

# Proceedings of the Inception Meeting of CIAT/ADB Project

## "Development of Sustainable Technologies for Resource-Poor Upland Farmers in Asia"

17-18 February 2000, Los Baños, Philippines



Compiled by R.L. Roothaert  
CIAT  
July 2000



Technical Assistance for Agricultural and Natural Resources Research at  
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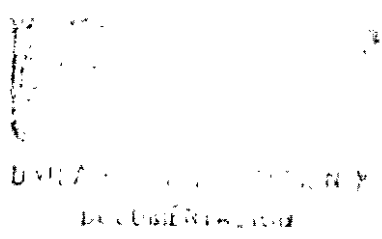
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## **Summary**

The inception meeting was attended by 18 people from Indonesia, Laos PDR, Philippines, Thailand, Vietnam and Australia. The objectives of the meeting were to review the achievements of the first phase of the Forages for Smallholder Project (FSP) funded by AusAID, to discuss the expectations of the second phase of FSP, and to initiate strategies for the implementation of the new project.

### **The first phase of the Forage for Smallholders Project**

A general paper for FSP – phase I, and individual country papers were presented. The project had gone through a metamorphosis from agronomic fodder experiments on-station to participatory research on-farm. All stages were vital for the final outcome of the project, but it was repeatedly stressed that only participation of farmers in the research process has shaped the technologies in such a way that they were actually used and adopted. The second phase of the project is going to build on these experiences.

### **ADB's expectations of the second phase**

The ADB representative presented the expected outputs of the ADB-FSP project as listed in Appendix 1. All outputs were grouped into the 5 components:

1. Productive and sustainable technologies developed
2. Forage technologies extended to other farmers
3. Local planting material supply systems developed
4. Programmed training of NARSs personnel conducted
5. Information shared

### **Organisational structure**

The participating countries are Indonesia, Lao PDR, Philippines, PR China, Thailand and Vietnam. The ADB representative will be Dr. Tony Perez, the Project Manager Dr. Peter Kerridge, and the Project Co-ordinator Dr. Ralph Roothaert. The latter would also serve as a resource person. The Co-ordination Committee is made up of the Country Co-ordinators (Liaison Officers), the Project Director, the Project Officer and the ADB Representative. The committee will agree on the strategy of implementation of the project at the annual meetings.

## **General strategy**

The main components of the project are: 1. Development of sustainable technologies, and 2. Dissemination of forage technologies. The other components, 3. Development of forage multiplication systems, 4. Training, and 5. Networking are tools that complement the first two. One or two focus Municipalities or Districts have been identified in every country. These are sites where adoption was high in the first phase of the project and they will form the basis of further forage technology development. Participatory diagnosis and evaluation are used to improve the technologies. At the same time field days and cross visits will help to spread the use to other farmers in the district.

Before dissemination activities start outside the focus districts, the new districts will be selected through the study of secondary data and through rapid rural appraisals. People will be trained at district level in participatory research and in forage technology. These training events also serve as an opportunity to assess the availability of skilled and motivated extension person in the field.

## **Country strategies**

Every country representative presented his (or her) views about which direction he would like the FSP to see moving in the second phase. A framework was then developed to plan activities for the individual countries, for the focus sites within the countries and for the new sites. A start was made during the meeting to identify activities, to allocate timetables and predict the outputs for the next three years. During the following months, the country teams and FSP co-ordinators further developed these frameworks into workplans. The results are attached in chapter 5 of these proceedings.

# 1. Programme

**16<sup>th</sup> February, Wednesday**

Arrival of participants and registration

**17<sup>th</sup> February, Thursday**

**Chairperson:** Dr. Peter Kerridge

0800 Official welcome Dr. Patricio Faylon, PCCARD  
Dr. Antonio Perez, ADB

## **Phase I Forage for Smallholders Project - Review of progress**

**Chairperson:** Dr. Ralph Roothaert

**Rapporteur:** Mr. Francisco Gabunada

0830 Summary of outputs of FSP 1995-1999 Dr. Werner Stur

### Country presentations

0900 Philippines Mr. Eduedo Magboo  
0930 Lao PDR Mr. Vanthong Phengvichith  
1000 Coffee Break  
1030 Indonesia Mrs. Maimunah Tuhulele  
1100 Vietnam Mr. Le Hoa Binh  
1130 Thailand Mrs. Chaisang Phaikaew  
1200 China Dr. Peter Kerridge  
1230 Lunch Break

## **Phase II Forage for Smallholders - The ADB Project**

**Chairperson:** Mr. Eduedo Magboo

**Rapporteur:** Mr. Phonepaseuth Phengsavanh

1330 Expected outputs from the project  
and ADB reporting requirements Dr. Tony Perez  
1430 Roles of participants in the project Dr. Peter Kerridge  
1500 Coffee Break  
1530 Strategy for implementing Phase II Dr. Ralph Roothaert  
1800 Dinner  
1900 Country representatives review their strategy for implementation

**18<sup>th</sup> February, Friday**

**Country strategy for implementation of the various components  
of the ADB project, including tentative outputs**

**Chairperson: Dr. Tony Perez**

**Rapporteur: Dr. Ralph Roothaert**

- Component 1. Productive and sustainable forage technologies:  
Continuing research on forage technology development
- Component 2. Dissemination and extension of forage technologies:  
Development of participatory approaches for scaling-up and scaling-out
- Component 3. Effective local seed and planting material multiplication systems  
Methods of multiplication to be used in different countries
- Component 4. Improved capability to develop and deliver new technologies  
Training and follow-up programs for extension workers and farmers
- Component 5. Regional Network  
SEAFRAD Network

**Country presentations**

0800 Philippines

0830 Lao PDR

0900 Indonesia

0930 Vietnam

1000 Coffee Break

1030 Thailand

1100 China

1130 General discussion

1200 Lunch break

1300-1600 Finalize program and budget by country

Separate discussions with country representatives

1600 Final summary session -- Dr. Peter Kerridge (Chairperson)

1900 Workshop dinner in Los Banos

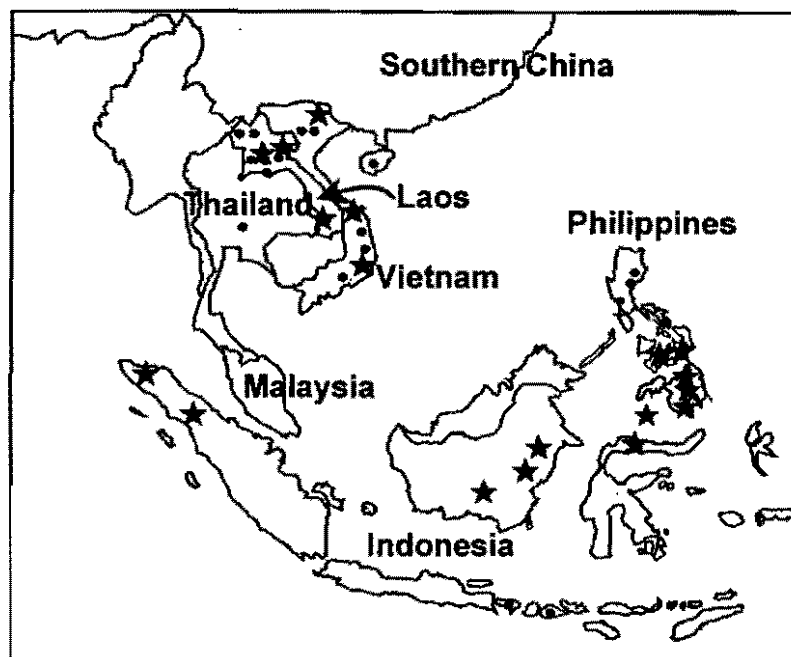
**19<sup>th</sup> February, Saturday** Departure of participants



## 2. Forage for Smallholders Project – Review of Phase 1

### 2.1 Forages for Smallholders Project (FSP) – AusAID 1995 - 1999

*Werner Stür*

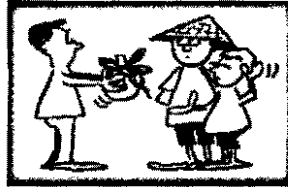
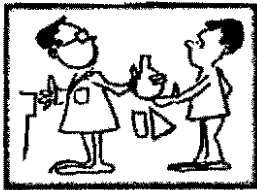


#### Goals

- to identify forage varieties adapted to upland environments of Southeast Asia (for livestock feed and NRM)
- to integrate forages into smallholder farming systems
- capacity building
- information systems

#### Issues

- access to 'forage technologies'
- 'central source' model



## Other Issues

- growing forages is a new concept for many farmers in Southeast Asia
- farm size is small (1-3 ha)
  - how to integrate forages?
  - use and opportunities
- smallholder systems are immensely diverse and dynamic

## Partnerships

### International level

- CIAT and CSIRO
  - germplasm
  - participatory approaches
- National governments (Livestock Dept)
  - build on existing work
  - integration, ownership sustainability

### Local level

- farmers, farmer group
- agricultural extension agencies
- NGOs

GRASSES	CLIMATE			SOIL FERTILITY AND ACIDITY		
	Wet tropics with no or short dry season	Wet/dry tropics with long dry season	Cooler tropics (eg. high elevation)	Fertile (neutral to mod. acid soils)	Moderately fertile (neutral to mod. acid soils)	Infertile (moderate to extreme acid soils)
<i>Andropogon gayanus</i>	•	••		•	•	•
<i>Bracharia brizantha</i>	•	••	••	•	••	•
<i>Bracharia decumbens</i>	•	••	••	•	••	•
<i>Bracharia humidicola</i>	••	•	•	•	•	••
<i>Bracharia ruziziensis</i>	••		•	••	•	
<i>Panicum maximum</i>	••	•	•	••	•	
<i>Paspalum atratum</i>	••		•	•	••	•
<i>Pennisetum purpureum</i> and hybrids	••		•	••	•	
<i>Setaria sphacelata</i>	••	•	••	••	•	



### Participatory approaches

- the Participatory Research (PR) model
- participatory approaches to technology development are new
- traditional R & D model in all countries
- training in PR with the help from CIAT
- mutual learning of all partners

### Outcome:

#### Identification of forage varieties

#### Identified a range of forage options

- broadly adapted, robust varieties
- many of the selected varieties are cultivars that have also been selected for release in South America (networking)
- farmer experimentation was essential
- varieties suitable for different 'systems' and uses as adopted by smallholder farmers

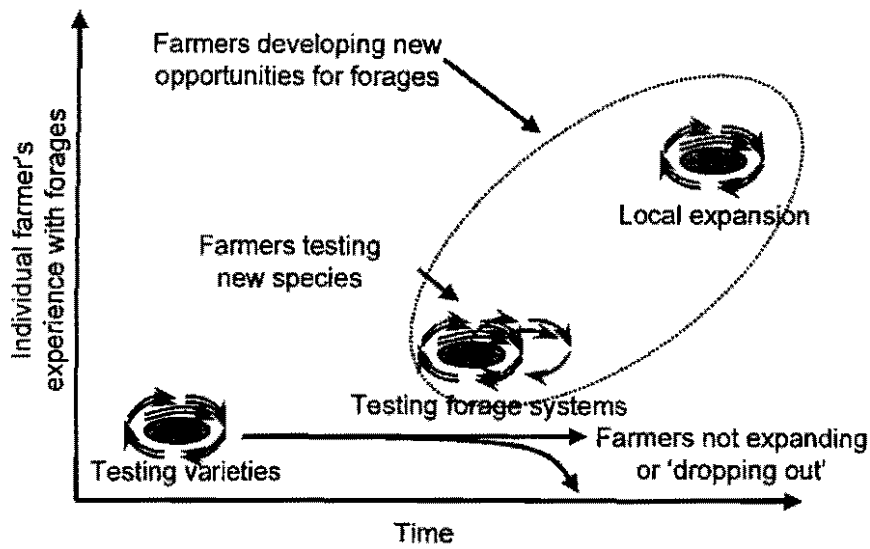
Integration of forages: Number of farmers evaluating forages.

Farming system	Sites	Farmers in 1999
Shifting cultivation	4	395
Intensive upland	3	385
Moderately intensive upland	4	452
Extensive upland	2	268
Grassland	2	240
Total	15	1740

Integration: Adoption of forage options.

Farming system	% of farmers expanding							
	Cut and carry	Grazed plots	Live fences	Hedgerows	Improved fallow	Cover crops: annual crops	Cover crops: under trees	Ground cover: erosion
Slash & burn	100	1	2					
Grassland	88	9	29	21				
Extensive upland	99	<1		13	<1			
Mod. Intensive upland	73	4	27	16		6	6	6
Intensive upland	63		6	35				
Rainfed lowland	0							

## Adoption of forages: a learning process



Outcome:

### Integration of forages

- adoption is a learning process
- forages adopted as a supplement to existing feed resources
- overcoming particular feed shortage and labor saving
- livestock feed rather than NRM issues tended to be the first consideration
- farmers considered NRM when they started to integrate forages on their farms (e.g. adoption of hedgerows)



## Finally!

- adapted germplasm available
  - ? do we need more varieties, maybe more legumes
- participatory approaches for technology development successful
  - ? how will these need to be modified for 'scaling up'
- provide 'raw material' for farmers to develop their 'forage technologies'
  - ? how can we speed up the learning process
- partnerships or 'coalitions for development'
  - ? do we need new partners

## 2.2 Output of FSP 1995 – 1999 in the Philippines

*Ed Magboo and Francisco Gabunada*

### 2.2.1 Brief Description of Sites

- 7 regional evaluation sites
- 4 farmer participatory research (FPR) sites
- all FPR sites have mixed crop-livestock system

Table 1. Description of Philippines FSP Sites.

Site	Gamu, Isabela	Aglipay, Quirino	Bicol	Matalom, Leyte	Guba, Cebu	Cagayan de Oro	Malitbog, Bukidnon	PCA-Davao
Activity								
Reg'l Evaln	✓	✓	✓	✓ <sup>a</sup>	✓ <sup>a</sup>	✓ <sup>a</sup>		✓
FPR				✓	✓	✓	✓	
Rainfall (mm/yr)	1800	2500	3000	2000	1700	1500	1800	2200
Soil Type	Clay loam	Clay loam	Clay loam	Clay loam	Clay loam	Clay loam	Clay loam	Clay loam
Soil pH	5.6	5.1	5.5	4.8-8.6	4.8-6.5	5.1-8	5.5-6.5	5.1-6.1

<sup>a</sup>Forage plots also served as multiplication area

### 2.2.2 Regional evaluation

- aimed to identify environmentally adapted forage species
- done either on-station (Isabela, Quirino, Davao) or in farmers' field (other sites)

Table 2. Forage accessions tested in the different regional evaluation sites.

Species	Gamu, Isabela	Aglipay, Quirino	Bicol	Matalom, Leyte	Guba, Cebu	Cagayan de Oro	PCA-Davao
Grasses	5	4	4	15	9	16	17
Herbaceous legumes	4	8	4	5	7	8	18
Shrub/Tree Legumes	4	0	0	10	7	7	11
Total	13	12	8	30	23	31	46

Table 3. Potential forage species identified in the regional evaluation sites.

Species	Site						
	Gamu, Isabela	Aglipay, Quirino	Bicol	Matalom, Leyte	Guba, Cebu	Cagayan de Oro	PCA, Davao
<b>Grasses</b>							
<i>Pennisetum purpureum</i> and hybrids				✓	✓	✓	✓
<i>Panicum maximum</i>				✓	✓	✓	✓
<i>Paspalum atratum</i>					✓	✓	✓
<i>Brachiaria brizantha</i>	✓	✓		✓	✓	✓	
<i>Andropogon gayanus</i>	✓	✓		✓			
<i>Setaria splendida</i>				✓	✓	✓	✓
<i>Brachiaria decumbens</i>	✓	✓	✓	✓		✓	✓
<i>Brachiaria humidicola</i>	✓	✓	✓	✓		✓	✓
<b>Herbaceous Legumes</b>							
<i>Stylosanthes guianensis</i>	✓	✓	✓	✓	✓	✓	✓
<i>Arachis pintoi</i>			✓		✓	✓	✓
<i>Centrosema pubescens</i>	✓	✓	✓	✓		✓	✓
<i>Centrosema macrocarpum</i>							✓
<i>Calopogonium caeruleum</i>							✓
<i>Pueraria phaseoloides</i>							✓
<b>Shrub and Tree Legumes</b>							
<i>Desmanthus virgatus</i>				✓	✓		✓
<i>Desmodium cineria</i>				✓	✓	✓	✓
<i>Flemengia macrophylla</i>				✓			
<i>Calliandra calothyrsus</i>					✓	✓	✓
<i>Gliricidia sepium</i>				✓	✓	✓	✓
<i>Leucaena leucocephala</i>				✓	✓	✓	

### 2.2.3 Farmer Participatory Research in Development of Forage Technologies

- on-farm testing of potential forage species by farmers
- farmers tested and developed ways of integrating forages into their farms (options)
- later on, additional forage species/accession were tested based on results of farmers evaluation

Table 4. Additional information about FPR sites in the Philippines.

