Technical Report No. 2

Forages for Smallholders Project

Proceedings of the Second Regional Meeting of the Forages for Smallholders Project held at the Chinese Academy of Tropical Agricultural Sciences

Danzhou, Hainan, P.R. China
19-24 January 1997

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Edited by W.W. Stür, J.A. Owen, P.C. Kerridge, P.M. Horne and J. B. Hacker

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Introduction

Regional meetings of the Forages for Smallholders Project (FSP) are held annually. They serve to summarise the activities and results obtained, and to give partners a voice in formulating the direction of the FSP. It is a forum to review activities, reflect on progress and decide on activities for the coming year. The proceedings are a technical summary of the activities and results obtained in all partner countries.

The first Regional Meeting was held in Vientiane, Lao PDR from 16-20 January 1996. The proceedings from that meeting have been published as Technical Report No. 1 (CIAT Working Document No. 156, 1997).

The current proceedings are a compilation of papers presented at the second Regional Meeting of the FSP held at the Chinese Academy of Tropical Agricultural Science (CATAS), Danzhou, Hainan, P.R. China from 19-24 January 1997. The meeting consisted of two days of presentations and discussion at CATAS and a two-day field visit to see *Stylosanthes guianensis* CIAT 184 seed production and leaf meal processing in Hainan. We thank our Chinese hosts for a successful and enjoyable meeting at CATAS.

The next Regional Meeting will be held in East Kalimantan, Indonesia in March 1998.

FSP Activities in China

Liu Guodao, Bai Changjun, Jiang Changshun and Wei Jiashao[1]

The Tropical Pasture Research Centre (CATAS) in Hainan, China is involved in a variety of "Forage for Smallholders Project" activities. These include: Selection of *Stylosanthes* spp. for leaf meal production, selection of *Arachis*, farmer training and publication.

Selection of forages for leaf meal production

An experiment to evaluate anthracnose disease resistance and persistence of 30 accessions of *Stylosanthes* spp. (Table 1) was carried out on the CATAS farm starting August 1996. The accessions were introduced from CSIRO Australia, CIAT (Philippines and Colombia) and compared to four CATAS released varieties.

The experiment was designed as randomized complete block with 3 replications. The experimental plots were 5m single-row plots, 1.5m apart. Anthracnose damage was visually rated monthly using the following 0-9 scale provided by Segenet Kelemu, CIAT):

0 = no visible disease symptom
1 = 1-3% tissue necrotic
2 = 4-6% tissue necrotic
3 = 7-12% tissue necrotic
4 = 13-25% tissue necrotic
5 = 26-50% tissue necrotic
6 = 51-75% tissue necrotic
7 = 76-87% tissue necrotic
8 = 88-94% tissue necrotic
9 = 95-100% tissue necrotic

A visual presentation of the damage scale is shown in Figure 1. Productivity of the *Stylosanthes* spp. was measured by cutting plot three times per year. Initial results show that *S. guianensis* cv. Mineirao, *S. guianensis* CPI 58719, *S. guianensis* CIAT 184, *S. capitata/S. macrocephala* GC 1580, *S. guianensis* CIAT 10417, *S. scabra* cv. Seca, *S. hamata* cv. Verano, and *S. guianensis* E3 had very strong resistance to anthracnose, while *S. guianensis* cv. Cook (CSIRO), *S. guianensis* cv. Cook (China), *S. guianensis* CPI 87830, and *S. guianensis* GC 1579 were nearly destroyed by the disease (Table 2).

[1] Tropical Pasture Research Center, CATAS, Hainan, P.R. China.

Table 1. List of *Stylosanthes* spp. for leaf meal production.

