operate the breeding system and when new varieties are to be produced is worked out. The number of techniques and equipment which will be improved for pasture seed production and post-harvest processing in the project. Methods for multiplication, post-harvest processing and storage of pasture seed will be determined by AND. A future plan of the pasture seed marketing control system which cover forage seed production at AND are worked out. 3 kinds of manuals will be published for inspection and quality control. More than ten officers who will conduct seed testing completely in accordance with the rule of the ISTA. The DLD will be able to certify quality of pasture seed by own standard. The number of useful techniques and equipment which will be improved for forage production, processing and utilization in the project. 2 types of manuals will be published for forage production, processing and utilization. The number of model farmers which will participate in verification and demonstration for useful techniques of forage production, processing and utilization. Importance and effectiveness of forage are recognized by participant in verification and demonstration programs. 	<ol style="list-style-type: none"> Annual report of the AND and Report of project Activities. Record of seed inspection and control at the ANRC. Content of manuals and teaching materials. Survey and monitoring of livestock farmers. 	<p>Sufficient support is to be secured for seed production and extension activities.</p>

Activities	Inputs	The allocation of counterparts is not to be changed during the cooperation period
<p>To transfer the following techniques to the counterparts:</p> <ol style="list-style-type: none"> 1. Development of evaluation and selection techniques of appropriate pasture varieties. 2. Development of pasture seed production and post-harvest processing technique for Registered and Commercial seeds. 3. Development of pasture seed inspection and control techniques. 4. Improvement of useful techniques for forage production, processing and utilization. 	<p>(Japanese side) Long-term Experts: Chief Advisor, Coordinator, Evaluation and selection of appropriate varieties of pasture, Production, Post-harvest processing, Quality inspection and quality control of pasture seed production, Processing and Utilization of high-quality forage Short-term experts: when necessity arises Machinery, equipment and vehicles Receipt of Thai personnel for technical training</p> <p>(Thai side) Counterpart personnel and administrative personnel Land, building, and facilities Supply of replacement of machinery, equipment, instruments, vehicles, tools, spare parts and any other materials necessary for the implementation of the project other than those provided through JICA Running expenses for the project implementation</p>	<p>Well cooperation among organizations and people concerned with the project</p>

Target species: *Panicum maximum*, *Stylosanthes guianensis*, *Stylosanthes hamata*, *Centrosema pascuorum*, *Brachiaria ruziziensis* and *Alysicarpus vaginalis*
 DLD: Department of Livestock Development. AND: Animal Nutrition Division. ISTA: International Seed Testing Association.

ANNEX 2 Project Achievements according to the PO

Activities		Output	Result or Progress	Achievement	Problems or Comments	Prospects
Item	Details					
1) Development of evaluation and selection techniques of appropriate pasture varieties	a) Collection of existing data from D/D, etc Thailand	a) Present conditions in Thailand are identified.	<ul style="list-style-type: none"> As the example <i>S. guianensis</i> introduction and evaluation is surveyed. Major pasture varieties and research center, is also surveyed. Published English and Thai version. 	4	<ul style="list-style-type: none"> More than one year delayed. For data collection and translation. 	<ul style="list-style-type: none"> Useful for the follow-up work after this project or making future plan of breeding of Thailand.
a)-1 Introduction system	b)-1 Introduction of selection techniques developed in Japan for appropriate pasture varieties	b)-1 Selection techniques are acquired by the C/P and applied to develop appropriate pasture varieties with high productivity, disease resistance, high nutritive value as well as adaptability for Thailand.	<ul style="list-style-type: none"> Introduction the systems and manuals of Japan. Invitation of short term expert from Japan. Publish manuals English and Thai version. 	3	<ul style="list-style-type: none"> Delayed publishing manual because Thai site practice system did not test start with hopeful selected strains by the breeding future plan. 	
a)-2 Evaluation system	b)-2 Publication of manuals for local adaptability and specific characters	b)-2 Manuals of local adaptability and specific characters are published for new cultivar breeding.	<ul style="list-style-type: none"> Same as the above 	3	<ul style="list-style-type: none"> Delayed publication of manual because we can not collect enough data. 	
a)-3 Varieties and production ability	b)-3 Method of multiplication for foundation seed	b)-3 Cultivar characteristics are maintained.	<ul style="list-style-type: none"> Fixed the standard strain and designed the breeder's seed foundation seed production method. 	3	<ul style="list-style-type: none"> Post control test could not be achieved in this Thai side. 	<ul style="list-style-type: none"> In next year test will continue by Thai side.
b) Development of selection techniques for appropriate pasture varieties and preservation of stock seed	c) Publication of manuals for evaluation of genetic resources of tropical grass and legume	c) Manuals of evaluation techniques for tropical grass and legume are published by the Project and genetic resources of forage crops are evaluated in accordance with the manuals.	<ul style="list-style-type: none"> Some morphological character show the variation but verdict is difficult. Embryo analysis has not finished with <i>P. maximum</i> By the space planting test and progeny test, selected good mother plants for polycross. Established the high natural crossing ratio in <i>S. guianensis</i>, and selected excellent mother plants by 	3	<ul style="list-style-type: none"> Field test data varied overall because field condition was not good. 	
b)-1 Local adaptability	c)-1-1 <i>Panicum maximum</i> FDSR			4		
b)-2 Specific characters	c)-1-2 <i>Brechynia ruziziensis</i>			4		
b)-3 Method of preservation for foundation seed	c)-2-1 <i>Syntherisma guianensis</i> CTRR4			4		
c) Development of evaluation techniques for appropriate pasture varieties						
c)-1 Grass						
c)-2 Legume						

e)-2-2 <i>Nyctanthes hamata</i>	the space planting and progeny test. *With severe termite damage, persistency was not evaluated, but disease resistant, good productivity stay green characteristic mother plants are selected. *Virus disease has been severe year by year, could not do enough evaluation and selection.	4	*Pak Chung is very severe and Khen Kae; is also severe.	* <i>C. pascurorum</i> will be cut from the target species.
e)-2-3 <i>Centrosema pascurorum</i>	*As the model of genetic resources collection, 34 strain are collected and investigated characters. *Teritally character is not finished.	3	*Productivity etc. need a lot of work.	*According to necessity performance test will be done by Thailand.
e)-2-4 <i>Miscanthus vaginatus</i>	* <i>S. guineensis</i> is almost finished with Anthracnose disease, but <i>C. pascurorum</i> Rhizoctonia and Virus disease is too severe to establish the evaluation and selection.	3	*Disease and plant basic mechanism must be analyzed.	* <i>C. pascurorum</i> will be cut from the target species.
e)-3-1 Field resistance	*Virus inoculation training is finished. *Virus inoculation Rhizoctonia disease are could not carry out at Center.	2	*Artificial inoculation need special equipment.	*If in future fungus race appear, need collaboration work to plant pathology section.
e)-3-2 Artificial inoculation	*To find the mutant in the experimental field is very difficult. Some selected plants are testing by progeny and embryo sack analysis will be done.	3	*Experimental field is not enough uniformity. And C/P is very busy	*At least fix <i>P. maximum</i> will be fixed standard strain.
d) Introduction of breeding techniques for breeding of tropical grass and legume varieties	*The first and second cycle selection is finished by progeny test and some mother plants are selected. B. ruziziensis selected plants are poly-crossed in isolation field. Synthetic strain have been tested for performance, and 3rd cycle selection and poly-cross is done.	4		*To breed the new cultivar, synthetic strains must begin regional adaptability and specific character test, and continue after project.
d)-1 Apomix grass breeding	*Both open or isolate progeny show wide variation at progeny test, so higher natural crossing is supposed.	4		
d)-2 Out-crossing grass breeding	* <i>S. guineensis</i> <i>S. hamata</i> evaluation is all carried out by space planting test, progeny test. *New composite strain of <i>S. guineensis</i> , <i>S. hamata</i> show good data in performance test. * <i>C. pascurorum</i> could not harvest the seed with severe disease.	3	*Certification of new variety need the special adaptability and special character test.	*It is necessary to continue the test after project.
d)-3 Self-pollinated legume breeding				* <i>C. pascurorum</i> will be cut from the target species.
d)-3-1 Self-fertilizing ratio				
d)-3-2 Selection by space-planting				
2) Development of pasture seed production and				

<p>post-harvest processing techniques for Registered and Commercial seeds</p> <p>a) Development of cultivation techniques for pasture seed production</p> <p>a)-1 Investigation of present conditions</p>	<p>a)-1-1 Collection of research papers on seed production in Thailand</p> <p>a)-1-2 Collection of natural conditions data in Northeast Thailand</p> <p>a)-1-3 Investigation of production cost of seed from existing reports</p> <p>a)-1-4 Survey of cultivation methods of the main species</p>	<p>a)-1 Present problems at the Project site are identified.</p>	<p>*Collection of literature about pasture seed production for past about 20 years of Thailand. And the contents investigation was conducted and it ended in 1999.</p> <p>*The soil and weather data of the examination field of project site (Khon Kaen Tharn) were collected. (1999-2000)</p> <p>*Refer to the investigation report of the before JICA individual expert for seed production cost and a sale price.</p> <p>*Seed production farmer of four houses is extracted and the work process from cultivation to seed cleaning is hearing-investigated. In order to grasp the seed production farmer actual condition, work diaries are collected by two farmers.</p>	<p>4</p> <p>4</p> <p>4</p> <p>4</p> <p>4</p>	
<p>a)-2 Improvement of registered seed production</p>	<p>a)-2 Improvement of cultivation techniques for registered seed</p>	<p>a)-2 Genetic purity of registered seed is maintained at the Animal Nutrition Research Center.</p>	<p>* (1) Investigate about <i>S. guineensis</i> how Cutting Date and Planting Date Affect Seed Product Yield.</p> <p>(2) Influence planting date of <i>C. paserorum</i>. (3) Cultivation technical investigation using the rack of <i>C. paserorum</i>. (4) Investigation about hard seed treatment of Tropical legume seed.</p> <p>Much data about cultivation technology was obtained by the above investigation.</p> <p>*Investigation of the amount of nitrogen fertilization of <i>Brachiaria brizantha</i> and investigation of harvesting timing were conducted till 2002.</p> <p>And the influence investigation which irrigation and cutting timing exert on <i>B. brizantha</i> is under execution now.</p>	<p>4</p>	
<p>a)-3 Study of seed production techniques for selected species</p>	<p>a)-3 Trial of seed production of selected species</p>	<p>a)-3 Methods of seed production for selected species are improved.</p>	<p>*Data this year has not been obtained yet.</p>	<p>3</p>	<p>*Results of an investigation will be summarized by April, next year.</p>
<p>b) Development of pasture seed harvesting and post-harvest processing techniques</p> <p>b)-1 Investigation of present conditions</p>	<p>b)-1 Survey of seed harvesting and post-harvest techniques at the farmer's level</p>	<p>b)-1 Present problems at the Project site are identified.</p>	<p>*In order to check the technical level of seed harvest from a farmer, it investigated about <i>P. maximum</i>, <i>B. mizianensis</i>, and <i>S. hamata</i>. And the concrete improvement point was clarified by experiencing the work of a farmer.</p> <p>*"Tiger" was developed as a tool for pasture grass</p>	<p>4</p>	
<p>b)-2 Improvement of</p>	<p>b)-2-1 Improvement of seed</p>	<p>b)-2-1 Farmer can get higher</p>	<p>*Development and</p>	<p>3</p>	<p>*The data collection, and</p>

<p>investing and post-harvest processing techniques</p>	<p>harvesting and cleaning tools for farmers</p>	<p>quality seed with less labor cost.</p>	<p>seed harvest. *As tool for legume seed harvest, "sweeper" is introduced from Japan and is under improvement. *Following tools were developed as pasture seed processing machines. 1. Manual and electric "Tomi" 2. "Jumain separator" 3. With motor power "a sheave machine" 4. Clod break machine Electric Tomi and Sheave machine are manufactured in the demonstrations to farmer this year.</p>	<p>development and improvement are due to finish by project period end.</p>
<p>c) Development of pasture seed storage techniques</p>	<p>h) 2-2 Establishment of system of post-harvest processing for each species at "Cheng-Yuen Animal Nutrition Station</p>	<p>b) 2-2 Harvested pasture seed is cleaned more efficiently and precisely, and quality of pasture seed is improved in Thailand.</p>	<p>4 *By Mahalakam station, seed cleaning installed the seed processing system which set difficult legume seed as the main object. And it started operation from 2001. Furthermore, "Velvet roll mill" was installed in 2003 and transfer techniques also including the method of a maintenance was ended mostly.</p>	<p>improvement of tool are under continuatio 3.</p>
<p>e) 1 Investigation of present conditions</p>	<p>c) 1-1 Investigation of seed storage methods at the farmer's level c) 1-2 Investigation of seed storage at the Animal Nutrition Research Center</p>	<p>c) 1 Present problems at the Project sites are identified.</p>	<p>4 *At the farm level, since it dries after harvesting seeds are sold to ANRC immediately, there is especially no problem of storage. *The seed low-temperature storehouse of KKANRDC and NCANRDC was investigated on the assumption that storage of important seeds, such as breeder seed. Consequently, although area was satisfactory, as for a part of KKANRDC, it turns out that there was the necessity for repair. Moreover, in NCANRDC, it turns out that it is in a situation that it cannot work. Based on the result, a small seed storehouse was installed in KKANRDC in 2002.</p>	<p>3 *Since investigation this year has not finished.</p>
<p>c) 2 Improvement of pasture seed storage techniques</p>	<p>c) 2 Determination of suitable storage methods for 5 species of pasture seed</p>	<p>e) 2 Suitable storage methods for KS and CS are practiced for 5 species of pasture seed.</p>	<p>*<i>P. maximum</i>, <i>B. nazizenis</i>, <i>S. guineensis</i>, <i>S. himata</i>, and <i>C. pascurum</i> was saved at normal temperature, 5 degrees C, and 15 degrees C, respectively. And germination and moisture of that were investigated periodically. Investigation is under continuation.</p>	<p>*Data is due to be collected by April.</p>
<p>3) Development of pasture seed inspection and control</p>				