Site Description	Matalom, Leyte	Guba, Cebu	Cagayan de Oro	Malitbog, Bukidnon
Land use intensity (10 = high)	3	10	4	5
Main crops	Corn, upland rice, sweet potato	Corn, vegetables, flowers	Corn, banana	Corn, banana
Cattle/carabao (hd/farmer)	1-3	1-5	1-9	0-3



## 2.2.4 Activities

*Selection of site and collaborators– involved initial contact with:*

- Regional Department of Agriculture
- Local Government Units (provincial and municipal)
- NGO's and other organizations based in the site
- Farmers (interaction with farmers through site visits and participatory diagnosis)

*Activities in selected sites: (collaborators served as facilitators)*

- group meetings and individual visits to plan out on-farm activities
- establishment of forages (initial evaluation and source of planting materials)
- monitoring through follow-up meetings, individual visits and adoption tree survey
- facilitating exchange of information through field days, cross-visits
- participatory evaluation (group and individual)
- impact assessment (in Malitbog)

Table 5. Results of FPR activities.

Site	No. of farmers participating in initial evaluation	No. of farmers evaluating forages in 1999	No. of farmers expanding their area
Matalom, Leyte	14 (1995)	26	7
Guba, Cebu	6 (1997)	187	61
Cagayan de Oro	14 (1995)	126	33
Malitbog, Bukidnon	15 (1996)	160	48

Table 6. Forage grass species planted by farmers and emerging forage technologies.

Species	Emerging Technologies	Matalom, Leyte	Guba, Cebu	Cagayan de Oro	Malitbog, Bukidnon
<i>Pennisetum purpureum</i> and hybrids	Contour hedgerows	✓		✓	✓
	Cut and carry plots	✓	✓	✓	✓
<i>Panicum maximum</i>	Contour hedgerows	✓	✓	✓	✓
	Cut and carry plots			✓	✓
<i>Paspalum atratum</i>	Contour hedgerows		✓	✓	✓
	Cut and carry plots			✓	✓
<i>Brachiaria brizantha</i>	Contour hedgerows		✓		✓
	Cut and carry plots	✓		✓	✓
<i>Andropogon gayanus</i>	Cut and carry plots	✓		✓	✓
<i>Setaria splendida</i>	Contour hedgerows		✓	✓	✓
	Cut and carry plots	✓		✓	✓
<i>Brachiaria decumbens</i>	Grazed plots			✓	✓
	Cut and carry plots			✓	✓
<i>Brachiaria humidicola</i>	Grazed plots	✓		✓	✓

Table 7. Herbaceous forage legume species planted by farmers and emerging forage technologies.

Species	Emerging Technologies	Matalom, Leyte	Guba, Cebu	Cagayan de Oro	Malitbog, Bukidnon
<i>Stylosanthes guianensis</i>	Cut and carry plots	✓	✓	✓	✓
	Contour hedgerow		✓		
<i>Arachis pintoi</i>	Ornamental		✓	✓	✓
	Cover crop		✓		
	Grazed plots			✓	✓
<i>Centrosema pubescens</i>	Grazed plots (in mixture)			✓	✓
	Cut-and-carry (in mixture)			✓	✓
<i>Centrosema acrocarpum</i>	Grazed plots (in mixture)			✓	✓
	Cut-and-carry (in mixture)			✓	✓

Table 8. Shrub and tree forage species planted by farmers and emerging forage technologies.

Species	Emerging Technologies	Guba, Cebu	Cagayan de Oro	Malitbog, Bukidnon
<i>Desmanthus virgatus</i>	Contour hedgerows	✓	✓	✓
<i>Desmodium cineria</i>	Contour hedgerows	✓	✓	✓
<i>Flemingia macrophylla</i>	Contour hedgerows		✓	✓
<i>Calliandra calothyrsus</i>	Contour hedgerows	✓	✓	✓
	Fence line	✓	✓	✓
<i>Gliricidia sepium</i>	Contour hedgerows	✓	✓	✓
	Fence line	✓	✓	✓
<i>Leucaena leucocephala</i>	Contour hedgerows	✓	✓	✓
	Fence line	✓	✓	✓

### 2.2.5 Training

- Includes formal training, hands-on training, actual exposure, cross-visits, attendance to workshops
- Includes training for existing and potential collaborators, farmers and staff
- Farmer-trainings were also conducted as part of the activities of the collaborators in the site
- A core group of trainers from collaborating agencies was formed for "Developing Forage Technologies" training
- In the latter stages of the project, trainings were conducted upon request by and in collaboration with other interested agencies (Livestock Development Council, Provincial and Regional Department of Agriculture)

Table 9. Formal training and workshop conducted.

Training/Workshop	Date	Participants
Farmer Participatory Research	Oct 1995	• potential collaborators (17)
Developing Forage Technologies	Aug 1997	• site and potential collaborators (15)
with Farmers	Oct 1998	• collaborators and DA staff from Visayas and Mindanao (23)
	Nov 1998	• collaborators and Regional DA staff (26) <sup>1</sup>
	Jun 1999	• municipal technicians of Cavite Province (31) <sup>2</sup>
	Sep 1998	• collaborators and farmers from FSP sites and So. Luzon (22)
	Nov 1999	• representatives from DA Region 2 (44) <sup>3</sup>
Experiences in participatory development of forage technologies	Jan 1999	• collaborators (13)

<sup>1</sup> requested by Livestock Development Council (LDC) and co-funded by LDC and PCARRD

<sup>2</sup> requested by Provincial Veterinary Office (PVO) and co-funded by LDC, PCARRD and PVO

<sup>3</sup> requested by DA Region 2 and co-funded by LDC, PCARRD and DA Region 2

Table 10. Cross visits and hands-on training of collaborators and farmers.

Year	Subject	Participants
1995	Hands-on training in forage seed production	1 collaborator from Gamu, Isabela
	Hands-on training in forage agronomy, multiplication and seed production	Collaborators from Cagayan de Oro (1), Gamu, Isabela (1), Quirino (1) and Misamis Oriental (2)
	Participatory Diagnosis (actual exposure)	5 collaborators from Cagayan de Oro
	Hands-on training in forage seed production	1 collaborator from Quirino
	Participatory Planning (actual exposure)	5 collaborators from Cagayan de Oro
1996	Participatory Diagnosis (actual exposure)	2 collaborators from Malitbog
	Hands-on training in forage agronomy and multiplication	3 collaborators from Cebu
	Hands-on training on Stylo 184 seed production	14 collaborators and 7 farmers from Isabela and Quirino
1997	Attend training course on "Management and Utilization of Fodder Trees in Asian Farming Systems"	1 collaborator from Leyte
1998	On-site training in Indonesia FSP sites (PD, farmer evaluations, farm visits)	1 collaborator from Malitbog
	Attend 6 <sup>th</sup> Regional Meeting of FAO Working Group on Grazing and Feed Resources in Southeast Asia	1 collaborator from Cagayan de Oro
1999	Hands-on training on forage legume seed production	1 collaborator and 3 farmers from Cagayan de Oro
	Impact assessment (actual exposure)	4 collaborators from Malitbog
	Hands-on training on vegetative propagation of Leucaena	Farmers from Cebu (3), Cagayan de Oro (2) and Malitbog (1)

Table 11. Attendance to training/workshop/symposia facilitated.

Year	Subject
1996	Cross-visit to Australia Philippine Grassland Congress
1997	Training course on "Management and Utilization of Fodder Trees in Asian Farming Systems" International Grassland Congress
1998	International workshop on Leucaena Regional Meeting of FAO Working Group on Grazing and Feed Resources in Southeast Asia
1999	Training on GxE: analysis and interpretation of results

### 2.2.6 Networking

- Working relationships were established:
  - National Level
    - Bureau of Animal Industry (BAI) – training and research
    - Livestock Development Council – training
  - Regional Department of Agriculture - training
- Other agencies (government and non-government) also availed of forage germplasm
- Informal networks within the site (Philippine Carabao Center, National Dairy Authority)

### 2.2.7 Lessons Learned

- a) Development of productive and sustainable technologies, and (b) Dissemination and extension of forage technologies
- There is a need to collaborate with an institution; not an individual (e.g. LGU instead of technician)
  - Even if organization/agency already had a pre-identified site, there is still a need to verify whether the site is really suitable – no commitment must be made until site suitability is ascertained through PD and initial interaction with farmers
  - Incentive system – providing technician a chance to present the results of his work as well as exposure to other areas rather than honorarium
  - Working with an established farmers' group/organization is a means for reaching to individual farmers
  - Farmers' participation is essential in developing and spreading innovations
  - Constant interaction with and among farmers is necessary

- Interaction and sharing of experiences between and among collaborators and farmers essential
  - Highly subsidized (e.g. providing fences and other inputs) demonstrations are difficult to sustain
  - Forages are integrated into the cropping system utilizing whatever areas are available – not replacing crops
  - The way farmers are growing forages and the species they are using is changing as farmers gain experience
- b) Effective local seed and planting material multiplication systems
- Vegetatively-propagated species easier spread and multiplied between farmers within the site
  - There is a need to develop seed multiplication systems locally in the sites
  - Farmers are gradually narrowing the germplasm available through expansion of only the species they selected. There is a need to assure the maintenance of a broad range of options for other farmers to test in the future or in other sites.
- c) Improved capability to develop and deliver new technologies (training)
- Practical and hands-on training are essential for developing skills of farmers and collaborating staff
  - There is a need for follow-up activities after the training (e.g. helping the trainee apply the learning from the training in the field)
  - Cross-visits are very effective in disseminating information
- d) Regional network
- There is a need to strengthen networks (e.g. encourage site collaborators to take part and contribute)

Table 12. Examples of expansion of forages by individual farmers.

## a) Alex Magbanua (Malitbog, Bukidnon)

Species	Total Area Planted (sq. m)	
	1998	1999
<i>Pennisetum purpureum</i> (local)	50	50
<i>Leucaena leucocephala</i> K636	0	50
<i>Andropogon gayanus</i> CIAT 621	6	0
<i>Setaria splendida</i> 'Simuang'	250	350
<i>Paspalum atratum</i> BRA 9610	125	225
<i>Panicum maximum</i> 'Tobiata'	50	0
<i>Brachiaria ruzizienses</i>	50	150

## b) Leoncio Bontuyan (Guba, Cebu)

Species	Total Area Planted (sq. m)	
	1998	1999
<i>Setaria splendida</i> 'Lampung'	8	80
<i>Paspalum atratum</i> BRA 9610	8	0

## c) Darwin Otang (Cagayan de Oro)

Species	Total Area Planted (sq. m)	
	1998	1999
<i>Pennisetum purpureum</i> (Florida)	15	1000
<i>Stylosanthes guianensis</i> CIAT 184	15	15
<i>Arachis pintoi</i> CIAT 22160	8	8
<i>Paspalum atratum</i> BRA 9610	8	8
<i>Panicum maximum</i> T58	8	8
<i>Centrosema pubescens</i> CIAT 15160	8	8
<i>Gliricidia sepium</i> cv. Retalhuleu	50	50

## d) Ramoncito Seno (Guba, Cebu)

Species	Total Area Planted (sq. m)		
	1997	1998	1999
<i>Leucaena diversifolia</i>	3	3	3
<i>Pennisetum purpureum</i> cv. Mott	3	3	3
<i>Setaria splendida</i> 'Simuang'	25	500	1300
<i>Paspalum atratum</i> BRA 9610	3	3	3
<i>Panicum maximum</i> 'Tobiata'	15	0	0
<i>Desmodium cineria</i>	4	0	0
<i>Flemingia macrophyll</i> CIAT 17403	2	0	0

## **2.3 FSP activity in Lao PDR**

*Phonepaseuth Phengsavanh, Vanhthong Phengvichith*

### **2.3.1 Introduction**

FSP as a regional project started in Lao PDR in 1995 with two main objectives of identifying suitable forage species to the local environment and helping farmers to integrate these species into their farming systems.

In Lao PDR, livestock production is almost totally a smallholders farming practice, providing a vital component of livelihood security. Animals generally graze on native forages that are available in forests and grasslands. However, native grasses are abundant only during the wet season. Dry season shortages of feed are common, resulting in severe animal feeding problems for farmers throughout the country.

To help farmers to overcome the feed shortage problem, the FSP in collaboration with National Agriculture and Forestry Research Institute and Department of Livestock and Fishery have developed forage technology with farmers evaluating and adopting them to smallholder farming systems. Currently, the FSP is working in 6 districts in 2 provinces of Luangphabang and Xiengkhuang.

### **2.3.2 Brief description of FSP sites**

The FSP activities have been conducted mainly in 2 provinces Luangphabang and Xiengkhouang. These provinces are situated in the northern part of Laos, which is mountainous.

#### *Luang Phabang province*

Luangphabang is located in between latitude 19° and 21° N. Mountains cover 80 % of the province and elevations range from 300 to 1900 m ASL. The climate is tropical to subtropical, characterised by distinct wet and dry seasons. Annual rainfall ranges from 1000 to 1800 mm. The wet season lasts from April to October, with most of the rain occurring from May to September. There is some rainfall in March and November. Dry season runs from November to March, December to February are particularly dry, accounting for only 1-3 % of total annual rainfall. Mean maximum temperatures range from 28°C in January to 35°C in April, mean minimum temperatures range from 14°C in January to 24°C in the period, June to August.



There are 3 major agro-ecological zones that occur throughout the province of Luangphabang. These are:

- the moderately fertile lowland valleys where rainfed and irrigated paddy rice production predominates;
- the steep, mountainous uplands dominated by shifting cultivation and secondary regrowth;
- the infertile upland plateaux dominated by shifting cultivation with repeated cropping periods, short fallows and imperata grasslands.

#### *Xiengkhuang province*

Xiengkhuang is situated in the central eastern part of Laos, between latitude 18.5° to 20°N. The province is characterised by high mountains to 2600 m altitude (average altitude 1300 m) with scattered narrow valleys in the east and north and upland plateaux and rolling hills in the west and south. The climate in Xiengkhuang ranges from tropical monsoonal in the lowlands, through sub-tropical to temperate monsoonal at higher altitude. There are two distinct seasons: (1) the warm and wet season lasts from mid March to mid October, (2) the cool and dry season lasts from mid October to mid March. Annual rainfall ranges from 1000 to 1600 mm, with the highest rainfall in July and August. Absolute maximum temperatures range from 26°C in December to 35°C in May. Absolute minimum temperatures range from 0°C in January to 18°C in July. In some mountainous areas, the minimum temperatures fall below 0°C.

There are 4 major agro-ecological zones in Xiengkhuang. These are:

- the pine tree grassland zone in the central west of the province, characterised by the presence of pine trees and extensive grassland;
- the fertile valleys where rainfed and irrigated paddy rice production predominates;
- the high, fertile mountains near the borders of the province where *Imperata* grasslands, shifting cultivation are common; and
- the dense forests of the high mountains (up to 2600 m ASL) where there is little agriculture or animal husbandry.

Soils in the upland areas of both provinces are highly variable because of the presence of karstic limestone formations. They are generally moderately infertile being strongly leached and mildly to strongly acidic. Soil in the lowlands are moderately acidic to neutral sandy loam with low base saturation and organic matter content.

### 2.3.3 Regional evaluation

Forage evaluation nurseries were established at five sites. A large range of forage species was evaluated at each of the 5 sites.

Table 1. Description of regional evaluation sites.

Site	Altitude (m)	Rainfall (mm)	Soil pH (in H <sub>2</sub> O)
Houayphai	428	1600-1800	5.9
Houaykkoth	400	1600-1800	5.0
Km 32	900	1000-1600	6.5
Namsuang	150	1500-2000	4.5
Khinak	85	1300-1500	6.0

Number of species tested at each site varied, depending on the potential forage systems in that area and availability of seeds.

Table 2. Forage accessions tested in the different sites.

Species	Houayphai	Houaykkoth	Km 32	Namsuang	Khinak
Grasses	14	13	20	20	20
Legumes	42	48	64	64	64
Total	56	61	84	84	84

Results of evaluation showed that many grasses and legumes were well adapted to the particular local condition in each site. A small group of varieties were particularly promising at all site as follows:

Table 3. Species that performed well in each site.

