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- 6．タイ国における牧草種子生産を巡る情勢

**MINUTES OF DISCUSSIONS
BETWEEN THE JAPANESE MANAGING CONSULTATION TEAM
AND AUTHORITIES CONCERNED OF THE GOVERNMENT
OF THE KINGDOM OF THAILAND
ON JAPANESE TECHNICAL COOPERATION
FOR THE PASTURE SEED PRODUCTION DEVELOPMENT PROJECT
IN NORTHEAST THAILAND**

The Japanese Managing Consultation Team (hereinafter referred to as "the Team"), organized by Japan International Cooperation Agency (hereinafter referred to as "JICA") and headed by Mr. Masami Kuramochi, visited the Kingdom of Thailand from June 5th to 15th, 2000 in order to formulate the Plan of Operation (hereinafter referred to as "the PO") for The Pasture Seed Production Development Project in Northeast Thailand (hereinafter referred to as "the Project") in corroboration with the Thai authorities concerned. The Team also discussed major issues related to the implementation of the Project.

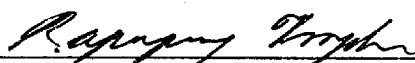
As a result of the discussions, both parties have jointly drawn up the PO for the Project as attached in ANNEX II and it was accepted by the joint committee on June 13th, 2000. The PO may be subject to change within the framework of the Record of Discussions when necessities arise in the course of implementation of the Project.

Both parties have also confirmed the major point of discussions as attached in ANNEX I and the necessary steps be taken accordingly towards the smooth and successful implementation of the Project.

Bangkok, June 13th, 2000

倉持 正実

Mr. Masami KURAMOCHI
Leader
Japanese Managing Consultation Team
Japan International Cooperation Agency
Japan



Dr. Rapeepong VONGDEE
Director General
Department of Livestock Development
Ministry of Agriculture and Cooperatives
The Kingdom of Thailand

ANNEX I

THE MAJOR POINTS OF DISCUSSIONS

1.Support to the Project activities by Thai authorities concerned

Thai authorities concerned reconfirmed that the Government of Thailand is implementing the Project in cooperation with the Government of Japan as stated in the Record of Discussions . For a successful conclusion of the Project, it is vitally important that the Thai side should play main role and make active effort as an owner of the Project.

2.Public relations of the Project

The Government of Thailand will take appropriate measures to make the Project widely known to the people of Thailand in cooperation with the Japanese side.

3. Improvement of Communication within the Project

Both parties have confirmed that the members of Project will hold several meetings to improve communication and have necessary discussions for smooth implementation of the Project.

4.Improvement of seed storage room

Both parties have confirmed that seed storage room with the necessary equipment should be installed in the Khon Kaen Animal Nutrition Research Center, in order to transfer pasture seed storage techniques smoothly and future develop the breeding for tropical pasture. After renovation of seed storage room by his own budget, Thai side will consult installation of in-house equipment with Japanese side, within the limitation of JICA's budget.

5.Extension of technology developed by the Project

The Project will select several model farmers around the Khon Kaen Animal Nutrition Research Center and the Pak Chong Animal Nutrition Research Center in order to verify and demonstrate the developed technology by the Project.



6. Scheme for supplying pasture seeds of good quality to farmers

Thai side has a future plan to establish the scheme on breeding of pasture varieties, pasture seed production and pasture seed quality control for the purpose of supplying pasture seeds of good quality to farmers, in consideration of sustainable development within and after the period of the Japanese Technical Cooperation.

7. Strengthening the cooperation with JIRCAS's Project

Both parties have confirmed that the Project will strengthen cooperation with JIRCAS's project which is implementing in Northeast Thailand in order to further develop the Project .

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ANNEX II

1. Revised Project Design Matrix (PDM)
2. Plan of Operation (PO)
3. Annual Plan of Operation in 1999 (APO-1999)
4. Annual Plan of Operation in 2000 (APO-2000)
5. Progress Report (by the end of May, 2000)

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Annex II-1

FORMAT OF THE PROJECT DESIGN MATRIX (PDM) Pasture Seed Production Development Project in Northeast Thailand

Narrative Summary	Objective Verifiable Indicator	Means of Verification	Important Assumption
Overall Goal Appropriate forage is secured for the development of cattle raising in Thailand	Results after a certain period of the post-project; 1. Several appropriate varieties are bred. 2. Cultivated acreage of new varieties are expanded by livestock farmers. 3. Livestock farmers increase production of forage, hay and silage.	Evaluation survey of the post-project by joint evaluation team	1. Policy of seed production in Thailand is to be maintained or strengthened. 2. Situation of seed market is to be maintained or expanded.
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.	Result of final stage of the Project; 1. Several appropriate strains are raised for Northeast Thailand. 2. Seed production of the new strains is started in the ANRC. 3. Foundation seed produced by the ANRC are delivered to seed production farmers in Northeast Thailand. 4. Trial and demonstration of developed technology for production and utilization of forages are implemented in farmers fields in Northeast Thailand.	Report of final evaluation	1. Extension services in Northeast Thailand are well operated. 2. Developed technology is to be applied by livestock farmers.
Outputs 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.	1-1. The number of genetic resources which will be evaluated in the *target species of pasture. 1-2. The number of strains which will be selected in the *target species of pasture. 2-1. The number of techniques and equipment which will be developed for pasture seed production and post-harvest processing in the project. 2-2. Methods for multiplication, post-harvest processing and storage of pasture seed will be determined at the ANRC. 3-1. The number of officers who will conduct seed testing completely in accordance with the rule of the ISTA. 3-2. The DLD will be able to certify quality of pasture seed by own standard. 4-1. The number of useful techniques and equipment which will be developed for forage production, processing and utilization in the project. 4-2. The number of model farmers which will acquire useful techniques for forage production, processing and utilization.	1. Annual report of the AND and Report of project Activities 2. Record of seed inspection and control at the ANRC 3. Content of manuals and teaching materials.	Sufficient support is to be secured for seed production and extension activities.
Activities 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 techniques 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.	Inputs (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 (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	<div>The allocation of counterparts is not to be changed during the cooperation period</div> <div>Pre-condition</div> <div>Well cooperation among organizations and people concerned with the project</div>	

Target species: *Panicum maximum*, *Stylosanthes guianensis*, *Stylosanthes hamata*, *Centrosema pascuorum*, *Brachiaria ruziziensis* and *Alysicarpus vaginalis*

DLD: Department of Livestock Development. AND: Animal Nutrition Division. ANRC: Animal Nutrition Research Center. ISTA: International Seed Testing Association.

Plan of Operation (PO 1)

Item	Project Activities	Responsible Person	Output (Goal or Achievement)
1) Development of evaluation and selection techniques of appropriate pasture varieties			
a) Study and confirmation of major pasture varieties in Thailand	a) Collection of existing data from DLD, etc	Chaisang. P Sumran. V , Sasithon. V Ganda.N , Viroj. R Sarayut. T	a) Present conditions in Thailand are identified
a)-1 Introduction system			
a)-2 Evaluation system			
a)-3 Varieties and production ability			
b) Development of selection techniques for appropriate pasture varieties and preservation of stock seed	b) Introduction of selection and preservation techniques developed in Japan for appropriate pasture varieties	Chaisang. P Sumran. V, Viroj. R Sasithon. T, Ganda.N Sarayut. T	b) Selection and preservation 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.
b)-1 Local adaptability			
b)-2 Specific characters			
b)-3 Method of preservation for foundation seed and registered seed			
c) Development of evaluation techniques for appropriate pasture varieties	c) Production 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.

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Item	Project Activities	Responsible Person	Output (Goal or Achievement)
c)-1 Grass	c)-1-1 Panicum maximum TD 58	Sumran. V	d) Basic techniques for breeding of tropical grass and legume are acquired by the C/P, and strains of target species are selected.
c)-2 Legume	c)-1-2 Brachiaria ruziziensis	Sasithon. T	
	c)-2-1 Stylosanthes guianensis CIAT 184	Sarayut. T	
	c)-2-2 Stylosanthes hamata	Viroj. R	
	c)-2-3 Centrosema pascuorum	Ganda. N	
c)-3 Evaluation of disease and insect resistance	c)-2-4 Alysicarpus vaginalis	Sasithon. T	
	c)-3-1 Field resistance	Ganda. N	
d) Introduction of breeding techniques of pasture varieties	c)-3-2 Artificial inoculation	Ganda. N	
	d) Introduction of basic techniques for breeding of tropical grass and legume		
d)-1 Apomix grass breeding	d)-1-1 Identification of apomix strain by differential interference contrast microscope ,etc.	Sumran. V Sasithon	
	d)-1-2 Progeny test	Sumran. V , Sasithon	
d)-2 Out-crossing grass breeding	d)-2-1 Crossing techniques of Brachiaria ruziziensis	Sasithon. T,	
	d)-2-2 Combining ability	Sasithon. T	
d)-3 Self-pollinated legume breeding	d)-3-1 Self-fertilizing ratio	Sarayut. T, Viroj. R, Ganda.N	
	d)-3-2 Selection by space- planting	Sarayut. T, Viroj. R, Ganda.N	
	d)-3-3 Crossing techniques	Sarayut. T, Viroj. R, Ganda. N	

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Item	Project Activities	Responsible Person	Output (Goal or Achievement)
2) Development of pasture seed production and post-harvest processing techniques for Registered and Commercial seeds			
a) Development of cultivation techniques for pasture seed production			
a)-1 Investigation of present conditions	a)-1-1 Collection of research papers on seed production in Thailand a)-1-2 Collection of natural conditions' data in Northeast Thailand a)-1-3 Investigation of production cost of seed from existing reports a)-1-4 Survey of cultivation methods of the main species	Chureerat. S Krailas. K Chureerat. S Krailas. K Chureerat. S Krailas. K	a)-1 Present problems at the Project sites are identified
a)-2 Improvement of registered seed production	a)-2-1 Improvement of cultivation techniques for registered seed a)-2-2 Establishment of multiplication system for registered seed	Chureerat. S , Krailas. K Weerasak. C Chureerat. S, Krailas. K , Supachai. U , Weerasak. C	a)-2 Genetic purity of registered seed is maintained at the Animal Nutrition Research Center.
a)-3 Study of seed production techniques for selected species	a)-3 Trial of seed production of selected species	Supachai. U Weerasak. C	a)-3 Methods of seed production for selected species are improved