Accessions	Source of seed
S. capitata Multiline 5	B. Grof
S. capitata/S. macrocephala GC 1580	CIAT
S. guianensis CIAT 10417	CIAT (Philippines)
S. guianensis CIAT 11833	CIAT
S. guianensis CIAT 11844	CIAT
S. guianensis CIAT 136	China (from CIAT in 1982)
S. guianensis CIAT 184	CIAT
S. guianensis CIAT 2312	CIAT
S. guianensis CPI 55848	CSIRO
S. guianensis CPI 58719	CSIRO
S. guianensis CPI 67652	CSIRO
S. guianensis CPI 87830	CISRO
S. guianensis cv. Cook	China (from Australia in early 1980s)
S. guianensis cv. Cook (L1-82)	CSIRO
S. guianensis cv. Graham	China (from Australia in early 1980s
S. guianensis cv. Graham (L7-84)	CSIRO
S. guianensis cv. Mineirao	CIAT
S. guianensis cv. Semilla negra	China, selected from CIAT 184s
S. guianensis FM05-1	CIAT (Philippines)
S. guianensis FM05-2	CIAT (Philippines)
S. guianensis FM05-3	CIAT (Philippines)
S. guianensis FM07-2	CIAT (Philippines)
S. guianensis FM9405 Parcela 3	CIAT
S. guianensis FM9405 Parcela 5	CIAT
S. guianensis FM9405 Parcela 6	CIAT
S. guianensis GC 1578	CIAT
S. guianensis GC 1579	CIAT
S. guianensis GC 1581	CIAT
S. scabra cv. Siran (L3-93)	CSIRO
S. scabra cv. Seca	China (from Australia in early 1980s
S. guianensis CIAT 184	China (from CIAT in 1982)
S. hamata cv. Verano	China (from Australia in early 1980s)
S. guianensis L8	China, selected from CIAT 184
S. guianensis E3	China, selected from CIAT 184

Table 2. Mean anthracnose damage range (0-9) of *Stylosanthes* species.

Accessions	Anthracnose damage rating (0-9)	
	Seedling phase	Regrowth phase
S. guianensis cv. Cook (L1-82)	6	7.8
S. guianensis cv. Cook (China)	4	4.7
S. guianensis CPI 87830	3	4.5
S. guianensis GC 1579	3	4.2
S. guianensis CIAT 2312	0	3.9
S. guianensis CPI 67652	1	2.4
S. guianensis GC 1581	2	2.1
S. guianensis CIAT 184 (China)	1	2.1
S. guianensis CIAT 136	2	2.0
S. guianensis cv. Semilla negra	2	1.9
S. capitata Multiline-6	0	1.8
S. guianensis cv. Graham (China)	1	1.5
S. guianensis FM9405 Parcela 6	2	1.4
S. guianensis FM9405 Parcela 3	1	1.4
S. guianensis FM9405 Parcela 5	1	1.3
S. guianensis CIAT 11838	1	1.3
S. guianensis FM05-1	0	1.3
S. guianensis FM05-2	0	1.3
S. guianensis FM05-3	1	1.3
S. guianensis FM07-2	1	1.3
S. guianensis CIAT 11844	0	1.2
S. guianensis CPI 55848	2	1.2
S. scabra cv. Seca (L3-93)	0	1.2
S. guianensis cv. Graham (L7-84)	1	1.2
S. guianensis L8	0	1.2
S. guianensis GC 1578	1	1.1
S. guianensis CIAT 184	1	1.0
S. capitata/*S. macrocephala* GC 1580	0	1.0
S. guianensis CIAT 10417	1	1.0
S. scabra cv. Seca	0	1.0
S. hamata cv. Verano	1	1.0
S. guianensis E3	1	1.0
S. guianensis CPI 58719	0	0.9
S. guianensis cv. Mineiro	0	0.8

Selection of Arachis

The following materials were used in an experiment to evaluate forage yield; four accessions of *Arachis pintoi,* two accessions of *A. glabrata* from CIAT Philippines and one *A. glabrata* introduced from Guangxi province. The experiment has been planted on the CATAS farm. Transplanting of material was done on 8 September 1996. No results of are available as yet.

Table 3. List of *Arachis* spp.

Accessions	Source	Introduced
A. pintoi CIAT 18744	CIAT Philippines	1995
A. pintoi CIAT 17434	CIAT Philippines	1991
A. pintoi CIAT 18748	CIAT Colombia	1995
A. pintoi CIAT 22160	CIAT Philippines	1995
A. glabrata IRFL 3019	CIAT Philippines	1995
A. glabrata CPI 93483	CIAT Philippines	1995
A. glabrata	Guangxi	1993

Persistence of *Stylosanthes guianensis* CIAT 184 as incluenced by cutting management

When managed for leaf meal production, *S. guianensis* is only cut 1-3 times per year. In some cases plants do not regrow after cutting. This experiment was designed to investigate if early cutting would increase branching and thus persistence of Stylo 184. The experiment was layed out as a RCB design with the following treatments:

First cutting (A) = 3
- A1 = 1 month after sowing
- A2 = 2 months after sowing
- A3 = no early cutting

Cutting frequency (B) = 3
- B1 = 4 months
- B2 = 6 months
- B3 = 12 months

Cutting high (C) = 2
- C1 = 15 cm
- C2 = 30 cm

Treatments were replicated three times. Results are not available.

Farmer Training

Thirty Li farmers were trained for 1 week in Lingshui county. The training course focused on cultivation and utilization of *Stylosanthes* spp., and the stylo booklet (see publications) was the primary training resource.