Species	Houayphai	Houaykhoth	Namsuang	Km 32	Khinak
<i>Andropogon gayanus</i>	Not planted	Not planted	✓	Not planted	Not planted
<i>Brachiaria brizantha</i>	✓	✓	✓	✓	✓
<i>Brachiaria decumbens</i>	✓	✓	✓	✓	✓
<i>Brachiaria humidicola</i>	✓	✓	✓		
<i>Brachiaria ruziziensis</i>				✓	
<i>Panicum maximum</i>	✓	✓	✓	✓	✓
<i>Stylosanthes guianensis</i>	✓	✓	✓	✓	✓

### 2.3.4 Farmer Participatory Research in development of forage technologies

The on-farm work started in 1997, just after nursery evaluation of the forages had finished. Most of promising species were tested in farmers' fields and some species were selected by farmers to integrate into their own farming systems.

Essential activities in development of forage technologies with farmers are: Site and farmer selection, planning and on-farm test, regular visit to farmers and participatory evaluation.

- Site selection is based on some criteria such as:
  1. There is a problem with livestock feeding
  2. Farmers also identify this problem
  3. We have some potentially appropriate solutions
  4. There are many farmers in the area with the same problem
  5. There is an active local development worker who is keen to work with farmers.
- Activities in site selection:
  1. Meet and plan with local development workers
  2. Village visit and meeting.
  3. PD
- On-farm test
  1. Planing with farmers where, when and how do they would like to test.
  2. Evaluation plots were planted and managed by farmers
  3. Technical advise/suggestions are provided by project staff (Provincial and district officers)

- Regular visit to farmers/participatory evaluation

Local development workers usually make at least 6 visits to farmers particularly in critical times, as:

1. Planting time (give technical advise)
2. Two weeks after planting (to find out what specie germinated well and which ones not and why)
3. One month after planting (talk and explain to farmers about early weeding)
4. In the middle of wet season (give technical advise how to cut forages)
5. In the middle of dry season
6. At the end of dry season (to do PE and planing for next year with farmers)

Table 4. Result of FPR activities.

Site	No. farmers who participated in initial evaluation (1997)	No. farmers evaluating forage in 1999	No. farmers who have expanded their area
Xieng Ngeun	19	87	55
Chomphet	38	56	23
Luangpabang	9	23	3
Pek	9	116	45
Phoukoud	3	67	12
Nonghet	5	12	0

Table 5. Forage species planted by farmers and emerging forage technologies.

Species	Technologied developed	Xieng Ngeun	Chomphet	Luangpabang	Pek	Phoukoud	Nonghet
<i>Brachiaria brizantha</i> CIAT 6780	Cut and carry Hedgerows	✓ ✓	✓	✓	✓	✓	✓
<i>Brachiaria decumben</i> cv. Baselisk	Cut and carry Hedgerows	✓ ✓	✓	✓	✓	✓	✓
<i>Panicum maximum</i> TD 58	Cut and carry Hedgerows	✓ ✓	✓	✓	✓	✓	✓
<i>Stylosanthes guianensis</i> CIAT 184	Cut and carry Hedgerows	✓ ✓	✓	✓	✓	✓	✓

### 2.3.5 Training

Training including formal, on-site, cross-visit and attendance workshop were provided for project staff including officers from district, provincial and center levels.

Table 6. Summary of conducted training and workshops.

Training/workshop	Date	Participants
Farmer Participatory Research English	Nov 1995	36
	Feb 1996	12
	Jul-Aug 1995	4
	Sep-Oct 1995	3
Participatory evaluation with farmers	Feb 1998	13
Developing Forage technology with farmers	Apr 1998	21
	Jun 1999	12
Developing forage technology with farmers: Putting plans into action in northern Lao PDR	Aug 1999	63

Table 7. Cross-visit and study tour.

Cross-visit and study tour	Date	Participants
4 Cross-visits for district officers	1997-1999	8
On-site practice PE and conduct Adoption tree with farmers	March 1999	10
Cross-visit to on-farm sites in Vietnam	Feb 1998	2
Study tour on forage development in Australia	March 1997	2

Table 8. Training/workshop attended.

Training/workshops attended	Date	Participants
Farmer Participatory Research	Aug 1995, Philippines	2
Forage Agronomy and seed supply system	Nov 1996 Thailand	4
International Grassland congress	1997 Canada	1
Study tour and training on forage in Australia	March 1997	2

### 2.3.6 Networking

Linkage from National level to district and other local development projects/organization, NGO was established.

- National level – Livestock Research Center, NAFRI.  
Department of Livestock and Fishery
- Provincial level – Livestock and Fishery section, PAFO
- District level – Livestock and Fishery unit, DAFO
- Local rural development organization/project and NGO.

### 2.3.7 Lesson Learned

- Skills and commitment are needed for local development officers.
- Careful site and farmer selections are essential at the early stages of on-farm technology development but with time farmers' select themselves.
- When first visiting villages, it is less important to talk with many farmers than to talk with those who have a real need for forages.

- There is a need for quick support after the first visit from the project. It is not necessary to make long appraisals of village conditions before offering options to test.
- It is important to confirm that the selected farmers are really facing a feeding problem and would like to solve problem by planting forages (instead of other reasons such as trying to get livestock credit).
- Farmers participation in each stage is essential.
- Local seed production has to be developed, as imported seeds are very expensive.
- On-farm training is much more successful for farmers than formal training.
- Field trips for farmers that have a livestock feeding problem are a good way to encourage them to become interested in forage.
- Regular visit to farmers is help to build trust with farmers and to provide early advice if there were problems.
- Sharing information and experience from farmer to farmer is very effective in increasing adoption.
- The success of forage development does not depend on how large an area the farmers first plant but on how well we help farmers to solve their problems.
- It is important to offer farmers the best variety and not just any variety of forage species.
- It is important to offer farmers a range of forage options not just favoured varieties.
- In Laos, working with individual farmers on their own land has proved to be more successful for the FSP than working with farmer groups.

## 2.4 Farmer Evaluation of Forages in Indonesia – Progress, Experiences and Future Plans

*Maimunah Tuhulele and Ibrahim*

### 2.4.1 Introduction

On-farm evaluation of forages with the Forages for Smallholders Project (FSP) in Indonesia commenced in 1995. From then on, the work expanded to include seven sites located in the provinces of East and Central Kalimantan, Aceh, North Sumatra, and North Sulawesi.

Collaborators based at the sites are Provincial and District Livestock Services, and the Agency for Agriculture Technology Assessment, all under the Ministry of Agriculture of the Republic of Indonesia. These institutions have personnel based in the communities (Table 1).

Collaborators from East and Central Kalimantan had previous working relationships with the Southeast Asian Forage Seeds Project. All had previous experience in research and/or development work either with forages or with farmers.

Table 1. Sites and Collaborators of FSP in Indonesia.

Site	Collaborator(s)
Saree	Provincial Livestock Services of Aceh
Pulau Gambar	Assessment Institute for Agriculture Technology
Marenu	Assessment Institute for Agriculture Technology and Transmigration Office of North Sumatra
Sepaku	Provincial Livestock Services of E. Kalimantan
Makroman	Provincial Livestock Services of E. Kalimantan
Kanamit	Provincial Livestock Services of C. Kalimantan
Gorontalo	Provincial Livestock Services of N. Sulawesi

### 2.4.2 Description of sites

Table 2 provides a brief description of FSP sites in Indonesia.

Most of the sites are upland, except for Pulau Gambar, North Sumatra, Kanamit, Central Kalimantan, and Makroman, East Kalimantan, which are a combination of upland and rain-fed lowland. The site in Gorontalo, North Sulawesi is mainly under coconut while, the rest are based mainly on annual crops. Generally, soils are of clay type, with pH varying from acidic to slightly acidic and low to moderate fertility. All the



upland sites vary in topography from flat to steep. Altitude ranging from less than 20 to more than 500 m above sea level. Erosion is evident in the area of Aceh.

All sites have farms that are crop-based but livestock play an important role as source of draft and cash income, and manure. Often, corn and cassava are the major food and crops, rice is cultivated in valleys or flat areas. Fruit crops, vegetables, and oil palm are planted by farmers in North Sumatra. Fruit crops, vegetables and peppers are cultivated in East Kalimantan. Farmers in Central Kalimantan plant banana, coconut, and coffee as cash crop. Most farmers in all sites use fertilizer and manure for their crops, and some also sell the manure.

Sale of crops is a major source of cash income in all sites. Chicken and goats are used for religious ceremonies, festivals, or provide cash for immediate needs, while cattle or buffalo is sold when the family needs a large amount of cash, like for schooling, weddings, or building a house. In some cases, during the dry season, male members of the families, go to adjacent towns, working off-farm. All the sites experience an increase in area devoted to crop production, thereby reducing the grazing areas available for ruminants.

In most areas, except in Aceh and Central Kalimantan, cattle and buffalo are tethered or let free in vacant areas to graze on native vegetation during the day with basically no or minimal supplementation of salt, except for fattening animals, which are kept in pens or tethered near the house, and are supplemented with rice bran. Farmers cut native grasses from roadsides, rice fields, forest areas, or near plantation crops, for night feeding. In Aceh, large areas of natural grassland are still available, but their conditions has deteriorated. The collaborating farmers raised their animals in these areas, and relied solely on the available vegetation, before the FSP. With a forage bank available near the communal shed, farmers now are practising night feeding. In Central Kalimantan, most of the cattle are kept near the houses, supplemented with grasses the farmers cut.

Table 2. General description of FSP sites in Indonesia: physical characteristics.

Site	Latitude	Altitude (m)	Annual Rainfall (mm)	Wet season (start-end)	Wet months. (>50mm)
Saree, Aceh	5° NL	600	1600	Oct-Apr	4-7
Marenu				Oct-Apr	5
Pulau Gambar			1700	Sep-Apr	5
Sepaku	1° SL	<100	1601	Oct-Apr	7
Makroman	1° SL	<50	2200	Oct-Apr	7
Kanamit		<50	2400	Oct-Apr	7
Gorontalo	0°NL	18	1290	Nov-Jul	6

Table 3. General description of FSP the site in Aceh: soil and farming system.

Site	Soil Characteristics	Description of farming system
Saree	Clay-loam? Slightly acid Moderate fertility Well-drained Flat to steep	intensive upland farming and grassland crops: corn, sweet potato, peanuts, vegetables, for consumption and cash crops fertilized with manure and inorganic fertilizer animals: local breed beef cattle grazed native vegetation with salt supplementation

Table 4. General description of FSP sites in North Sumatera: soils and farming systems.

Site	Soil Characteristics	Description of farming system
Pulau Gambar	clay slightly acid moderate fertility well-drained flat	Intensive upland farming and rain-fed rice Crops: corn, beans, vegetables for consumption and cash Crops fertilized with manure and inorganic fertilizer Animals: sheep pen-feeding
Marenu	clay-loam very acid low fertility well-drained flat to rolling	Intensive upland farming Crops: corn, upland rice, vegetables, and oil palm for consumption and cash Crops fertilized with manure and inorganic fertilizer Animals: sheep pen-feeding

Table 5. General description of FSP sites in E. Kalimantan: soils and farming systems.

Site	Soil Characteristics	Description of farming system
Sepaku	red-yellow podzolic very acid low fertility well-drained rolling to steep	Lowland rain-fed rice and vegetables (home garden), pepper for consumption and cash Crops are fertilized with manure and inorganic fertilizer Animals: beef cattle (Brahman crossbred) Tethered to graze native vegetation during the day, and cut and carry for night feeding
Makroman	podzolic very acid well-drained low fertility rolling to steep	Lowland rain-fed rice and upland crops Crops: corn, rainfed rice (valleys and flat areas), cassava, sweet potato, vegetables for consumption and cash Crops are fertilized with manure and inorganic fertilizer Animals: beef cattle and goats Mostly pen-feeding

Table 6. General description of FSP site in Central Kalimantan: soil and farming system.

Site	Soil Characteristics	Description of farming system
Kanamit, Central Kalimantan	clay-loam? Seasonally flooded Moderate fertility flat	under lowland rain-fed rice and upland crops crops: coconut, corn, banana, fruit trees, coffee, vegetables; for consumption and cash crops fertilized with manure and inorganic fertilizer animals: beef cattle animal tethered near the house, and fed cut and carry forages during the day and for night feeding.

Table 7. General description of FSP site in North Sulawesi: soil and farming system.

Site	Soil Characteristics	Description of farming system
Gorontalo	clay-loam? Seasonally flooded Moderate fertility flat	under coconut and upland crops crops: coconut, corn, banana, fruit trees, vegetables; for consumption and cash crops fertilized with manure and inorganic fertilizer animals: beef cattle animal tethered to graze native vegetation, and cut and carry for night feeding. During dry season feed are bought or used corn plant specifically planted for forage.

#### 2.4.3 Procedure and results of participatory diagnosis (PD)

Participatory diagnosis (PD) has been done in all sites. The major basis for selecting farmers in the activity were their membership in farmers' group that have a working relationship with collaborators and their potential need for forages.

Table 8 shows a summary of the problems expressed by farmers and those that are addressed by on-farm activities in the various sites.

Lack of feed during the dry season, poor animal performance, and unavailability of adapted forage species were problems expressed in most sites. This problem was mostly due to an increase in the animal population and the area being devoted to crops. Feed unavailability was also a problem during the cropping season, when most areas are planted to crops. Soil erosion, despite being evident in the Blang Ubo ubo (Saree) was not recognized as a problem. Uncontrolled grazing is a problem only for farmers in Aceh and Pulau Gambar who have tried establishing forages.

Farmers in East Kalimantan and Marenu have expressed the need for adopted forages. These farmers had tried establishing plots of giant napier grass (King grass) or *Setaria sphacelata* cv. Splendida for their animals. They observed that these species were not able to persist under their cut and carry management system.

Farmers in the sites have evolved some coping mechanisms in times of feed unavailability. These include feeding rice straw or other agriculture by-products, taking their animals to distant areas to graze, gathering tree leaves and banana trunks for feeding as well as gathering native forages from areas along roadsides, rice fields, or near plantation and forest areas, then feeding these to their animals, some with salt supplementation.

#### **2.4.4 Activities conducted in the sites**

Details on the activities at each site are shown in Table 9. These activities vary between sites in terms of nature and time. The basic procedure, however, involves consulting the farmers (PD and planning), followed by establishment of initial testing and multiplication area before individual testing by farmers. In between these stages, field days, training and cross-visits are done. Regular meetings with farmers were done to exchange experiences (participatory evaluation) and maintain the initial testing area. Likewise, visits to farmers were done to gather feedback.

Table 8. Summary of problems identified by farmers during PD.

Problem	Saree	Pulau Gam-bar	Mare-nu	Sepa-ku	Makro-man	Kana-mit	Goron-talo	Kanamit	Goron-talo
Lack of feed in dry season	+*	+*	+++*	+++*	+*	+*	+++*		+++*
Uncontrolled grazing	+	+							+
Increase in unpalatable weeds	+								
Diseases in animals		+	+	+				+	
Poor animal performance	+	+	+	+	+			+	+
Unavailability of adapted forages	+*	+*	+++*	+*	+*	+*	+*		

\*problem addressed by on-farm activities

The initial testing and multiplication areas were established and managed by farmer groups. Decision on which species to evaluate is made by consultation between collaborators and farmers. These areas were very useful for conducting field days and training. Farmers see the species and decide for themselves which ones they would like to try individually.

The major basis for selecting farmer-cooperator is their interest and availability of areas to try out the forages. Whenever possible, innovative farmers who possess leadership and communication abilities were chosen.

Distribution of planting materials was done either during field days or by individual request. The latter apparently leads to better establishment since the farmer is ready before he gets the planting materials. This was done in cases when farmers wanted large amount of planting materials.

On the other hand, farmers always ask and get planting materials during field days. In this case, collaborators ask the farmers to plant just a few hills near the house to later serve as source of planting materials if farmers want to expand.

#### 2.4.5 Progress of forage technology development, evaluation and adoption

Validation of the result of PD was conducted 2 – 3 months after the PD. If the farmers still expressed a need for forages, a participatory planning (PP) followed. During PP, farmers proposed what they need individually. Later on, the technicians and the field extension workers, assisted by the chairman of the group, helped the farmers in setting up the forage plots.

The pace and progress of on-farm work varied between sites, but most sites are already into individual farmer testing (except Aceh), conduct of training and farmer field days, as well as participatory evaluation of most forages, except legume trees in East Kalimantan and Gorontalo (still in early stage), and Central Kalimantan (have not started individual planting).