Item	Project Activities	Responsible Person	Output (Goal or Achievement)
b)Development of pasture seed harvesting and post-harvest processing techniques			
b)-1 Investigation of present conditions	b)-1 Survey of seed harvesting and post-harvest techniques at the farmer's level	Krailas. K	b)-1 Present problems at the Project sites are identified
b)-2 Improvement of harvesting and post-harvest processing techniques	b)-2-1 Trial production of simple harvesting tools for farmers	Krailas. K	b)-2-1 Pasture seed is harvested more efficiently by farmers
	b)-2-2 Trail production of simple seed cleaning tools to farmers	Supachai. U, Krailas. K	b)-2-2 Pasture seed is cleaned more efficiently by farmers
	b)-2-3 Establishment of system of post-harvest processing for each species at the Animal Nutrition Research Center	Jaroonroj. J	b)-2-3 Harvested pasture seed is cleaned more efficiently and precisely, and quality of pasture seed is improved at the Animal Nutrition Research Center.
c)Development of pasture seed storage techniques			
c)-1 Investigation of present conditions	c)-1-1 Investigation of seed storage methods at the farmer's level	Pimpaporn. P, Rumphrai. N Walaikarn. J	c)-1 Present problems at the Project sites are identified
	c)-1-2 Investigation of seed storage at the Animal Nutrition Research Center	Pimpaporn. P, Rumphrai. N Walaikarn. J	

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Item	Project Activities	Responsible Person	Output (Goal or Achievement)
c)-2 Improvement of pasture seed storage techniques	c)-2 Establishment of suitable seed storage method for grass and legume at the Animal Nutrition Research Center	Pimpaporn. P Rumphrai. N, Walaikarn. J Sasiwimol. S	c)-2 Quality of seed put in storage is maintained at the Animal Nutrition Research Center
3) Development of pasture seed inspection and control techniques			
a)Development of seed quality inspection techniques			
a)-1 Investigation of present conditions	a)-1 Investigation of seed testing at the Animal Nutrition Research Center	Pimpaporn. P Rumphrai. N Walaikarn. J	a)-1 Present problems at the Project sites are identified.
a)-2 Improvement of seed quality inspection techniques	a)-2 Introduction and training of seed testing techniques base on the rule of the ISTA	Pimpaporn. P Rumphrai. N Walaikarn. J Sasiwimol. S	a)-2 Seed testing is conducted by the C/P and officers in accordance with the rule of the ISTA, and quality of seed is inspected accurately.

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Item	Project Activities	Responsible Person	Output (Goal or Achievement)
b)Development of seed quality control techniques b)-1 Improvement of seed quality control techniques	b)-1-1 Introduction of seed quality control techniques referred to the standard of the OECD Scheme for Varietal Certification -Field Inspection - Seed Inspection -Post Control test b)-1-2 Determination of standard for seed quality control of main pasture species.	Pimpaporn. P, Rumphrai. N Walaikarn. J, Sasiwimol. S Pimpaporn. P, Rumphrai. N Walaikarn. J, Sasiwimol. S	b)-1 Quality control on seed multiplication is conducted by the C/P according as the standard of the OECD Seed Scheme, and genetic purity of main pasture species are maintained on seed multiplication.
4) 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	Somchit. I , Vuthipong. I Vanida. K, Sompop. K Chinda. S, Osoth. N Supachai. U	a)-1 Pasture production techniques at farmer's level is identified.

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Item	Project Activities	Responsible Person	Output (Goal or Achievement)
a)-2 Improvement of pasture management techniques for selected species	a)-2 Trial of grazing and cutting methods with selected species	Somchit. I , Sompop. K Witthaya. S , Sasiporn. K	a)-2 Useful pasture management techniques are acquired by the C/P to guide extension officers And model farmers.
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	Somchit. I, Sompop. K , Witthaya. S. Sasiporn. K Supachai. U	b)-1 Pasture harvesting and post-harvest processing techniques at farmer's level is identified.
b)-1 Survey of present situation	b)-2 Improvement of useful techniques for hay-making and ensiling		b)-2 Useful techniques for hay-making and ensiling are acquired by the C/P to guide extension officers and model farmers.
b)-2 Improvement of pasture harvesting and ensiling techniques using selected species and hay-making	b)-2-1 Trial of good quality hay production technique using a solar house in the rainy season		
	b)-2-2 Trial production of bailer on hay and silage for small -scale dairy farmers		
c)Verification and demonstration of forage production, processing and utilization	c)-1-1 Publication of useful techniques	Thamrongsakd. P	c)-1 Useful techniques for forage production, processing and utilization are acquired by model farmers.
c)-1 Transfer of useful techniques to model farmers	c)-1-2 Demonstration in fields of model farmers	Kitti. K	

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ANNEX II -2-2

Plan of Operation for Whole Period (PO 2)

Item	Schedule				
	1	2	3	4	5
1) Development of evaluation and selection techniques of appropriate pasture varieties					→
a) Study and confirmation of major pasture varieties in Thailand			→		
a)-1 Introduction system			→		
a)-2 Evaluation system			→		
a)-3 Varieties and production ability			→		
b) Development of selection techniques for appropriate pasture varieties and preservation of stock seed					→
b)-1 Local adaptability					→
b)-2 Specific characters		→			→
b)-3 Method of preservation for foundation seed and registered seed			→		→
c) Development of evaluation techniques for appropriate pasture varieties					→
c)-1 Grass (Panicum maximum TD58, Brachiaria ruziziensis)		→			→
c)-2 Legume (Stylosanthes guianensis CIAT 184, Stylosanthes hamata, Centrosema pascuorum, Alysicarpus vaginalis)					→
c)-3 Evaluation of disease and insect resistance					→
d) Introduction of breeding techniques of pasture varieties					→
d)-1 Apomix grass breeding					→
d)-2 Out-crossing grass breeding					→
d)-3 Self-pollinated legume breeding					→

Item	Schedule				
	1	2	3	4	5
2) Development of pasture seed production and post-harvest processing techniques for Registered and Commercial seeds					→
a) Development of cultivation techniques for pasture seed production					→
a)-1 Investigation of present conditions		→			
a)-2 Improvement of registered seed production			→		
a)-3 Study of seed production techniques for selected species		→			→
b) Development of pasture seed harvesting and post-harvest processing techniques					→
b)-1 Investigation of present conditions		→			→
b)-2 Improvement of harvesting and post-harvest processing techniques					→
c) Development of pasture seed storage techniques					→
c)-1 Investigation of present conditions		→			
c)-2 Improvement of pasture seed storage techniques		→			→
3) Development of pasture seed inspection and control techniques					→
a) Development of seed quality inspection techniques			→		
a)-1 Investigation of present conditions	→				
a)-2 Improvement of seed quality inspection techniques		→			→
b) Development of seed quality control techniques			→		→
b)-1 Improvement of seed quality control techniques			→		→

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Item	Schedule				
	1	2	3	4	5
4) 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)-2 Improvement of pasture management techniques for selected species					→
b) Development of pasture harvesting and post -harvest processing techniques					→
b)-1 Survey of present situation					→
b)-2 Improvement of pasture harvesting and ensiling techniques using selected species and hay-making					→
c) Verification and demonstration of forage production, processing and utilization					→
c)-1 Transfer of useful techniques to model farmers					→

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ANNEX II-3

Annual Plan of Operation for the First Year (APO)

Activities	Schedule (Aug.1999- July 2000)												Responsible Person
	8	9	10	11	12	1	2	3	4	5	6	7	
1)Development of evaluation and selection techniques of appropriate pasture varieties													Koichi. N (Expert)
a)Study and confirmation of major pasture varieties cultivated in Thailand													Chaisang. P
a)-1 Introduction system													
a)-2 Evaluation system													
a)-3 Varieties and production ability													
b)Development of selection techniques for appropriate pasture varieties and preservation of stock seed													Chaisang. P
b)-1 Local adaptability test													Sumran. V
c) Development of evaluation techniques for appropriate pasture varieties													Sasithon. T
c)-1 Manual for evaluation of genetic resources													

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Activities	Schedule (Aug. 1999- July 2000)													Responsible Person
	8	9	10	11	12	1	2	3	4	5	6	7		
c)-1-1 Grasses (Panicum, Ruzi)													Sumran. V , Sasithon. T	
c)-1-2 Legumes (Stylo, Centurion)													Ganda. N, Viroj. N	
c)-1-3 Alyce clover													Sasithon. T	
c)-2 Evaluate disease and insect resistance													Ganda. N	
d) Introduction of breeding techniques of pasture varieties														
d)-1 Apomix grass breeding techniques													Sumarn. V, Ganda. N	
													Sasithon. T	
d)-2 Out-cross grass breeding techniques													Sasithon	
d)-3 Self-pollination legume breeding techniques													Sumran. V	
													Ganda. N	
													Viroj. C	

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Activities	Schedule (Aug.1999- July 2000)												Responsible Person
	8	9	10	11	12	1	2	3	4	5	6	7	
2) Development of pasture seed production and post-harvest processing techniques for Registered and Commercial seeds													Seijun. K (Expert)
a)Development of cultivation techniques for pasture seed production													
a)-1 Investigation of present conditions													Chureerat. S, Krailas. K
a)-2 Registered Basic seed production													Chureerat. S
b)Development of pasture seed harvesting and post-harvest processing techniques													
b)-1 Investigation of present condition													Krailas. K
b)-2 Improvement of harvesting and post-harvesting processing techniques													Krailas. K
c) Development of pasture seed storage techniques													
c)-1 Investigation of present conditions													Pimpaporn. P
													Ramphai. N
													Walaikarn. J

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Chureerat

Activities	Schedule (Aug.1999- July 2000)											Responsible Person	
	8	9	10	11	12	1	2	3	4	5	6		7
3) Development of pasture seed inspection and control techniques													Seijun. K (Expert)
a) Development of seed quality inspection techniques													
a)-1 Survey of seed testing techniques													