<p>techniques</p> <p>a) Development of seed quality inspection techniques</p> <p>a)-1 Investigation of present conditions</p>	<p>a)-1 Investigation of seed testing at the Annual Nutrition Research Center</p>	<p>a)-1 Present problems at the Project sites are identified.</p>	<p>*This investigation was ended by 2000. According to the result, inspection apparatus was old although the technology and the knowledge of inspectors were at a high level. For this reason, inspection based on the rule of ISTA using these inspection apparatus cannot be performed. Then, new inspection apparatus was introduced and the problem was solved.</p>	4		
<p>a)-2 Improvement of seed quality inspection techniques</p>	<p>a)-2-1 Publication of manuals for pasture seed testing (in Thai) applying from ISTA's Rules</p> <p>a)-2-2 Training officers in 5 laboratories on 'pasture seed testing'</p> <p>a) -2-3 Audit (I, a, b, Inspection/Quality Control)</p>	<p>a)-2 Pasture seed testing is conducted by the C/P and officers in accordance with the ISTA's rule</p>	<p>*The "seed inspection manual" which used the rules of ISTA as the base was completed by March, 2003. And it was distributed to responsible persons and the organization of pasture seed inspection.</p> <p>*"pasture seed inspectors" were trained from March 17, 2003 to March 19 for the inspectors of five research institutes. 18 seed inspectors were trained.</p> <p>*It is under preparation in order to perform audit in connection with quality control in the seed inspection place of 5.</p>	4	<p>5 inspection place is inspected based on the "seed inspection manual" completed last year.</p>	<p>*The schedule which carries out Audit this year</p>
<p>b) Development of seed quality control techniques</p> <p>b)-1 Improvement of seed quality control techniques</p>	<p>b)-1-1 Set up Field Standard for RS and CS</p> <p>b) -1-2 Determination of standard for seed quality control of main pasture species and publication manual for field inspection</p> <p>b)-1-3 Training field inspector on 'field inspection' for registered seed production</p> <p>b)-1-4 Publication of manual for post control test</p>	<p>b)-1 Quality control on seed multiplication is conducted based on the standard of the OFCD Seed Scheme in order to maintain genetic purity.</p>	<p>*In order to maintain genetic purity of main pasture seed, it decided to introduce following inspections based on international rules.</p> <p>1) field inspection 2) seed inspection 3) post control test</p> <p>Therefore, in order to make C/P understand the meaning and the purpose of inspection, a lecture was given on "OFCD seed scheme introduction" in 2000 and 2001.</p> <p>*The "field inspection manual" of Thailand based on OFCD seed scheme was completed by October, 2002. And it published.</p> <p>*Field inspector training was held 2 times, October 9, 2002 to October 11, and October 16 to October 18. 42 researchers and engineers were trained by it.</p> <p>*The method of Post Control Test transferred technology to "C/P" from "short term expert" in</p>	4		<p>*The manual using the typical sample is created as reference.</p>

			2002 and 2003. Post Control Test is tried by KKARDC now. The manual was completed 80%.		However, since the breeding of new variety is not made, the finalized manual has not been completed.	
a) Improvement of useful techniques for forage production, processing and utilization						
a) Development and extension of pasture management techniques						
a)-1 Survey of present situation	a) -1 Survey of forage production techniques at farmer's level	a) -1 Pasture production techniques at farmer's level is identified.	*Survey of present situation of 2 dairy cattle farm and 1 beef cattle farm was implemented. *Survey of present situation of 67 dairy cattle farmers in Khon Kaen area was implemented. *The questionnaire about forage production and utilization was implemented for 146 livestock farmers who participated in the technical training for farmer.	4 4 4		*The questionnaire in farmers' technical training will be implemented accordingly. *The study will be implemented combining with the verification and demonstration, and the technical training for farmer until project termination.
a)-2 Improvement of pasture management techniques for selected species	a)-2 Trial of grazing and cut and carry methods with selected species	a)-2 The data and information for useful pasture management techniques are obtained to guide extension officers and model farmers by the C/P.	*Study of grazing technique and forage preservation technique is carrying out for raising dairy cattle. *Study of pasture management is being carried out for dairy cattle. *A trial production and examination of a press roller were implemented.	3 3 4	*The study is in progress. *The study is in progress.	*The study will be continued after the project termination.
b) Development of pasture harvesting and post-harvest processing techniques	b) -1 Survey of pasture harvesting and post-harvest processing techniques at farmer's level	b)-1 Pasture harvesting and post-harvest processing techniques at farmer's level is identified.	*Survey was implemented as survey of "b)".	4		
b)-2 Improvement of hay-making and silage-making techniques for the farmers	b)-2 Improvement of useful techniques for hay-making and silage-making	b)-2 The data and information for useful techniques for hay-making and silage-making are obtained to guide extension officers and model farmers by the C/P	*The trial production of hay baler. *The trial production a solar house made of bamboo. *The trial production a bamboo bed for hay-making in a bamboo solar house. *Study of hay-making is carrying out using a bamboo solar house. *Study of high quality silage-making using	4 4 4 4 4	*The study is in progress.	*The study will be implemented until project termination.

<p>c) Verification and demonstration of forage production, processing and utilization</p> <p>c)-1 Transfer of useful techniques to model farmers</p>	<p>silage production techniques for farmers</p>	<p>c)-1 Useful techniques for forage production by C/P for model farmers.</p> <p>c)-1-1 Publication of useful techniques</p> <p>c)-1-2 Establishment of a model farm to enlighten dairy farmers on importance and effectiveness of forage</p> <p>c)-1-2 Establishment of a model farm for practical forage production</p>	<p>additives was implemented.</p>	<p>4</p>	<p>• Making a manual for livestock farmers. • Making a manual for extension officers.</p>	<p>3</p>	<p>• The making a manual is in progress. • The making a manual is in progress.</p>	<p>3</p>	<p>• Making a manual of hay-making and silage-making techniques for a livestock farmers. • 4 dairy farmers were selected as model farmers. The C/P and the technical officer is guiding them pasture management techniques, silage-making techniques, etc.</p>	<p>3</p>	<p>• Schedule of making manual is in this fiscal year. • Schedule of making manual is in this fiscal year. • Verification and demonstration will be implemented until the project termination.</p>
<p>c)-1-1</p>	<p>4</p>	<p>• Technical training for farmer will be held next fiscal year.</p>	<p>• Technical training for farmer, which was held 2 times.</p>	<p>3</p>	<p>• Holding of the forage production, processing and utilization training which utilized the grazing field and model farmers.</p>	<p>3</p>	<p>• Hay making technique using bamboo solar house was guided for 4 forage production farmers group.</p>	<p>4</p>	<p>4</p>	<p>4</p>	<p>4</p>

ANNEX 3 Dispatch of Japanese Experts

1) Long Term Experts

No.	Name of long-term expert	Post Title	Period (year.Month.day)	Organization
1	Mr. Yoshitake Takeoka	Chief Advisor Forage Production and Utilization Project Coordinator	1999.08.14 - 2001.08.13	Ministry of Agriculture, Forestry, and Fisheries (MAFF)
2	Mr. Yoshihiro Shimizu		1999.08.14 - 2002.08.13	Japan international Cooperation Agency (JICA)
3	Mr. Seijun Kikuchi	Production, post-harvest processing, Quality inspection and Quality control	1999.08.25 - 2001.08.13	Japan international Cooperation Agency (JICA)
4	Mr. Koichi Nakashima	Evaluation and Selection	1999.08.25 - 2004.08.13	Ministry of Agriculture, Forestry, and Fisheries (MAFF)
5	Mr. Masami Kuramochi	Chief Advisor Forage-Production and Utilization	2001.08.27 - 2004.08.13	Ministry of Agriculture, Forestry, and Fisheries (MAFF)
6	Mr. Yoshiro Tozawa	Production, post-harvest processing, Quality inspection and Quality control Project Coordinator	2002.03.07 - 2004.08.13	Ministry of Agriculture, Forestry, and Fisheries (MAFF)
7	Mr. Kiyomi Endo		2002.08.05 - 2004.08.13	Japan international Cooperation Agency (JICA)

2) Short Term Experts

No.	Name of short-term expert	Post Title	Period (year.Month.day)	Organization
1	Mr. Kazuaki Amari	Seed inspection and control	1999.11.08 - 2000.01.07	National Livestock Breeding Center
2	Mr. Kenji Yoda	Seed Harvesting and Post-harvest forage utilization	1999.11.08 - 2000.01.07	National Livestock Breeding Center
3	Mr. Hidenori Kawamoto	Pasture seed inspection and control	2000.02.14 - 2000.03.29	National Institute of Livestock and Grassland Science
4	Mr. Yoshihide Tsuji	Seed Harvesting and Post-harvest Processing	2001.01.15 - 2001.02.28	National Livestock Breeding Center
5	Mr. Itsunobu Shimizu	Apomix Pasture Species	2001.01.15 - 2001.02.28	National Livestock Breeding Center
6	Mr. Hiroshi Nakagawa	Ensiling Technology for Tropical pasture	2001.02.28 - 2001.03.25	National Grassland Research Institute
7	Mr. Yasuhisa Masuda	Breeding Technology for Ruzi and Ginia	2001.04.10 - 2001.05.08	Kyushu University
8	Mr. Kenji Okumura	Appropriate hay making and ensiling	2001.05.10 - 2001.06.05	Okinawa Prefecture Livestock Experiment Station
9	Mr. Hidenori Kawamoto	Identification of virus disease on legume	2001.06.18 - 2001.08.14	National Institute of Livestock and Grassland Science
10	Mr. Toshiro Mikoshiba	Guidance of grazing techniques	2001.06.30 - 2001.09.27	National Institute of Livestock and Grassland Science
11	Mr. Yuji Nakanishi	Adaptability and specific character test	2002.09.25 - 2002.10.30	National Agricultural Research Center
12	Mr. Hidemichi Matsuoka	Identification/control for soil-borne Viral disease	2002.10.27 - 2002.11.12	National Agricultural Research Center
13	Mr. Toshiro Mikoshiba	Post-Harvest processing/Inspection	2002.10.27 - 2002.11.12	National Institute of Livestock and Grassland Science
14	Mr. Kenji Yoda	Evaluation and selection	2002.12.10 - 2003.01.31	National Livestock Breeding Center
15	Mr. Shimichi Sugita	Seed inspection and control	2003.10.12 - 2003.10.26	National Institute of Livestock and Grassland Science
16	Mr. Takemasa Yamatoki	Seed inspection and control	2003.10.01 - 2003.11.29	National Livestock Breeding Center

ANNEX 4 Training of Counterpart Personnel in Japan

No.	Name	Training Period	Job Title	Course Objective and Training Institution	Position before training	Position after training
1	Mr. Sumran Wijjphan	Oct.19, – Dec. 23, 99	Pasture Researcher	Evaluation and Selection Techniques on Pasture Varieties / National Institute of Grassland Research	Pasture Researcher	Pasture Researcher
2	Mr. Weerasak Chinosang	Mar. 28 – Jun 18, 2000	Animal Researcher	Pasture Seed Production / National Livestock Breeding Center	Animal Researcher	Animal Researcher
3	Ms. Ganda Nakamane	Jun 18 – Sep.15, 2000	Animal Researcher	Evaluation and selection of disease and insect resistance in forage crop / National Grassland Institute	Animal Researcher	
4	Ms. Pimpaporn Pholsen	Jun 18 – Aug.19, 2000	Scientist	Pasture seed inspection and quality control / National Livestock Breeding Center	Scientist	Scientist
5	Mr. Thunrongsakd Phonbunwung	Jun.26 –Aug.14, 2001	Researcher (Animal Science)	Forage production, processing, utilization and extension method / National Breeding Center	Researcher (Animal Science)	Researcher (Animal Science)
6	Mr. Jaroontroj Chantarasiri	Jun.2 – Jul.31, 2001		Pasture seed production and post-harvest processing /National Livestock Breeding Center		
7	Mr. Sarayut Thakua	Jul 2, – Sep. 29,2003	Scientist	Evaluation and selection of tropical grass /	Scientist	Scientist
8	Mr. Viroj Ritruetchai	Jul. 1 – Aug. 30, 2003	Animal Researcher	Forage production, processing and utilization	Animal Researcher	Animal Researcher
9	Ms. Jantakam Arananat	May 19 – July 18, 2003	Scientist	Evaluation and selection techniques on pasture varieties	Scientist	Scientist
10	Ms. Wataikarn Jiemjetcharorn	May 26 – Aug. 3,2003	Scientist	Pasture seed inspection control techniques	Scientist	Scientist
11	Mr. Kitti Kookaew	Jun.23 – Aug. 30, 2003	Animal Researcher	Forage production, processing and utilization	Animal Researcher	Animal Researcher
12	Mr. Taweesak Chuenpreedch	Aug.4 – Sep. 20, 2003	Animal Scientist	Techniques of cultivation and seed processing for pasture seed production	Animal Scientist	Animal Scientist
13	Ms. Sasitthon Thinnakorn	Sep. 1 – Oct. 11, 2003	Animal Researcher	Utilization of ecotype gene source for pasture breeding	Animal Researcher	Animal Researcher

ANNEX 5 Inputs by Both Japanese and Thai sides

(1) Japanese Side

(Unit: Thousand Yen)

Item/Year	1999	2000	2001	2002	2003	2004 (p l n)	Total (000Yen)
Equipment Procurement from Japan	0	26,106	5,317	0	0	0	31,423
Equipment Procurement from Thai	21,841	3,384	12,123	7,739	6,823	740	52,650
Equipment by carried expert	3,945	1,031	2,614	3,430	1,987	0	13,007
Total	25,786	30,521	20,054	11,169	8,810	740	97,080
Equipment Local Expenditure	2,767	3,452	3,959	3,809	4,955	3,487	22,429
Enlightment and Extension	0	1,513	937	2,386	5,000	2,082	11,918
Grand total	28,553	35,486	24,950	17,364	18,765	6,309	131,427

*2003: Estimate

Dispatch of Japanese experts and Acceptance of C/P Training

Item/Year	1999	2000	2001	2002	2003	2004	Total
Long term expert	4	4	4	4	4	4	24
Short term expert	3	3	4	4	2	1	17
C/P Training	2	2	2	2	5	3	16

2004: Plan

(2) Thai Side

Budget Year	1999	2000	2001	2002	2003	2004 (p. an)	Total (Baht)
Salary and Permanent Wage	21,530,000	17,181,800	20,083,800	20,393,400	21,633,560	21,775,400	122,597,960
Daily allowance	435,300	346,500	346,500	574,500	505,400	530,100	2,738,300
Research Activities	2,057,550	0	1,236,313	926,430	1,004,435	3,554,970	8,779,698
Temporary wage for JICA	0	321,207	321,207	415,679	415,679	243,776	1,717,548
Cattle feed and Manure	0	0	0	0	0	120,000	120,000
Training (Technician and Farmers)	150,000	141,500	0	317,000	540,100	413,000	1,591,600
Total	24,172,850	17,991,007	21,987,820	22,627,009	24,099,174	26,517,246	137,545,106