Table 9. Summary of activities at FSP sites in Indonesia.

Activity	Saree	Pulau Gambar	Marenu	Sepaku	Makroman	Kanamit	Gorontalo
<b>Type of Activity</b>							
1. Communal (formal <sup>1</sup> )	+	+	+	+	+		+
2. Individual (formal <sup>1</sup> )		+	+	+	+		+
3. Individual (informal <sup>2</sup> )	+		+	+	+	+	+
<b>Method of Planting Material Distribution</b>							
1. Field days				+	+	+	+
2. From FSP	+	+	+	+	+	+	+
3. Individual contact				+	+	+	+
<b>Possible Forage Types/Options</b>							
<b>A. Grasses</b>							
1. cut-and-carry	+	+	+	+	+	+	+
a. hedgerows				+	+	+	+
b. blocks	+	+	+	+	+	+	+
2. grazing	+				+	+	+
<b>B. Legumes</b>							
1. herbaceous							
a. grazing	+				+	+	+
b. cover crops					+		+
c. soil improvement	+	+	+	+	+	+	+
d. relay to main crop			+	+	+	+	+
2. trees/shrubs							
a. hedgerows			+	+	+	+	+
b. fenceline	+	+	+	+	+	+	+

1) Option and species were decided through PD

2) Option and species were decided by farmers themselves

Major observation by collaborators at the site is that in some sites, it takes considerable time in establishing the forages with the farmers. Factors like farmer access to other cash crops or other sources of income, the availability of native species often slows down the process despite constant visits and discussions.

Farmers who have a strong need are the ones who establish forages, even to a point where they approach the technicians or pay some cash to get the planting materials. On the other hand, there are farmers who just succumb to peer pressure or to the impulsive but temporary instinct to get planting materials. Moreover, there are also "wait-and-see" types of farmers.

Farmer visits, field days, training and cross-visits were very useful in sustaining the interest of farmers. It is during these activities where farmers and technicians share ideas, learn from each other and plan out activities.

It was also observed that there were more farmers who obtained planting materials in sites where livestock dispersal programs exist. This implies that forage technology development would be facilitated if implemented with livestock improvement program.

Moreover, successful forage establishment was facilitated in cases where strong farmer organizations exist. The existence of "kelompok tani ternak" (farmer groups) was a big factor in rapid establishment of forages in individual farmers' fields.

#### Farmers' feedback

Farmers reacted well to the participatory approach. They felt involved and free to choose whatever species, options and way of establishment they want. Involving these farmers in field days and in training other farmers has been beneficial for the trainees and the farmer trainers as well.

In terms of individual forage species, farmer preferences varied with sites. At the early stages (initial testing and multiplication) farmers tended to prefer species which grew well and showed good yield potential. Their major criteria were then palatability, easy establishment and management and persistency during dry season.

For grazing species, farmers started realizing the value of grazing tolerance (for grazing species), ability to spread and produce ground cover and palatability to animals. For instance, *B. humidicola* was found by farmers in East Kalimantan to spread fast, tolerate close grazing and possess good palatability. Even for cut and carry species, farmers in Central Kalimantan found it very useful.

A farmer in East Kalimantan observed that the meat quality of his cattle improved when his cattle grazed this grass.

*Centrosema pubescens* 15160 was found to suppress *Imperata* in Makroman, East Kalimantan, making it useful as a cover crop and was palatable to goats and cattle. They also observed that when they intercropped it with corn and cassava, the taste was the same, the need for fertilizer decreased, no weeding was required, the yield of corn was increased, and that of cassava only slightly reduced.

Farmers favoured tall and upright grasses like Napier (King and elephant grass), *P. maximum*, *Setaria sphacelata* var. *Splendida*, *Paspalum atratum* and *P. guenoarum*, *Andropogon gayanus* for cut-and-carry, especially because of their good yield and palatability. In addition, *P. atratum* and *P. guenoarum* were found tolerant to occasional flooding and was not itchy when cut, but *P. atratum* possesses sharp leaves which hinder its further use.

Farmers have also observed that legumes like *Stylosanthes guianensis* 184 were not as palatable as grasses for cattle. These cases occurred when these species were fed with grasses during the wet season.

*Desmodium rensonii* was found to possess deworming effect in Saree, while *Desmodium heterophyllum* CIAT 349 died during the dry season, even though it formed a dense ground cover during the wet season.

#### **2.4.6 Farmer management of the different species**

At this time, many individual farmers in East and Central Kalimantan, and Marenu are planting bigger areas, while those in Pulau Gambar and Gorontalo are still planting the species in small plots (either in blocks or short hedgerow lines), either near their houses or in portions of their farms. The farmers' group in Aceh has not expanded the initial area of improved pasture, the species are either grazed or cut and fed to animals from time to time.

The farmers' group in Saree, Aceh also planted *Panicum maximum*, *Paspalum atratum*, and *Brachiaria brizantha* near the communal shed, and they cut them every 2 – 3 weeks, even during dry season. They said that if they let them grow more than 3 weeks, they are too coarse for the animals. This is also the case with *Brachiaria humidicola* in Central Kalimantan

Grasses and shrub/tree legumes were also planted in fence lines. A farmer in Makroman started planting *Centrosema pubescens* CIAT 15160 and *Stylosanthes guianensis* CIAT 184 between the rows of corn and cassava. He then observed that, the Centro preserved the moisture of the soil, suppressed the weed, kept the soil in its friable condition, reduced the need for fertilizer, while providing good feed for his goat. Learning these results, his neighbouring farmers were excited to try this “new



technology", to the point that they planted *Paspalum atratum* between the rows of corn. When they were told that the grass could reduce the yield of the corn, they said it did not matter, since they also needed the forages for their animals.

#### **2.4.7 Learnings from participatory evaluation (PE)**

Participatory evaluation (PE) has been done at most sites. This was done mostly in the initial testing and multiplication area. Farmers observed the species and give their comments. In some sites where individual testing has been done, farmers' observations on the forages that they established were also taken. Open-ended evaluation and preference ranking are the methods being used.

Farmers responded on the characteristics related to the utilization of a particular species. This includes information on yield, palatability, regrowth ability, itchiness, persistence, as well as easy management and time saved in planting forages near the house.

There is still a need to gain more experience and skills in evaluation techniques like probing and asking questions as well as getting farmers' criteria in selection of a certain species. In the process of the evaluation, a lot of things can happen and the person handling the evaluation has to learn how to deal with the situation. These skills only be obtained by practice, reflection and training. As it may seem, every evaluation session is different from the other.

#### **2.4.8 Technical issues**

In working with forages on-farm, a major issue is on production and handling of seeds. At this stage, most of the grass species establishment is done using vegetative planting materials. Legume species were established with seed. The problem is there is no existing commercial market for forage seeds in Indonesia. Government stations only produce a small amount of legume seed, due to their location and climate limitations. Moreover, there has been no successful seed production attempted at the farmers' level. Under the tropical climatic conditions with high relative humidity, it is difficult to store seeds for future needs. This problem should be addressed with closely, if rapid adoption both in area and number of farmers, is to be attained.

## 2.5 Country Presentation Vietnam

### *Le Hoa Binh*

#### 2.5.1 Brief Description of Sites

- 4 regional evaluation sites
- 4 farmer participatory research (FPR) sites
- all FPR sites have mixed crop-forestry-livestock system

Table 1. Activities at FSP Sites.

Site	Activity	
	Regional Evaluation	FPR
Ha Tay ( <i>Bavi</i> )	✓	
Tuyen Quang ( <i>Ham Yen</i> )		✓
Phu tho ( <i>Phong chau</i> )	✓	
Hue ( <i>Xuan Loc</i> )	✓	✓
Daklak ( <i>M'Drak</i> )	✓	✓
Binh Thuan ( <i>HamTan</i> )		✓

Table 2. Description of FSP sites.

Site	Latitude	Altitude (m)	Annual Rainfall (mm)
Ha tay ( <i>Ba vi</i> )	21°N	50	1840
Tuyen Quang ( <i>Ham Yen</i> )	21.5°N	40	1650
Phu tho ( <i>Phong chau</i> )	21°N	40	1850
Hue ( <i>Xuan Loc</i> )	16°N	150	2300
Daklak ( <i>M'Drak</i> )	12°N	550	1895
Binh Thuan ( <i>HamTan</i> )	10.5°N	40	16 50

Table 3. Seasons, soils and farming systems at FSP sites.

Site	Wet Season	Soil Characteristics	Farming Systems
Ha tay (Bavi)	Apr - Nov	pH (KCl) 5.5-5.7; light loam, moderately fertile, well-drained	Forestry in highland, industrial and other crops, home gardens, irrigated rice and livestock
Tuyen Quang (Ham Yen)	Apr - Nov	pH 4.5-6.0, light loam, moderately fertile and well drained	Forestry and upland crop, lowland rice and fishing, home garden and livestock
Phu tho (Phong chau)	Apr - Nov	pH (KCl) 3.8-4.0, light loam, moderate drainage, poor soil	Forestry and upland crops, lowland rice and livestock
Hue (Xuan Loc)	Sep - Feb	pH (1:5 water) 5.0-5.5, light to medium texture and well-drained	Slash and burn cultivation on steep hills, irrigated rice, home garden, livestock
Daklak (M'Drak)	Jul - Feb	pH (1:5 water) 5, sandy loam, well-drained, moderately fertile but P-deficient	New economic zone; grasslands and extensive upland cropping
Binh Thuan (HamTan)	May - Nov	pH 4.5-5.5, sandy poor soil	Forestry in highland, upland crop, fruit tree, lowland rice and livestock

### 2.5.2 Regional evaluation

- The total number of forage accessions tested was 101, of which 63 were legumes, 31 were grasses and 7 were tree legumes.

Table 4. Forage accessions tested in the different regional evaluation sites.

Species	Site			
	Ha Tay (Ba vi)	Daklak (M'Drak)	Hue (Xuan loc)	Phu tho (Phong chau)
Total Species	69	61	53	42
Grasses	20	21	21	24
Legumes	49	36	28	18
Tree Legumes		4	4	

Table 5. Potential forage species identified in the regional evaluation sites.

Species	Site			
	Ha tay (Ba vi)	Daklak (M'Drak)	Hue (Xuan loc)	Phu tho (Phong chau)
<b>A. Grasses</b>				
<i>Brachiaria decumbens</i> cv. Basilisk	✓	✓		
<i>Brachiaria brizantha</i>	✓	✓	✓	✓
<i>Andropogon gayanus</i> cv. Kent	✓	✓		
<i>Panicum maximum</i> TD58	✓	✓	✓	✓
<i>Brachiaria humidicola</i> (several)		✓		
<i>Brachiaria ruziziensis</i>	✓		✓	✓
<i>Paspalum atratum</i> BRA 9610			✓	
<b>B. Herbaceous Legumes</b>				
<i>Stylosanthes guianensis</i> CIAT 184	✓	✓	✓	✓
<i>Stylosanthes guianensis</i> FM05-2		✓		✓
<i>Stylosanthes hamata</i>			✓	✓
<i>Aeschynomene histrix</i> CIAT 9690	✓			✓
<i>Centrosema pubescens</i> CIAT 15160				✓
<b>C. Tree Legumes</b>				
<i>Flemingia macrophylla</i>		✓	✓	
<i>Gliricidia sepium</i>	✓	✓	✓	✓

### 2.5.3 Farmer Participatory Research in Development of Forage Technologies

- Selection of site involved initial contact with
  - agricultural department of the province
  - local government unit (provincial, district and community)
  - other organizations based in the site
  - farmers (interaction with farmers through site visits and PD)
  
- Better site selection
  - Site selection should focus on areas where:
  - There is a real need for livestock feed (quality and quantity)
  - Farmers receive considerable income from livestock
  - Farmers have the capacity to solve their livestock feed problem (land, labor, fertilizer, fencing)

Table 6. Methods of planting and utilizing forages by farmers at each FSP site.

Sites	Daklak (M'Drak)	Hue (Xuan loc)	Binh Thuan (Ham Tan)	Tuyen Quang (Ham Yen)
Ways of planting forages				
Intensive plots for cut-and-carry feed	✓	✓	✓	✓
Intensive grazed plots	✓			
Fencing	✓	✓	✓	✓
Contour rows for erosion control				✓
Forages planted for which animals				
Cattle and buffalo	✓	✓	✓	✓
Pigs				✓
Fish				✓

Table 7. Result of FPR Activity.

Sites	Daklak (M'Drak)	Hue (Xuan Loc)	Binh Thuan (Ham Tan)	Tuyen Quang (Ham Yen)
No. of farmers participating in initial evaluation	10 (1996)	8 (1997)	12 (1998)	9 (1997)
No. of farmers evaluating forages in 1999	90	50	22	142
No. of farmers expanding their area	35	18	13	46

Table 8. Grass species planted by farmers and emerging forage technologies.

Sites	Emerging technologies	Daklak (M'Drak)	Hue (Xuan Loc)	Binh Thuan (Ham Tan)	Tuyen Quang (Ham Yen)
<b>A. Grasses</b>					
<i>Brachiaria decumbens</i> cv. Basilisk	Cut-and-carry plots	✓	✓	✓	✓
	Grazed plots	✓	✓	✓	✓
<i>Brachiaria brizantha</i>	Cut-and-carry plots	✓	✓	✓	✓
	Grazed plots	✓	✓	✓	✓
<i>Brachiaria ruziziensis</i>	Grazed plots	✓	✓	✓	✓
<i>Panicum maximum</i> TD58	Cut-and-carry plots	✓	✓	✓	✓
	Contour hedgerow	✓	✓	✓	✓
	Grazed plots	✓	✓	✓	✓
<i>Paspalum atratum</i> BRA 9610	Cut-and-carry plots	✓	✓	✓	✓
<b>B. Herbaceous Legumes</b>					
<i>Stylosanthes guianensis</i> CIAT 184	Cut-and-carry plots	✓	✓	✓	✓
	Contour hedgerow	✓	✓	✓	✓
	Grazed plots	✓	✓	✓	✓
<b>C. Shrub and Tree Legumes</b>					
<i>Calliandra calothyrsus</i>	Fenceline	✓	✓	✓	✓
<i>Gliricidia sepium</i>	Fenceline	✓	✓	✓	✓
<i>Leucaena leucocephala</i>	Contour hedgerows	✓	✓	✓	✓
	Fenceline	✓	✓	✓	✓

Table 9. Training/workshop conducted

Training/Workshop Conducted	Date	Participants
Participatory research with forages	October 1996	14 participants from 8 provinces
Developing forage technologies with farmers	February 1998	16 participants from 8 provinces, 2 from VN-SW Project, 1 from NGO
Farmer training	August 1999	15 participants from 8 provinces (3 from NGO)
	1996	50 farmers
	1997	60 farmers
	1998	125 farmers
	1999	240 farmers

Table 10. Training/workshops attended

Year	Subject
1995	International training course on participatory research with farmers in feed resources (Philippines)
1996	International training course on forage agronomy, seed production and seed supply systems (Thailand) Visit to northern Australia
1998	International workshop on <i>Leucaena</i> Agricultural English course
1999	Evaluation of tropical legume germplasm for livestock nutrition and soil improvement (Vietnam) Regional meeting of FAO working group on grazing and feed resources in Southeast Asia

#### 2.5.4 Networking

- National level
  - Ho Chi Minh University of Agriculture and Forestry
  - Hue University of Agriculture and Forestry
  - Tay Nguyen University
  - Provincial department of agriculture – provincial livestock company, farmers' club in district
  - Other agencies (non government and other projects)
  - Informal networking within the site (farmers' association, women's association)

#### 2.5.5 General conclusion: Lesson learned

1. Productive and sustainable forage technologies.
  - forage evaluation sites were established in different parts of the country.
  - forage species were evaluated by farmers to determine promising species for different uses in farm condition
    - Don't begin with a very large number of species
    - Select best forage species for offer to farmers
    - Forages for regional evaluation should include representative accessions of species that have potential and are available in the region
    - On-farm forage activities can start (in a small scale) at the same time as regional evaluation – choice of species to be tested will be based mostly on existing information about forages. Later on, expansion of activities (both area

and number of species) can be done incorporating results of regional evaluation.