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Activities	Schedule (Aug. 1999- July 2000)												Responsible Person
	8	9	10	11	12	1	2	3	4	5	6	7	
4) Improvement of useful techniques for forage production, processing and utilization													Yoshitake. T (Expert)
b) Development of pasture harvesting and post-harvest processing techniques													
b)-1 Improvement of pasture harvesting and ensiling techniques using selected species and hay-making													
													Sompop. K
													Withaya. S
													Sasiporn. K




ANNEX II-4

Annual Plan of Operation for the Second Year (APO)

Activities	Schedule (Aug. 2000-July 2001)												Responsible Person
	8	9	10	11	12	1	2	3	4	5	6	7	
1) Development of evaluation and selection techniques of appropriate pasture varieties													Koichi .N. (Expert)
a) Study and confirmation of major pasture varieties in Thailand													Chaisang, P, Sumran.V
a)-1 Introduction system													Sasithon, V, Ganda, N,
a)-2 Evaluation system													Viroj, R, Sarayut, T
a)-3 Varieties and production ability													
b) Development of selection techniques for appropriate pasture varieties and preservation of stock seed													Chaisang, P, Sumran, V
b)-1 Local adaptability													Sasithon, T, Ganda, N,
b)-2 Specific character													Viroj, R, Sarayut, T
c) Development of evaluation techniques for appropriate pasture varieties													Sumran, V, Sasithon, T
c)-1 Grass													Ganda, N, Viroj, R,
c)-1-1 Panicum maximum TD 58													Sasithon, T
c)-1-2 Brachiaria ruziziensis													Sumran, V
c)-2 Legume													Sasithon, T
c)-2-1 Stylosanthes guianensis CIAT 184													Sarayut, T
c)-2-2 Stylosanthes hamata													Viroj, R
c)-2-3 Centrosema pascuorum													Ganda, N
c)-2-4 Alysicarpus vaginalis													Sasithon, T
c)-3 Evaluation of disease and insect resistance													Ganda, N

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Activities	Schedule (Aug. 2000-July 2001)												Responsible Person
	8	9	10	11	12	1	2	3	4	5	6	7	
d) Introduction of breeding techniques of pasture varieties													Sumran. V , Sasithon.T Sasithon. T Ganda. N , Sarayut. T Viroj. R, Seijun. K. (Expert)
d)-1 Apomix grass breeding													
d)-2 Out-crossing grass breeding													
d)-3 Self-pollinated legume breeding													
2) Development of pasture seed production and post-harvest processing techniques for Registered and Commercial seeds.													Chureerat. S, Krailas. K Chureerat. S, Krailas. K Weerasak. C. , Supachai. U Supachai. U, Weerasak. C Krailas. K Supachai. U, Krailas. K Jaroonroj.C
a) Development of cultivation techniques for pasture seed production													
a)-1 Investigation of present conditions													
a)-2 Improvement of registered seed production													
a)-3 Study of seed production techniques for selected species													
b) Development of pasture seed harvesting and post-harvest processing techniques													
b)-1 Investigation of present conditions													
b)-2 Improvement of harvesting and post-harvest processing techniques													

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Activities	Schedule (Aug. 2000-July 2001)												Responsible Person
	8	9	10	11	12	1	2	3	4	5	6	7	
c) Development of pasture seed storage techniques													Pimpaporn. P , Rumphrait. N , Walaikarn. J Pimpaporn. P, Rumphrai. N. Walaikarn. J, Sasiwimol. S
c)-1 Investigation of present conditions													
c)-2 Improvement of pasture seed storage techniques													
3)Development of pasture seed inspection and control techniques													Pimpaporn. P, Rumphrai. N , Walaikarn. J Sasiwimol. S
a) Development of seed quality inspection techniques													
a)-2 Improvement of seed quality inspection techniques													

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Walaikarn J

Activities	Schedule (Aug. 2000-July 2001)												Responsible Person
	8	9	10	11	12	1	2	3	4	5	6	7	
4) Improvement of useful techniques for forage production, processing and utilization													Yoshitake. T (Expert)
a) Development and extension of pasture management techniques													Somchit. I, Vuthipong. I, Vanida. K, Sompop. K, Chinda. S, Osoth. N, Supachai. U
a)-1 Survey of present situation													
a)-2 Improvement of pasture management techniques for selected species													
b) Development of pasture harvesting and post-harvest processing techniques													Somchit. I, Sompop. K, Witthaya. S, Sasiporn. K , Supachai. U
b)-1 Survey of present situation													
b)-2 Improvement of pasture harvesting and ensiling techniques using selected species and hay-making													

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Supachai U

Progress Report on the activities of the Pasture Seed production Development Project
in Northeast Thailand
by the Japanese Experts Team
Covering the period (August, 1999-May, 2000)

1. Background

A livestock development plan has been clearly emphasized as an important aspect of the agriculture sector in the 8th National Economic and Social Development Plan in order to cope with expanding domestic consumption, especially for dairy products and beef.

In an attempt to promote livestock farming, the authorities recognized the importance of strengthening forage crop production as a measure of expanding livestock production and reducing production costs. The Thai government therefore requested technical assistance from Japan on appropriate methods of pasture seed production - a prerequisite for livestock development. Importantly, Northeast Thailand is suitable for pasture seed production because of its adequate precipitation pattern for growth and harvest of pasture crops. As a matter of fact, pasture seed production is being done in many parts of the country but about 90% of it is grown in the Northeast Thailand. Not incidentally, the formation of a seed-producing district should augment income generation and promote local employment in the economically depressed region.

The Pasture Seed Production Development Project began in August 1999 as a technical cooperation between the government of Thai and Japanese.

2. The Progress outline

The project activities consist mainly of improving conventional pasture seed production technology and extension of newly developed techniques of pasture seed management, forage production, processing and utilization. The activities are expected to promote productivity of pasture seed and forage production at the farmer level by strengthening the capability of technical guidance of the staff engaged in the project.

In the initial stage of the project, Thai and Japanese staff focused efforts on the formulation of Plan of Operation (PO) for the whole 5-year period as well as Annual Plan of Operation (APO) through a series of meetings and discussions. After the PO and the APO were drawn up tentatively in December 1999, the project was started accordingly.

2.1 The Project Activities

2.1-1 Development of evaluation and selection techniques of appropriate pasture seed varieties

The study was started to identify the major pasture varieties cultivated in Thailand. Since the target species, *Panicum*, *Stylosanthes* (2), *Centrosema*, *Brachiaria* and *Alysicarpus*, were to be used for selection and evaluation of pasture varieties, the team started the field experiments using *Thapra Stylo* and *Cavacade* at KhonKaen Center.

Thirteen ecotypes of alyx clover were already collected at the Pakchong Center. Further selection and evaluation for grasses and legumes will be done in accordance with the second year plan.

2.1-2 Development of pasture seed production and post-harvest processing techniques for Registered and Commercial seed

The registered seed production of *Thapra Stylo* and *Ruzi* grass at KKANCR and PCANRC started in accordance with the plan. In the future, the farmers' home seed should be replaced by the basic seed (guaranteed seed) of which the genetic character is maintained.

A seed processing unit will be provided for the Chang Yuen Station by JICA in the fiscal year 2000 and the installation of the unit is planned by end of this year. In this connection, it is suggested that a secure power supply and wiring for the seed processing unit should be completed before December. Allocation of the unit and the estimated power consumption are drawn up. However, due to financial constraints, JICA informed that the seed processing unit will not have a "Gravity separator".

The winnower "Toumi" arrived at the KKANRC. It will be used for the grass seed processing trial this harvest season.

2.1-3 Development of pasture seed inspection and control techniques

This section is mainly consulted by short-term expert. Mr. Amari, a former short-term expert explained the OECD scheme and ISTA rules. He suggested that the standard for basic seed production should be formulated at an early opportunity to maintain the genetic purity of the seed. In this regard, laboratory equipment will be supplied this fiscal year in order to carry out seed inspection to ISTA standards.

2.1-4 Improvement of useful techniques for forage production, processing and utilization

The most important topic of this section is the establishment of processing and utilization techniques for good forage in rainy season. Subsequently, using a solar-house system, the techniques for good hay and silage production should be established. The plan for the these experiments has been prepared.

3. The assignment of experts

In the 1999 Fiscal Year, a total of four long-term experts were assigned to the project. Two short-term experts were also assigned to the project. Additionally, three short-term experts are expected to be assigned to the Project in the 2000 Fiscal Year.



4. The Provision of Machinery and Equipment

Machinery and equipment equivalent to about 25 million Yen are provided in the 1999 fiscal year and about 26 million Yen will be provided in 2000. Additional equipment carried by experts was equivalent to 4.0 million Yen compared with local expense of 3.0 million Yen in 1999.

5. Counterpart study in Japan

In the 1999 fiscal year, two counterparts were accepted to study in Japan. In 2000 fiscal year, two counterparts are expected to begin their studies from this June.

These are summarized in Table - 1

Table-1 Summary of input by JICA in 1999-2000 Fiscal year

Item	1999	2000 (plan)
Experts : Long-term	4 experts	4 experts
: Short-term	3 experts	3 experts
Counterpart Training	2 persons	2 persons
Equipment & Machinery	25.0 Million yen	26.0 Million yen
Carried by experts	4.0 Million yen	2.2 Million yen
Local expenditures	3.0 Million yen	4.0 Million yen
Enlightenment & Extension		1.5 Million yen



AnnexII-5-2
The Progress Report
By
Counterparts of the Pasture Seed Production Development Project
In Northeast Thailand (August 1999-May 2000)

1. Background

The Pasture Seed Production Development Project In Northeast Thailand has been implemented since August 1999 as a technical cooperation between the government of Thailand and Japan.

Department of Livestock Development, Ministry of Agriculture and Cooperatives, Thailand and the Japan International Cooperation Agency are the responsible partners who will implement the project during August 1999 until July 2004.

The project sites include Khon Kaen Animal Nutrition Research Center, Pakchong Animal Nutrition Research Center, and some dairy farms in the Northeast of Thailand where the Animal Nutrition Division, Department of Livestock Development, Bangkok is a headquarter of the project administration.