*This amount of budget is the total of (3 site) related to

Others	1999	2000	2001	2002	2003	2004	Total (Baht)
Salary for secretary and driver Etc	0	0	0	0	0	0	0
From DIEC	0	577,765	616,838	566,879	701,898	19,232	3,152,612

ANNEX 6 List of Provided Equipment

J.F.Y	No.	Name of Equipment	Price (Baht)	Q'ty Disposal	Q'ty (Present)	Using Place	In use	Condition
Vehicle								
1999	27-28	TOYOTA SPORTRIDER PRERUNNER	1,720,000	2	2	Khon Kaen Center	use	Good
	29	TOYOTA HILUX TIGER CAB	470,000	1	1	Khon Kaen Center	use	Good
	30-31	TOYOTA HILUX DOUBLE CAB	1,093,688	2	2	Khon Kaen Center	use	Good
	37	TOYOTA COMPUTER HI ROOF	870,000	1	1	Khon Kaen Center	use	Good
Provision Equipment								
1999	1	Photocopy Machine Cannon	117,075	1	1	Khon Kaen Center	use	Good
	2	Fax Machine Cannon	37,170	1	1	Khon Kaen Center	use	Good
	3, 4, 5, 6, 7	Airconditioner	126,000	5	5	Khon Kaen Center	use	Good
	8, 9	Desktop Computer OMNI	64,575	2	2	Khon Kaen Center	use	Good
	10	Note book PC Computer	84,525	1	1	Khon Kaen Center	use	Good
	11	Laser Printer with scanner HP	34,650	1	1	Khon Kaen Center	use	Good
	12	Color Printer HP	19,950	1	1	Khon Kaen Center	use	Good
	13	Digital Camera (Sony)	47,250	1	1	Khon Kaen Center	use	Good
	14	Scanner HP	26,250	1	1	Khon Kaen Center	Out of order	
	15	Microscope (Olympus)	162,960	1	1	Khon Kaen Center	use	Good
	16	Accessories for above Microscope	283,416	1	1	Khon Kaen Center	use	Good
	17, 18	Digital Camera with printer for above microscope	142,128	2	2	Khon Kaen Center	use	Good
	19	Cultivator for the tractor	112,653	1	1	Khon Kaen Center	use	Good
	20	Electric balance (0.01 ~ 2100g.) (A&D)	37,088	1	1	Khon Kaen Center	use	Good
	21	Electric balance (0.01 ~ 2100g.) (A&D)	37,088	1	1	Khon Kaen Center	use	Good
	22	Hand Cultivator (Kubota)	266,787	1	1	Khon Kaen Center	use	Good
	23-26	Oven (YAMATO)	734,840	4	4	Khon Kaen Center	use	Good
	32	4 Wheel Tractor	596,295	1	1	Khon Kaen Center	use	Good
	33	Plow for the above Tractor (K.K)	27,300	1	1	Khon Kaen Center	use	Good
	34	Harrow for the above Tractor (EHP)	57,750	1	1	Khon Kaen Center	use	Good
	35	Rotary tiller for the above Tractor	99,225	1	1	Khon Kaen Center	use	Good
	36	Front Blade for the above Tractor	30,450	1	1	Khon Kaen Center	use	Good
2000	38	Electronic balance 1 (Yamato Scientific) (0.01g)	84,800	1	1	Khon Kaen Center	use	Good
	39	Electronic balance 2 (Yamato Scientific) (0.001g.)	100,800	1	1	Khon Kaen Center	use	Good
	40	Incubator for germination test (legume) (SANYO)	200,858	1	1	Khon Kaen Center	use	Good
	41	Incubator for germination test (grass) (SANYO)	432,860	1	1	Khon Kaen Center	use	Good
	42	Sample Splitter (Fujiwara Seisakusho) (JIS 20)	90,606	1	1	Khon Kaen Center	use	Good
	43	Sample Splitter (Fujiwara Seisakusho) (JIS 10)	48,617	1	1	Khon Kaen Center	use	Good
	44	Sample Splitter (Fujiwara Seisakusho) (JIS 6)	41,482	1	1	Khon Kaen Center	use	Good
	45-46	Dispenser (Ioyoglass) (rang 1-10 ml. with cap)	20,486	2	2	Khon Kaen Center	use	Good
	47-48	Dispenser (Ioyoglass) (rang 2-20 ml. with cap)	28,538	2	2	Khon Kaen Center	use	Good
	49-50	Drying rack	60,644	2	2	Khon Kaen Center	use	Good
	51	luminance meter	13,860	1	1	Khon Kaen Center	use	Good

J. F. Y	No.	Name of Equipment	Price	Q'ty Disposal	Q'ty (Present)	Using Place	In use	Condition
	52	Seed Sample Pan(10 X 10 X 1cm.)	22,321	100 pcs	100 pcs	Khon Kaen Center	use	Good
	53	Seed Sample Pan(16 x 2cm.)	31,188	100 pcs	100 pcs	Khon Kaen Center	use	Good
	54	Aluminum petri dish	3,262	10 boxes	10 boxes	Khon Kaen Center	use	Good
	55	Desiccator (YAMATO)	39,750	1	1	Khon Kaen Center	use	Good
	56	Seed Processing Plant	6,857,573	set	1 set	Mahasarakham Station	use	Good
	57	Cabinet X-ray Apparatus	2,486,360	1	1	Khon Kaen Center	use	Good
2001	58	Pasture Seed Drill	208,675	1	1	Khon Kaen Center	use	Good
	59	Boom Sprayer	90,550	1	1	Khon Kaen Center	use	Good
	60	K-type roller	356,005	1	1	Mahasarakham Station	use	Good
	61	Ultrasonic cleaner	270,920	1	1	Khon Kaen Center	use	Good
	62, 63	Incubator (YAMATO)	381,530	2	2	Khon Kaen Center	use	Good
	64	Vacuum packing machine	138,930	1	1	Khon Kaen Center	use	Good
	65	Leaf acreage meter	548,555	1	1	Khon Kaen Center	use	Good
	66	Clean Bench	487,210	1	1	Khon Kaen Center	use	Good
	67	Cold Room	1,026,310	1	1	Khon Kaen Center	use	Good
	68, 69	Air-conditioner	61,560	2	2	Khon Kaen Center	use	Good
	70	Autoclave	202,405	1	1	Khon Kaen Center	use	Good
	71	Computer Notebook (TOSHIBA SATELLITE)	95,690	1	1	AND, Bangkok	use	Good
	72	Printer (HP)	37,080	1	1	AND, Bangkok	use	Good
	73	LCD Overhead Projector	200,850	1	1	Khon Kaen Center	use	Good
	74	Rotary Cultivator	338,985	1	1	Khon Kaen	use	Good
	75	Grass Seed Cleaning Plant with Conveyor	1,509,025.27	1 set	1	Mahasarakham Station	use	Good
2002	76	Near Infrared Reflectance Spectroscope (Feed & Forage Analysis)	2,154,900	1	1	Khon Kaen Center	use	Good
	77	Forage Harvester	515,000	1	1	Mahasarakham Station	use	Good
2003	78	Shakerator (Sub-solier)	148,190	2	2	Khon Kaen and Mahasarakham use	Good	Good
	78	Reversible Bottle Soil Plow	543,640	1	1	Khon Kaen	use	Good
	79	Plant Culture Shelf	664,780	1	1	Khon Kaen	use	Good
	80	Desiccator Auto Dry	73,910	1	1	Khon kaen	use	Good
	81	Desiccator Auto Dry	393,660	3	3	KK, CY, PC	use	Good
	82	Surry tank	407,403	1	1	Khon Kaen	use	Good
		Equipment Carried by Experts	(Japanese Yen)					
1999	1	Personal Computer MAC G3 with soft ware and accessories	701,900	1	1	Khon Kaen Center	use	Good
	2	Personal Computer TOSHIBA DYNABOOK with soft ware and accesso	471,600	1	1	Khon Kaen Center	use	Good
	3	Digital Camera KODAK Q-M2000	76,300	1	1	Nakhonrajachasima Center	use	Good
	4	Personal Computer TOSHIBA DYNABOOK with soft ware and accesso	663,500	1	1	Khon Kaen Center	use	Good
	5	Digital Camera SONY DSC-F55K	86,000	1	1	Khon Kaen Center	use	Good
	6	Personal Computer Power Book G3233 (Notebook)	421,300	1	1	AND, Bangkok	use	Good
	7	Garrying bag	10,000	1	1	Khon Kaen Center	use	Good
8, 9, 10		Dial Caliper	104,700	3	3	Khon Kaer. Center	use	Good
11, 12		Force Gauge (2kg/2E)	111,600	2	2	Khon Kaen Center	use	Good
13, 14		Force Gauge (10kg/10g)	111,600	2	2	Khon Kaen Center	use	Good
	15	Altimeter	45,000	1	1	Khon Kaen Center	use	Good
16-21		Slide File	17,400	6	6	Khon Kaen	use	Good
22-46		Spare Index (for slide file)	19,680	24	24	Mahasarakham Station	use	Good

J. F. Y	No.	Name of Equipment	Price	Q'ty (Personal)	Q'ty (Present)	Using Place	In use	Condition
	47, 48	Testing Rice Husker	13, 400	2	2	Khon Kaen Center	use	Good
2000	49	Winrower (10m)	46, 000	1	1	Village	use	Good
	50-55	Winrower (10m)	276, 000	6	6	Village	use	Good
	56-59	Tweezer (Inox 5t)	10, 800	4	4	Khon Kaen Center	use	Good
	60-63	Tweezer (Taxal 7t)	19, 400	4	4	Khon Kaen Center	use	Good
	64-84	Slid Glass	57, 800	20	20	Khon Kaen Center	use	Good
	85-90	Micro Cover Glass	17, 425	5	5	Khon Kaen Center	use	Good
	91-92	Memory Stick (Sony)	16, 000	2	2	Khon Kaen Center	use	Good
	93-99	Mini DV Cassette 10VM-60RM (SONY)	7, 200	6	6	Khon Kaen Center	use	Good
	100	Micro Drive (MELCO)	24, 400	1	1	Khon Kaen Center	use	Good
	101, 102	PC Card Adapter	13, 000	2	2	Khon Kaen Center	use	Good
	103	CD-R/RW Drive	39, 500	1	1	Khon Kaen Center	use	Good
	104	CD-RW Disc	5, 000	1	1	Khon Kaen Center	use	Good
	105	Mobile Scanner (Panasonic)	23, 500	1	1	Khon Kaen Center	use	Good
	106, 107	Electric Drill Set with case . spare drill & transformer	160, 000	2	2	Khon Kaen Center	use	Good
2001	108	Lactic Bacillus Akuremo Powder for Silage	9, 800	1	1	Maharakham Center	(finished)	Good
	109	Compact pH meter	20, 500	1	1	Khon Kaen Center	use	Good
	110	Propionic Acid	4, 200	1	1	Maharakham Station	(finished)	Good
	111	Formic Acid	4, 500	1	1	Maharakham Station	(finished)	Good
	112	Stercomicroscope, SCZ-40PFw/transformer	148, 000	1	1	Khon Kaen Center	use	Good
	113-116	Smart Media	32, 400	4	4	Khon Kaen Center	use	Good
	117, 118	Head Loupe R7500	10, 600	2	2	Khon Kaen Center	use	Good
	119	Thermo-Hyrometer	12, 200	2	2	Khon Kaen Center	use	Good
	120	Basic fuchsin with certified	7, 700	1	1	Khon Kaen Center	use	Good
	121, 122	Garmin with Certified	22, 700	1	1	Khon Kaen Center	use	Good
	123	Memory stick	16, 400	2	2	Khon Kaen Center	use	Good
	124	Connection Cable.	2, 500	1	1	Khon Kaen Center	use	Good
	125, 126	Software	9, 500	1	1	Khon Kaen Center	use	Good
	127	Adaptor for micro drive	6, 800	2	2	Khon Kaen Center	use	Good
	128	Micro Pipet NPX-20	23, 250	1	1	Khon Kaen Center	use	Good
	129	Micro Pipet NPX-200	23, 250	1	1	Khon Kaen Center	use	Good
	130	Micro Pipet NPX-1000	23, 250	1	1	Khon Kaen Center	use	Good
	131	Rack Tip	9, 300	1	1	Khon Kaen Center	use	Good
	132	Rack Tip	9, 300	1	1	Khon Kaen Center	use	Good
	133	Rotary Stand	5, 580	1	1	Khon Kaen Center	use	Good
	134-138	Micro test tube	5, 220	1	1	Khon Kaen Center	use	Good
	139	Rack for test tube	7, 200	5	5	Khon Kaen Center	use	Good
	140	Shaker w/down transformer	132, 620	1	1	Khon Kaen Center	use	Good
	141	Base and Sheet set for Shaker	17, 100	1	1	Khon Kaen Center	use	Good
	142	Tube Mixer	28, 325	1	1	Khon Kaen Center	use	Good
	143	Personal Centrifuge	52, 000	1	1	Khon Kaen Center	use	Good
	144	Polystyrene case	2, 980	1	1	Khon Kaen Center	use	Good
	145, 146	Polyethylene Bag	2, 280	1	1	Khon Kaen Center	use	Good
		Tweezer	5, 960	2	2	Khon Kaen Center	use	Good