- Close relationship with farmers affect results in on-farm activities
2. Dissemination and extension of forage technologies:
    - field and cross visits is effective way to improve farmer knowledge on forage technologies
    - forages need to be integrated in the farming systems
    - researchers, field workers and farmers can learn from each other about utilization and management of forage species (e.g. characteristics of forage species used for feeding fish)
  3. Effective local seed and planting material multiplication system
    - vegetatively propagated species easier spread and multiplied between farmers in one site and between the sites (for small area and any time in the year)
    - there is a need to develop seed supply system and control the quality of seed before sowing
    - need for technologies for harvesting and storage to obtain high yield and quality of seed.
  4. Improve capability to develop and deliver new technologies (training)
    - There is a need for more training courses on forage technologies for farmers and staff
    - Follow up activities after the training for improve the knowledge and skill for farmers and staff.
  5. Regional network
    - Annual regional project meeting (exchange experiences and information between countries on organization network in country, development new technologies).
    - Organize in-country meetings for collaborators in and between sites to take part and contribute (interaction and sharing experiences between sites, present the results of their work, encouraging field worker and farmer on development new technologies in site).
    - Cross visits for sharing of experiences (on field work, improve knowledge on characteristics of forage species and utilization of them in feeding animal, soil improvement)



## **2.6 Achievements of the FSP in Thailand over the period 1995-1999**

*Chaisang Phaikaew*

### **2.6.1 Introduction**

The forages for Smallholders Project (FSP) in Thailand is a cooperative program involving the Thai Department of Livestock Development (DLD) and CIAT/CSIRO, which had been financed and supported by AusAID. Local staff and facilities have been mostly provided by the Animal Nutrition Division, DLD. The staff directly involved in the work are the country coordinator, Chaisang Phaikaew, and two counterparts: Mrs. Ganda Nakamaneer from Pakchong Animal Nutrition Research Centre and Mr. Kiatisak Klum-em from the Division of Animal Nutrition. During 1995-1999 Thailand was one of the 7 countries (Thailand and Indonesia, Lao PDR, Philippines, Vietnam, Malaysia, and PR China) in Southeast Asia that the FSP had as an objective to develop close linkages in forage development activities.

The specific objectives of the FSP were:

1. To increase the availability of forages for different ecoregions and farming systems within the Southeast Asia region,
2. To facilitate the integration of forages into smallholder farming systems,
3. To increase capability of local staff in forage agronomy and technology transfer,
4. To facilitate and create effective information exchange systems on forage research and development.

The components of the FSP were:

1. Selection of forage species.
2. Delivery of forages into farming systems.
3. Staff development.
4. Information system development.

### **2.6.2 Site description**

The FSP worked in the Northeast of Thailand. The Northeast Region is a slightly elevated plateau of 17 M ha 100-300 m a.s.l., receives an average of 1250 mm rainfall per annum with 85% falling mid-April to mid-October. Average monthly temperatures range from 30°C/17°C in December to 36°C/24°C in April.

Principal land use in the region is rainfed paddy rice, upland field crops, forest lands and grazing lands. The Northeast Region has the highest ruminant population and therefore the greatest potential for forage improvement.

A typical Northeastern household cultivates 1-4 ha of upland crops (cassava, sugar cane, maize, horticultural crops) and raises 1-3 head of buffalo for draft. Many households also own a few head of cattle for draft and commercial sale.

Upland soils in the Northeast region are largely podzolics, latosols, and regosols characterised by sandy texture, acid reaction, low organic matter content and low cation exchange capacity. They are characterised by a low level of plant nutrients particularly, N, P, K and S, while Cu, and Mo are limiting in some soils

### 2.6.3 Achievements

*Regional evaluation: Forages available for different ecoregions and farming systems.*

The FSP has been played an important role in the forages R&D activities in Thailand, especially in selection of adapted species. There is a need for a wider range of species which are better adapted to the particular conditions in Thailand, such as upland areas with a long dry season, lowlands, waterlogged soils and saline soils. The FSP provided new tropical forage germplasms and technical support for species evaluation, including the design, implementation, analysis and interpretation of on-farm evaluations.

*Selection of Brachiaria spp. for seed production and dry season forage yield in upland area.*

The majority of cattle and buffalo in Thailand are located in the Northeast region, where feed shortages during the six month long dry season are a major concern of farmers. To ease this problem, the Thai research organization have been developing improved forage systems, with the result that ruzi grass (*Brachiaria ruziziensis*) has become widespread, primarily because of its high seed yield and ease of establishment. However, ruzi grass has poor drought tolerance. *Brachiaria decumbens* cv. Basilisk has been identified as having better dry season growth than Ruzi but its use in Thailand is limited by very low seed yield and poor seed quality.

Forty nine accessions of *Brachiaria* from 4 species (*B. brizantha*, *B. decumbens*, *B. humidicola* and *B. jubata*) were evaluated as alternatives to *B. ruziziensis* in an area with a long dry season. The first goal of the experiment was to screen the accessions for seed production potential. Once accessions with promising seed yields had been identified, the second goal was to assess their dry season yield potential. An experiment was conducted at Pakchong Animal Nutrition Research Centre, Nakorn Ratchasima during 1996-1998.

forage yield. They are *Brachiaria brizantha* CIAT 6387, 6780, 16779, 16827, 16829, 16835 and 16463. Other accessions are looking promising based on pure seed yield. They are *Brachiaria brizantha* CIAT 16327, 16322 and *Brachiaria decumbens* CIAT 1873, 26318, 16212, 1737 and *Brachiaria humidicola* CIAT 16315. The multiplication of promising accessions will be done and the seed used to establish larger plots for measurements of dry matter yields and pure seed yield and then to offer a range of these promising accessions to a small group of cattle farmers for field evaluation.

#### *Regional experiment to quantify the environmental adaptation of promising species in South East Asia.*

A formal genotype x environment interaction experiment (GxE) was conducted at Pakchong Animal Nutrition Research Centre, (which is one of 12 sites in 7 countries) to compare 36 of forage species for their adaptation to climate and soil type. These 36 species included all new forage species identified in the FSP. The experiment commenced in 1998 and will finish in 2001. Data are being collated.

#### *Availability of forage species*

*Paspalum atratum* was introduced by FSP, and evaluated as a lowland forages in 1995. It has been shown to be tolerant of acid, waterlogged soils and produce good forage yield and has a high potential for seed production. In 1999, the Thai Department of Livestock Development (DLD) organized 21,800 kg of *P. atratum* seed production from Animal Nutrition stations and farmers. This seed will mostly be used for dairy and beef production in the country.

Currently, the main species of forage seed produced by DLD are: *Brachiaria ruziziensis*, *Panicum maximum* TD. 58, *Paspalum atratum*, *Stylosanthes guianensis* CIAT 184, *S. hamata* cv. Verano, *Centrosema pascuorum* cv. Cavalcade, *Arachis pintoi* and *Desmanthus virgatus*.

#### **Forages integrated into smallholders farming systems.**

##### *Multiplication of forage species*

From the 1996 Trial, there were 5 accessions of *Brachiaria* species which had potential to produce seed and had drought tolerance, namely: *Brachiaria brizantha* CIAT 6780, 6387, 16835, 16829 and 16827. Seed multiplication of these 5 accessions was carried out at Pakchong Animal Nutrition Research Centre in 1997. This seed was used for the on-farm trials in 1998.

In 1999, seed of several forage species have been multiplied for use by the FSP in other countries. These species included *Centrosema pubescens* CIAT 15160, *Centrosema macrocarpum* CIAT 255222, *Stylosanthes guianensis* CIAT 184 , *Desmanthus virgatus*, *Brachiaria ruziziensis*, *Brachiaria brizantha* CIAT 6387, 6780, 16835, *Panicum maximum* cv. Purple and *Paspalum atratum*.

*Farmers participation in the introduction of new forage species to dairy farms in Nakornratchasima Province.*

In 1996-1998 the experiment at Pakchong Animal Nutrition Research Centre was conducted to find the forage species with potential for drought resistance and high seed production. To follow up these experiment, farmers participation on the introduction of new forage species commenced in 1998 at Sung Nuen District, Nakorn Ratchasima Province in the Northeast Thailand

Site characteristics: It is located between latitude 14°30' - 15°15' N longitude 101°43' - 101°56'E. Average annual rainfall 805 mm. The principal crops grown are rice, maize, cassava and sugar cane. Seventy-five percent of population are in the agriculture sector.

Twenty dairy farmers participated. The results from participatory diagnosis showed that the main problem of these dairy farmers was lack of good quality roughage in the dry season. Farmers were looking for alternative feed supplies for their dairy cows. Farmers planted a range of *Brachiaria* accessions in individual farms. Participatory evaluation of forages by farmers was conducted. The most promising species so far have been *Brachiaria brizantha* CIAT 6780,6387,16827 and 16829.

Table1. Summary of Farmer Participatory Research.

Site	No.farmers who participated in initial evaluation (1998)	No.farmers evaluating forages in (1999)	No. of farmers who have expanded their area	Species	Technologies developed
1	20	17	3	<i>Brachiaria brizantha</i> CIAT 6780, 6387 and 16829	Species for dry season

### **Local staff trained in forage development and technology transfer.**

- Two local staff (Ganda and Kiatisak) were trained in "training for trainers in farmer participatory research" held in the Philippines in 1995. In these training course, participants contributed to the development of in country training modules.
- In-country training courses on "Farmer Participatory Research" have been conducted 3 times in Thailand for 63 forage officers from 8 research centers and 25 stations of Animal Nutrition Division, DLD. The training modules adapted and translated from the regional training course conducted in the Philippines were used. The first course was conducted on 19-29 February 1996 with 19 participants, and received financial support from FSP. This course was so successful that DLD funded an additional two courses. The second course was conducted on 1-8 August 1996 with 15 participants, and the third course was conducted on 28 April - 2 May 1997 with 29 participants
- One local staff (Ganda) visited Northern Australia in 1996 to gain experience of Australian pasture and seed production systems.
- FSP and DLD conducted a regional "training for trainers on Forage Agronomy, Seed production and Supply Systems" course on 21-29 October 1996, and held a symposium on "Forage seed supply system" workshop during 31 October- 1 November 1996, at Khon Kaen. Six participants from Thailand gained experience, knowledge, shared experience with participants from participating countries and contributed to the development of in-country training modules.
- FSP and DLD conducted a regional "training for trainers" course on "Developing forage technologies with farmers" 4-13 November, 1996 at Pakchong. Six participants from Thailand attended this training course.
- One local staff (Ganda) attended a training course on Farmer Participatory Research in Pakchong, Thailand on 4-13 September 1997.
- One of local staff (Ganda) attended an Agricultural English training course in Lao PDR in 1999 to enable intra regional communication.
- Two FSP partners from Thailand (Chaisang and Ganda) visited the seed production site of FSP in Lao in 1997.
- Two local staff from Thailand (Ganda and Amnat) visited the seed production site of FSP in Lao in 1999. The aim of the trip was to see and discuss different approaches in working with farmers.

#### **2.6.4 Regional Networking**

- Annual regional project meetings.

The Thai coordinator and counterpart attended and contributed information on forage research and development in 4 Annual Regional meetings in Lao PDR, China, Indonesia and Vietnam in 1996, 1997, 1998, and 1999, respectively.

- Thai coordinator, counterpart and Director of Animal Nutrition Division attended and contributed information in a workshop "Working with farmers: The key to adoption of forage technologies" held in the Philippines on 12-15 October 1999.
- Thai coordinator attended and presented a paper at the 18<sup>th</sup> International Grassland Congress in Canada in 1997
- Contributed information to SEAFRAD newsletters.
- Contributed information for forage species booklet and translated the booklet into Thai language.
- Translated brochure on forages into Thai language.

A further benefit of the FSP is that forage researchers from different countries in SE Asia now cooperate and share their ideas in forage development, through the annual FSP Regional meeting, the FSP training courses, SEAFRAD News and direct communications by E-mail. This active networking is a good indicator of the success of the project.

#### **2.6.5 Lessons learned: General conclusion**

Towards the end of the project, a forage evaluation site was established and 14 *Brachiaria* accessions showed promising seed production and forage yield in the dry season. The multiplication of promising species and another 10 broadly adapted species has been carried out for on farm evaluation. Forage species that can provide forage yield during drought period are being evaluated by farmers. However, there is a need for more experience in working with farmers, since we had just started working on farmer participatory approach.

There has been close contact and information sharing on forage R&D among participating countries and other countries outside the project areas.

Factors contributing to the success of this project were: the availability of forage seed, the participatory research approach, the good cooperation from farmers and local extension officers and technical input from FSP coordinators.

### **2.6.7 Acknowledgement**

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### **3. Forage for Smallholders – The ADB Project : Expected outputs from the Project and ADB requirements**

*Tony Perez and Peter Kerridge*

#### **3.1. Introduction**

##### **3.1.1 Choices of Livestock Feed**

1. Grasses
2. Herbaceous legumes
3. Shrub and tree legumes

##### **3.1.2 Forage Integration into Farming Systems**

1. Intensive plots for cut and carry
2. Intensive grass plots
3. Intercropping with food crops, filed crops
4. Fencing
5. Contour rows for erosion control
6. Cover crops under coconut

##### **3.1.3 Type of Animal/fish**

1. Cattle
2. Goats
3. Sheep
4. Fish

#### **3.2 ADB Scaling up**

##### **3.2.1 Site Selection for Scaling – Up**

1. Need and demand for livestock feed (quantity and quality)
2. Livestock a major source of farm income
3. Transportation access to the site
4. Potential for commercialization (Groups of individual)

##### **3.2.2 Scaling – up/Project Area**

1. Number of provinces
2. Number of district/sub-district (town)
3. Number of villages (Barangay)



### **3.2.3 Type of Nursery/Multiplication**

1. Seed
2. Vegetative materials
  - Set-up germplasm nursery/demonstration
  - Commercial farmer group /plan nursery

### **3.3 Parameters to measure outputs (Year 3)**

1. Number of farmers or farmer groups (extension systems)
2. Expansion in area planted
3. Number of villages participating
4. Increase in number of animals
5. Number of multiplication sites
  - Germplasm nurseries
  - Farmer groups/nurseries (commercial)
6. Continue participatory research (applied research)
7. Continue networking in each country
8. Regional and country training courses conducted
9. Selected socio-economic data on farm income, and improved welfare (e.g. tv, bicycles)

### **3.4 Workshops, reports and disbursement**

1. Three Workshops
  - a) First workshop: To provide an opportunity to:
    - Introduce the goal, objectives, strategies, and work plans of the study.
    - Set direction and priorities.
  - b) Second workshop: To assess the progress made and set future directions.
  - c) Third workshop: To assess accomplishments and to finalize the year's activities.
2. Reports: CIAT will submit to ADB
  - Semiannual progress reports and semiannual financial statements
  - Audited annual statements
  - TA completion report (within 4 months of study's end)

### 3. Disbursements

- Semiannual installments (based on CIAT's estimates of activities) after satisfactory liquidation of expenditure at the end of each 6 months.

The logo of ADB, FSP and CIAT will be used on official correspondence, publications and wherever else appropriate. Agreements on the implementation strategy of the project in each country are signed by CIAT and the collaborating National Institutes, in the form of a letter of understanding (LOU).

#### 3.4.1 Roles of Participants in the Project

##### 1. Countries

Indonesia, Lao PDR, Philippines, P.R. China, Thailand, Vietnam

ADB – Tony Perez

CIAT – Project Director – Peter Kerridge

Project Officer (Resource Person) – Ralph Roothaert

##### 2. Coordination Committee

Country Coordinator/Liaison Officer

Project Director/Project Officer

ADB Representative

- 1) Agree on Strategy and implementation

##### 3. Country Coordination

- 1) LOU

- 2) Implementation

- Agreed plan (Focus)
- Budget (Counterpart budget)
- Financial reports (Actual receipts)
- Technical reports (M&E)

## 4.1 Introduction

This paper provides some guidelines and suggestions on how the main outputs proposed in the Asian Development Bank (ADB) project might be achieved through specific activities. In consultation with country co-ordinators Forages for Smallholders (FSP) Phase I, focus sites were selected for continuing research on the development of forage technologies and for dissemination to other districts in the same province during Phase II. The selected focus sites and provinces in Indonesia, Lao PDR, Philippines, and Vietnam are described in Table 1. In Thailand and China, Phase II will initiate Farmer Participatory Research (FPR) activities.

The proposed components of phase II are:

- Development of sustainable forage technologies
- Dissemination of forage technologies
- Development of forage multiplication systems
- Training in participatory approaches to developing new forage technologies
- Strengthening existing forage networks

## 4.2 Guidelines for activities

### **4.2.1 Continuing development of sustainable forage technologies**

Farmers are still in a new stage of evaluating and developing forage technologies. We will continue to monitor this development of forage technologies by farmers. Through intensive monitoring, important information can be obtained, such as preferred accessions, reasons why they are preferred, planting niches, grazing or cutting management, palatability, animal responses and problems that farmers encounter. This process may need to be supported by providing information, facilitating discussion and learning among farmers through meetings, cross visits, etc. – encourage the development of more intensive animal production systems such as fattening and improved breeding.