After the training course, all of the trainees had one month of practical experience growing stylo.

Publications

Stylo booklet

CATAS researchers have produced a booklet on stylo, and 1000 copies have been produced in Chinese. More than 500 copies have been distributed to farmers and extension workers. A draft of the Stylo booklet is available in English.

Handbook on tropical forages

The cultivation and utilization of the main varieties of tropical forages which have been released in South China have been recorded in a handbook. This has been edited and is awaiting publication.

FSP Newsletter translation

FSP news were translated and distributed.

Future Activities

- Continue the experiment on selection of forages for leaf meal production.
- Continue the experiment on CIAT 184 stylo management by cutting.
- Continue the experiment on selection of *Arachis.*
- Set up an experiment on the selection of *Brachiaria* spp. for grazing purpose.
- Set up an experiment on the selection of *Panicum* spp. for cut and carry.
- Set up an experiment on the selection *Setaria* spp. for cut/carry and grazing.
- Publish the handbook on the cultivation and utilization of tropical forages

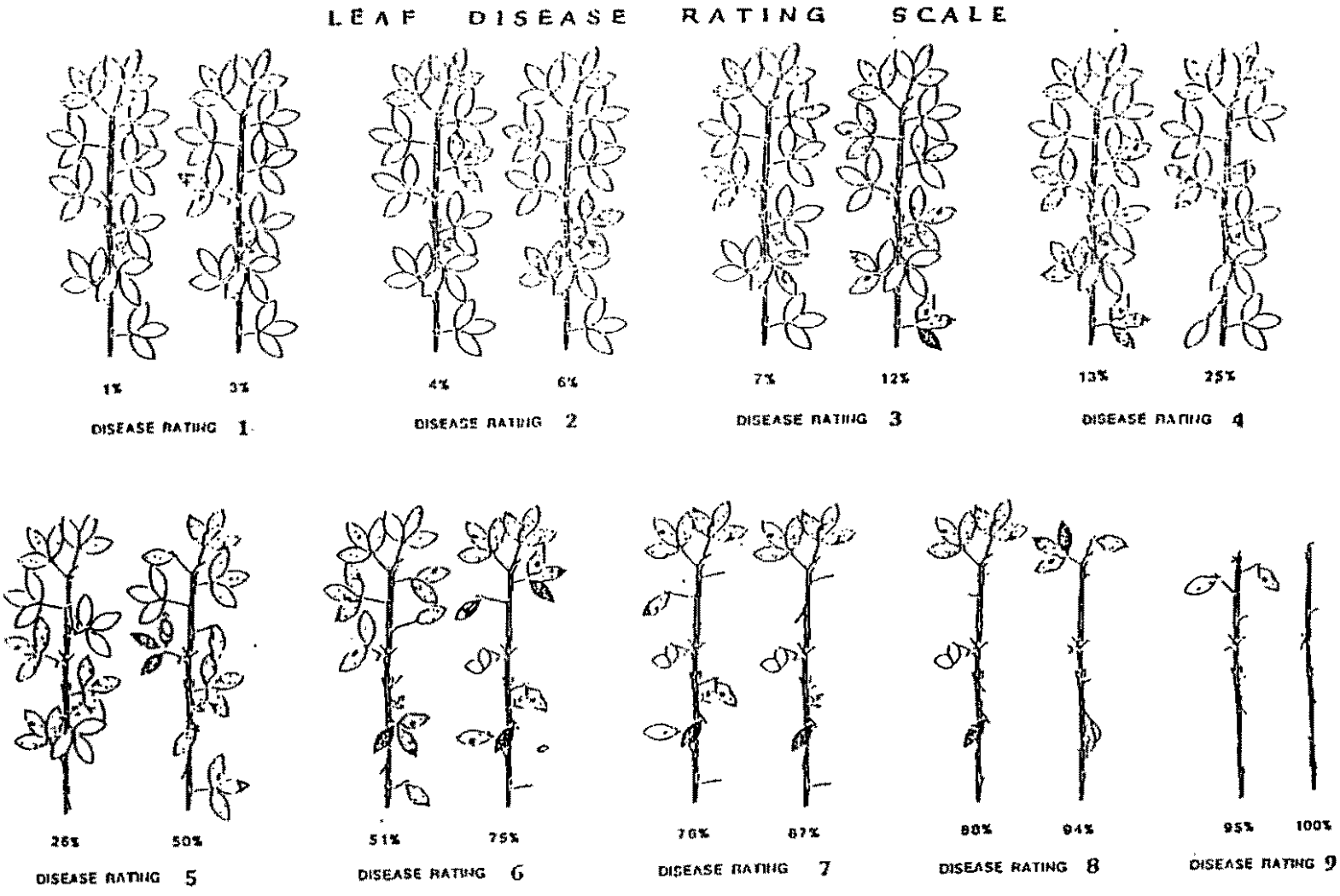

Figure 1. Anthracnose damage rating scale (0 – 9)