The project main activities concern developing of appropriate technology in the field of pasture seed production, appropriate species selection, and improving technology of pasture utilization for cattle.

Since August 1999, Japanese experts were dispatched, and Thai counterparts were assigned to operate technical investigation in accordance with the Plan of Operation of the Whole Period and Annual Plan of Operation.

2. Project Administration

2.1 Administration Personnel

Department of Livestock Development assigned administrative personnel to guide and supervise to the project as follow:

- | | |
|----------------------|-------------------------------------|
| 1) Project Director: | Dr. Rapeepong Vongdee |
| | Director General |
| | Department of Livestock Development |



- 2) Project Coordinator: Mr. Chirawat Khemsawat
Director
Animal Nutrition Division
- 3) Project Manager: Mr. Somchit Intharamanee
Director
Khon Kaen Animal Nutrition Research Center
- 4) Project Assistant Coordinator: Mrs. Krisna Srisunpakit
Scientist
Animal Nutrition Division

2.2 Counterparts personnel

Department of Livestock Development assigned researchers responsible particular activities of the project as follow:

- 1) Development of evaluation and selection techniques of appropriate pasture varieties:
 1. Mrs. Chaisaeng Phaikaew
 2. Mr. Sumran Vichitphun
 3. Mrs. Ganda Nakamanee
 4. Mrs. Sasithon Thinnakorn
 5. Mr. Viroj Rittruechai
 6. Mr. Sarayut Thaikua
- 2) Development of pasture seed production and post-harvest processing techniques for Registered and Commercial Seed:
 1. Ms. Chureerat Satjipanon
 2. Mr. Supachai Uddachachon
 3. Mr. Weerasak Chinosaeng
 4. Mr. Jaroonroj Chantarasiri
 5. Mr. Krailas Khyothong
- 3) Development of pasture seed inspection and control techniques:
 1. Mrs. Pimpaporn Pholsen
 2. Mrs. Rumpchai Namseelee
 3. Mrs. Walaikarn Jiemjetcharoon
 4. Ms. Sasiwimol Singhophol



4) Improvement of useful technique for forage production, processing and utilization:

1. Mr. Somchit Intharamanee
2. Dr. Sompop Kesamma
3. Dr. Vanida Khamnoedpeth
4. Mr. Vuthipong Intarathum
5. Mrs. Chinda Sanithwong Na Ayudhaya
6. Mr. Osoth Naksakul
7. Mr. Withaya Sumamal
8. Mr. Thumrongsakd Phonbumrung
9. Mr. Kittti Kubkaew
10. Ms. Sasiporn Kunanupongkiti

3. Allocation of Offices, Facilities, Machinery and Equipment

To facilitate the implement of the Project, Department of Livestock Development allocate offices, facilities, machinery and equipment as follow:

3.1 Offices:

- 1) One temporary working room for a project secretary at the Animal Nutrition Division, Bangkok.
- 2) One temporary working room for experts at Pakchong Animal Nutrition Research Center.
- 3) Eight working rooms for experts, counterparts, and secretary at Khon Kaen Animal Nutrition Research Center.
- 4) Two conference rooms at Khon Kaen Animal Nutrition Research Center.

3.2 Laboratories and Equipment:

- 1) One Laboratory and equipment at Khon Kaen Animal Nutrition Research Center.
- 2) One Laboratory and equipment at Pakchong Animal Nutrition Research Center.

3.3 Experimental Fields includes:

- 1) Experimental fields at Khon Kaen Animal Nutrition Research Center.
- 2) Experimental fields at Pakchong Animal Nutrition Research Center.



- 3) Experimental fields at Chiangyuen Animal Nutrition Station.

3.4 Other Facility and Equipment includes:

- 1) Seed Storage room at Khon Kaen Animal Nutrition Research Center.
- 2) Seed Storage room at Pakchong Animal Nutrition Research Center.
- 3) Seed Storage room at Chiangyuen Animal Nutrition Station.
- 4) Building to install seed processing equipment at Chiangyuen Animal Nutrition Station.
- 5) Agricultural Machinery and vehicle, as shown in Table 3 and 4.

3.5 Allocation of budget:

The Thai government allocated budget supports Khon Kaen Animal Nutrition Research Center, Pakchong Animal Nutrition Research Center, and Chiangyuen Animal Nutrition Station, as shown in Table 1.

3.6 Allocation of Personnel:

The staff shown in Table 2, are permanently employ at Khon Kaen Animal Nutrition Research Center, Pakchong Animal Nutrition Research Center, and Chiangyuen Animal Nutrition Station who may participate and assist in the project implementation on request.

4. Progress of Activities

4.1 Development of evaluation and selection technique of appropriate pasture varieties.

The progresses of this activity are as follow:

- 1) Compiled, analyzed and presented data on pasture production condition, pasture varieties, productivity of important varieties, and the system of Introduction and Evaluation of new species.
- 2) Assigned individual counterpart studying, compiling and analyzing data and cultivate particular species in experimental field to study adaptability and specific characteristics of pasture species as follow:

Species	Counterpart	Site of Experimental Field
1. <i>Panicum maximum</i> TD58	Mr.Sumran Vichitphan	Khon Kaen ANRC
2. <i>Brachairia ruziziensis</i>	Mrs.Sasithon Thinnakhon	Pakchong ANRC
3. <i>Stylosanthes guianensis</i> CIAT184	Mr.Sarayut Thaikue	Khon Kaen ANRC
4. <i>Stylosanthes hamata</i> cv.Verano	Mr.Viroj Rittruechai	Chiangyuen ANS
5. <i>Centrosema pascuorum</i> cv.Cavalcade	Mrs.Ganda Nakmanee	Pakchong ANRC
6. <i>Alysicarpus vaginalis</i>	Mrs.Sasithon Thinnakhon	Pakchong ANRC

4.2 Development of pasture seed production and post-harvest processing technique for Registered and Commercial Seed. The progress of activities are:

- 1) Studied, investigated and presented data of present technique of pasture seed production and post-harvesting technique of Commercial Seed by the Animal Nutrition Research Centers, Animal Nutrition Stations and Farmers.
- 2) Studied, investigated and compiled data of present technique of Registered Seed production and post-harvest technique by Animal Nutrition Research Centers and Animal Nutrition Stations in the Northeast.
- 3) Studied present condition and disadvantages of present condition of seed harvesting, post-harvest processing technique of the Animal Nutrition Research Centers, Animal Nutrition Stations and Seed Producer Farmers in the Northeast area.

4.3 Development of pasture seed inspection and control technique.

The progresses of this activity are:

- 1) Studied and compiled data of present condition of seed storage at Khon Kaen Animal Nutrition Research Center which collects, processes, storage and distributes seeds of 7 varieties of grass and 4 varieties of legume.

- 2) Examine seed testing technique of Khon Kaen Animal Nutrition Research Center which operate seed test as required by ISTA rules. However, the Laboratory at Khon Kean has not been a member of ISTA.

4.4 Improvement of useful technique for forage production processing and utilization.

Counterparts and JICA experts examine present practice of pasture utilization of smallholders in the Northeast. The shortage of forage during dry season seems to be common to most farmers in the Northeast, which the team agreed that pasture conservation is a sound solution. The following actions have been planned to implement in the experimental field:

- 1) To introduce high quality hay production used Solar House at Khon Kaen Animal Nutrition Research Center.
- 2) To introduce forage preservation technique used small baling press machine and preserve forage as silage used plastic bags.



Table 1 Annual Budget of Khon Kean Animal Nutrition Research Center,
Pakchong Animal Nutrition Research Center and Chiangyuen Animal
Nutriton Station Fiscal Year 2000(October 1999 to September 2000)

Unit: Baht

Items	Khon Kaen ANRC	Pakchong ANRC	Chiangyuen ANS	Total
1.Salary	2,476,800	2,389,900	1,339,900	6,206,600
2.Wage	4,949,815	7,579,505	4,701,205	17,230,525
3.Materials, Stipends and Maintenance	2,129,900	1,879,800	1,146,400	5,156,100
4.Utility	86,600	86,600	70,300	243,500
5.Equipment	408,600	82,700	341,400	832,700
Total	10,051,715	12,018,505	7,599,205	29,669,425

Source: Animal Nutrition Division, 2000



Table 2 Permanent Staff of Khon Kaen Aimal Nutrition Research Center,
Pakchong Animal Nutrition Research Center and Chiangyuen Animal
Nutrition Station Fiscal Year 2000(Oct. 1999 to Sep. 2000)

Fields/Positions	Khonkaen ANRC	Pakchong ANRC	Chiangyuen ANS	Total
1.Director	1	1	1	3
2.General Office administration	2	2	2	6
3.Researcher,	3	3	1	7
4.Technician of Animal Husbandry	4	4	3	11
5.Scientist	1	1	0	2
6.Machanic Technician	1	1	1	3
7.Driver	4	6	3	13
8.other permanent employee	28	47	28	103

Source: Animal Nutrition Division, DLD, 2000.



Table 3 Vehicles of Khonkaen Animal Nutrition Research Center, Pakchong
Animal Nutrition Research Center and Chiagyuen Animal Nutrition
Station, Fiscal Year 2000(Oct. 1999 to Sep. 2000)

Items	Khonkaen ANRC	Pakchong ANRC	Chiagyuen ANS	Total
1.Four Seated Car	1	-	-	1
2.Small Pick-up	2	1	1	4
3.Medium Truck 3 tons	1	1	1	3
4. Medium Truck 6 tons	2	2	2	6
5.Twelve Seated Minibus	1	1	1	3
6.Double Cap Pick-up	2	2	1	5

Source: Animal Nutrition Division, DLD, 2000.