J. F. Y	No.	Name of Equipment	Price	Q'ty Disposal	Q'ty (Present)	Using Place	In use	Condition
	147-156	Ceramic Motor	3,600	10	10	Khon Kaen Center	use	Good
	157, 158	Silica Gel	2,560	2	2	Khon Kaen Center	use	Good
	159	Support Microcellulose Membrane	6,860	1	1	Khon Kaen Center	use	Good
	160	Sickle for grass blade 60cm	20,000	10	10	Khon Kaen Center	use	Good
	161-171	Sickle for grass blade 30cm	9,000	10	10	Khon Kaen Center	use	Good
	172	Computer Notebook FUJITSU	268,000	1	1	Khon Kaen Center	use	Good
	173	Digital Still Camera CANNON	72,200	1	1	Khon Kaen Center	use	Good
	174	Software ILLIARO	17,500	1	1	Khon Kaen Center	use	Good
	175	Software powerpoint	25,000	1	1	Khon Kaen Center	use	Good
	176	CD-R Media	900	1	1	Khon Kaen Center	use	Good
	177	Compact Flash Memory	27,200	1	1	Khon Kaen Center	use	Good
	178	Ph meter HORIBA	87,000	1	1	Khon Kaen Center	use	Good
	179	Ph electrode HORIBA	18,500	1	1	Khon Kaen Center	use	Good
	173	Electronic Balance 30 kg	264,200	1	1	Khon Kaen Center	use	Good
	174	Electronic Balance 10 kg	184,000	1	1	Khon Kaen Center	use	Good
	175	Electronic Balance 10 kg	13,500	2	2	Khon Kaen Center	use	Good
	176	Grain Dial Calipers	15,400	200	200	Khon Kaen Center	use	Good
	177-377	Hand Midgat Duster	26,000	1	1	Khon Kaen Center	use	Good
	378	Standard Leaf Color Chart	76,000	200	200	Khon Kaen	use	Good
	379-579	Seedling cases	143,000	1	1	Khon Kaen Center	use	Good
	580	Storage Cabinet	470,100	1	1	Khon Kaen Center	use	Good
	581	Computer Note book SONY Vaio with soft ware and accessories	185,410	1	1	Khon Kaen Center	use	Good
	582	Single lens reflex camera with lens, viny film CANNON	140,000	1	1	Mahasarakham Station	use	Good
	583	Sweeper	18,720	4	4	Khon Kaen Center	use	Good
	584-588	Books	615,410	1	1	Khon Kaen Center	use	Good
2002	585	Personal Computer Powerbook G4 M8551J/A Apple	33,800	1	1	Khon Kaen Center	use	Good
	586	Printer HP DESKJET 1551 HP	86,600	1	1	Mahasarakham Station	use	Good
	587	Rising Plate Meter	77,200	1	1	Mahasarakham Station	use	Good
	588	Ketometer	44,300	2	2	Mahasarakham Station	use	Good
	589, 590	Keto film	19,000	1	1	Mahasarakham Station	use	Good
	591	Hand Refract meter Serum Protein	24,300	2	2	Khon Kaen Center	use	Good
	592, 593	Digital Caliper Type	116,400	1	1	Khon Kaen Center	use	Good
	594	Chlorophyll meter	28,300	2	2	Khon Kaen Center	use	Good
	595	Hand Refract meter	5,000	10	10	Khon Kaen Center	use	Good
	596-606	Video Tape	18,600	10	10	Khon Kaen Center	use	Good
	607-617	Sickle	6,100	5	5	Khon Kaen Center	use	Good
	618-623	Sickle	27,000	10	10	Khon Kaen Center	use	Good
	624-634	Sharpening stone	16,600	5	5	Khon Kaen Center	use	Good
	635-640	Watering Pot	14,000	1	1	Khon Kaen Center	use	Good
	641	Field syscom	6,000	4	4	Khon Kaen Center	use	Good
	642-645	Handy counter	14,400	2	2	Khon Kaen Center	use	Good
	646, 647	Counter with base	90,000	2	2	Khon Kaen Center	use	Good
	648, 649	Quartz thermo-hygrograph	21,250	1	1	Khon Kaen Center	use	Good
	650	Dispenser MPX-10	21,250	1	1	Khon Kaen Center	use	Good
	651	Dispenser MPX5000	21,250	1	1	Khon Kaen Center	use	Good

J.F.Y	No.	Name of Equipment	Price	Q'ty (Disposal)	Q'ty (Present)	Using Place	In use	Condition
	652	Tip 96	8,500	1	1	Khon Kaen Center	use	Good
	653, 654	Tip 50	11,300	2	2	Khon Kaen Center	use	Good
	655	Tip 1000 EMT-SG	6,800	1	1	Khon Kaen Center	use	Good
	656	Tip 1000 EMT-L	6,800	1	1	Khon Kaen Center	use	Good
	657, 658	Stainless net	22,400	2	2	Mahasarakham Station	use	Good
	659	Stainless net	6,000	1	1	Mahasarakham Station	use	Good
	660	Stainless net	5,900	1	1	Mahasarakham Station	use	Good
	661	Stainless net	8,300	1	1	Mahasarakham Station	use	Good
	662	Stainless net	18,200	1	1	Mahasarakham Station	use	Good
	663	Stainless net	6,600	1	1	Mahasarakham Station	use	Good
	664	Nylon brush	20,200	1	1	Mahasarakham Station	use	Good
	665	Nylon brush	20,600	1	1	Mahasarakham Station	use	Good
	666, 667	Nylon brush	71,400	2	2	Mahasarakham Station	use	Good
	668	Quadrat sampling rice separator	66,800	1	1	Khon Kaen Center	use	Good
	669	All purpose scissors	6,200	1	1	Khon Kaen Center	use	Good
	670	Thermo record	29,500	1	1	Khon Kaen Center	use	Good
	671	Digital camera SONY DSCF-717	118,947	1	1	Khon Kaen Center	use	Good
	672, 673	Battery	15,453	2	2	Khon Kaen Center	use	Good
	674	Hard case for DSCF-717	6,049	1	1	Khon Kaen Center	use	Good
	675	HP Office Jet Scanner	47,203	1	1	Khon Kaen Center	use	Good
	676	Eppendorf micropipet research	15,000	1	1	Nakhonratchasima Center	use	Good
	677	Habu type stable gauge for wagu	98,500	1	1	Khon Kaen Center	use	Good
	678	Rising plate Meter, standard type	86,500	1	1	Nakhonratchasima Center	use	Good
	679	Keto meter N	76,000	1	1	Nakhonratchasima Center	use	Good
	680	Serum refractometer	18,300	1	1	Khon Kaen Center	use	Good
	681	Gluctest Ace R	14,300	1	1	Nakhonratchasima Center	use	Good
	682-694	Gluctest sensor	68,400	12	6	Nakhonratchasima Center	use	chemical
	695-698	Thermo-Hygro Card (Body)	24,300	4	4	Khon Kaen Center	use	Good
	699-707	Thermo Hygro Sensor	13,600	8	8	Khon Kaen Center	use	Good
	708-711	Cable	3,800	4	4	Khon Kaen Center	use	Good
	712	Handy Thermo Hygrometer	77,700	1	1	Khon Kaen Center	use	Good
	713	Sensor Probe P for VH-10 P	41,700	1	1	Khon Kaen Center	use	Good
	714, 715	Weeding machine	19,200	2	2	Khon Kaen Center	use	Good
	716	Manure Sprayer	14,200	1	1	Khon Kaen Center	use	Good
	717	pH meter	26,200	1	1	Khon Kaen Center	use	Good
	718	Keto filmN box	22,000	6	2	Mahasarakham, Nakhonratchasima Station	use	chemical
2004	719	Infrared moisture balance FD-600	165,500	1	1	Khon Kaen Center	use	Good
	720	Grain moisture tester PhM-830	99,800	1	1	Khon Kaen	use	Good
	721, 722	Bamboo ruler 1m	1,260	2	2	Khon Kaen	use	Good
	723, 724	Bamboo ruler 50cm.	500	2	2	Khon Kaen	use	Good
	725	Daisiston	2,816	1	1	Khon Kaen	use	chemical
	726-746	Ruler 30cm	1,760	20	20	Khon Kaen	use	Good
	747-757	ruler 50 cm	15,802	10	10	Khon Kaen	use	Good
	758-768	Ruler 100 cm.	4,049	10	10	Khon Kaen	use	Good

J. F. Y	No.	Name of Equipment	Price	Q'ty	Disposal	Q'ty (Present)	Using Place	In use	Condition
	769-775	Ruler 200 cm.	11.936	6		6	Khon Kaen	use	Good
	776-786	Teeth for IS - 500	2.112	10		10	Khon Kaen	use	Good
	787-797	Teeth for IS - 500	2.112	10		10	Khon Kaen	use	Good
	798-804	Spring Balance 1 kg	6.126	6		6	Khon Kaen	use	Good
	805-811	Spring Balance 2 kg	6.126	6		6	Khon Kaen	use	Good
	811-817	Spring Balance 5kg	2.042	2		2	Khon Kaen	use	Good

ANNEX 7 Allocation of Counterpart Personal

Name	Position	Responsibility	Training period in Japan	Name of Expert	Expert' period
Mr. Chirawat Kitemsawat	Director of ANID	Project Coordinator		Mr. Yoshitake Takeoka Mr. Masami Kuramochi Mr. Koichi Nakashima	Aug 14, 99 – Aug 13, 01 Aug 27, 01 – Aug 13, 04 Aug 25, 99 – Aug 13, 04
Ms. Chaisang Phaikaew	Researcher	Selection and Evaluation of Pasture			
Ms. Jantakarn Aranant	Scientist	Selection and Evaluation of Pasture	May 19 – July 18, 2003	Mr. Koichi Nakashima Mr. Kiyomi Endo Mr. Seijun Kikuchi	Aug 25, 99 – Aug 13, 04 Aug 5, 02 – Aug 13, 04 Aug 25, 99 – Aug 13, 01
Ms. Walai Karn Jeimjetcharoon	Scientist	Seed Production and Post harvest processing Seed Inspection and Quality Control	May 26 – Aug. 3, 2003	Mr. Yoshiro Tozawa	Mar. 7, 02 – Aug 13, 04
Mr. Thumrongsakd Phonbumrung	Researcher (Animal Science)	Forage Production and Utilization	Jun.26 –Aug.14, 2001	Mr. Yoshitake Takeoka Mr. Masami Kuramochi	Aug 14, 99 – Aug 13, 01 Aug 27, 01 – Aug 13, 04
Mr. Weerasak Chinosang	Animal Researcher	Seed Production and Post harvest processing	Mar. 28 – Jun 18, 2000	Mr. Seijun Kikuchi Mr. Yoshiro Tozawa	Aug 25, 99 – Aug 13, 01 Mar. 7, 02 – Aug 13, 04
Mr. Kitti Kubkeaw	Animal Researcher	Forage Production and Utilization	Jun.23 – Aug. 30, 2003	Mr. Yoshitake Takeoka Mr. Masami Kuramochi	Aug 14, 99 – Aug 13, 01 Aug 27, 01 – Aug 13, 04
Mr. Somchit Indramanee	Director of KKANRDC	Project Manager Forage Production and Utilization		Mr. Masami Kuramochi	Aug 27, 01 – Aug 13, 04
Ms. Chureerat Saijanon	Animal Researcher	Seed Production and Post harvest processing		Mr. Seijun Kikuchi Mr. Yoshiro Tozawa	Aug 25, 99 – Aug 13, 01 Mar. 7, 02 – Aug 13, 04
Mr. Witthaya Sumamal	Animal Researcher	Forage Production and Utilization		Mr. Yoshitake Takeoka Mr. Masami Kuramochi Mr. Seijun Kikuchi	Aug 14, 99 – Aug 13, 01 Aug 27, 01 – Aug 13, 04 Aug 25, 99 – Aug 13, 01
Ms. Pimpaporn Pholsen	Scientist	Seed Production and Post harvest processing Seed Inspection and Quality Control	Jun 18 – Aug.19, 2000	Mr. Yoshiro Tozawa	Mar. 7, 02 – Aug 13, 04
Mr. Sumran Wijitphan	Animal Researcher	Selection and Evaluation of Pasture	Oct.19, – Dec. 23,1999	Mr. Koichi Nakashima	Aug 25, 99 – Aug 13, 04
Mr. Taveesak Chuenpreecha	Animal Researcher	Seed Production and Post harvest processing	Aug.4 – Sep. 20, 2003	Mr. Yoshiro Tozawa	Mar. 7, 02 – Aug 13, 04
Ms. Rumphrai Namsseelee	Scientist	Seed Production and Post harvest processing Seed Inspection and Quality Control		Mr. Seijun Kikuchi Mr. Yoshiro Tozawa	Aug 25, 99 – Aug 13, 01 Mar. 7, 02 – Aug 13, 04

Name	Position	Field of Job	Training period in Japan	Name of Expert	Expert' period
Mr. Sarayut Thaikua	Scientist	Feed and Forage Analysis and Research Seed Production and Post harvest processing	Jun 2, - Sep. 29, 2003	Mr. Koichi Nakashima Mr. Yoshiro Tozawa	Aug 25, 99 - Aug 13, 04 Mar. 7, 02 - Aug 13, 04
Mr. Kraias Kiyothong	Animal Researcher	Seed Production and Post harvest processing		Mr. Seijun Kikuchi Mr. Yoshiro Tozawa	Aug 25, 99 - Aug 13, 01 Mar. 7, 02 - Aug 13, 04
Mr. Jaroontoj Chanarasiri	Chief of Mahasarakham Station	Seed Production and Post harvest processing	Jun.2 - Jul.31, 2001	Mr. Seijun Kikuchi Mr. Yoshiro Tozawa	Aug 25, 99 - Aug 13, 01 Mar. 7, 02 - Aug 13, 04
Mr. Viroj Ritruetchai	Animal Researcher	Selection and Evaluation of Pasture Forage Production and Utilization	Jul. 1 - Aug. 30, 2003	Mr. Koichi Nakashima Mr. Masami Kuramochi	Aug 27, 01 - Aug 13, 04
Mr. Supachai Udchachon	Animal Researcher	Seed Production and Post harvest Forage Production and Utilization		Mr. Yoshitake Takeoka Mr. Seijun Kikuchi Mr. Masami Kuramochi Mr. Yoshiro Tozawa	Aug 13, 99 - Aug 13, 01 Aug 25, 99 - Aug 13, 01 Aug 27, 01 - Aug 13, 04
Ms. Sasithon Thinnakorn	Animal Researcher	Selection and Evaluation of Pasture	Sep. 1 - Oct. 11, 2003	Mr. Koichi Nakashima	Aug 25, 99 - Aug 13, 04
Ms. Ganda Nakamance	Animal Researcher	Selection and Evaluation of Pasture	Jun 18 - Sep. 15, 2000	Mr. Koichi Nakashima	Aug 25, 99 - Aug 13, 04
Ms. Sasiporn Kunakhunkiti	Scientist	Forage Production and Utilization		Mr. Yoshitake Takeoka Mr. Masami Kuramochi	Aug 14, 99 - Aug 13, 01 Aug 27, 01 - Aug 13, 04