The FSP in Vietnam – Progress and Plans

Le Hoa Binh[1]

Introduction

The FSP was first implemented in Vietnam in February 1995. It has, since then, contributed significantly to our capacity to develop forage technologies with farmers (in particular through introduction and evaluation of new species and through training in Farmer Participatory Research). This paper summarises the activities of the FSP in Vietnam in 1996.

Activities of the FSP in Vietnam

	Sites[1]			
	BV	M'D	XL	K
Selection of Forages				
Nursery evaluation	✓	✓	✓	✓
Regional evaluation	✓	✓		
Leucaena evaluation		✓		
Site Selection for FPR				
Participatory diagnosis	✓		✓	✓
Seed production				
Stations, universities	✓	✓		
Farmer training				
Agronomy and utilisation	✓	✓		
FPR training				
in-country course	✓			

[1]Sites:
BV = Ba Vi (Ha Tay province)
M'D = M'Drak (Daklak province)
XL = Xuan Loc (Thua Thien Hue province)
K = Kado (Lam Dong province)

Selection of Forages

In May 1995, two nursery evaluations were established:

1. Ba Vi (Ha Tay province) – representing the mountainous northern areas of Vietnam on moderately fertile soils with a cool humid winter.

[1] National Institute of Animal Husbandry, Ministry of Agriculture and Rural Development, Hanoi, Vietnam.

2. M'Drak (Daklak province) – representing extensive grasslands in the central highlands on acid, infertile soils and with moderate dry season.

In the second year, an additional two sites were added:

1. Xuan Loc (Thua Thien Hue province) – representing the mountainous areas of central coastal Vietnam with infertile-moderately fertile soils and a short dry season
2. Kado (Lam Dong province) – representing upland areas in the central-southern highlands with fertile soils and a moderate dry season.

The environmental characteristics of the sites are presented in Table 1. The number of species being evaluated at each site is:

Site	Number of accessions
Ba Vi	70
M'Drak	71
Xuan Loc	53
Kado	52

Table 1. Environmental characteristics of the forage selection sites

Site	Altitude (m)	Rainfall (mm)	Length of dry season (months < 50mm rainfall)	Temperature (°C)		Soil pH (in H_2O)
				Max	Min	
Ba Vi	400	2050	5	5	35	5.0-6.0
M'Drak	400	1850	3	5	38	5.5-6.5
Xuan Loc	100	3300	2	11	40	4.5-5.5
Kado	500	2400	4	7	38	5.0-6.5

The most promising species at each site are presented in Table 2. Note that the information from Kado and Xuan Loc is preliminary as the nurseries were only sown quite recently. For Ba Vi and M'Drak, the species listed have performed well over two wet seasons. Forage establishment at Kado was poor, as seed arrived late and was sown at the time of heaviest rain. Therefore, results from Kado are not reported.

Table 2. Promising species at each site.

Species	Site[1] BV	M'D	XL
Andropogon gayanus cv. Kent	✓	✓	-
Brachiaria decumbens cv. Basilisk	✓	✓	✓
Brachiaria brizantha (various accessions)	✓	✓	✓
Brachiaria humidicola cv. Tully, CIAT 6133	✓	✓	
Panicum maximum CIAT 6299, TD 58	✓	✓	✓
Paspalum guenoarum BRA 3824		✓	
Chamaecrista rotundifolia (3 accessions)	✓	✓	
Centrosema macrocarpum CIAT 25522			✓
Centrosema pubescens CIAT 15160	✓		✓
Stylosanthes guianensis CIAT 184	✓	✓	✓

[1]Sites:
BV – Ba Vi (Tay province)
M'D – M'Drak (Daklak province)
XL – Xuan Loc (Thua Thien Hue province)

Regional Evaluations

Based on the apparent potential for forages in the central highlands region, the best 15 accessions from the nursery at M'Drak were offered to three farmers at new sites (Kontum, Buon Ma Thuot and KhanhDuong) to confirm their broad adaptation. These sites represented the broad range of soil and climatic conditions of the central highlands. The results of these regional evaluations are summarised in Table 3.