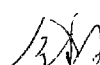



Table 4 Farm Machines of Khon Kaen Animal Nutrition Research
Center, Pakchong Animal Nutrition Research Center and
Chiangyuen Animal Nutrition Station, Fiscal Year 2000
(Oct. 1999 to Sep. 2000)

Items	Khonkaen ANRC	Pakchong ANRC	Chiangyuen ANS	Total
1.Farm Tractor	4	5	6	15
2.Plough Set	2	10	6	18
3.Rotary Tiller	1	1	1	3
4.Spikes Roller	2	5	2	9
5.Fertilizer Spreader	2	2	2	6
6.Manure Spreader	-	1	-	1
7.Gravity Seeddrill	1	2	1	4
8.Rotary Slasher Mower	2	2	4	8
9.Dise Mower	1	3	3	7
10.Drum Mower	1	-	1	2
11.Crop Chopper	-	2	1	3
12.Wheel Rake	1	2	2	5
13.Rotary Rake	2	1	-	3
14.Rectangular Baler	3	4	3	10
15.Round Baler	-	1	-	1
16.Plant Chopper	1	1	1	3
17.Two Wheels Tractor	1	1	1	3
18.Two Wheels Tailor	1	1	1	3
19.Four Wheels Tailor	3	4	5	12

Source: Animal Nutrition Division, DLD, 2000.




1. Development of Evaluation and Selection Techniques (Second Year Plan)

Mr. K. NAKASHIMA

1. Grasses

Apomix Grass Breeding

a : Purple Guinea (*Panicum maximum*, TD-58) Petchaburi Station 1600 → 100 plants were selected ('99)

- Progeny test by space planting (Khon Kaen) : Mr. Sumran
- 1 row (1.5 m X 0.75 m X 6) 3 replications (100 X 6.75 X 3) = 2.025 m²
- Check the variation* and apomixs *heading date, leaf size,
- Verdict of apomixs plants by microscope and plant height, etc.

Outcross Grass Breeding

b: Ruzi (*Brachiaria ruzi zensis*)

- Progeny test by row (Pakchong) : Ms. Sasithorn

1600 → 160 selected (1999) in Pakchong

1 plant to 1 row (1.5 m X 0.75 m X 9) = 10.13 m² , 2 replications

$$160 \times (10.13 \text{ m}^2) \times 2 = 3,242 \text{ m}^2$$

Nursing was damaged by heavy rain, so direct seeding will be done in June.

- Check for morphological variation, physiological character*, and judge for apomixing or not
- *(heading date, plant height, leaf size, anther color, etc.)
- Productivity (fresh yield by cutting, or scoring drought resistance, etc.)
- Individual plant selection and polycross 3rd year → New Strain; → performance test, local adaptability test, specific character test → New Variety

2. Legumes

Self – pollination Legume Breeding

a: Thapra Stylo (Khon Kaen) : Recruit

- Space planting test (1999); continue about 1,600 plants : Mr. Viroj

Heading date (2nd year), productivity, (regrowth, yield)

disease resistance (anthracnose virus, etc.)

○ Progeny test of selected plants (192 x 2 Replication)

(correlate to basic seed production test)

- Check for fixation and outcross ratio

(morphological, physiological characters, flowering date, growth habit etc..)

- Self check : paper bag isolation (10) Total = 20

Open ; natural condition (10)

$$20 \times (7 \times 0.5 \text{ m} \times 1.5 \text{ m}) \times 2 \text{ Reps} = 210 \text{ m}^2$$

- Selection of new *Thapra* strains (pre-performance test of new strains)

- Grouping to early to very late 4 groups by first flowering date, selected 32 plant of each group, and 28 combinations are made (1 ~ 128)

$$1 \text{ plot } (2 \times 3 \text{ m} + 6 \text{ m}^2) \quad 28 \text{ new strains} \times 4 \text{ replications}$$

b : *Hamata* (*Stylosanthes hamata*)

: Mr. Viroj

○ Space planting test (Chiang Yun Station)

$$(1600 \sim) \times 1 \text{ m} \times 1 \text{ m} = 1,600 \text{ m}^2 \sim$$

physiological, morphological characters (heading date, plant type etc.)

c: *Centurion* (*Centrosema pascuorum*)

: Ms. Ganda

Seed harvest was finished with individual plants at the Khon Kaen and Station (1999)

○ Progeny test by row (1.5 m X 0.5 m X 3) 4 replications (Pak Chong)

$$\text{Total } 240 \text{ (Station } 111 + \text{ Khon Kaen } 129)$$

- Check for fixation by progeny variation

Selected individuals → pre-performance test (next year)

*Yield , Disease resistance , seed yield, etc.)

d: *Alyce* clover

(Pak Chong)

: Ms. Sasithone

- Collection and evaluation of ecotypes in Thailand

already 13 ecotypes have been collected

○ Primary essential and optional characters evaluation

$$35 \times (10 \text{ plants} \times 0.5 \text{ m}) \times 4 \text{ replication} \quad 3 \text{ weeks} \rightarrow \text{Transplantation}$$

To decide the characters and methods (What variation can be found?)

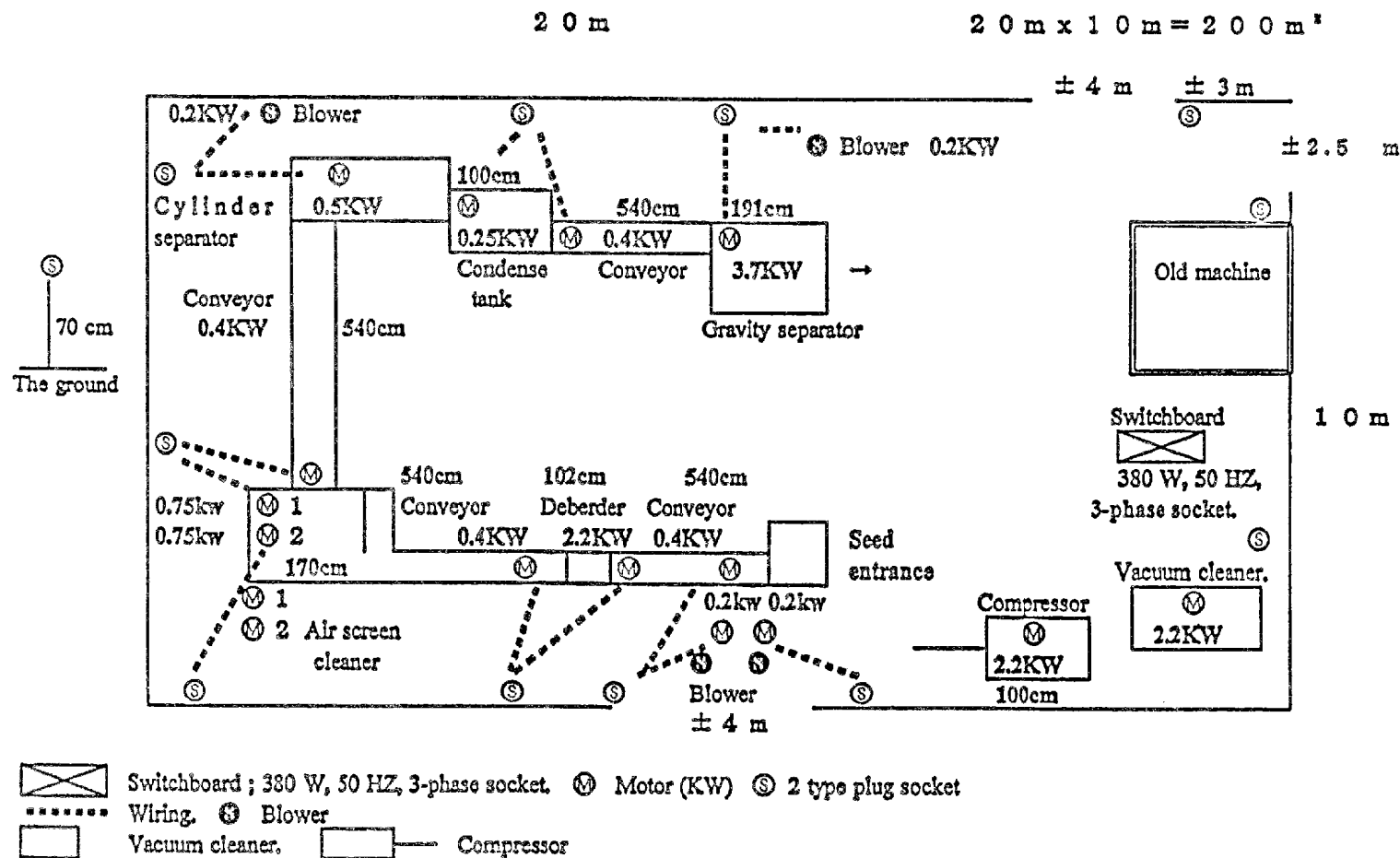
Basic seed production 2000 plan

Ms.Chureerat. S
Mr. S. Kikuchi

Name	Thapra stylo	Ruzi grass
Scientific name	<i>Stylosanthes guianensis</i>	<i>Brachiaria ruzizensis</i>
Site	Khon Kaen	Pak Chong

Plant Number	1000	1000
Sowing for seedbed time	May 10	May
Seed treatment	Hot water or H ₂ SO ₄	No
Seed number	2 seeds/pot	2 seeds/pot
Transplanting time area	May-June 1000 m ²	May-June 250 m ²
Planting density	100 x 100 cm	50 x 50 cm
Fertilizing time quantity	June and August 15-15-15 25Kg/rai or conventional method	June and August 15-15-15 25Kg/rai or conventional method
Weed control	As often as it needs	As often as it needs
Harvesting time method	Jan.-Feb. Cover nylon bag	Oct.-Nov. Cover nylon bag