東北タイ牧草種子生産開発計画 PDMe

ターゲットグループ：東北タイ農民 協力期間：1998.8.14～2004.8.13 相手側実施機関：農業・共同組合省畜産振興局家畜養育部

作成日：2004年3月3日

上位目標	目標	指標	指標データ入手手段	外部条件
<p>タイの畜産振興に必要な飼料が確保される</p>	<p>1 数種類の優良品種が育成される 2 新品種の栽培面積が畜産農家で拡大される 3 畜産農家が飼料、乾草、サイレージの生産を拡大する</p>	<p>1 数種類の優良品種が育成される 2 新品種の栽培面積が畜産農家で拡大される 3 畜産農家が飼料、乾草、サイレージの生産を拡大する</p>	<p>1 家畜養育部の年次報告書 2 畜産農家の調査及びモニタリング 3 畜産農家の調査及びモニタリング</p>	<p>1 政府の畜産政策・種子生産政策が維持される 2 種子生産市場が維持又は拡大する</p>
<p>プロジェクト目標 タイ東北部の小規模畜産農家及び種子生産農家が利用可能な牧草種子及び適切な飼料の生産・利用・調製技術が開発される</p>	<p>1 新しい牧草品種の育成の重要性が利害関係者に理解される 2 東北タイに適応する幾つかの優良系統品種が選抜される 3 家畜養育部で新系統の種子生産が始まる 4 家畜養育部において原種が生産され、タイの種子生産農家に配布される 5 タイにおける牧草種子の検査及び品質管理システムが家畜養育部により構築される 6 良質粗飼料利用の重要性が利害関係者に理解される</p>	<p>1 プロジェクト活動報告書及び関係者インタビュー 2 プロジェクト活動報告書 3 家畜養育部の年次報告書及びプロジェクト活動報告書 4 家畜養育部の年次報告書及びプロジェクト活動報告書 5 家畜養育部の年次報告書及びプロジェクト活動報告書 6 プロジェクト活動報告書及び関係者インタビュー</p>	<p>1 プロジェクト活動報告書及び関係者インタビュー 2 プロジェクト活動報告書 3 家畜養育部の年次報告書及びプロジェクト活動報告書 4 家畜養育部の年次報告書及びプロジェクト活動報告書 5 家畜養育部の年次報告書及びプロジェクト活動報告書 6 プロジェクト活動報告書及び関係者インタビュー</p>	<p>1 普及組織がプロジェクト成果を積極的に利用する 2 開発された技術が農家に受け入れられる</p>
<p>成果 1 優良牧草品種の評価選抜技術が開発される 2 原種及び流通種子の生産・収穫調製技術が開発される 3 牧草種子の検査及び品質管理技術が開発される 4 良質粗飼料生産、調製及び利用技術が開発される</p>	<p>1-1 評価及び選抜に関する4種類のマニュアルが作成される 1-2 対象牧草種の選抜された系統数 1-3 育種事業計画（活動場所、責任者、運営方法、新品種生産時期）が作成される 2-1 改善された牧草種子生産技術及び収穫後処理技術と器具数 2-2 牧草種子の増殖と収穫調製及び保存方法が決定される 2-3 家畜養育部における種子生産を含めた牧草種子流通管理システムの将来計画が作成される 3-1 検査及び品質管理に関する3種類のマニュアルが作成される 3-2 ISTAの種子検定スキームに沿った種子検査が実施できる職員数が10人以上になる 3-3 DLDが自らの基準で牧草種子品質保証ができる 4-1 粗飼料生産、調製及び利用のために改善された適正技術と器具数 4-2 粗飼料生産、調製及び利用に関する2種類のマニュアルが作成される 4-3 粗飼料生産、調製及び利用技術に関する実証展示に参加するモデル農家の数 4-4 粗飼料の重要性及び有効性が実証展示プログラムの参加者に理解される</p>	<p>1 評価及び選抜に関する4種類のマニュアルが作成される 2 対象牧草種の選抜された系統数 3 育種事業計画（活動場所、責任者、運営方法、新品種生産時期）が作成される 4 改善された牧草種子生産技術及び収穫後処理技術と器具数 5 牧草種子の増殖と収穫調製及び保存方法が決定される 6 家畜養育部における種子生産を含めた牧草種子流通管理システムの将来計画が作成される 7 検査及び品質管理に関する3種類のマニュアルが作成される 8 ISTAの種子検定スキームに沿った種子検査が実施できる職員数が10人以上になる 9 DLDが自らの基準で牧草種子品質保証ができる 10 粗飼料生産、調製及び利用のために改善された適正技術と器具数 11 粗飼料生産、調製及び利用に関する2種類のマニュアルが作成される 12 粗飼料生産、調製及び利用技術に関する実証展示に参加するモデル農家の数 13 粗飼料の重要性及び有効性が実証展示プログラムの参加者に理解される</p>	<p>1 家畜養育部の年次報告書及びプロジェクト活動報告書 2 家畜養育研究センターにおける種子検査及び品質管理記録 3 各種マニュアル及び教材の内容 4 畜産農家の調査及びモニタリング</p>	<p>種子生産及び普及活動への十分な支援が確保される</p>
<p>活動 1 優良牧草品種の評価選抜技術の開発 2 原種及び流通種子の生産・収穫調製技術の開発 3 牧草種子の検査及び品質管理技術の開発 4 良質粗飼料生産、調製及び利用技術の開発</p>	<p>投入 1 長期専門家派遣 2 短期専門家派遣 3 C/P研修員受入 4 機材供与</p>	<p>投入 1 プロジェクト用地、建物、備品 2 カウンターパート、運営スタッフ 3 運営予算</p>	<p>タイ側 1 プロジェクト用地、建物、備品 2 カウンターパート、運営スタッフ 3 運営予算</p>	<p>C/Pが移動しない 前提条件 プロジェクト関係者及び関係機関の協力が得られる</p>

5. プロジェクト投入実績

(1) 日本側の投入実績

1) 専門家の派遣実績

No.	長期専門家氏名	指導科目	派遣機関	派遣前の所属	備考
1	武岡 義武 (チーフアドバイザー)	粗飼料生産・利用	1999.08.14 - 2001.08.13	農林水産省畜産部畜産技術課	帰国
2	清水 芳洋	業務調整	1999.08.14 - 2003.08.13	元 JICA 専門家	帰国
3	菊池 成純	種子生産・検査	1999.08.25 - 2002.08.13	元 JICA 専門家	帰国
4	中嶋 紘一	評価・選抜育種	1999.08.25 - 2004.08.13	農林水産省草地試験場	派遣中
5	倉持 正実 (チーフアドバイザー)	粗飼料生産・利用	2001.08.27 - 2004.08.13	農林水産省畜産部畜産技術課	派遣中
6	戸澤 芳郎	種子生産・検査	2002.03.07 - 2004.08.13	農林水産省畜産部飼料課	派遣中
7	遠藤 清美	業務調整	2002.08.05 - 2004.08.13	元 JICA 専門家	派遣中

No.	短期専門家氏名	指導科目	派遣機関	派遣前の所属	備考
1	甘利 和明	種子品質検査検定	1999.11.08 - 2000.01.07	農林水産省家畜改良センター	
2	余田 健二	種子収穫精選	1999.11.08 - 2000.01.07	農林水産省家畜改良センター	
3	河本 英憲	粗飼料利用	2000.02.14 - 2000.03.29	農林水産省草地試験場	
4	辻 佳秀	種子品質検査検定技術	2001.01.15 - 2001.02.28	農林水産省家畜改良センター	
5	清水 逸秀	収穫精選技術	2001.01.15 - 2001.02.28	農林水産省家畜改良センター	
6	中川 仁	アポミックス育種技術	2001.02.28 - 2001.03.25	農林水産省草地試験場	
7	増田 泰久	熱帯放草調製理論・評価	2001.04.10 - 2001.03.08	九州大学大学院農学部	
8	奥村 健治	熱帯イネ科の牧草育種手法	2001.05.10 - 2001.06.05	沖縄県畜産試験場	
9	河本 英憲	良質放草調製法	2001.06.18 - 2001.08.14	独立行政法人畜産草地研究所	
10	御子柴 義郎	熱帯マメ科のウイルス病	2001.04.30 - 2001.09.27	独立行政法人畜産草地研究所	
11	中西 雄二	放牧技術	2002.09.25 - 2002.10.30	独立行政法人畜産草地研究所	
12	松岡 秀道	地域適応試験・特性検定	2002.10.27 - 2002.11.12	独立行政法人畜産草地研究所	
13	御子柴 義郎	土壌伝染性ウイルス病	2002.10.27 - 2002.11.12	独立行政法人畜産草地研究所	
14	余田 健二	種子調製・検査技術	2002.12.10 - 2003.01.31	独立行政法人家畜改良センター	
15	杉田 紳一	育種組織体制・品種審査	2003.10.12 - 2003.10.26	独立行政法人畜産草地研究所	
16	山時 丈昌	種子検査システム	2003.10.01 - 2003.11.29	独立行政法人家畜改良センター	

2) カウンターパート研修員の受入実績

No.	研修員氏名	受入期間	協力分野名	研修内容及び受入機関	当時の役職	現在の役職
1	Mr. Sumran Wijjphan	1999.10.19-12.23	評価・選抜育種	適正牧草品種の選抜・評価技術 草地試験場	Pasture Researcher	Pasture Researcher
2	Mr. Weerasak Chinosang	2000.5.28-6.18	種子栽培・精選技術	牧草種子の生産収穫・調製貯蔵技術 家畜改良センター	Animal Researcher	Animal Researcher
3	Ms. Ganda Nakamane	2000.6.18-9.15	評価・選抜育種	牧草耐病虫性の評価・選抜 草地試験場	Pasture Researcher	Pasture Researcher
4	Ms. Pimpaporn Pholsen	2000.6.18-8.19	種子検査・品質管理	牧草種子品質検査 家畜改良センター、草地試験場	Scientist	Scientist
5	Mr. Thumrongsakd Phonbumrung	2001.6.26-8.14	粗飼料生産・利用	粗飼料生産・調製・利用及びその普及 家畜改良センター	Researcher (Animal Science)	Researcher (Animal Science)
6	Mr. Jaroonroj Chantarasiri	2001.6.2-7.31	種子栽培・精選技術	牧草種子の生産・収穫・調製技術 家畜改良センター	Director of MS station	Director of MS station
7	Mr. Sarayut Thaikua	2002.7.2-9.29	評価・選抜育種	熱帯牧草の評価・選抜 畜産草地研究センター	Scientist	Scientist
8	Mr. Viroj Ritruetchai	2002.7.1-8.30	粗飼料生産・利用	粗飼料生産・調製・利用 家畜改良センター	Animal Researcher	Animal Researcher
9	Ms. Jantakarn Arananat	2003.5.19-7.18	評価・選抜育種	最適牧草の評価・選抜 畜産草地研究センター	Scientist	Scientist
10	Ms. Walaikarn Jiemjetcharoon	2003.5.26-8.3	種子検査・品質管理	牧草種子検査・品質管理 家畜改良センター	Scientist	Scientist
11	Mr. Kitti Kookaew	2003.6.23-8.30	粗飼料生産・利用	粗飼料生産・調製・利用技術 家畜改良センター	Animal Researcher	Animal Researcher
12	Mr. Taweesak Chuenpreecha	2003.8.4-9.20	種子栽培・精選技術	牧草種子生産の栽培技術・精選技術 家畜改良センター	Animal Scientist	Animal Scientist
13	Ms. Sasithon Thinnakorn	2003.9.1-10.11	評価・選抜育種	牧草種子におけるエコタイプ等の遺伝資源 の活用/畜産草地研究センター	Animal Researcher	Animal Researcher

3) 機材及び現地業務費

項目/年度	1999	2000	2001	2002	2003	2004(plan)	合計(円)
機材(本邦調達)	0	26,106	5,317	0	0	0	31,423
機材(現地調達)	21,841	3,384	12,123	7,739	6,823	740	52,650
専門家携行機材	3,945	1,031	2,614	3,430	1,987	0	13,007
機材合計	25,786	30,521	20,054	11,169	8,810	740	97,080
一般現地業務費	2,767	3,452	3,959	3,809	4,955	3,487	22,429
現地適用化事業費	0	1,513	937	2,386	5,000	2,082	11,918
合計	28,553	35,486	24,950	17,364	18,765	6,309	131,427

*2003年は見込み値

専門家派遣及び研修受け入れ

項目/年度	1999	2000	2001	2002	2003	2004	合計(名)
長期専門家	4	4	4	4	4	4	24
短期専門家	3	3	4	4	2	1	17
C/P研修	2	2	2	2	5	3	16

2004年は計画額

(2) タイ側投入実績

1) タイ側予算	1999	2000	2001	2002	2003	2004(plan)	合計(Baht)
職員給与	21,530,000	17,181,800	20,083,800	20,393,400	21,633,560	21,775,400	122,597,960
旅費・日当	435,300	346,500	346,500	574,500	505,400	530,100	2,738,300
試験研究費	2,057,550	0	1,236,313	926,430	1,004,435	3,554,970	8,779,698
JICA人夫賃	0	321,207	321,207	415,679	415,679	243,776	1,717,548
放牧牛・肥料	0	0	0	0	0	120,000	120,000
研修(技術者、農家)	150,000	141,500	0	317,000	540,100	443,000	1,591,600
合計	24,172,850	17,991,007	21,987,820	22,627,009	24,099,174	26,667,246	137,545,106

*3サイトのプロジェクト関連の予算合計額

2) その他

秘書/ガソリン代	1,999	2,000	2,001	2,002	2,003	2,004	合計(Baht)
DTECより補填	0	577,765	616,838	566,879	701,898	689,232	3,152,612