Table 3. Promising species from regional evaluations.

Species	Site[1] K	BMT	KD
Andropogon gayanus cv. Kent		✓	✓
Brachiaria decumbens cv. Basilisk	✓	✓	✓
Brachiaria brizantha (various accessions)	✓	✓	✓
Chamaecrista rotundifolia (3 accessions)		✓	
Stylosanthes guianensis CIAT184	✓	✓	

[1]Sites:
K – Kado (Lam Dong province)
BMT – Buon Man Thuot
KD – Khanh Duong

Leucaena evaluation

A *Leucaena* evaluation trial was planted at Buon Ma Thuot in September 1996. The aim of the trial was to identify promising new germplasm for the volcanic soils of the central highlands. Twenty six accessions were planted in replicated plots. Measurements of insect damage and height are being taken every month. The plots will be harvested throughout the wet season in 1997.

Site selection for FPR

Preliminary diagnosis work was completed at Ba Vi and plans were made with twenty households to test forage species in backyard plots. Diagnosis at Kado and Xuan Loc had been carried out in 1995 and 1996.

Site selection in the central highlands has not been easy. A possible site has been identified at Chu' kroa commune near M'Drak. If secondary information indicates this is a promising site, diagnosis will be conducted here, and FPR started, in 1997.

A possible new area for collaboration in FPR has been found in northern Vietnam. A regional evaluation was sown in May 1996 at the Forest Research Centre in Vinh Phu. The Vietnam-Sweden Mountain Region Development Program has a long-term project focussing on rural development in five northern provinces. After detailed PRA, they have learned that livestock feeding is a major issue at farm level. The promising results of the regional evaluation encouraged them to discuss possibilities of collaborating with us. We plan to start FPR with them this year, in all five provinces.

Seed production

Two small activities were started this year to produce seed for future on-farm work. Seed orchards of *Gliricidia sepium* were sown in both Ho Chi Minh City and Buon Ma Thuot. The Livestock Production Company of Daklak have showed interest in producing seed of *Brachiaria* species. They imported 100kg *B. decumbens* seed for on-farm trials and an area for testing potential of seed production.

There is significant potential for grass seed production in the central highlands. A seed production experiment is planned for 1997 to confirm that it is possible to produce larger quantities of seed of the promising grass species.

Farmer training

Farmer training is going to become more important in Vietnam as the FSP starts to expand its on-farm work. In anticipation of this, two farmer training courses were held in 1996. A farmer training day on forage establishment and management was held at M'Drak in November, attended by 20 farmers. A second course was held at Ba Vi, with 30 farmers attending over three days.

This kind of training is valuable for farmers and should be conducted more often, on-site. We need to develop simple training materials to assist with farmer training.

FPR training

A training course on Farmer Participatory Research methods was held at Ba Vi from 07-14 October 1996. Fourteen participants from eight provinces attended. The trainees were technicians and development workers from research centres, Universities and provincial agriculture offices.

The course provided new insights and methods on how to work with farmers to develop forage technologies. The FSP will continue to work with most of the trainees in the future as on-farm work in Vietnam expands.

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Progress Report on the FSP in Indonesia

Maimunah Tuhulele[1]

Introduction

In Indonesia, the FSP carried out regional evaluation of forages, farmer evaluation, multiplication of species and training in East Kalimantan, North Sulawesi, Aceh and North Sumatra. Seed of promising forages is produced at government stations.

These activities will be reported in two papers. Dr. Tatang Ibrahim will report on the activities in North Sumatra and the remaining sites will be included in this paper. A summary of all activities is presented in Table 1.

Table 1. Summary of FSP activities in Indonesia.

	Makroman	Sepaku	Saree	Gorontalo	Loa Janan	Indrapuri	Serading	Kabaru	Pelaihari
Selection of forages (regional evaluation)	✓	✓	✓	✓	✓				
Site selection for on-farm evaluation	✓	✓	✓	✓					
Farmer evaluation of forages	✓	✓	✓	✓					
Species multiplication at sites	✓	✓	✓	✓	✓				
Government seed production						✓	✓	✓	✓
FPR training for field staff	✓	✓	✓	✓					
Farmer training	✓	✓	✓	✓					

Site Selection for Farmer Evaluation of Forages

Potential sites were identified as a result of discussions with Regional Livestock Officers. These sites were selected after considering farming system, livestock population, need for forage, availability of field technician and extension workers and regional development programs. If an area appeared promising, a regional evaluation was set up by extension workers in the area. Regional evaluation sites also served as a source of planting materials for the farmer evaluations and were places where farmers could become familiar with new species or accessions. In 1996, participatory diagnoses were conducted at several sites. If farmers expressed a pressing need for forages, a validation diagnosis was conducted, followed by participatory planning. If farmers felt that their feed resources were sufficient for their needs, no follow-up activities were conducted.