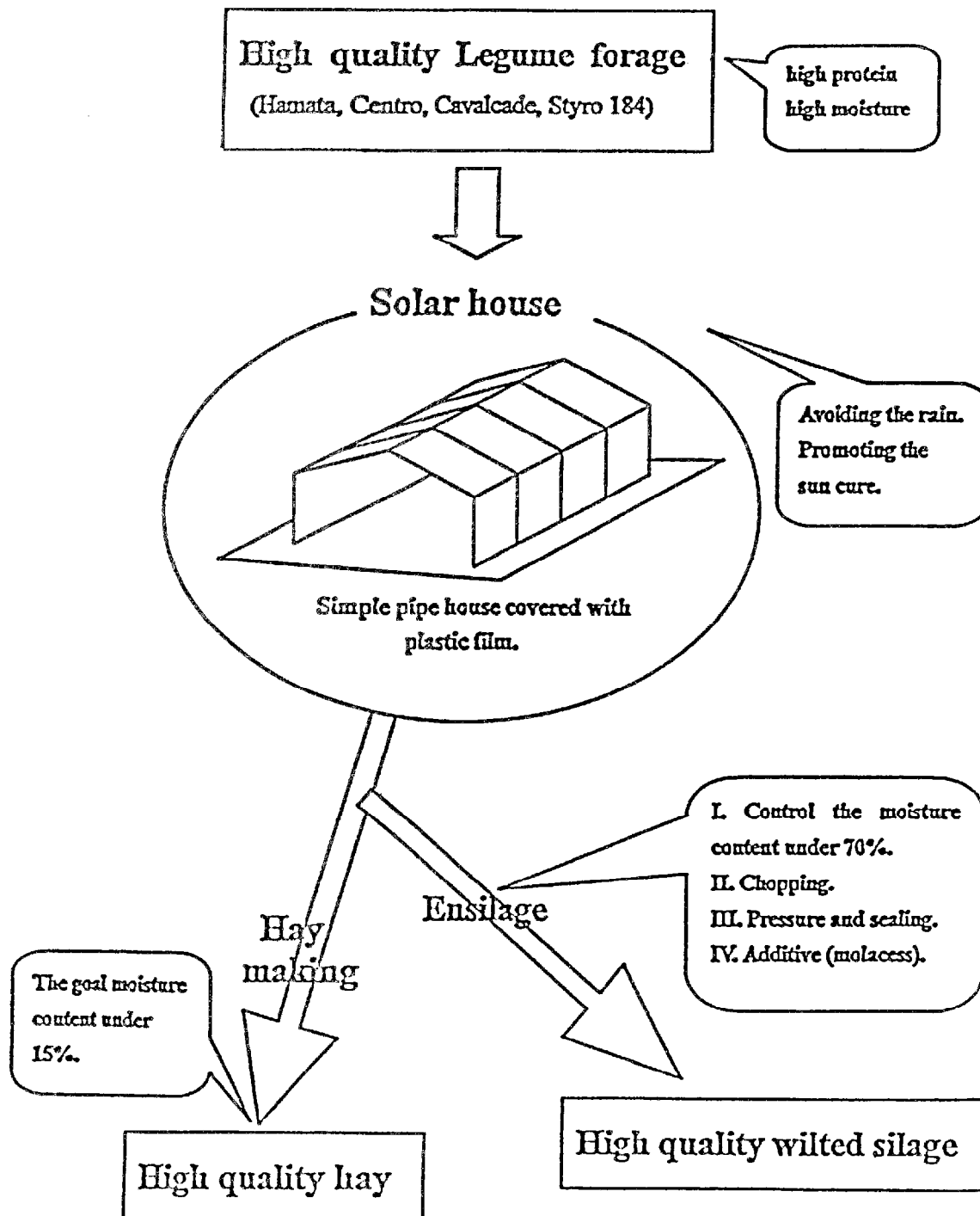
April 2000



Electric power of individual machine

1. Deberder	2. 2	KW
2. Air Screen Cleaner	1. 5	KW (2 x 0.75 KW)
3. Cylinder Separator	0. 5	KW
4. Condense Tank	0. 2 5	KW
5. Gravity Separator	3. 7	KW
6. Conveyor	1. 6	KW (4 x 0.4KW)
7. Air Compressor	2. 2	KW
8. Cleaner	2. 2	KW
9. Blower	0. 8	KW (4 x 0.2KW)
Total		14. 9 5 KW

The basic concept of "Improvement of processing techniques of legume forage used by solar house in rainy season."



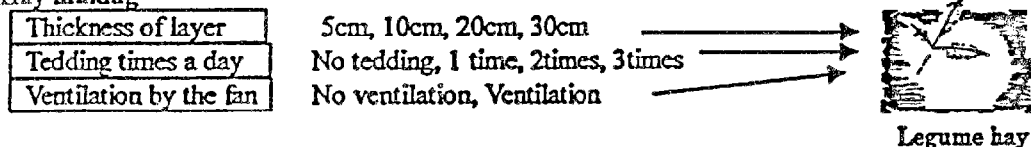
The basic concept of “Improvement of processing techniques of legume forage used by solar house in rainy season.”

I. Main Point of the Research

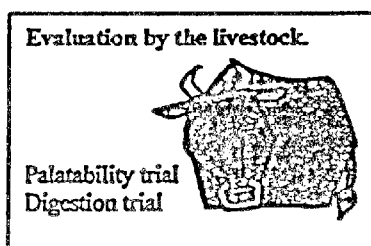
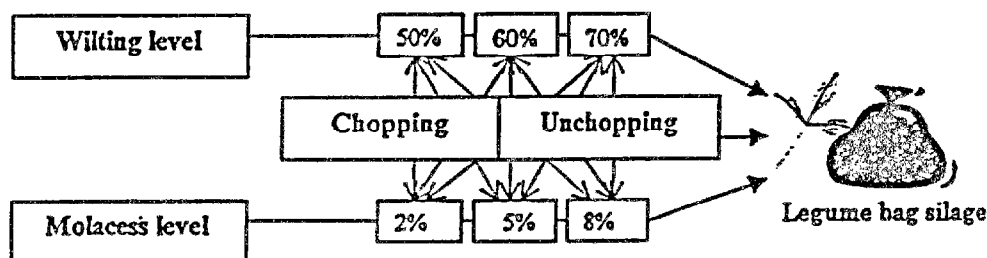
- i) Hay making: To evaluate the drying conditions inside the solar house in rainy season and to investigate the effect of the thickness of forage layer, tedding times and ventilation.
- ii) Ensilage: To investigate the effect of wilting by solar house and addition of molasses on chopping and unchopping legume silage quality.

II. Treatment

i) Hay making



ii) Ensilage(plastic bag silo)



Selection of the treatment level.

III. Analysis




- ② The environmental condition of outside and inside solar house during drying(temperature, humidity, rainfall etc.) and a water decrease speed in the various conditions.
- ③ The chemical composition of material and hay and silage(DM, WSC, CP, EE, NDF, ADF, Ash)
- ④ Fermentation quality of silage(pH, Organic acids, VBN)
- ⑤ DM losses of during conservation.
- ⑥ If the spoilage(or mould) is occurred, the quantity of the spoilage should be weighed.
- ⑦ Intake (or palatability) and nutritive value(DCP, TDN) of hay and silage.







Verification and demonstration of high quality legume forage conservation system in rainy season.

EXPERTS	1 st Year (Aug 1999-)	2 nd Year (Aug. 2000-)	3 rd Year (Aug. 2001-)	4 th Year (Aug. 2002 -)	5 th Year (Aug. 2003 -)
1. Long-term Experts					
Chief Advisor /Forage Production and Utilization					
Mr. Yoshitake TAKEOKA					
Aug. 14, 1999 - Aug. 13, 2001					
Coordinator					
Mr. Yoshihiro SHIMIZU					
Aug. 14, 1999 - Aug. 13, 2001					
Forage Seed Production					
Mr. Seijun KIKUCHI					
Aug. 14, 1999 - Aug. 13, 2001					
Forage Evaluation and Selection					
Mr. Koichi NAKASHIMA					
Aug. 14, 1999 - Aug 13, 2001					

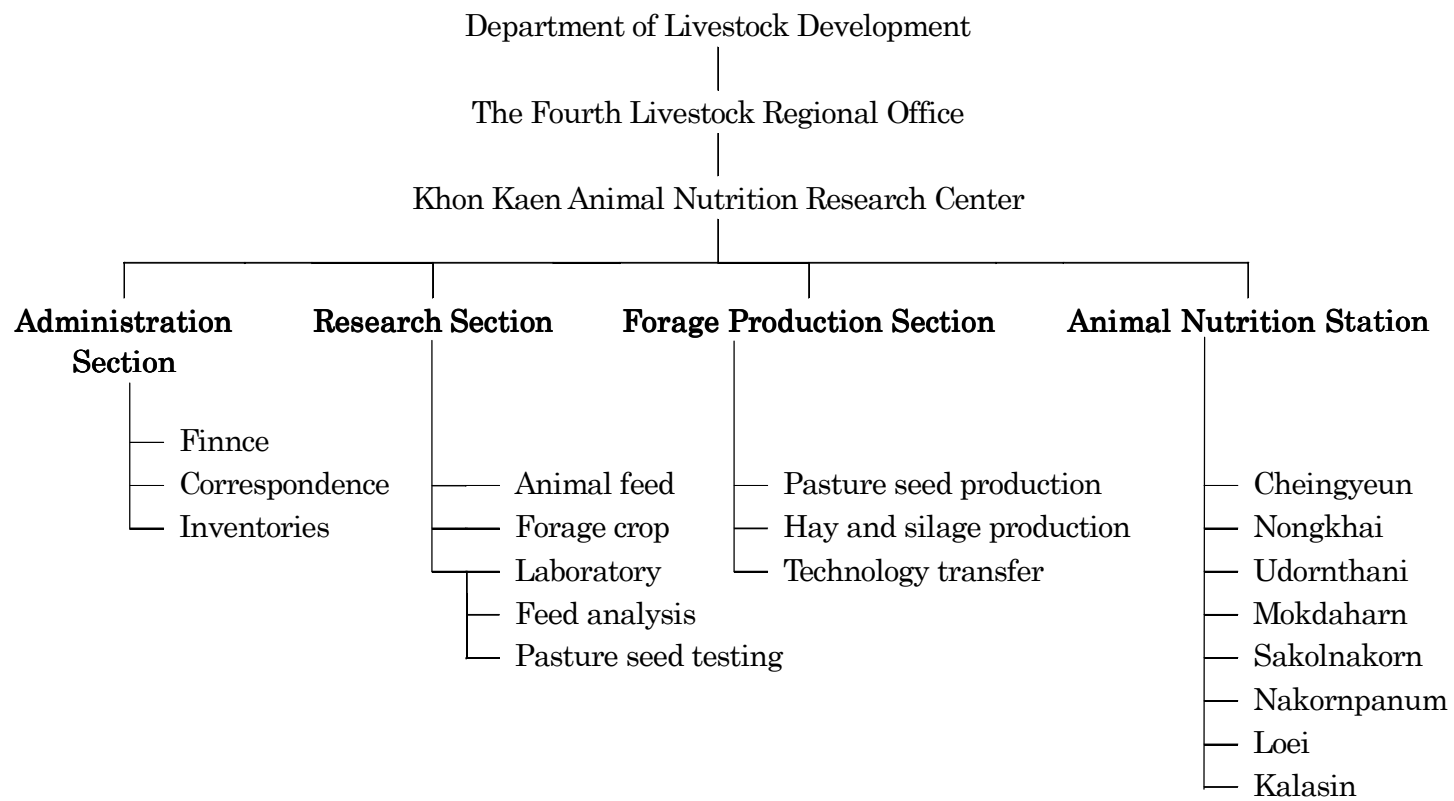
List of Japanese Experts Assigned to the Project