Table 1. Proposed focus sites in phase II of FSP and their dominant farming system (Source: FSP, 1999).

Country	Province	Focus district/ municipality	Dominant farming system <sup>a</sup>
Indonesia	East Kalimantan	Loa Janan, Samarinda	E-UP, GR
		Makroman, Samarinda	R-LO, I-UP
		Sepaku II, Pasir	E-UP, GR
Lao PDR	Luang Phabang	Xieng Ngeun	E-UP, S-SB
	Luang Phabang	Houay Pay	S-SB
	Xieng Khouang	Nong Het	S-SB, I-UP
Philippines	Misamis Oreintal	Cagayan de Oro	E-UP
	Bukidnon	Malitbog	E-UP
Vietnam	Dakiak	M'Drak	GR
Thailand	NE Thailand	Pakchong	E-UP
	Nakornratchasima	Sung Nuen	
	Burirum	Pa - Kam	
China	Hainan		

<sup>a</sup> I-UP = intensive sedentary upland, E\_UP = extensive sedentary upland, S\_SB = short rotation slash and burn, GR = grasslands, R\_LO = rainfed lowland

*A technology can be called successful once farmers have started to expand with their own resources means and their neighbours start using it spontaneously. When this happens, the technology can be said to be ready for dissemination to other districts. The impact a successful technology has within groups of individual farms will be evaluated. This will assist in extrapolation to the provincial level.*

In addition to monitoring forage technology development we also propose to work with farmers to develop new options for increasing livestock productivity. Some of these options are:

- Greater integration of shrubs and trees in the farming system.
- Closer integration of improved forages with existing feed resources.
- Assessment of local woody and herbaceous fodder species.
- Inputs in livestock management where this is seen to be limiting.

Farmers who have adopted a technology are the best examples for other farmers who want to learn something new. Successful farmers have provided demonstration farms in the past. This habit will be encouraged in the new phase, and where ever possible, extended.

The target group for the participatory technology development are the resource-poor farmers. It is envisaged that working with this group will decrease wealth inequity in the community. At the same time social and economic inequity among gender will not be increased. We need to ensure that the most resource-poor farmers are included in our program.

#### 4.2.2. Dissemination of forage technologies

A remarkable number of farmers have been testing forages as a result of FPR activities during Phase I. In 1999, 499 farmers had been testing forages in the Philippines and 149 of these had expanded the area that they had initially planted (Gabunada, 2000). Phase II of the project is going to capitalise on this experience by disseminating the knowledge and experience gained by these farmers to farmers in other districts.

How we implement this new component on dissemination will depend on the situation within each country. This has been discussed with country co-ordinators and a possible plan of action might be as follows:

- Firstly, we will consult with the co-ordinators and the stakeholders in each province. At places without any previous FSP involvement, all stakeholders in the area will be consulted on the first steps of interaction. Stakeholders might be regional departments of agriculture, local governments, NGOs, churches, National Agricultural Research Institutes (NARs) and farmer groups and individual farmers.
- Secondly, we will only plan to extend or disseminate technologies where there is demand by farmers for improved forages. That is, where improved forages can overcome some of their problems. Participatory rural appraisal (PRA) will be carried out to identify new sites. At sites where secondary information is already available, participatory diagnosis will be sufficient. This will provide a clear picture of the farming system. At the same time, baseline information will be collected to assess the opportunities for increasing livestock production. The output will be identification of sites for dissemination.
- Thirdly, we would use experienced persons from focus sites to train local technicians in implementing a participatory approach to forage development. These trainees will become resource persons in forage technology development.
- Fourthly, these newly trained technicians would then undertake Participatory Diagnosis and Planning with farmers at the selected sites. This will identify constraints and potential solutions and *farmers are natural problem solvers*.
- Leading farmers from the selected sites will then be taken to visit farmers in the focus sites to obtain first hand knowledge of forage species and how they are being used and to take planting material back to their village.
- Once planting materials are available, training sessions will be organised for interested farmers where their implementation will be discussed. They will be

advised on accessions which have been tested so far, management aspects, advantages and disadvantages. If possible farmer extension workers from the focus sites would attend these sessions. A field worker will be assigned to closely follow-up on the planting and management of these forages on-farm.

This suggested plan of action includes the use of various tools such as exchange visits, workshops for extension workers and farmers and extension materials. People who have been trained and have experience in participatory approaches and forage technologies will train other field workers to carry out PRAs and technical workshops. Experienced farmers used as resource persons in new areas will receive some form of remuneration. The project will finance field days during which farmers will be transported to focus districts with successful technologies.

Field workers in new areas are encouraged to identify and work with functioning farmers groups. Farmers groups are an effective medium of reaching many farmers while at the same time monitoring becomes easier. A demonstration plot can easily be established on a farm that is often already used for this purpose. The use of farmer schools will be evaluated.

Extension material will be developed on examples of technologies of different forage species which have been adopted and naturally expanded in some areas. This will be an important tool to spread the technology to new areas. We will explore whether the extension material will be developed by trained agricultural staff or by farmers themselves. Literacy of farmers in the area will be a crucial factor for this decision. The aim is to write the material in the language which is most easily read by the target group.

#### **4.2.3 Development of forage multiplication systems**

The project emphasises the sustainability of the developed technologies. One major condition for dissemination and then the continuity of an improved forage system after the completion of the project is the availability of planting material. The emphasis will be placed on farmers multiplying their own materials. In most countries there is not an established forage seed industry and further, resource-poor farmers will be loathe to spend resources on purchasing expensive seed. However, local production and sale of planting materials will be encouraged.

In certain countries, such as China and Thailand and other areas with reasonable infrastructure, regional multiplication sites can be developed. However, in many remote areas the access to regionally produced seeds, seedlings or cuttings will be very hard if not impossible. In those areas multiplication of planting material has to be carried out on small scale on-farm.

forage technology. Training can be conducted for trainers of trainers, other workshops for field workers and farmers. Once multiplication of planting material is effectively taking place on-farm, farmers can be used as resource persons to train farmers in new areas. Farmers groups are again an efficient entry point. A group might decide to establish a collective multiplication site, rather than individual ones on each farm. All successful multiplication systems developed in the project will be documented and processed into publications, for dissemination purpose.

#### **4.2.4. Training in participatory research approaches for forage technologies and other related skills**

It is essential that field technicians and other agricultural officers actively involved in implementation are competent in applying participatory research tools for the development of site-specific sustainable forage technologies.

There are different levels of experience of FPR among staff that will be involved in Phase II. It is higher in countries that were actively involved in developing new forage technologies with farmers. Staff or "trainers" with extensive experience in the use of FPR approaches will assist in training other personnel. We will continue to provide additional training for these "trainers" who will then conduct in-country courses in their own countries. Likewise there are different levels of experience in tropical forage agronomy. It will be particularly important to provide training in forage agronomy to local technical staff who will be responsible for disseminating forage technologies.

There will be a training workshop in Hanoi from 20-25<sup>th</sup> March on implementing a gender and equity strategy within the project. It is planned that "trainers" from each country will participate. We are also planning a workshop for "trainers" on "Participatory Monitoring and Evaluation" and "Strategies for Dissemination" in August 2000.

In-country workshops will be held on participatory research for forage technology development and multiplication of planting materials for technical persons from other municipalities or districts selected as sites for dissemination using the course materials we have already developed.

#### **4.2.5 Strengthening existing forage communication networks**

Every year a workshop will be organised involving all member countries. One aim of these workshops is to provide an opportunity for the participants to exchange experiences in the form of presentations and informal discussions. The second aim will be to develop a detailed country work plan for the next year, based on feed back from the field, and inputs from other participants and consultants present at the workshop.

To facilitate ease of communication, every country will aim to establish e-mail and Internet facilities for country and site co-ordinators. A web page can be developed with active inputs from all member countries. A regular updated hard copy of this web page can be made in the form of the SEAFRAD newsletter, which was founded in the first phase of the project. Suitable topics for publication are: developed forage technologies, forage multiplication or participatory development and research methodologies.

Regular progress reports are written not only for donor requirements but also to provide feedback to institutional leaders and policy makers. These leaders and policy makers will be actively involved throughout the course of the project through participation in workshops, site visits and seminars. Further, we want to support and encourage national networks.

Although the five components of the project have been described in separate paragraphs, there is a natural flow from one components into the other (Fig 1). For instance, cross visits of farmers from new areas to the focus sites are a tool for dissemination, but they provide training for the new farmers at the same time.



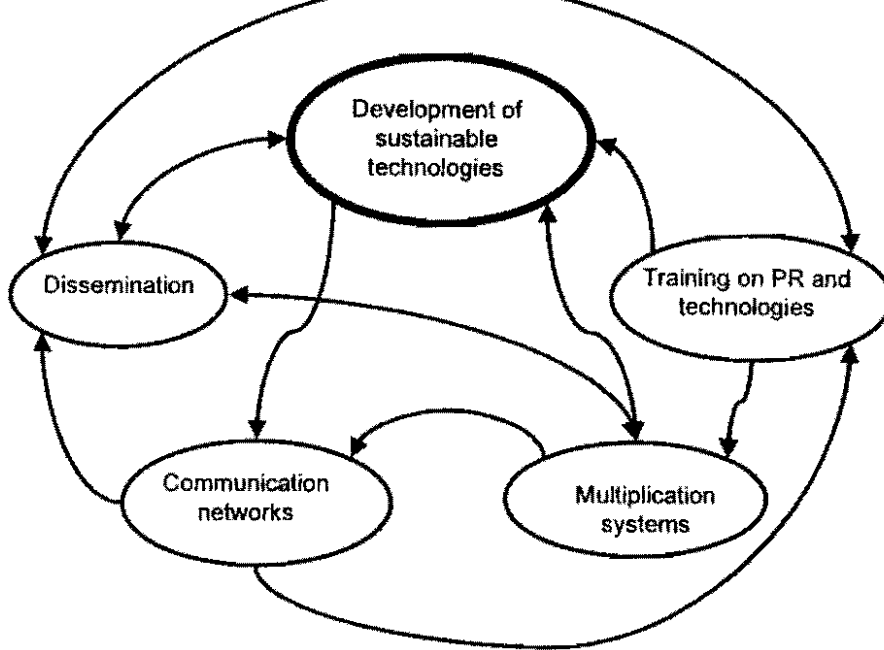


Figure 1. There is a natural flow of one component into the other

### 4.3 Sequence of activities

The two major components of the project are development of sustainable technologies and dissemination (component 1 and 2). Components 3, 4 and 5 (multiplication, training and networking, respectively) support the first two components. There is a logical sequence of activities that can take place.

#### Component 1: Development of sustainable technologies

1. Selected sites
2. Trained people
3. PD
4. Identified "problem solvers" (key farmers)
5. Evaluation
6. Field days
7. Cross visits
8. Measurement of impact, participatory evaluation

What additional inputs?

- E.g. -support system  
- other options, opportunities, training

#### Component 2: Dissemination

1. (P)RA Select potential districts
2. Train people at district level
3. Select 2 or 3 villages each of 2 – 3 districts
4. PD at village level



Continuation as in component 1, activity 4 – 8

#### Capacity building (Component 4):

- Continue support for trainers
- Support of new technicians

#### Gate keepers (Component 5):

Institutionalise FPR approach

- Talking to Mayor
- Meeting with Governor

### 4.4 Planning of strategy for individual countries

Between February and July 2000, member countries of the project should have completed the strategy for the implementation of the first year of the project in their country. The continuous flow of information from the field necessitates a constant adjustment of the plan of activities. Nevertheless, experiences from the last five years enabled the co-ordinating committee to develop a strategy. The following format was developed during the meeting to plan the activities in each district or municipality:

Name of country	Component	Activities			Expected output (performance targets, indicators)
		2000	2001	2002	
	Development of technology				
Focus districts					
1					
2					
	Dissemination				
Focus districts					
1					
2					
New districts					
1					
2					
3					
#					
General	Forage multiplication,	↑	↑	↑	
	Training,	↑	↑	↑	
	Networking	↑	↑	↑	

## References

- Gabunada, F. 2000. Country presentation – Philippines. Paper presented at the Inception Meeting of the CIAT/ADB Project "Development of Sustainable Technologies for Resource-Poor Upland Farmers in Asia", 17-18 February 2000, Los Banos, Philippines.
- FSP, 1999. Forages for Smallholders Project, Annual plan, 1 July – 31 December 1999.

## **5 Country strategies and workplans**

### **5.1 Strategy for implementing Forage for Smallholder Phase II in Lao PDR.**

#### **5.1.1 Introduction**

This paper highlights the components and expected outputs proposed in the ADB project which might be accomplished through specific activities in selected focus sites in Lao PDR. The development activities proposed in this project are aiming to continue development of sustainable forage technologies for diversified farming systems in the uplands. The lessons learned and experience gained from the first phase of FSP regional project would be considered and taken into account for developing and dissemination of developed forage technologies. A major lesson learned was that participatory approaches offered a better way to interact with farmers. However, participatory approaches will be a continuing process for scaling-up/scaling-out of adapted technologies. The activities and expected outputs from the second phase of the project are outlined and briefly discussed in this paper.

#### **5.1.2 Overview of the agricultural Development context**

Based upon income criteria, Lao PDR is a poor country with an average per capita income of only US\$ 400. The base of the economy is mainly agriculture with farmers, many of them at the subsistence level, comprising 85% of the population. According to the National Statistics Centre 1998 data reported that the agriculture sector could contribute about 51% to the Gross Domestic Product (GDP), and in which livestock sub-sector shared about 22%.

Priorities in the government's policy are to obtain food self-sufficiency and alleviate poverty. More emphasis is now being given to improving of the nutritional level and to family income generation of the rural poor.

The government agricultural development strategy is to introduce diversified, productive and sustainable agricultural practices that would foster sustainable economic development and preserve the environment, and as well as the secure employment and income generation opportunities and consequently raise gradually the standard of living and socio-economic status of rural people.

Livestock is becoming an increasingly attractive production alternative to complement crop production. Likewise livestock has always been an important element in the rural farming systems and agro-ecosystems especially in the upland and mountainous areas. Most of households keep cattle which are raised for sale in order to

areas where cattle are sold for rice to make up for months where there is a deficit of this staple. One adult cattle sells for about 1,000,000-1,500,000 Kips (US\$ 150-200) and is enough to feed a family of 6 people for one whole year. There is a great diversity of livestock farming systems in the upland because of the large heterogeneity among ethnic groups. These small holder farmers have well established traditions and indigenous skills and knowledge in management livestock. It is then essential that new developed technologies be grafted onto the already well established traditional practices i.e. group formation for grazing cattle on natural grassland, grazing cattle rotated on fallow land in shifting cultivation farming system, etc...

### **5.1.3 Strategy for implementing Forage for Smallholders Project (FSP) Phase II**

The proposed component are based on the project goal and objectives these are:

1. Development of Productive and Sustainable Forage technologies
2. Dissemination and extension of forage technologies
3. Effective local seed and planting material multiplication systems
4. Improved capability to develop and deliver new technologies (Training)
5. Strengthening national and regional forage communication networks

#### *Development of Sustainable Forage technologies*

There is a need for dramatic improvement of feed and fodder resources at the farm- and village level. The feed development for livestock in upland and mountainous farming systems should be concentrated on the continuum of existing forage technologies which have been tested and demonstrated at the farm level. The project will also continue to support and facilitate on-farm trials and demonstrations to identify high productivity and quality of adapted forage species such as fast growing high-biomass nutritional fodder trees and shrub legumes to suit to specific farming systems. Lack knowledge in managing improved forage is a major obstacle to adoption such of forages. Emphasis should be given to supplementing the natural grazing areas or local feed resources by growing forage crops and introducing improved livestock management systems.

Improved fallow systems, combining the effects of fodders and the grazing animal are expected to accelerate nutrient cycling, soil erosion control, and improve soil moisture conservation in shifting cultivation systems. The main activities to be undertaken within this component are:

- Assessment of the availability of local feed resources (in relation to animal requirement). Two priority grasslands are: (1) Plain of Jar grassland (Xieng Khouang Province), and (2) Pek Savanna (central and/or southern Province).