[1] Bina Produksi, Directorate General of Livestock Services, Department Pertanian, Indonesia.

Often, when the farmers became more familiar with the new species, they took the planting material of their own accord.

Following are brief description of FSP sites and current and future activities:

Makroman, East Kalimantan

Collaborators: Mr. Ibrahim (Provincial Livestock Service of East Kalimantan)
Mr. Tugiman (local extension officer)

Site: Mixture of upland (*Imperata cylindrica* grassland) and lowland (rainfed rice) areas. Rolling hills, red-yellow podcolic soil of moderate fertility, pH 4.5 – 5.5. Approximately 10 km from Samarinda (2 km poor road access). Farmers have cattle (grazing) and goats (in pens) and are interested in legumes to suppress *Imperata cylindrica* in upland cropping.

Activities Conducted in 1996

Activities included a regional evaluation and farmer evaluation of legumes in an upland cropping area.

1. **Regional evaluation plots**

A list of species tested in the regional evaluation and their overall performance is presented in Table 2. Farmers expressed that they like *Paspalum atratum* BRA 9610, *Brachiaria brizantha* CIAT 6780, *Stylosanthes guianensis* CIAT 184 and *Centrosema pubescens* CIAT 15160.

Table 2. Adaptation of forages, Makroman.

Established	Species list	Growth
July 1995	*Andropogon gayanus* cv. Kent	very good
	Brachiaria brizantha CIAT 6780	good
	B. decumbens cv. Basilisk	very good
	Paspalum atratum BRA 9610	very good
May 1996	*Centrosema acutifolium* CIAT 5277	good
	C. pubescens CIAT 5160	very good
	Stylosanthes guianensis CIAT 184	very good
	Calliandra calothyrsus	good
	Desmodium rensonii ex. MBRLC	poor
	Gliricidia sepium	very good
	Leucaena leucocephala K636	poor

2. **Legumes in upland crops**

Growing legumes with corn and cassava was evaluated by Mr. Ruslan, the leader of the farmer group. The legumes tested were *Centrosema pubescens* CIAT 15160, *C. acutifolium* CIAT 5277,

and *Stylosanthes guianensis* CIAT 184. *Centrosema pubescens* CIAT 15160 was preferred by farmers since it is more than more vigorous than *C. acutifolium*. They found that growing *C. pubescens* resulted in

- better corn yield,
- no decrease cassava yield but better tasting cassava,
- no fertilizer required, and
- less weeding required.

Proposed Activities for 1997-1998

- Focus on improving upland cropping introducing legumes.
- Conduct more experiments on cut & carry species, focusing on species' tolerance to cutting.
- Conduct participatory diagnosis with other farmer groups.
- Conduct more farmer field days.

Sepaku, East Kalimantan

Collaborators: Mr. Ibrahim (Provincial Livestock Service of East Kalimantan)
Mr. Ismail (local livestock officer)
Mr. Heryanto (local extension officer)

Site: *Imperata cylindrica* grassland area with little upland cropping because of wild pigs. Rolling hills, red-yellow padcolic soil of low fertility, pH 4.5-5. Approximately 40 km from Balikpapan (15 km poor road) Farmers interested in cut-and-carry forages and grassland improvement for cattle grazing.

Activities Conducted in 1996

Activities included regional evaluation and farmer testing of forages

1. Regional evaluation of forage species

A list of forage species evaluated in Sepaku is presented in Table 3. Many of the grasses are well adapted but only *Stylosanthes guianensis* CIAT 184 is growing very well among the legumes. Farmers prefer *Brachiaria decumbens* cv. Basilisk, *B. brizantha* CIAT 6780, *Andropogon gayanus* CIAT 621 and *Stylosanthes guianensis* CIAT 184.

Table 3. List of forages species and their adaptation, Sepaku.