EXPERTS	1 st Year (Aug 1999-)	2 nd Year (Aug. 2000-)	3 rd Year (Aug. 2001-)	4 th Year (Aug. 2002 -)	5 th Year (Aug. 2003 -)
2.Short- term Experts 1999 Japanese Fiscal Year					
Pasture Seed Inspection and Control Mr.Kazuaki AMARI Nov. 8, 1999 -- Jan. 7, 2000					
Pasture Seed Harvesting and Post-harvest Processing Mr.Kenji YODA Nov. 8, 1999 -- Jan. 7, 2000					
Forage Production and Utilization Mr.Hidenori KAWAMOTO Feb. 14, 2000 - March 29, 2000					

List of Counterparts study in Japan

EXPERTS	1 st Year (Aug 1999-)	2 nd Year (Aug. 2000-)	3 rd Year (Aug. 2001-)	4 th Year (Aug. 2002 -)	5 th Year (Aug. 2003 -)
1999 Japanese Fiscal Year					
Evaluation and Selection Technique on Pasture Varieties					
Mr.Sumran WIJITPHAN Oct. 19, 1999 – Dec. 23, 1999					
Pasture Seed Production					
Mr.Weerasak CHINOSAENG Mar. 28, 2000 – Jun. 18, 2000					
Evaluation and Selection of Disease and Insect in Forage Crop					
Mrs.Ganda NAKAMANEE Jun. 18, 2000 – Sep. 15, 2000					
Pasture Seed Inspection and Quality Control					
Mrs.Pimpapom PHOLSEN June. 18, 2000 –Aug. 19, 2000					

資料 4 . コンケン家畜栄養研究センターの組織図



Committee	Function	Chairman and Members	Frequency
1. Joint Coordinating Committee	① To formulate the annual work plan (AWP- P.O.-Plan of Operation) ② To review the overall progress of technical cooperation program & achievement of AWP; ③ To review the measures taken by the Japanese side (Dispatch of experts, C/P training in Japan, Provision of M&E); ④ To review the measures taken by Thai side (Allocation of budget including local cost expenditures, C/P allocation, Utilization of M & E provided by JICA) ⑤ To recommend the two Governments on Budgetary matters, Appointment of C/P, Selection and utilization of E & M, Appropriate dispatch of Japanese Experts, C/P training in Japan.	DG Listed in R/D	1/F.Y
2. Counterpart Meeting -1 (Quarterly)	① To formulate the Criteria for Monitoring and Evaluation # ② To implement quarterly monitoring and evaluation; Progress of the Activities, Problems, Feed back , plan of the next term	Director AND All Experts All C/P	Quarterly
3. Coordinator Meeting	To consul and discuss the project management on whole matters of the project implementation	Director AND Chef Advisor/ Coordinator	Fortnightly
4. Counterpart Meeting -2 (monthly)	To implement monthly monitoring and evaluation; Progress of the Activities, Problems, Feed back , plan of the next term	Director KANC Experts All C/P	Monthly
5. Manager Meeting	To consul and discuss the project implementation on the progress of activities and problems	Director KANC Chief Advisor	Any time
6. Working Group Meeting	To consult and discuss the activities in each field	Expert C/P	Any time

Detailed Implementation Plan (Plan of Operation for whole period) and Annual Work Plan (Annual Plan of Operation) are consisted of

1. Target/ Indicator; outputs expected;
2. Schedule; period of activities showing on a bar-chart;
3. Responsible person ; Counterparts and Experts in each field;
4. Input;
5. Remark.

Progress of the activities should be reported by counterparts in each field at the meeting.

資料 6 . タイ国における牧草種子生産を巡る情勢

1. Livestock Development During the 8th National Economic and Social Development Plan

During 1997 – 2001, Thailand develops the country in accordance with the 8th National Economic and Social Development Plan.

Agricultural remains the most important sector since more than one half of the population of the country earns their living on agricultural activities. Livestock has important role since most farm families in the rural villages keep one or many types of Livestock for supplementary household income. Beef cattle, Dairy cattle, Buffaloes, Swine, Broilers, Layers and Local chickens are the promise domestic animals of the country. However, during 1997 – 1999, Thailand unable to increase number of beef cattle and buffaloes as mentioned in the plan, in contrast, number of beef cattle and buffaloes declined by 11 percent, and 15 percent per year respectively, as shown in table 1 and 2. There are 2 main factors depressed number of cattle and buffaloes, namely: **the economic crisis in 1998, and the transforming of the used of draft animal to small machine.** On the other hand, Thailand was successful on developing dairy production and encouraging Forage Crop Production.

The significant change in Livestock production during 1997 to 1999 were:

- 1.) Thailand imported less beef cattle, dairy cattle and dairy products.
- 2.) Department of Livestock Development, MOAC, Thailand produced and extended breeder animals to produce good

performance beef cattle, dairy cattle and upgrade local cattle.

- 3.) Department of Livestock Development provided opportunities to private sector and farmers involved a number of Livestock development projects, i.e. vaccine production project, meat- processing project, cattle breeding project.
- 4.) Department of Livestock Development provides more servicing activities, i.e. technical consultant, quality control, quality inspection, standardization, guidance information and transfer technology to private firms and farmers.
- 5.) Department of Livestock Development was every successful on developing and promoting pasture establishment, pasture utilization and pasture seed production. In 1999 and early 2000, number of farmers buying pasture seeds and establishing backyard pasture surprisingly increased which revealed the demand progressive and awareness of pasture important.

2. Change in number of dairy and beef cattle in the last 5 years :

Data presents in table 1 and 3.

3.1 Production volume of dairy products and beef:

Data presents in table 4 and 5.

3.2 Import volume of dairy products and beef :

Data presents in table 6 and 7.

4. Change in pasture seed production for different grass type, region, and producers for the last 5 years :

Data presents in table 8.

5.1 Change in pasture seed quotas for different grass type for the last 5 years

Data presents in table 9.

5.2 Change in price of pasture seed quotas for different grass type for the last 5 years

Data presents in table 10.

Table 1 Statistics of Beef Cattle in Thailand
(1988 – 1998)

Year	Number (Head)	Changes (Head)	Changes (%)
1988	4,500,740	-	-
1989	4,986,940	+ 486,200	+ 10.8
1990	5,510,993	+ 524,053	+ 10.5
1991	6,435,777	+ 924,784	+ 16.8
1992	6,898,980	+ 463,203	+ 7.2
1993	7,235,384	+ 336,404	+ 4.9
1994	7,405,732	+ 170,348	+ 2.4
1995	7,321,821	- 83,911	- 1.1
1996	5,854,529	- 1,467,292	- 20.0
1997	5,291,936	- 562,593	- 9.6
1998	4,567,950	- 723,986	- 13.7

Source : Planning Division, DLD, 1998

Table 2 Statistics of Buffalo in Thailand
(1988 – 1998)

Year	Number (Head)	Changes (Head)	Changes (%)
1988	4,619,826	-	-
1989	4,611,692	- 8,134	- 0.2
1990	4,694,290	+ 82,598	+ 1.8
1991	4,805,071	+ 110,781	+ 2.4
1992	4,728,271	+ 75,875	- 1.6
1993	4,804,146	+ 75,875	+ 1.6
1994	4,224,791	- 579,355	- 12.0
1995	3,710,061	- 514,730	- 12.2
1996	2,719,674	- 425,736	- 26.7
1997	2,293,938	- 425,736	- 15.6
1998	1,951,068	- 342,870	- 14.9

Source : Planning Division, DLD, 1998

Table 3 Statistics of Dairy Cattle in Thailand
(1988 – 1998)

Year	Number (Head)	Changes (Head)	Changes (%)
1988	94,927	-	-
1989	132,776	+ 37,849	+ 39.9
1990	157,537	+ 24,761	+ 18.6
1991	191,194	+ 33,657	+ 21.4
1992	222,499	+ 31,305	+ 16.4
1993	237,189	+ 14,690	+ 6.6
1994	231,618	- 5,571	- 2.3
1995	287,247	+ 55,629	+ 24.0
1996	276,345	- 10,902	- 3.8
1997	302,872	+ 26,527	+ 9.6
1998	295,423	- 7,449	- 2.6

Source : Planning Division, DLD, 1998

Table 4 Statistics of Raw Milk Production in Thailand
(1990 – 1999)

Year	Row Milk Production (Mt)	Changes (Mt)	Changes (%)
1990	125,605	-	-
1991	142,253	+ 16,648	+ 13.2
1992	177,000	+ 34,747	+ 24.4
1993	134,011	- 42,987	- 24.3
1994	205,407	+ 71,396	+ 53.3
1995	307,229	+ 101,822	+ 49.6
1996	343,388	+ 36,159	+ 10.5
1997	385,728	+ 42,340	+ 12.3
1998	387,918	+ 2,190	+ 0.6
1999	476,000	+ 88,082	+ 22.7

Source : FAO, 2000

Table 5 Statistics of Beef Production in Thailand
(1990 – 1999)

Year	Cattle Beef (Mt)	Buffalo Beef (Mt)	Total (Mt)
1990	188,129	136,620	316,749
1991	188,715	131,560	320,275
1992	191,200	126,500	317,700
1993	204,600	132,995	337,592
1994	236,830	111,477	348,307
1995	232,468	104,737	337,205
1996	228,392	101,139	329,531
1997	226,066	73,507	299,573
1998	210,280	64,604	274,884
1999	187,504	79,500	267,004