- Introduction of new forage technologies and livestock management options to compliment selected natural grasslands.
- Continuing development of sustainable forage technologies for specific upland farming systems:
  - Intensive and productive forage for cut and carry feeding
  - Forage or fodder shrub and trees legumes in fallow land for multiple purpose use ie. livestock feed, conserving soil erosion and improving soil fertility
  - Forage/fodder trees as protein banks for feeding livestock during the dry season
  - Mineral supplement to overcome P deficiency in the Plain of Jar grassland
  - Livestock management options
  - Using indigenous forage and fodder trees as animal feeding

#### *Dissemination and extension of forage technologies*

From a technical aspect, livestock research and development strategies in the medium term should be on-farm and focussed on the primary constraints of animal disease and nutrition; the better use of local and natural feed resources, developed forages and leguminous fodders integrated into farm management and land conservation systems. An extensive on farm technology testing program (OFTT) should be developed and implemented as part of new extension approach (PR approach). This would also mean the planned OFTT and demonstration programmes should be focussed on problems identification through farmer participation and farmer's actively participation in problem solving.

The approach that needs to be taken for any livestock development interventions, or in other words in development of forage technologies aimed at improving small holder livestock farming systems, should be community-based development implying the active participation of the rural community and farmers themselves. It is important to take into consideration the social context of the farming system, to analyse and understand customs and traditional methods of livestock raising. The attitudes, willingness and acceptance of the farmers will help to determine the appropriate type and level of techniques and technologies, the extension programmes and forms of interventions (technical and economical) that can be successfully grafted onto the system for the sustainable benefit of the target population.

A remarkable number of farmers have been testing forages in Lao PDR, especially in two active provinces ie. Xieng Khouang and Luang Prabang. The lessons learned and experience gained by both researcher/development workers and farmers will be used for extension or dissemination of adapted forage technologies to farmers in other villages, districts and provinces. There is also a need to develop an appropriate

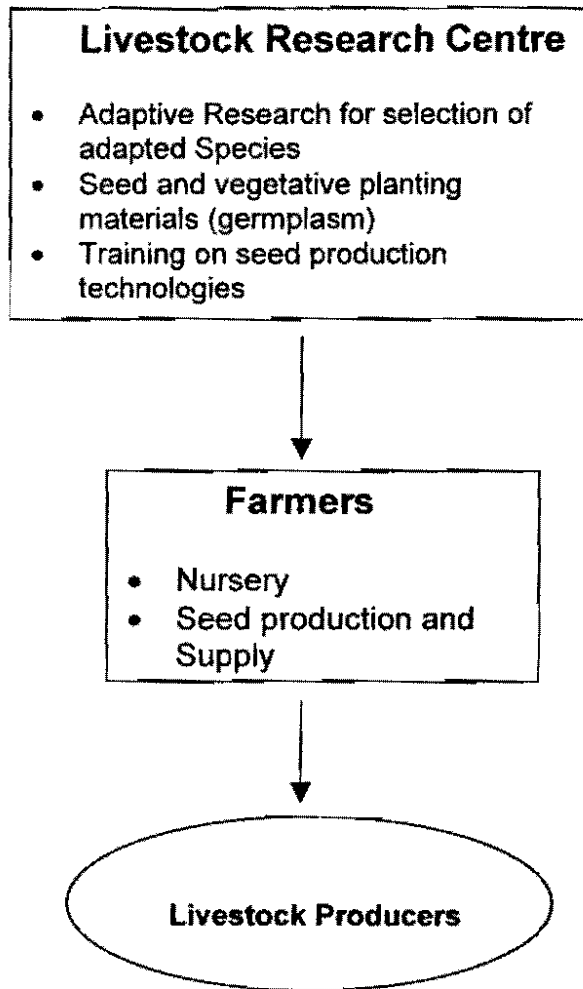
development workers at the district level will be identified for technology dissemination. The farmer-to-farmer extension approach will be important. Activities in this component will follow the PR approach in technology development and dissemination.

*Local seed and planting material multiplication systems.*

A most important outcome from the first phase of FSP was the identification of a wide range of adapted species for different agro-ecosystems. Seed production and vegetative propagation species such as *Brachiaria* spp. *Stylosanthes guianensis* CIAT 184, and some fodder trees have been started in the provincial stations, and the national research center as well as on farm level. There is a great potential to produce and multiply those adapted forage species. The proposed development of forage multiplication systems outlined below are aiming to develop a sustainable local seed and planting material multiplication system. The expected output from this system is the provision of the availability and accessibility of forage planting materials to farmers.

- The role of research centre and provincial level is to coordinate and facilitate for development of local forage multiplication systems. Adaptive research for selection of adapted forage species for a wide range of environment and farmer's management will be managed at the central and provincial levels. The adapted forage species will be then produced and multiplied at the farm level, meaning that the seed and planting materials will be produced and multiplied by farmers in their own farms. Farmers and the district extension staffs might be trained in seed production technologies. Therefore the research centre will take a role in training them and providing seed or planting material and technical support at the initial stage.

## Development of Forage multiplication systems





### *Improved capability to develop and deliver new technologies (Training)*

The livestock sub-sector is constrained by both staff numbers and skills at all levels (central, provincial and district). Appropriate training programmes should be developed to address the human resource constraints. Training programmes at different levels of management should focus on relevant subject matter covering both management and technical fields. An initial thought would be to train central level staff to be research managers and facilitators (training them as 'trainer'), provincial level staff to be trained as subject matter specialists and district level staff to be development specialists or extensionists. District extensionists would have the direct role in linking forage extension activities to farmers. Another important area that needs to be addressed is the information system (media information) to serve forage development in the country within different farming systems and provide useful messages to the rural community.

- The training will be formal and informal training, it should cover different fields of forage production and management such as forage agronomy, seed production technology, natural resource management, participatory approach in technologies development and technologies transfer, project management, and include English language training, computer skills and training skills.

### *National and regional forage communication networks*

It is proposed and expected that the activities and outputs from project in the second phase would be the strengthening the existing forage communication networks:

- Improvement of existing information exchange and communication systems, including the organisation of workshops, meeting and publications.
- Establishment of operational office (i.e. at provincial and district level).
- Continuing operation of a regional communication network (establishment of e-mail and internet facilities).
- Reporting (regular progress report to both donors and administrator or policy makers).
- Collaboration with rural development projects and agencies and NGOs.

## 5.2 Workplans

### 5.2.1 Workplan East Kalimantan, Indonesia January – December 2000.

Component	Activities	Expected outputs											
		J	M	A	M	J	J	A	S	O	N	D	
Focus village (Pasir and Samarinda Districts)	i. Development of forage technology												
Sepaku II, Makroman	2 Field days with 6 new groups, 3 farmers per group		X										
Sepaku II, Makroman	Training of key farmers in forage technologies				X								
Sepaku II	Oversowing of <i>Imperata</i> areas				X								
Sepaku II, Makroman	Identification of suitable alternative fodder tree species and sweet potato varieties		X	X									
Sepaku II, Makroman	Obtaining of seeds		X	X	X								
Sepaku II, Makroman	Raise tree seedlings poly bags					X	X	X					
Sepaku II, Makroman	On-farm planting tree legumes for dry season feeding									X	X		
Sepaku II, Makroman	Participatory research using forages strips and hedgerows on contours			X	X	X	X	X	X	X	X	X	
Sepaku II, Makroman	Develop seasonal feed calendar				X								
Sepaku II, Makroman	Participatory development of animal feeding practices, including legumes					X	X	X	X	X	X	X	
Sepaku II, Makroman	PME exercises	X	X	X	X	X	X	X	X	X	X	X	

Component	Activities	Expected outputs											
		J	M	A	M	J	J	A	S	O	N	D	
New Sub-district	II. Dissemination												
Samarinda Iiir (new village), Balikpapan Utara, Loa Kulu, Samboja, Tanjung Redeb, Talisayan/ Biduk-biduk, Sepaku (new villages), Tanjung Palas	Selection of new sites, collection of secondary data		X	X	X								3 new districts and 5 new subdistricts identified
	PD and PP with 7 villages <sup>1</sup>					X	X						Farmers' problems and solutions identified
	Field day for 7 farmer groups, involving 25 new key farmers <sup>2</sup>					X	X	X					Increased knowledge of new farmers
	Hands-on training of forage technologies for key farmers						X	X					15 trained farmers
	Assistance in planting of new multiplication plots at key farms						X	X	X	X			7 new multiplication plots established
	Cross visits of all farmers to focus sites							X	X	X	X		50 farmers have visited focus sites and new technicians have met with technicians from focus sites
	Meetings of leaders and key farmers of different farmer groups to discuss strategies for scaling up					X	X	X	X	X	X		Meetings every two months with villages within close proximity
	PME exercises new sites				X	X	X	X	X	X	X		7 PMEs conducted
	Radio and TV broadcasting on FSP activities.			X					X				2 interviews
	III. Multiplication												
	Production of vegetative planting materials on communal nurseries	X	X	X	X	X	X	X	X	X	X		200 cuttings supplied to every new farmer
	Production of vegetative planting materials on individual farms	X	X	X	X	X	X	X	X	X	X		200 cuttings supplied to every new farmer
	Production of vegetative planting materials on new sites.										X		7 new multiplication plots established

<sup>1</sup> 13 villages for 3 years

<sup>2</sup> 25 new farmer groups after 3 years

Component	Activities												Expected outputs	
	J	M	A	M	J	J	A	S	O	N	D			
IV. Training														
In country workshop for exchange of experiences													X	1 workshop organised
Training on FPR and forage technology <sup>3</sup>					X									15 technicians and field workers to be trained
V. Networking														
Establishment of email facilities			X											E-mail connection established
Contribution to SEAFRAD newsletter			X			X								2 contributions
Involvement in national workshops and seminars						X								1 workshop
Attendance of regional and international workshops													X	1 workshop

<sup>3</sup> Ibrahim, Maimuna, Tugiman and Herianto are potential trainers. Two fieldworkers and technicians from every sub-district will be invited, plus one person from every District (6 districts). The training will consist of two parts; one week FPR and the second week forage technology with farmers.

## 5.2.2 Workplan Bukidnon, Philippines, January – December 2000.

Component	Implementation 2000				Expected output (performance targets, indicators)
	Jan-Mar	Apr-Jun	Jul-Sep	Oct- Dec	
Focus site 1. Maitbog, Bukidnon	I. Development of forage technology				
	1) Expansion of forage area by core farmers (Kaluluwayan, Tagmaray)				
		✓			Identification of expansion plans (uses of forages, area for expansion, training needs, other support needed)
				✓	2 Cross-visits/field days conducted
	2) Evaluation of new forage species and uses				
	a) Group evaluation of existing forage species and uses				
			✓		Workshops conducted to identify :
			✓		i) desirable/undesirable characteristics of forage species
			✓		ii) current and potential uses of forages
			✓		iii) farmers interested to try out new forage species or uses
	b) identify farmers interested to try out new species (including local) or uses				
	c) support forage evaluation activities				
			✓		Scheme of access and transport for forage planting materials
			✓		Evaluation sessions conducted
			✓		Cross-visits and field days conducted
	d) evaluation of results				
	e) field days/cross visits to disseminate results				

3) Integration between farmers' groups	✓	✓	✓	✓	4 Quarterly meetings for exchanging views and share learning experiences
4) enhancing opportunities of core farmers to avail of livestock/livelihood programs that would enhance use of forages					
a) identification of existing programs of interest to farmers			✓		4 Programmes identified
b) linkage with existing programs that farmers are interested with			✓		
i) organize visits by program personnel to interested farmers			✓		Visits to facilitate interaction between interested farmers and Applications
ii) facilitation of processing papers for loans and other benefits			✓		
5) Impact assessment (focus farmer groups)			✓		Impact of forage technologies assessed
6) Impact assessment (other farmer groups)			✓		Impact of forage technologies assessed
7) Integration of more forage legume species in farming system (leucaena, calliandra, stylo 184, trychantera, glyricidia, mulberry)			✓		15 Farmers have started planting seedlings and preliminary evaluating

Component	Implementation 2000				Expected output (performance targets, indicators)	
	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec		
New Municipalities in Bukidnon Province	II. Dissemination of forage technologies to selected sites					
	1) Selection of potential sites					
	a) Visits to regional, and provincial officers to introduce project activities					
			✓			Regional and Municipal Agricultural Officers made aware of the project - cooperation and involvement agreed upon - initial identification of potential municipalities
	b) Review of secondary data					3-4 potential municipalities identified
	c) Visit municipal officers and potential collaborators in 3-4 potential municipalities					Potential collaborators made aware of project
	d) Visit 2-3 potential village sites in each municipality					Initial idea on potential villages Farmers and existing organizations visited and made aware of project
	e) Selection of village sites and initial planning with collaborators					Village sites selected Initial activities identified and scheduled
	2) Carry out forage technology development activities					
	a) PD					12 PD's conducted
	b) Participatory planning					Plans and commitment formulated by farmers
	c) field days, cross-visits					5 Field days, cross visits conducted
	d) informal trainings with core farmers as trainers					Trainings conducted by farmer-trainers
	e) facilitate establishment of forages by interested farmers					Forages established by farmers on-farm
f) participatory evaluation of forages and forage uses					12 Evaluation sessions conducted	
g) facilitating access to livestock and livelihood programs					12 Groups (sitios) have access to livestock/livelihood programs facilitated	

Focus site (Malitbog)	3) Increase number of farmers planting/evaluating forages in other barangays within Malitbog	✓		4 new farmer groups evaluating forages
	a) continue forage technology development activities with other farmer groups			
	i) PD	✓		4 PD's conducted
	ii) Participatory planning	✓		Plans formulated by farmers
	iii) field days, cross-visits	✓		4 Field days, cross visits conducted
	iv) informal trainings with core farmers as trainers		✓	Training conducted by farmer-trainers
	v) facilitate establishment of forages by interested farmers	✓		Forages established by farmers on-farm
	vi) participatory evaluation of forages and forage uses	✓	✓	Evaluation sessions conducted
vii) facilitating access to livestock and livelihood programs			✓	Access to livestock/livelihood programs facilitated



Component	Implementation 2000				Expected output (performance targets, indicators)
	Jan-Mar	Apr-Jun	Jul-Sep	Oct- Dec	
III. Development of forage multiplication systems					
Focus sites	a) identification of multiplication farmers for grasses	✓			
	b) obtaining seeds of legumes		✓		
	c) raising seedlings in polybags		✓		15 farmers have raised seedlings
	d) exchange experiences of forage multiplication		✓		1 exchange visit
New municipalities	a) identification of planting material sources in Malitbog, Cagayan de Oro, Malaybalay Stock Farm				Sources identified
	b) Collection of planting materials from Malitbog by farmers from new municipalities, during cross visits		✓		Farmers in 3 new municipalities have received planting material
	c) Establish nurseries on farm for tree legumes			✓	3 nurseries established
	d) exchange experiences of forage multiplication			✓	1 exchange visit

Component	Implementation 2000				Expected output (performance targets, indicators)
	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	
IV. Training in participatory approaches and developing new forage technologies (capacity building)					
1) Trainings for collaborating technicians					
a) forage agronomy, natural resources management and farmer participatory research			✓		1 training conducted for 15 TA's and regional representatives
b) participatory tools			✓		1 field training conducted for 15 TA's and regional representatives in 4 municipalities
d) gender/stakeholder analysis				✓	1 training conducted
e) participatory monitoring and evaluation			✓		1 international workshop held in Cagayan de Oro
2) Training for core group of farmers					
a) forage agronomy, utilization and animal nutrition	✓		✓		Trainings conducted in focus site and new municipalities on forage agronomy and utilization
3) Cross-visits to exchange ideas and experiences					
a) farmer-to-farmer and technician-to-technician	✓	✓	✓	✓	9 visits from new municipalities to Malitbog
V. Strengthening existing forage networks					
1) Close contact and sharing of information between technicians and farmers on forage research and development	✓	✓	✓	✓	Weekly visits
2) take part and contribute to SEAFRAD		✓		✓	2 articles written and published

### 5.2.3 Workplan Misamis Oriental, Philippines January – December 2000.

Component	Implementation 2000				Expected output (performance targets, indicators)	
	Jan-Mar	Apr-Jun	Jul-Sep	Oct- Dec		
Focus site 1. Pagalungan and Lumbian, Cagayan De Oro	I. Development of forage technology					
	1) Expansion of forage area by core farmers					
		✓			Identification of expansion plans (uses of forages, area for expansion, training needs, other support needed)	
	2) Integration of herbaceous and tree legumes in farming system					
		✓	✓		2 groups	
					10 farmers	
	Sowing of <i>Desmodium cinerea</i> and stylo 184 on-farm					
					2 groups	
	3) Integration between farmers' groups	✓	✓	✓	✓	4 Quarterly meetings for exchanging views and share learning experiences
	5) Impact assessment (focus farmer groups)			✓		Impact of forage technologies assessed
	6) Impact assessment (other farmer groups)			✓		Impact of forage technologies assessed