Established	Species	Growth
July-Dec 1995	*Andropogon gayanus* CIAT 621	very good
	Brachiaria brizantha CIAT 6780	very good
	B. decumbens cv. Basilisk	very good
	B. humidicola CIAT 6369	very good
	B. humidicola cv. Tully	very good
	Stylosanthes guianensis CIAT 184	very good
May 1996	*Brachiaria brizantha* CIAT 26110	very good
	B. brizantha CIAT 16835	did not germinate
	B. brizantha CIAT 6387	did not germinate
	B. humidicola CIAT 6133	good
	Paspalum atratum BRA 3824	very good
	P. guenoarum BRA 9610	good
	Arachis pintoi	fair
	Centrosema acutifolium CIAT 5277	moderate
	C. macrocarpum CIAT 25522	moderate
	C. pubescens CIAT 15160	moderate
	Desmodium heterophyllum CIAT 349	good
	D. ovalifolium CIAT 13305	good
Oct-Nov 1996	*Calliandra calothyrsus*	not yet assessed
	Gliricidia sepium Retalhuleu	not yet assessed
	Gliricidia sepium Belen Rivas	not yet assessed
	Leucaena leucocephala K636	not yet assessed

Proposed Activities for 1997-1998

- Continue looking for ways for farmers to rehabilitate alang-alang areas.

Saree, Aceh

Collaborators: Ir. T. Bustari (Provincial Livestock Service of Aceh
Ir. Masur (District Livestock Service of Aceh)
Mr. Ghozali Zaenal (local staff of Provincial Livestock Service o f Aceh)
Mr. M. Ali (local extension officer)
Mr. T. M. Yunnus (local extension officer)

Site: Communal grazing areas in hilly mountain areas, managed by farmer groups. Infertile soil.

Activities Conducted in 1996

Activities included development of a regional evaluation site at Saree, farmer testing of forages for cut-and-carry and improvement of grazing areas by the Blang Ubo-ubo farmer group.

1. Regional evaluation

This regional evaluation was established recently and only preliminary information is available. Establishment data and a list of species included in the evaluation is presented in Table 4.

Table 4. Regional evaluation at Saree, Aceh.

Established	Species	Establishment
Sep 1996	*Desmodium heterophyllum* CIAT 349	fair
	D. rensonii ex. MBRLC	very good
	Stylosanthes guianensis CIAT 184	very good
	S. hamata cv. Verano	fair
Oct 1996	*Brachiaria decumbens* cv. Basilisk	fair
	B. humidicola CIAT 6133	poor
	B. humidicola cv. Tully	poor
Nov 1996	*Paspalum atratum* BRA 9160	fair
	Brachiaria brizantha CIAT 26110	fair
	Paspalum atratum BRA 9160	fair
	Arachis pintoi	fair

2. Farmer evaluation of cut-and-carry forages

A list of forages established on-farm at Blang Ubo-ubo is presented in Table 5.

Table 5. Farmer evaluation of forages for cut-and-carry at Blang Ubo-ubo, Aceh.

Established	Species	Establishment
Oct 1996	*Andropogon gayanus* CIAT 621	did not germinate
	Brachiaria brizantha CIAT 26110	fair
	Panicum maximum CIAT 6299	good
	Paspalum atratum BRA 9610	fair
	Pennisetum purpureum (local)	good
	Pennisetum hybrid (King grass)	good
	Desmodium rensonii CPI 46562	good
	Gliricidia sepium Monterrico	good
	G. sepium Retalhuleu	good
	G. sepium Belen Rivas	good
	G. sepium (local)	fair
	Leucaena leucocephala K636	good
	L. leucocephala (local)	good

3. Farmer evaluation of forages for grazing

A list of forages evaluated by farmers at Blang Ubo-ubo is presented in Table 6.

Table 6. Farmer evaluation of forages for grassland improvement at Blang Ubo-ubo, Aceh.

Established	Species list	Present condition
Nov.1996	*Brachiaria humidicola* cv. Tully	fair
	B. humidicola CIAT 6133	good
	Centrosema mixture	fair
	Stylosanthes guianensis CIAT 184	good
	S. scabra cv. Siran	good
	S. hamata cv. Verano	good

Additional evaluations of grazing species were established at Seulimeum (Mr. T.M. Yunus) and Pidie (Drh. A. Wahab) by the Livestock Service. Species evaluated were identical to those in Blang Ubo-ubo. Results are not available yet.

Proposed Activities for 1997-1998

- Maintain and complete establishment of on-farm testing.
- Coduct participatory evaluation
- Conduct more P.D.

Gorontalo, North Sulawesi

Collaborators: Ir Susilan (District Livestock Service, Gorontalo)
Mr. Idrus Labantu (local extension officer)

Site: Moderately extensive upland cropping, mainly under coconuts. Moderately fertile soil

Activities Conducted in 1996

1. Regional evaluation

A regional evaluation was established at Gorontalo. A list of species included in the evaluation and their establishment are presented in Table 7.

Table 7. Regional evaluation in Gorontalo.