Source : FAO, 2000

Table 6 Statistics of Beef Imports to Thailand
(1988 – 1998)

Year	Beef and Veal , Boneless (Mt)	Value (Baht)
1988	99	30,880,000
1989	206	60,280,000
1990	459	94,560,000
1991	733	104,160,000
1992	1,076	126,680,000
1993	2,101	167,680,000
1994	960	106,920,000
1995	1,342	141,720,000
1996	1,157	110,600,000
1997	802	82,800,000
1998	802	82,800,000

Source : FAO, 2000

Note : convert value from dollar to baht; 1 dollar = 40 baht

Table 7 Statistics of Milk Product Imports to Thailand

(1988 – 1998)

Year	Product			
	Dry Skim Milk (Mt)	Dry Whey (Mt)	Dry Whole Milk (Mt)	Total (Mt)
1988	47,173	2,219	19,022	68,414
1989	32,589	5,182	14,109	51,880
1990	47,536	10,746	17,326	75,608
1991	50,905	11,715	18,286	80,906
1992	62,147	7,416	24,744	94,307
1993	52,375	8,519	24,656	85,550
1994	71,749	7,790	30,891	110,430
1995	79,919	11,774	41,192	132,885
1996	67,174	16,715	50,430	134,319
1997	45,528	16,647	45,548	107,723
1998	45,528	16,647	45,548	107,723

Source : FAO, 2000

Table 8 Statistics of Pasture seed Production in Thailand

(1996 - 2000)

Item		production (ton)					
		1996	1997	1998	1999	2000	Average
Grasses							
	DLD	123.1	76.5	75.4	67.4	42.4	77.0
Ruzi	Farmers	370.0	142.8	134.8	51.5	103.1	160.4
	Total	493.1	219.3	210.2	118.9	145.5	237.4
Purple guinea	DLD	36.8	30.1	21.1	17.8	7.9	22.7
	Farmers	10.0	19.1	21.1	10.0	20.0	16.0
	Total	46.8	49.2	42.2	27.8	27.9	38.8
Plicatulum	DLD	24.5	28.9	25.0	14.0	14.1	21.3
	Farmers	0.0	0.0	0.0	0.0	4.0	0.8
	Total	24.5	28.9	25.0	14.0	18.1	22.1
Atratum	DLD	0.0	3.3	11.2	25.0	17.1	11.3
	Farmers	0.0	0.0	0.0	3.0	21.0	4.8
	Total	0.0	3.3	11.2	28.0	38.1	16.1
Other grasses	DLD	14.0	27.1	14.2	13.4	8.8	15.5
	Farmers	20.0	1.5	4.3	1.0	0.0	5.4
	Total	34.1	28.6	18.5	14.4	8.8	20.9
Subtotal grasses	DLD	198.4	165.9	146.8	137.5	90.3	147.8
	Farmers	400.0	163.3	160.2	65.5	148.1	187.4
	Total	598.5	329.3	307.0	203.0	238.5	335.2

Source : Animal Nutrition Division , DLD

Table 8 Statistics of Pasture seed Production in Thailand(continue)

(1996 - 2000)

Item		production (ton)					
		1996	1997	1998	1999	2000	Average
Legume							
	DLD	18.4	7.1	4.1	1.7	2.6	6.8
Hamata	Farmers	179.4	55.8	58.1	45.5	48.0	77.4
	Total	197.8	62.8	62.2	47.2	50.6	84.1
	DLD	0.0	1.8	5.1	31.4	28.8	13.4
Cavalcade	Farmers	0.0	0.0	0.0	0.0	24.0	4.8
	Total	0.0	1.8	5.1	31.4	52.8	18.2
	DLD	0.0	0.0	0.0	2.1	3.5	1.1
Stylo CIAT184	Farmers	0.0	0.0	0.0	7.0	14.0	4.2
	Total	0.0	0.0	0.0	9.1	17.5	5.3
	DLD	9.4	18.2	6.8	5.6	6.6	9.3
Other legumes	Farmers	20.7	8.5	5.0	7.0	6.3	9.5
	Total	30.1	26.7	11.8	12.6	12.9	18.8
	DLD	27.9	27.1	16.0	40.8	41.5	30.6
Subtotal legumes	Farmers	200.1	64.3	63.1	59.5	92.3	95.9
	Total	228.0	91.4	79.1	100.3	133.8	126.5
	DLD	226.3	193.1	162.8	178.3	131.8	178.5
TOTAL	Farmers	600.1	227.6	223.3	125.0	240.4	283.3
	Total	826.4	420.7	386.1	303.3	372.3	461.7

Source : Animal Nutrition Division , DLD

Table 9 Pasture Seed Quotas Classified by Required Livestock
Development Projects in Thailand (1996 – 2000)

Unit = Mt

Project	Year				
	1996	1997	1998	1999	2000
1. The Livestock Extension project	135.	51.5	17.0	22.0	124.0
2. The Agricultural Restructuring Project	140.9	80.2	60.0	-	12.0
3. The Beef Cattle Promotion Project	-	6.2	-	-	-
4. The Dairy Cattle Promotion Project	195.0	21.6	23.0	32.0	36.0
5. The Livestock Extension Supports Agricultural Land Reform Project	129.1	-	26.0	17.0	-
6. The Livestock Promotion for Export Project	-	54.0	72.3	14.0	14.0
7. The Royal Project	-	5.0	5.0	-	-
8. The Animal Nutrition Division's Quota	-	-	20.0	40.0	60.0
9. Other	-	-	-	-	2.7
Total	600.1	218.5	223.3	125.0	248.7

Source : Animal Nutrition Division, DLD, 2000

Table 10 Price of Pasture Seed in Thailand(continue)
(1996 – 2000)

	Unit = baht/Kg				
	1996	1997	1998	1999	2000
<u>Selling Price</u> : DLD sells					
to farmers					
1. <i>Brachiaria ruziziensis</i>	60	60	60	60	60
2. <i>Panicum maximum</i> TD58	80	80	80	80	80
3. <i>Paspalum atratum</i>	60	60	60	60	60
4. <i>Paspalum plicatulum</i>	60	60	60	60	60
5. <i>Stylosanthes hamata</i>	50	50	60	60	60
cv. Verano					
6. <i>Stylosanthes guianensis</i>	na	na	60	60	60
CIAT 184					
7. <i>Centrosema pascuorum</i>	na	na	40	40	40
cv. Cavalcade					

Source : Animal Nutrition Division, DLD,2000

Table 10 Price of Pasture Seed in Thailand
(1996 – 2000)

	Unit = baht/Kg				
	1996	1997	1998	1999	2000
<u>Farm Price : farmers</u>					
Sell to DLD					
1. <i>Brachiaria ruziziensis</i>	55	55	55	55	55
2. <i>Panicum maximum</i> TD58	80	80	80	80	80
3. <i>Paspalum atratum</i>	na	na	55	55	55
4. <i>Paspalum plicatulum</i>	55	55	55	55	55
5. <i>Stylosanthes hamata</i>	45	45	55	55	55
cv. Verano					
6. <i>Stylosanthes guianensis</i>	na	na	55	55	55
CIAT 184					
7. <i>Centrosema pascuorum</i>	na	na	35	35	35
cv. Cavalcade					

Source : Animal Nutrition Division, DLD,2000

Pasture Seed Production in Thailand

Table 11 Pasture Seed to be produce in 2000/2001

Code	Varieties	Seed classes / Seed Production / Kg.				
		FS	RS	CS ₁	CS ₂	Total
01	<i>Brachiaria ruziziensis</i>	100	20,200	0	113,150	133,450
02	<i>Panicum maximum</i> TD58	80	13,650	6,650	24,000	44,380
03	<i>Paspalum atratum</i>	80	16,710	0	27,000	43,790
04	<i>Paspalum plicatulum</i>	80	3,600	0	3,000	6,680
05	<i>Panicum maximum</i> Var. trichoglume	0	900	0	0	900
06	<i>Setaria sphacelata</i>	0	600	0	0	600
07	<i>Chloris gayana</i>	40	1,400	0	0	1,440
08	<i>Brachiaria decumbens</i> , <i>Brachiaria humidicola</i>	0	250	0	0	250
09	<i>Sorghum bicolor</i>	0	0	3,000	0	3,000
	Grass Seed	380	57,310	9,650	167,150	231,490

Source : Animal Nutrition Division, 2000

Note : FS = Foundation Seed

RS = Registered Seed

CS₁= Commercial Seed produce by the Animal Nutrition Research center
and station

CS₂= Commercial Seed produce by the Farmers in contract with Department of
Livestock Development

Pasture Seed Production in Thailand

Table 11 Pasture Seed to be produce in 2000/2001(continue)

Code	Varieties	Seed classes / Seed Production / Kg.				
		FS	RS	CS ₁	CS ₂	Total
21	<i>Stylosanthes hamata</i>	80	2,000	0	41,850	43,930
	cv. Verano					
22	<i>Stylosanthes guianensis</i>	80	4,000	2,000	26,000	32,080
	CIAT 184					
23	<i>Centrosema pascuorum</i>	100	19,050	9,200	40,800	69,150
	cv. Cavalcade					
24	<i>Centrosema pascuorum</i>	0	2,300	0	0	2,300
	cv. Bundy					
25	<i>Desmenthus vigrathus</i>	80	2,200	0	3,000	5,280
26	<i>Arachis pintio</i>	0	800	0	100	900
27	<i>Centrosema</i> (New variety)	0	250	0	0	250
28	<i>American jointvech</i>	0	40	0	0	40
	cv. Lee					
29	<i>Stylosanthes guianensis</i>	0	100	0	0	100
	cv. Siran					
30	<i>Cajanus cajan</i>	0	0	300	0	300
	Legume Seed	340	30,740	11,500	111,750	154,330
	Total	720	88,050	21,150	278,900	385,820

Source : Animal Nutrition Division, 2000

Note : FS = Foundation Seed

RS = Registered Seed

CS₁= Commercial Seed produce by the Animal Nutrition Research center and
Station

CS₂= Commercial Seed produce by the Farmers in contract with Department of
Livestock Development