6. 活動実績一覧表

活動項目		活動内容	到達目標	進捗状況と実績	達成度	活動遅延の理由	今後の計画
1) 優良牧草品種の評価・選抜技術の開発	a) タイの主要牧草品種の調査確認	a) DLD等からのデータの収集	a) タイの現状が明らかになる。	・1970年代から導入され現在主要牧草となっている <i>S. guineensis</i> を例に導入、評価を分析し取り纏めた。 ・報告書としてタイ語、英語版として印刷。	4	・取り纏め、英語版、タイ語版等で手間取り1年遅れとなった。	・プロジェクト終了後の課題のフォローを含め、タイ国における牧草品種採来計画の策定を行う。
a)-1 導入システム	b)-1 最適品種選定のための日本で開発された選抜技術の導入	b)-1 Cノワが選抜技術を獲得し、タイに適合する高飼料価値、耐病性、高収量の品種開発に用いられる。	b)-1 Cノワが選抜技術を獲得し、タイに適合する高飼料価値、耐病性、高収量の品種開発に用いられる。	・日本からの短期専門家の招へいを含め、日本のシステム、マニュアルを紹介すると共に、英語版、タイ語版のマニュアルを策定。	3	・マニュアル策定が遅れ、タイ側の実行体制が定まらなかった。	・最終年度に有望系統を用いた地域適応性検定及び特性検定を各種採来計画に即り実施する。
a)-2 評価システム	b)-2 地域適応性及び特性検定マニュアルの策定。	b)-2 新品種の育種のための地域適応性検定、特性検定マニュアルが策定される。	b)-2 新品種の育種のための地域適応性検定、特性検定マニュアルが策定される。	・同上	3	・マニユアル策定が遅れた。	
a)-3 品種及び生産力	b)-3 原々種の増殖。	b)-3 品種の特性が維持される	b)-3 品種の特性が維持される		3		
b) 牧草品種の選抜技術と原種保存技術の開発	c) 熱帯イネ科・マメ科牧草選抜技術の開発	c) 熱帯イネ科・マメ科牧草選抜技術の開発	c) プロジェクトの中で熟帯イネ科・マメ科牧草の評価マニュアルが策定され、マニユアルを使って牧草選抜資源が評価される。	・懸想となる標準系統を定めると共に、育種家種子、原々種の採種方式を検討。	3	・原々種、原種の検定は時間的に間に合わなかった。	・タイ側でプロジェクト終了後も検定を継続する。
c)-1 イネ科	c)-1-1 <i>Panicum maximum</i> TD58	c)-1-1 <i>Panicum maximum</i> TD58	c)-1-1 <i>Panicum maximum</i> TD58	・形態的な幾つかの変異が認められたが、試験区の不均一さから判定は難しい。 ・アボミクシスの顕微鏡による判定が一部終了していない。	3	・全体として試験現場の不均一のため、試験データにばらつきがある。	
c)-2 マメ科	c)-1-2 <i>Brachiaria ruziziensis</i>	c)-1-2 <i>Brachiaria ruziziensis</i>	c)-1-2 <i>Brachiaria ruziziensis</i>	・個体値による評価、後代検定等による評価により合成品種育成のための母本を選抜。	4		
	c)-2-1 <i>Sylosanthus guineensis</i> CIT184	c)-2-1 <i>Sylosanthus guineensis</i> CIT184	c)-2-1 <i>Sylosanthus guineensis</i> CIT184	・自然交雑の多いことを明らかにし、個体値、後代検定により各種形質に優れた母本を選抜。	4		
	c)-2-2 <i>Sylosanthus hamata</i>	c)-2-2 <i>Sylosanthus hamata</i>	c)-2-2 <i>Sylosanthus hamata</i>	・白蟻の被害が著しく永続性の選抜は出来なかったが、耐病性、生産力、緑葉維持等の特性を有する優良母本を選抜。	4		
	c)-2-3 <i>Centrosema pascurianum</i>	c)-2-3 <i>Centrosema pascurianum</i>	c)-2-3 <i>Centrosema pascurianum</i>	・病害、特にウィルス病の被害が年々稀くなり十分な評価選抜が出来なかった。	2	・バクテリアの汚染地となった。	・当面各種採来計画からは <i>Centrosema pascurianum</i> は削除する。
	c)-2-4 <i>Alysicarpus vaginalis</i>	c)-2-4 <i>Alysicarpus vaginalis</i>	c)-2-4 <i>Alysicarpus vaginalis</i>	・遺伝資源収集評価のモデルとして全国より34系統収集し特性を明らかにした。 ・3次特性については終了していない。	3	・生産力検定には多くの労力と現場が必要である。	・必要に応じてタイ側のみのみで検定する。

c)-3	耐病性の評価	c)-3-1 ほ場抵抗性		<ul style="list-style-type: none"> ・ <i>S. givimensis</i> の炭疽病についてはほぼ完全であるが、<i>C. pasconorum</i> についてはあまりに被害が著しく、リゾクトニア、ウィルスともに検査方法が確立できなかつた。 ・ 人工接種には施設・装置等が必要で幼苗検査など出来なかつたが、ウィルス接種トレーニングは完了。 	<ul style="list-style-type: none"> ・ ウィルス病と植物の基本的な発病メカニズムの解明が必要。 ・ 人工接種装置、網室、隔離ガラス室などが必要。 	<ul style="list-style-type: none"> ・ <i>C. pasconorum</i> については対応が困難なため育種対象草種から削除する。
d)	牧草品種育種技術の導入	<ul style="list-style-type: none"> d) 熱帯イネ科・マメ科牧草の育種基礎技術の導入 d)-1-1 顕微鏡によるアポミクシスの確認 d)-1-2 後代検査 d)-2-1 <i>B.ruziziensis</i> の交配技術 d)-2-2 組合せ能力 	<ul style="list-style-type: none"> ・ ほ場における変異個体の発見は難しいが、選抜した個体の後代検査を実施中。更に後鏡(胚のう分析)により生殖様式を確認。 ・ 後代検査による一次サイクル、二次サイクルの選抜を行い、選抜母本により 2001,2002 各年に新合成系統を得、生産力検査中。三次サイクルの合成を実施。 ・ オープン、隔離ともに後代検査の結果幅広い変異を示し交雑率の高いことを確認。 ・ <i>S. guianensis</i> 及び <i>S. hamata</i> については個体評価及び後代検査で評価。 ・ 生産力検査の結果、スタイロ2種については各々優良な新混合系統を得た。 ・ <i>C. pasconorum</i> も同様に行うが病害(ウィルス)の発生著しく後代検査の採種が不能。 	<ul style="list-style-type: none"> ・ ほ場の不均一性。 ・ C/Pが多忙。 	<ul style="list-style-type: none"> ・ 新品種育成に向け合成了した新系統の系統適応性検査、特性検査試験を開始し、プロジェクト終了後も継続する。 	
d)-3	自殖性マメ科育種	<ul style="list-style-type: none"> d)-3-1 自殖率検査 d)-3-2 個体値による選抜 	<ul style="list-style-type: none"> ・ 新品種の認定には、地域適応性・特性検査が必要。 ・ <i>C. pasconorum</i> はウィルス病発生により十分な評価が出来ない。 	<ul style="list-style-type: none"> ・ 最終年以降も系統適応性検査・特性検査は継続する。 ・ <i>C. pasconorum</i> は今後育種対象草種として当面取り上げない。 		
2)	原種・流通種子の生産・収穫調製技術の開発					
a)	牧草種子生産のための栽培技術の開発					
a)-1	現況調査	<ul style="list-style-type: none"> a)-1-1 クイ国の種子生産研究レポートの収集 a)-1-2 東北タイの自然条件資料の収集 a)-1-3 既存の報告書からの種子の生産費の調査 a)-1-4 主要な草種の栽培方法に関する調査 	<ul style="list-style-type: none"> ・ タイ国の過去約 20 年間の牧草種子生産に関する文献の収集と内容調査を実施し、1999 年に終了。 ・ プロジェクトサイト(コンケン市タプア)の試験圃場の土壌と気象データの収集。(1999-2000 年) ・ 種子生産コストと売価価格の調査は、前 JICA 個別専門家の調査報告書を参照。 ・ 4 戸の採種農家を抽出し、栽培から精選に至る作業の課程を開き取り調査。また、採種農家の作業を把握するため、作業日記の収集を 2 軒の農家で実施。 	<ul style="list-style-type: none"> ・ 本年度の研究がまだ終了していかないため。 		

<p>a) 2 原種生産の改良</p>	<p>a) 2 原種用の栽培技術の改良</p>	<p>a) 2 原種の遺伝的純度を家畜栄養研究センターで維持する。</p>	<p>・これまで① <i>S. gitanensis</i> の刈取り時期の違い及び移植時期の違いによる種子生産量調査、② <i>C. paschnorum</i> の移植時期と灌漑利用に関する調査、③ <i>C. paschnorum</i> のラックを用いた栽培技術に関する調査、④ 暖地型マメ科牧草の硬実処理に関する調査を実施し、原種栽培技術改良に関する多くのデータを取得。</p>	<p>・来年4月までにデータをまとめる予定。</p>
<p>a) 3 選ばれた草種のための種子生産の状況</p>	<p>a) 3 選ばれた草種のための種子生産の状況</p>	<p>a) 3 選ばれた草種のための種子生産方法を改良する。</p>	<p>・本年度の研究がまだ終了していないため。</p>	<p>・来年4月までにデータをまとめる予定。</p>
<p>b) 牧草種子収穫・精選処理技術の開発</p>	<p>b) 1 農家における種子収穫と精選技術レベルの調査</p>	<p>b) 1 プロジェクト・サイトにおける現状の問題を確認する。</p>	<p>・農家段階の種子収穫技術水準を調査するため、<i>P. maximum</i>、<i>B. ruziziensis</i>、<i>S. hamata</i> の収穫方法を検証するとともに、実際に農家と同じ作業を経験し、具体的な改善可能な点を明らかにした。</p>	<p>・現在機械の開発及び改良を継続中。</p>
<p>b) 2 収穫及び精選処理技術の改良</p>	<p>b) 2-1 農家のための種子収穫と精選器具の開発</p>	<p>b) 2-1 農家はより少ない労働コストで品質の高い種子を得ることができ。</p>	<p>・イネ科の種子収穫用器具として「タイガー」を開発。 ・マメ科用種子収穫用器具として「スイーパー」を日本から導入して現在改良中。 ・精選機の開発としては「手動及び電動唐箕」、「ハマタセバレータ」、「動力付きシーブマシン」、「クロッドブレードクママシン」等を開発し、本年度は農家へのデモンストレーション用として、電動唐箕とシーブマシンを製作。 ・チュンエンステーションにおいて、精選が困難なマメ科を中心とした各草種のための精選処理システムを設置し、2001年に稼働を開始。さらに、2003年1月には精選の最終工程用機械である「ベルベットロータール」を設置し、メンテナンス方法も含め技術移転はほぼ終了。</p>	<p>・プロジェクト期間終了までに開発とデータ収集を終了する予定。</p>
<p>c) 牧草種子貯蔵技術の開発</p>	<p>c) 1-1 農家段階の種子貯蔵方法の調査</p>	<p>c) 1 プロジェクト・サイトにおける現状の問題を確認する。</p>	<p>・調査の結果、農家段階では収穫後、乾燥して直ちに家畜栄養部に販売しているため、特設貯蔵による問題が無いことがわかった。 ・青種家種子等の重要な種子の貯蔵を前庭にコンケンセンターとナコンラチャシマセンターの種子低温貯蔵庫の調査を行った。その結</p>	
<p>c) 1-2 家畜栄養研究センターにおける種子貯蔵の調査</p>	<p>c) 1-2 家畜栄養研究センターにおける種子貯蔵の調査</p>			

<p>c)-2 牧草種子貯蔵技術の改良</p>	<p>c)-2 5 草種の適切な貯蔵方の決定</p>	<p>c)-2 5 草種の牧草について、原種と流通種子の適切な貯蔵法が実施される。</p>	<p>a)-2 5 草種の牧草について、原種と流通種子の適切な貯蔵法が実施される。</p>	<p>果、面積については問題ないがコングセンタターは一部補修の必要あり、ナコンラチャシマセンターは故障し、稼働できない状況にあることがわかった。この結果を基に、平成13年度供与機材として小型種子貯蔵庫をコングセンターに新たに設置した。</p> <p><i>P. maximum</i>, <i>B. ruziziensis</i>, <i>S. guianensis</i>, <i>S. immitata</i>, <i>C. pascurorum</i> について、それぞれ常温、5℃、15℃の条件下で保存し、定期的に水分含量と発芽率を調査している。現在、調査継続中。</p>	<p>3</p>	<p>本年度の研究がまだ終了していないため。</p>	<p>来年度4月までにデータをとりまとめ、終了の予定。</p>
<p>3) 牧草種子の検査及び管理技術の開発</p>	<p>a)-1 家畜栄養研究所の種子検査の調査</p>	<p>a)-1 プロジェクト・サイトに於ける現状の問題を確認する。</p>	<p>a)-1 プロジェクト・サイトに於ける現状の問題を確認する。</p>	<p>・2000年まで本調査を実施した結果、検査員の技術及び知識は高い水準にあるものの、使用している検査機器は古いものが多く、目標とするISTAのルールに基づく検査を実施するには適さないものがあることが分かった。その後、検査に適した機器を新たに導入し、現在は問題が解決している。</p>	<p>4</p>	<p>・2000年まで本調査を実施した結果、検査員の技術及び知識は高い水準にあるものの、使用している検査機器は古いものが多く、目標とするISTAのルールに基づく検査を実施するには適さないものがあることが分かった。その後、検査に適した機器を新たに導入し、現在は問題が解決している。</p>	<p>・2000年まで本調査を実施した結果、検査員の技術及び知識は高い水準にあるものの、使用している検査機器は古いものが多く、目標とするISTAのルールに基づく検査を実施するには適さないものがあることが分かった。その後、検査に適した機器を新たに導入し、現在は問題が解決している。</p>
<p>a)-2 種子品質検査技術の改善</p>	<p>a)-2-1 ISTAの規則を応用した牧草種子検査マニュアル(タイ語)の公表。</p>	<p>a)-2 牧草種子検査がISTAのルールに従いC/P及び検査職員によって実施される。</p>	<p>a)-2 牧草種子検査がISTAのルールに従いC/P及び検査職員によって実施される。</p>	<p>・2003年3月までに、ISTAのルールに準じたタイ国の「種子検査マニュアル」(Seed Inspection Manual)を完成し、牧草種子検査担当者及び関係機関に配布。</p>	<p>4</p>	<p>・2003年3月までに、ISTAのルールに準じたタイ国の「種子検査マニュアル」(Seed Inspection Manual)を完成し、牧草種子検査担当者及び関係機関に配布。</p>	<p>・2003年3月までに、ISTAのルールに準じたタイ国の「種子検査マニュアル」(Seed Inspection Manual)を完成し、牧草種子検査担当者及び関係機関に配布。</p>
<p>b) 種子品質管理技術の開発</p>	<p>a)-2-2 5つの研究所の所員を「牧草種子検査員」として養成。</p>	<p>a)-2-2 5つの研究所の所員を「牧草種子検査員」として養成。</p>	<p>a)-2-2 5つの研究所の所員を「牧草種子検査員」として養成。</p>	<p>・2003年3月17日～19日で5つの研究所の検査員を対象に「牧草種子検査員」18名を養成。</p>	<p>4</p>	<p>・2003年3月17日～19日で5つの研究所の検査員を対象に「牧草種子検査員」18名を養成。</p>	<p>・2003年3月17日～19日で5つの研究所の検査員を対象に「牧草種子検査員」18名を養成。</p>
<p>b)-1 種子品質管理技術の改良</p>	<p>b)-1-1 原種と流通種子のための圃場基準の策定。</p>	<p>b)-1 増殖種子の品質管理が遺伝的純度を維持するため、OECD種子スキームに基づいて実施される。</p>	<p>b)-1 増殖種子の品質管理が遺伝的純度を維持するため、OECD種子スキームに基づいて実施される。</p>	<p>・現在5つの種子検査所で、品質管理に関する業務の監査を行うための準備中。</p>	<p>3</p>	<p>・現在5つの種子検査所で、品質管理に関する業務の監査を行うための準備中。</p>	<p>・現在5つの種子検査所で、品質管理に関する業務の監査を行うための準備中。</p>
<p>b)-1-2 主要草種の種子品質管理のための基準の策定し、圃場の改良</p>	<p>b)-1-2 主要草種の種子品質管理のための基準の策定し、圃場の改良</p>	<p>b)-1-2 主要草種の種子品質管理のための基準の策定し、圃場の改良</p>	<p>b)-1-2 主要草種の種子品質管理のための基準の策定し、圃場の改良</p>	<p>・2001年に「OECD牧草種子スキーム概論」の講義を実施。</p> <p>・2002年10月までにOECD種子スキームに基づいた、タイ国の「圃場検査マニュアル」</p>	<p>4</p>	<p>・2001年に「OECD牧草種子スキーム概論」の講義を実施。</p> <p>・2002年10月までにOECD種子スキームに基づいた、タイ国の「圃場検査マニュアル」</p>	<p>・2001年に「OECD牧草種子スキーム概論」の講義を実施。</p> <p>・2002年10月までにOECD種子スキームに基づいた、タイ国の「圃場検査マニュアル」</p>