Component	Implementation 2000				Expected output (performance targets, indicators)
	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	
II. Dissemination of forage technologies to selected sites					
			✓		4 new farmer groups evaluating forages
1) Selection of new barangays					
2) PD			✓		
3) Participatory planning			✓		
4) Field days, cross visits				✓	
5) Informal training with core farmers				✓	
6) Establishment of forages by farmers			✓		
7) Participatory evaluation				✓	
8) Facilitating access to livestock and livelihood programmes			✓	✓	
9) Study on factors that affect adoption of forage technologies			✓	✓	1 attachment of a foreign MSc student
III. Development of forage multiplication systems					
Focus sites					
a) Seed production of herbaceous and tree legumes on-farm for calliandra, leucaena K636, stylo 184	✓	✓	✓	✓	
b) Identification of multiplication farmers for grasses in Lumbian	✓				
c) exchange experiences of forage multiplication			✓		1 exchange visit
d) Maintenance of seed multiplication site at CCC	✓	✓	✓	✓	
Grafting, marcotting and cuttings of leucaena KX2 hybrid by farmers				✓	4 farmers producing trees of KX2
New barangays					
f) Cross visits of new farmers, buying planting material from focus sites	✓	✓	✓	✓	2-3 cross visits per quarter, 5-30 farmers per visit

Component	Implementation 2000				Expected output (performance targets, indicators)
	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	
IV. Training in participatory approaches and developing new forage technologies (capacity building)					
1) Trainings for collaborating technicians					
a) forage agronomy, natural resources management and farmer participatory research			✓		1 new AT joins training in Bukidnon
b) participatory tools			✓		4 TA's and 1 City representatives join Bukidnon trainings
c) gender/stakeholder analysis				✓	4 TA's and 1 City representatives join Bukidnon trainings
d) participatory monitoring and evaluation			✓		1 international workshop held in Cagayan de Oro
2) Training for core group of farmers					
a) forage agronomy, utilization and animal nutrition	✓		✓		Trainings conducted in focus site
3) Cross-visits to exchange ideas and experiences farmer-to-farmer and technician-to-technician					
	✓	✓	✓	✓	2-3 cross visits per quarter, 5-30 farmers per visit

Component	Implementation 2000				Expected output (performance targets, indicators)
	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	
V. Strengthening existing forage networks					
1) Close contact and sharing of information between technicians and farmers on forage research and development	✓	✓	✓	✓	Weekly visits
2) Take part and contribute to SEAFRAD			✓		1 articles written and published
3) Participate in National Dairy Congress		✓			Participation in fair and sales of seeds
4) Take part in Agricultural Fair in Manila Fortich		✓			Participation in fair and sales of seeds
5) Take part in Department of Agriculture Fair					Participation in fair and sales of seeds

5.2.4 Workplan Daklak, Vietnam January – December 2000.

Component	Activities												Expected outputs
	J	M	A	M	J	J	A	S	O	N	D		
Focus commune Cu Roa	I. Development of forage technology												
	X												Development of workplan
					X								5 farmers
					X	X	X						5 farmers
					X	X	X						10 farmers
					X	X	X						5 farmers
					X	X	X						2 villages
									X	X			2 courses of 1 day, 30 farmers per course

Component	Activities	Expected outputs												
		J	M	A	M	J	J	A	S	O	N	D		
New communes/districts	II. Dissemination													
Krong A, Krong Zin, Cu M' Ta, Ea Pill	Participatory diagnosis		X											Reports on PD's in 4 new communes
Ae Kar District	Farmers training			X										10 days training
	Collection of secondary data		X											Reports on natural conditions, population, land-use, agricultural data, organizations, services etc.
	Selection of villages/ communes			X										3 communes selected
	Participatory diagnosis				X	X								3 PD's
	Farmers field visits and training				X	X	X							6 days training (2 days per commune)
	Participatory planning					X	X	X						3 days (1 day per commune)
	Participatory evaluation							X	X	X	X			Description of suitable species and technologies
	Field visits of other farmers to the new farmers and exchange of planting material								X	X	X			More farmers trained and planting forages
	III. Multiplication													
	Obtaining seeds of <i>P. max</i> TD58, <i>B. dec</i> Basilisk, <i>P. atr.</i> , <i>B. briz.</i> Marandu, <i>B. hum.</i> , Stylo 184, Gliricidia		X											3 kg of seed per species obtained
Cu Roa	Production and sale of cuttings by farmers of <i>P. max</i> TD58, <i>B. dec.</i> Basilisk, <i>B. briz.</i> Marandu, Gliricidia			X	X	X	X	X	X	X	X	X		6000 cuttings per species for new communes in Mdrak
Cu Roa	Seed production of <i>P. max</i> , <i>B. briz.</i> , Stylo						X							3 farmers
Ae Kar	Production and sale of vegetative planting material by farmers.						X	X	X	X	X			10 farmers, species yet to be decided



Component	Activities												Expected outputs
	J	M	A	M	J	J	A	S	O	N	D		
IV. Training													
Training of trainers PGRA	X												4 scientists are trained on gender and stakeholder analysis
Training technicians in communication, PD and forage technology				X	X								17 people from province and districts and communes are trained
Workshop on participatory monitoring and evaluation in Malitbog							X						Binh and Khanh to participate
V. Networking													
Seafrad editorship													Completion of second issue 1999
Seafrad contributions						X						X	Two articles
Quarterly reports to national and regional coordinators				X	X		X					X	4 reports

### 5.2.5 Workplan Tuyen Quang, Vietnam January – December 2000.

Component		Activities												Expected outputs
		J	M	A	M	J	J	A	S	O	N	D		
Focus communes: Phu Lam in Yen Son district Duc Ninh/Ham Yen district	I. Development of forage technology													Development of workplan With 5 farmers  With 10 farmers With 10 farmers in each of 3 communes Survey initiated in 2000  Number of farmers planting forages increases from 100 to 200 Reports
	Review site		X											
	Evaluate legumes for ground covers						X							
	Introduction of shrub legumes													
	Survey of forest reserve as complimentary feed source to agricultural land								X					
	Expansion area in focus communes				X	X	X	X	X	X	X	X	X	
	Monitoring and evaluation of forage development					X			X			X		
New communes/ districts Ky Lam and Thuong Am/Son Duong dist. Thangquan and Thai Hoa. Yen Son district	II. Dissemination												Reports on natural conditions, population, land-use, agricultural data, organizations, services etc. 4 new communes selected 4 PD's 12 days training (2 days per commune)  4 days (1 day per commune) Description of suitable species and technologies 100 new farmers trained and planting forages Report on exchange of ideas between farmers	
	Collection of secondary data				X									
	Selection of villages/ communes						X							
	Participatory diagnosis						X	X						
	New farmers visit focus communes and training						X	X	X					
	Participatory planning							X	X	X				
	Participatory evaluation								X	X	X	X		
	Field visits of farmers from focus communes to new farmers after 6 mt									X	X	X		

Component	Activities												Expected outputs
	J	M	A	M	J	J	A	S	O	N	D		
III. Multiplication					X								
Obtain seed for new farmers			X										3-6 kg of seed per species obtained
Production and sale of cuttings by farmers				X	X	X	X	X	X	X	X	X	6000 cuttings per species for new communes
Seed production of Stylo/other legumes							X						3 farmers evaluating seed production of legumes
Production and sale of vegetative planting material by farmers.							X	X	X	X	X	X	20 farmers
IV. Training													
Training technicians in communication, PD and forage technology						X							17 people from province, districts and communes are trained
V. Networking													
Maintain contact with other FSP workers in Vietnam													

## 5.2.6 Workplan ThuaThien Hue, Vietnam January – December 2000.

Component		Activities												Expected outputs		
		J	M	A	M	J	J	A	S	O	N	D				
Focus commune Xuan Loc in Phu Loc district	I. Development of forage technology					X										Summary of site situation, Workplan With 10 farmers  Commune livestock officers and farmers trained  Number of farmers planting forages increases from 24 to 40 farmers in 2000 Expansion of area on participating farms Reports
	Review site					X										
	Continuation of evaluation of legume trees, e.g. for living fences						X	X								
	Training in livestock management and animal nutrition							X								
	Expansion activities in focus commune				X	X	X	X	X	X	X	X	X	X	X	
	Monitoring and evaluation of forage development and dissemination					X			X					X		
New communes in new districts To be named	II. Dissemination															Reports on natural conditions, population, land-use, agricultural data, organizations, services etc. 3 new communes selected 3 PD's sent to FSP coordinator 6 days training (2 days per commune) 3 days (1 day per commune) Description of suitable species and technologies 60 farmers trained and planting forages in 2000 Quarterly reports to national and ADB coordinator
	Collection of secondary data						X									
	Selection of villages/ communes						X									
	Participatory diagnosis						X	X								
	Farmers field visits and training						X	X	X							
	Participatory planning							X	X	X						
	Participatory evaluation								X	X	X	X				
	Field visits of other farmers to the new farmers and exchange of planting material										X	X	X			
Monitoring and evaluation of dissemination								X	X	X	X	X				

Component	Activities												Expected outputs
	J	M	A	M	J	J	A	S	O	N	D		
III. Multiplication					X								
Obtain seed for new farmers			X										3-6 kg of seed per species obtained
Develop local multiplication system through sale of vegetative planting material							X	X	X	X	X		20 farmers
IV. Training						X							
Training technicians in communication, PD and forage technology													16-20 people from province, districts and communes are trained
V. Networking													
Maintain contact with other FSP workers in Vietnam													

## 5.2.7 Workplan Nakornratchasima Province, Thailand, January – December 2000.

	Component	Activities												Expected outputs
		J	M	A	M	J	J	A	S	O	N	D		
Focus district Sung Nuen District Nakornratchasima Province	I. Development of forage technology													
	1) Expansion of new Brachiaria and Paspalum area by farmers													
	a) planning with farmers on expansion of Brachiaria and Paspalum area													Integration of new Brachiaria and some promising species in dairy farming systems
	b) Support expansion activities by making planting materials available													Number of farmers planted new Brachiaria and Paspalum 18 farmers at present, increase to 28 farmers
	c) identify desirable/undesirable characteristics of species													Participatory evaluation with farmers conducted to identify desirable/undesirable characteristics of forages species
	2) Integration of forage legumes in dairy farming system in Sung Nuen area													Suitable alternative forage legume species integration into dairy farming system
	a) identify farmers interest to try out forage legume species													As of June 2000, a set number (10) of farmers who are interested to try out forage legume species will identify
	b) support forage legume evaluation by making planting material available													As of June 2000, a set number (10) of farmers will established forage legumes on-farm
	c) informal training on forage establishment, management and utilization													As of July 2000, 10 farmers will have completed their training satisfactorily
	d) conduct training course on forage agronomy for provincial and district livestock officers													20 provincial and district livestock officers to be trained on forage agronomy
	e) participatory evaluation of forage legumes													PE with farmers conducted
	f) field days													Field days conducted
	g) Stylo and lab lab evaluation													2000

Component	Activities												Expected outputs
	J	M	A	M	J	J	A	S	O	N	D		
Selected potential sites in Nakornratchasima	II. Dissemination												2 new districts and 4 new sites identified
	a) selection of new sites												
	- collection of secondary data												
	- visit livestock officers in 3-4 potential districts												X
	- visit potential village sites												X
	- selection of village sites												X
	b) Carry out forage technologies development at new sites												X
	- participatory diagnosis including gender analysis												4
	- feedback meeting on result of PD												4
	- participatory planning												X
	- cross visits												4
	- informal training for farmers on forage establishment, management and utilization												4
	III. Multiplication												
Seed multiplication of new promising accessions of <i>Brachiaria brizantha</i> to disseminate to Sung Nuen site												X X X X X X X X	
Seed multiplication of some grasses and legume species												X X X X X X X	
To disseminate to Sung Nuen site and new sites													



Component	Activities												Expected outputs
	J	M	A	M	J	J	A	S	O	N	D		
<b>IV. Training</b>													
Training course for extension workers on FPR									X				Increase capability of local staff FPR training conducted
Training course for extension workers on forage agronomy													Increase capability of local extension worker in forage technology development Forage agronomy training conducted
On site training on participatory evaluation					X		X					X	
On site training on gender analysis									X				
<b>V. Networking</b>													
Operation a regional communication network	X	X	X	X	X	X	X	X	X	X	X	X	Improved communication system
Contribute articles in SEAFRAD newsletter (be the SEFRAD editor)			X	X	X	X	X	X	X	X	X	X	2 volume of SEAFRAD newsletter will be pulis



5.2.8 Workplan China, January – December 2000.

Component	Activities	Expected outputs											
		J	M	A	M	J	J	A	S	O	N	D	
Research in Hainan On-station	I. Development of forage technology												
	Review activities with PCK				X								
	Review research on stylo for anthracnose resistance and early flowering					X							Report to PCK and RR, possibly for publication
	Chemical analysis of promising species of shrub legumes and summarise research to present						X						Report on research on Cratylia
	Prepare for new stylo evaluation												Plans for planting in June 2000
Focus communes in Hainan Commune Danzhou County	Diagnosis with community/farmers					X							Problems defined, Report
	Evaluation of grasses, legumes and shrubs						X	X	X	X	X		10 farmers evaluating forages Evaluation report
Zhizhong Commune Le Dong County	Diagnosis with community/farmers					X							Problems defined
	Evaluation of grasses, legumes and shrubs						X	X	X	X	X		10 farmers evaluating forages Evaluation report



Component	Activities												Expected outputs
	J	M	A	M	J	J	A	S	O	N	D		
Danzhou and Le Dong	III. Multiplication					X	X	X	X	X	X		5-10 kg of seed per species obtained
	Build up seed supplies of shrub legumes												
Danzhou	Seed production of promising new Stylo accessions							X	X	X	X	X	500-1000 grams of new accessions
Danzhou and Le Dong	Seed production of <i>P. maximum</i> , <i>B. decumbens</i> , <i>B. brizantha</i> , <i>P. atratum</i> , <i>Melinis</i>					X	X	X	X	X	X		2-5 kg of each species
	IV. Training												
	Training technicians in communication, PD and forage technology										X		17 people from province and counties and communes are trained
	Workshop on participatory monitoring and evaluation in Malitbog								X				Yi Kexian to participate
	Training in carrying out PD								X				Yi Kexian
	V. Networking												
	Seafraad contributions								X			X	Two articles, send to Chaisang
	Quarterly reports to regional coordinators					X			X			X	3 reports
	Networking with PR group led by Prof. Li Xiaoyun					X	X	X	X	X	X		Collaborative projects

### 5.2.9 Workplan Lao PDR, January - December 2000.

	Component	Activities										Expected outputs	
		J	A	M	J	J	A	S	O	N	D		
Districts Pek , Xieng Ngeun and Savanakhet	1. Development of forage technology												
	Continue with selection and evaluation of planted legumes and grasses	X	X	X	X	X	X	X	X	X	X	X	Expansion of area of planted forage in focus villages
	Work with farmers to devise management systems to better integrate forages in different areas of crop and areas allocated for grazing				X	X	X	X	X	X	X	X	Less labor involved in cutting and carrying forage to animals
	Survey of indigenous plants used for forage in the different areas						X				X		Identification of native forage in different areas
	Establish productivity of the degraded grassland in Xiengkhouang and Savannakhet				X	X	X	X	X	X	X	X	Productivity improvement of grassland
	Legumes and fodder trees for fallow improvement				X	X	X	X	X	X	X	X	Solution for soil improvement
	2. Dissemination												
	Site selection, secondary data collecton		X										2-3 new villages in each district
	PD				X							X	Identification of constraints and solution
	On-farm activities in new selected villages				X	X	X	X	X	X	X	X	New farmers planting forages
	Cross visits for district staffs PE and monitoring						X				X		2 cross visits will be conducted Progress reports

Component	Activities										Expected outputs	
	J	A	M	J	J	A	S	O	N	D		
<b>3. Multiplication</b>												
Seed multiplication of promising species and disseminate for new sites in each district				×	×	×	×	×	×	×	×	Seeds of promising species are locally available
<b>4. Training</b>												
FPR for district staffs						×						Increase capability of local development workers
Forage Agronomy for district staffs									×			Increase capability of local development workers
Cross visit / on-site training											×	Increase capability of local development workers
Farmer on-site trainings												Some key farmers will be trained
Training in implementing a gender strategy	×											Four key persons trained
Training in M&E												Three key persons trained
<b>5. Net working</b>												
Contribution to SEAFRAD newsletter				×	×	×	×	×	×	×	×	Contribution to 2 newsletters
Maintenance regional communication network				×	×	×	×	×	×	×	×	

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