検査マニュアルを公表。	(Field Inspection Manual) を完成させると同時に公表。 ・2002年10月9日～11日、11月16日～18日の2期にわたり、研究者、技術者を対象とした圃場検査員研修を実施し、42名の検査員を養成。 ・2002年及び2003年に短期専門家によって日本の事後検査の方法をカウンタートパートに技術移転し、現在コンケンセンターで Post Control Test を試行している。マニュアルは現時点で約80%完成。	4 ・マニュアルのアウトラインはほぼ完成したが、新品種の育成には、まだ時間を要するため、具体的な検査マニュアルを作成することができなかった。	今後、代表例としていくつかの草種を抽出し、参考としてマニュアル化する予定。
4) 飼料生産・調製・利用技術の改善 a) 草地管理技術の開発と普及 a)-1 現況調査	b)-1-3 原種生産のための「圃場検査」に基づいた圃場検査員を養成。 b)-1-4 事後検査マニュアルの公表	4 ・2戸の酪農家と1戸の肉牛農家を対象に実地調査を実施。 ・コンケン地域の67の酪農家を対象に実地調査を実施。 ・技術研修会に参加した146戸の畜産農家を対象に粗飼料生産利用に対するアンケート調査を実施。 3 ・乳用牛育成牛のための放牧及び貯蔵飼料生産技術確立のための試験を実施中。 3 ・乳用牛のための草地管理試験を実施中。 4 ・鎮圧ローラーの試作とその調査を実施。 4 ・調査はa)の調査と一体的に実施。 4 ・ヘイベラーの試作。 4 ・竹を利用したソーラーハウス試作。 4 ・ソーラーハウス用乾草台の試作。 3 ・竹製ソーラーハウスを利用した乾草調製試験の実施。 4 ・添加剤を利用した良質サイレージ調製試験の実施	・技術研修会におけるアンケート調査は今後も引き続き実施する。 ・プロジェクト終了まで実証展示及び農家研修会と併せて実施する。 ・プロジェクト終了後も試験を継続する。 ・試験はプロジェクト終了時まで実施する。
a)-2 草地管理技術の改善 b) 牧草収穫調製技術の開発 b)-1 現況調査 b)-2 農家のための乾草及びサイレージ調製技術の改善 b)-2-1 雨季における、ソーラーハウスを利用した良質乾草生産技術の試行 b)-2-2 農家のための良質サイレージ生産技術の試行	a)-1 農家段階の粗飼料生産技術調査 a)-2 C/Pが普及職員及びモデル農家のために草地管理技術のデータ及び情報を取得する。 b)-1 農家段階の牧草収穫調製技術の調査 b)-2 C/Pが普及職員及びモデル農家のために乾草及びサイレージ調製技術のデータ及び情報を取得する。	4 ・調査はa)の調査と一体的に実施。 4 ・ヘイベラーの試作。 4 ・竹を利用したソーラーハウスの試作。 4 ・ソーラーハウス用乾草台の試作。 3 ・竹製ソーラーハウスを利用した乾草調製試験の実施。 4 ・添加剤を利用した良質サイレージ調製試験の実施	・技術研修会におけるアンケート調査は今後も引き続き実施する。 ・プロジェクト終了まで実証展示及び農家研修会と併せて実施する。 ・プロジェクト終了後も試験を継続する。 ・試験はプロジェクト終了時まで実施する。
c) 収穫調製利用技術の実証展示 c)-1 モデル農家に対する	c)-1-1 有用技術の公表	3 ・農家向けマニュアルの作成。	・改訂を予定

<p>る技術移転</p>	<p>c)-1-2 良質粗飼料の重要性と効果を酪農家に啓蒙するためのモデル農家の設立。 c)-1-2 実践的な良質粗飼料生産のためのモデル農家の設立</p>	<p>用な良質粗飼料収穫・調製・利用技術を指導する。</p>	<p>・普及職員向けマニュアルの作成。 ・農家向け乾草及びサイレージ調製マニュアルの作成。 ・4戸の酪農家をモデル農家として選定し、ほ場管理技術、サイレージ調製技術等を指導。 ・放牧試験ほ場及び酪農家のほ場を活用した良質粗飼料生産利用に関する研修会の開催。 ・4つの粗飼料生産農家グループに対するオンラインワークショップの利用による乾草調製技術を指導。</p>	<p>3 3 4 3 4</p>	<p>・現在作成中 ・現在作成中</p> <p>・12月に開催予定だった農家研修会が口蹄疫の発生により延期。</p>	<p>・本年度中に作成予定。 ・本年度中に作成予定。 ・実証展示はプロジェクト終了まで実施する。 ・次年度も農家研修会を開催する。</p>
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7. 牧草育種事業将来計画

Future Plan of Pasture Breeding

Division of Animal Nutrition, DLD

The role of Pasture Breeding will fulfill the livestock promotion policy of Thailand

The Livestock promotion policy of Thailand has been emphasized on high production and quality livestock product, for consumption in country and for better competition in export and be part of the kitchen of the world. This policy resulted in large demand of dairy and beef production. That consequently require large amount of good quality forage production for feeding animal.

In order to make availability of forages enough for feeding livestock, the appropriate varieties of forage species are urgent needed to fulfill this demand. Pasture breeding can play the important role on supplying the suitable forage species that can well adapted to specific local soil, climate and livestock farming system in Thailand. The better adapted varieties can increase availability of feed all year round, which can solve problem on lack of feed in dry season. Not only increase production but pasture breeding can also increase in quality of feed. In case of pasture legume, it can be a cheap source of protein and can reduce the amount of concentrate feed use, thus reduce the cost of production. Pasture breeding can also provide the disease resistant variety that usually be the problem with the current legume species used in country.

The livestock farmers can get more benefit from utilizing better forage variety through having better animal performance and better production, the lower cost of feeding provide more income and can improve their livelihood.

The other reason to have new forage cultivar in Thailand is that it is urgent and necessary for Thailand to breed our own cultivar in order to stay in business of pasture seed producers. This is because of the practice of seed production for export must follow the plant variety's right and conform with the law.

The new forage cultivar will benefit to farmer seed producer that need suitable pasture variety for specific environment of the country. The introduction of new cultivar will increase possibility of those farmers to increase seed production, increase income and improve their will being.

The Pasture Breeding System

From the Pasture Seed Production Development project which has been carried on in The Northeast of Thailand under technical collaborative between JICA and The Department of Livestock Development, Thailand, during 1999-2004. One of 4 main activities of the JICA-DLD Pasture Seed Production Development Project was The Development of Evaluation and Selection Techniques of Appropriate Pasture Varieties. This activities aimed to develop standard strains of 6 target species namely; *Brachiaria ruziziensis* , *Panicum maximum* , *Stylosanthes hamata* , *S. guianensis* CIAT 184 , *Centrocema pascuorum* cv. Cavalcade and *Alysicarpus vaginalis*. DLD will continue the breeding activities under the future plan of breeding development which had been assigned for 5 target species.

The government of Thailand supports the activity by including the pasture breeding activity in the long term strategic plan and long term package research of the organization. Due to the above plan the DLD will provide sufficient budget and personal include researchers, technicians and office administrator staffs.

The flow chart for pasture breeding system is shown in figure 1 and the target pasture species, objective, method, location and the responsible researchers are shown in Table 1.

Figure 1 The pasture breeding system

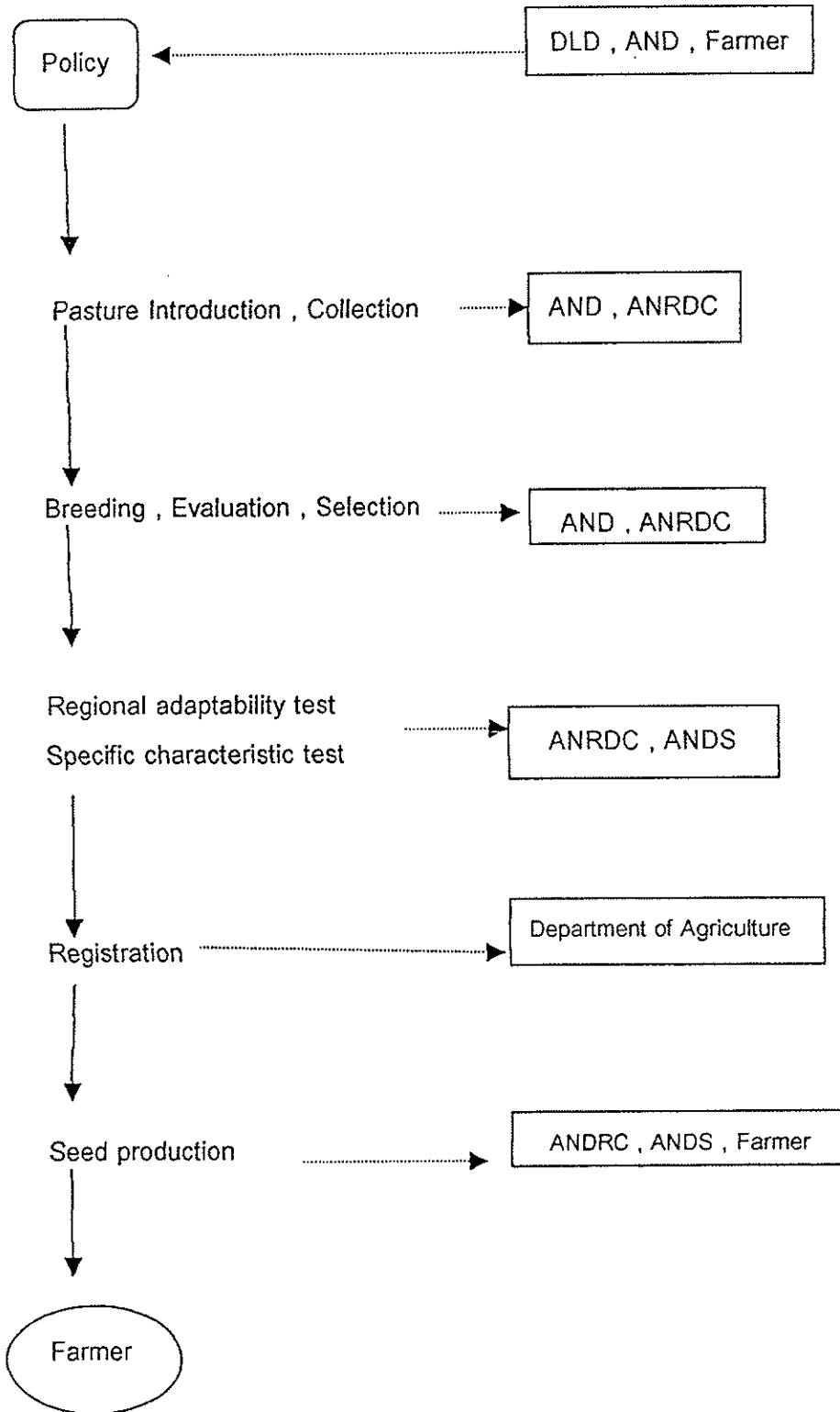


Table 1 Plan of Breeding (target species, objective, method, site and responsible person)

Target species	Objectives of breeding	Breeding method	Breeding sites	responsible researchers
<i>Stylosanthes guianensis</i> CIAT 184 2n = 20 self-pollination	Anthracnose resistance	Mass selection and pure line selection	Khon Kaen Animal Nutrition Research and Development Center (KKANRDC)	Sarayut Thaikua and Samran Vijitpan
<i>Brachiaria ruziziensis</i> 2n = 18 , 36 sexual reproduction and high degree of cross pollination	Drought tolerance (yield increasing in dry season)	Synthetic varieties	Nakorn Ratchasima Animal Nutrition Research and Development (NRANRDC)	Sasithorn Thinnakorn and Ganda Nakamane
<i>S. hamata</i> (Verano stylo) 2n = 40 self pollination	Anthracnose Resistance	Mass selection and pure line selection	Maharakam Animal Nutrition Development Station (MKANDS)	Viroj Ritruetchai, Taweesak Cheunpreecha
<i>Panicum maximum</i> (purple guinea) 2n = 18,32,36,48 Apomictic grass	High quality	Embryo sac Analysis for sexual type or introduction and crossing	Khon Kaen Animal Nutrition Research and Development Center	Samran Vijitpan
<i>C. pascuorum</i> cv. Cavalcade 2n = 22 self pollination	Viruses resistance	Collection and selection	Nakorn Ratchasima ANRDC	Ganda Nakamane, Sasithorn Thinnakorn

Table 2 Sites for Breeding (B), regional adaptability test (R) and specific characteristic test (S)

Sites	Stylo 184	Verano stylo	Ruzi	Purple guinea	Centurion
Chainat C.			R	R	R
Sa Kaew C.		R, S	R	R	R
NakonRatchasima C.	R	R	B, R		B, R
Khon Kaen C.	B, R, S	R	R	B, R	
Lampang C.	R	R	R		
Petchaburi C.	R	S		R	
Surat Thani C.	R	R	R	R	
Narathiwat C.	R, S				R
Roi et St.	S		R		
Mahasarakam St.		B, R, S			
Sakonnakhon St.		R			
Nong kai St.	R				
Phrae St.				R	R
Petchaboon St.				R	
Sukothai St.					R

The budget for pasture breeding program

We will provide 786,885 Baht for breeding program in 2005 (Table 3 and 4). Also, 15 stations and centers has provided budget for experimental field, building and facilities, salary and allowance of counterpart and worker, including wage for driver and fuel expenses for those breeding program. Beside this, in this year we are making research proposal of pasture breeding research paper during 2006-2010. The support of vehicles, tractors, planting tools, and equipments for chemical analysis from various Research Centers and Stations under Division of Animal Nutrition are shown in Table 5.






















































Table 3 Budget (bahts) for breeding , evaluation and selection of target pasture species in 2005.

Location	Stylo 184	Verano stylo	Ruzi	Purple guinea	Centurion
NakhonRatchasima C.			97,377		97,377
Khon Kaen C.	97,377			97,377	
Maharakham St.		97,377			

Table 4 Budget (bahts) for regional adaptability test and specific characteristic test in 2005

Location	Stylo 184	Veranostylo	Ruzi	Purple guinea	Centurion
Chainat C.			7,500	7,500	7,500
Sa Kaeo C.		15,000	7,500	7,500	7,500
Nakhonratchasima C.	7,500	7,500	7,500		7,500
Khon Kaen C.	15,000	7,500	7,500	7,500	
Lampang C.	7,500	7,500	7,500		
Phetchaburi C.	7,500	7,500		7,500	
Surat Thani C.	7,500	7,500	7,500	7,500	
Narathiwat C.	15,000				7,500
Roi et St.	7,500		7,500		
Maharakham St.		15,000			
Sakonnakorn St.		7,500			
Nong kai St.	7,500				
Phrae St.				7,500	7,500
Petchaboon St.				7,500	
Sukothai St.					7,500

Table 5 Supported equipments from centers and stations for pasture breeding program

Location	Chemical analysis equipment	Tractor with accessories (plow, harrow, rotary tiller, front blade)	Springer	Fertilizer spreader	Seed planting
Chainat C.					
Sa Kaew C.					
Nakhonratjasima C.					
Khon Kaen C.					
Lampang C.					
Phetchaburi C.					
Surat Thani C.					
Narathiwat C.					
Roi et St.					
Mahasarakam St.					
Sakonnakorn St.					
Nong kai St.					
Phrae St.					
Phetchaboon St.					
Sukhothai St.					

8. 牧草種子生産システム将来計画

Future Plan of Pasture Seed Production System (Seed Marketing and Seed Quality Control System)

Seed production system at present

The production is divided into 4 categories; breeder seed, foundation seed (FS), registered seed (RS) and certified seed or commercial seed (CS). The details of production in each seed category including multiplication, processing, quality control and marketing are summarized in Table 1.

Seed production system at future

The production will be divided into 4 categories similar to at present. The new improved varieties of pasture species from breeding program should be released to livestock farmers. FS and RS will be multiplied only in some Centers and Stations. Post control test of new varieties will be conducted in RS in order to ensure genetic purity. Field inspection will be implemented in farmer seed production filed (CS). All of seed multiplication process of CS will be transferred to the Farmer Seed Producer Club including processing, packaging and storage. AND only control and certify seed quality. Farmer Seed Producer Club should be more strengthen and transformed to 'Cooperative'. The details of future plan are summarized in Table 2.

Table 1. Seed production system at present

Activity	Breeder Seed	Foundation Seed (FS)	Registered Seed (RS)	Certified Seed (CS)
Production / Multiplication	8 ANRDC, 1 ANDS DLD budget 11 standard varieties	8 ANRDC, 1 ANDS DLD budget 1,000 kg	8 ANRDC, 21 ANDS DLD budget 10,000 kg	Seed producer farmers (Club's member) DLD budget 100 tons Seed Producer Club 305 tons
Quality control Field inspection	No.	Field officer Forage Seed Production Standard	Field officer Forage Seed Production Standard	No
Seed quality testing	Khon Kaen Seed testing laboratory ISTA	3 Seed testing laboratories ISTA	3 Seed testing laboratories ISTA	4 Seed testing laboratories ISTA
Post control test	No	No	No	No
Seed processing	8 ANRDC, 1 ANDS Seed Blower	2 ANRDC, 1 ANDS Air- screen cleaner	3 ANRDC, 1 ANDS Air- screen cleaner	2 ANRDC, 1 ANDS Air- screen cleaner
Seed certification	No	No	3 ANRDC, 1 ANDS Print on the bags	2 ANRDC, 1 ANDS Print on the bags
Seed storage	Khon Kaen ANRDC JICA Cold room	Khon Kaen ANRDC JICA Cold room	Bureum ANDS Air-condition room	Bureum ANDS Air-condition room
Sale	No	No	5 ANRDC, 12 ANDS Sell to seed producer farmers	8 ANRDC, 21 ANDS Sell to farmers & middle man

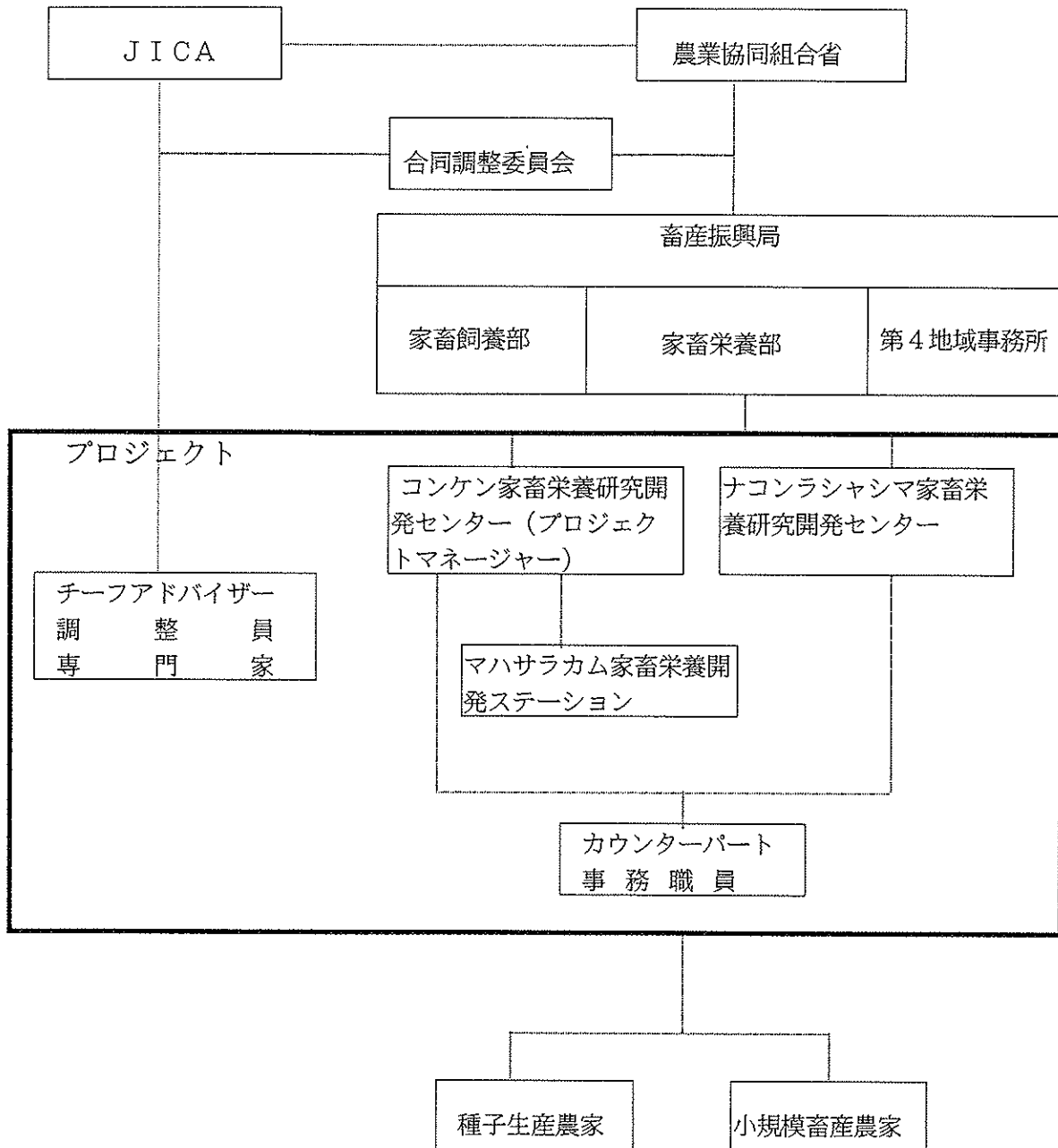
ANRDC, Animal Nutrition Research and Development Center
ANDS, Animal Nutrition Development Station

Table 2. Seed production system at future

Activity	Breeder Seed	Foundation Seed (FS)	Registered Seed (RS)	Certified Seed (CS)
Production / Multiplication	8 ANRDC DLD budget New varieties	8 ANRDC DLD budget 1,000 kg	21 ANDS DLD budget 10,000 kg	App. 3,000 Seed producer farmers (Club's member) DLD budget & Seed Producer Cooperative
Quality control Field inspection	No.	Feed and Forage Analysis Section Forage Seed Production Standard	Feed and Forage Analysis Section Forage Seed Production Standard	Field officer Forage Seed Production Standard
Seed quality testing)	Khon Kaen Seed testing laboratory ISTA No	3 Seed testing laboratories ISTA No	3 Seed testing laboratories ISTA ANRDC	4 Seed testing laboratories ISTA No
Post control test	8 ANRDC, 1 ANDS Seed Blower	2 ANRDC, 1 ANDS Air- screen cleaner	3 ANRDC, 1 ANDS Air- screen cleaner	2 ANRDC, 1 ANDS Air- screen cleaner
Seed processing	No	No	3 ANRDC, 1 ANDS Print on the bags	2 ANRDC, 1 ANDS Certificate/Print on the bag
Seed certification	Khon Kaen ANRDC Seed bank	Khon Kaen ANRDC Seed bank	Khon Kaen ANRDC Air-condition room	Cooperative Air-condition room
Seed storage	No	No	5 ANRDC, 12 ANDS Sell to seed producer farmers	8 ANRDC, 21 ANDS Sell to farmers & middle man
Sale	No	No		

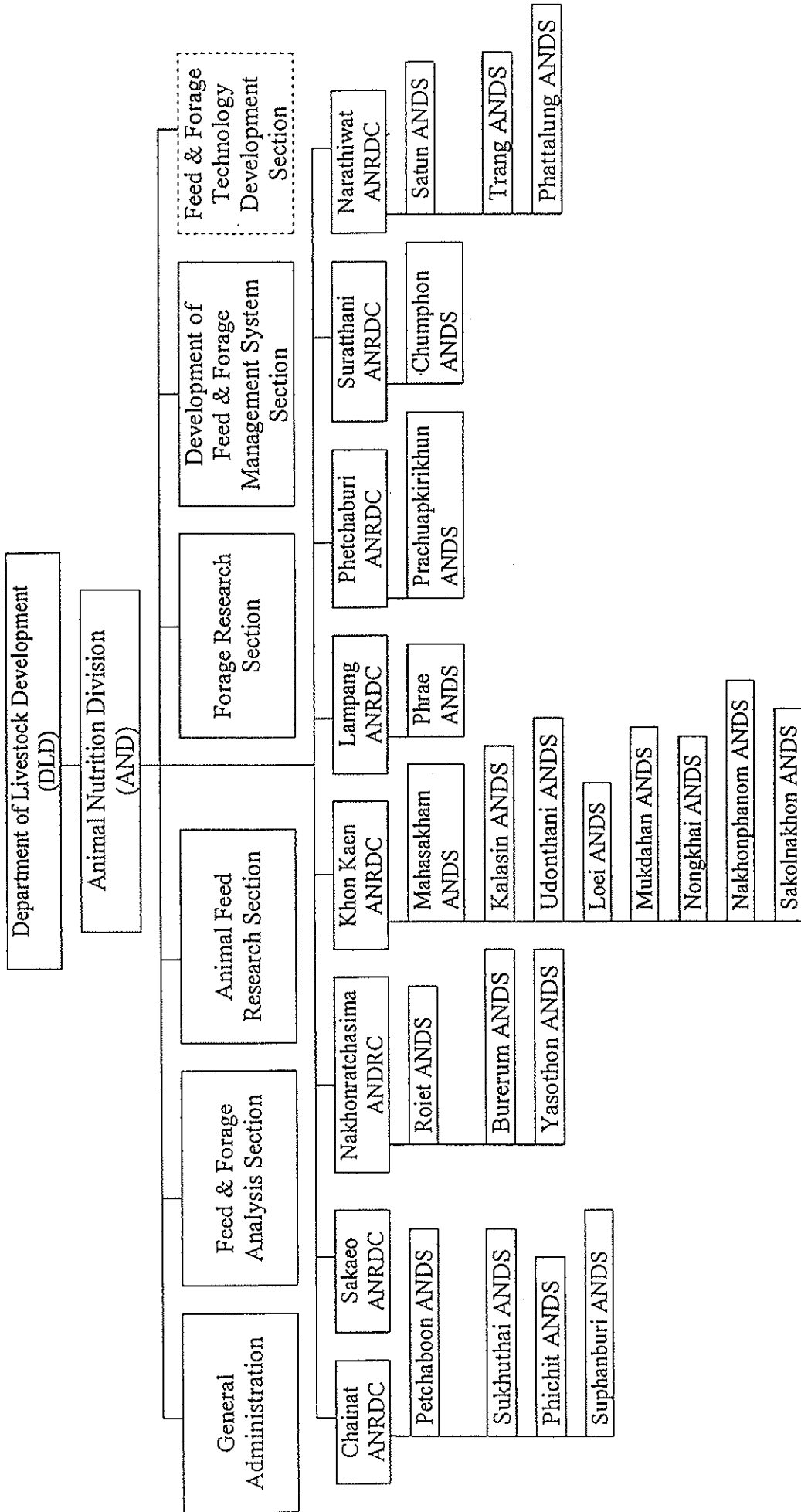
ANRDC, Animal Nutrition Research and Development Center
 ANDS, Animal Nutrition Development Station

9. プロジェクト実施体制図



10. 家畜栄養部組織図

Organization Chart of Animal Nutrition Division



ANRDC, Animal Nutrition Research and Development Center

ANDS, Animal Nutrition Development Station