Established	Species	Establishment
Jun-Sep 1996	*Brachiaria decumbens* cv. Basilisk	good
	B. brizantha CIAT 6780	good
	B. brizantha CIAT 26110	good
	B. humidicola cv. Tully (ex. Lolak)	good
	B. humidicola CIAT 6133	did not germinate
	Panicum maximum CIAT 6299	poor
	Paspalum atratum BRA 9610	good
	P. notatum cv. Competidor (ex. Lolak)	poor (slow)
	Pennisetum hybrid cv. Mott (Dwarf napier)	good
	P. hybrid (King grass)	good
	Stenotaphrum secundatum cv. Floratam (ex. Lolak)	good
	Arachis pintoi CIAT 22160	very good
	A. repens (from Lolak)	poor (slow)
	Centrosema acutifolium CIAT 5277	good
	C. pubescens CIAT 15160	good
	C. macrocarpum CIAT 25522	good
	Desmodium heterophyllum CIAT 349	very good
	Desmodium rensonii CPI 46562	good
	Stylosanthes guianensis CIAT 184	good
	Calliandra calothyrsus	good
	Flemingia macrophylla CIAT 17403	good
	Gliricidia sepium cv. Retalhuleu	good
	Leucaena leucocephala K636	good

2. Farmer evaluation of forages at Molalahu and Reksonogoro

Farmers in these two areas were interested in forage for grazing and they established several areas of grass-legume association under coconuts. Species sown included *Brachiaria decumbens*, *B. humidicola, Stylosanthes guianensis* and *Centrosema pubescens*. Results are not available yet.

Proposed Activities for 1997-1998

- Maintain the existing evaluation and multiplication plots.
- Establish on-farm cut-and-carry plots.
- Conduct trials on oversowing legumes into corn.
- Conduct FPR on more sites.
- Conduct more farmer field days.

Kapuas, Central Kalimantan

Collaborators: Drh. M.S. Taufik
Ir. Arief Heriadi
Mr. Said Hasyim

Site: Seasonally flooded acid, sulphate peat areas. Very infertile soil.

Activities Conducted in 1996

1. Regional evaluation of forages

A large species evaluation was established in 1993 as part of the Forage Seeds Project. Some additional species were added to the best species from this evaluation in 1995 (Table 8). Farmers are showing preference for *A. gayanus, B. humidicola* and *P. atratum*.

Table 8. Regional evaluation in Kapuas.

Established	Species list	Present condition
1993	*Andropogon gayanus* cv. Kent	good
1993	*A. gayanus* CIAT 621	good
1993	*Brachiaria decumbens*	fair
1995	*Brachiaria humidicola* CIAT 6369	very good
1995	*Paspalum atratum* BRA 9610	very good
1995	*P. guenoarum* BRA 3439	good
1993	*Stylosanthes guianensis* CIAT 184	good
1995	*Cratylia argentea* CIAT 18516	good
1993	*Flemingia macrophylla* CIAT 17402	very good

2. Site selection for farmer testing of forages

Conducted participatory diagnoses at two potential on-farm areas. The potential for farmers to be involved in forage evaluation was limited as farmers are barely able to plant sufficient food crops. Some farmers have many cattle but most have none. We will continue to look for alternative sites.

Proposed Activities for 1997-1998

- Complete regional evaluation

Loa Janan, East Kalimantan

Collaborator: Ir. Ibrahim (Provincial Livestock Service of East Kalimantan)

Site: *Imperata cylindrica* grassland with moderately fertile soils, pH 4.5-5, rolling hills.

Activities Conducted in 1996

1. Regional evaluation

The previously started evaluation of forages was continued. Species and their adaptation are presented in Table 9.

Table 9. Regional evaluation of Loa Janan, East Kalimantan.

Established	Species list	Adaptation
Carried on from Forage Seed Project	*Andropogon gayanus* CIAT 621	fair
	Brachiaria brizantha CIAT 6780	very good
	B. decumbens cv. Basilisk	good
	B. humidicola CIAT 6369	very good
	Paspalum atratum BRA 9610	fair
	Pennisetum guenoarum BRA 3824	fair
	Pennisetum hybrid (King grass)	fair
	Centrosema pubescens CIAT 15160	very good
	C. macrocarpum	very good
	C. schiedeanum cv. Belalto	fair
	Desmodium heterophyllum CIAT 349	very good
	D. ovalifolium CIAT 13089	fair
	Macroptilium gracile cv. Maldonado	fair
	Stylosanthes guianensis CIAT 184	very good
	Flemingia macrophylla CIAT 17403	very good

Seed production

Seed production of promising forages has been initiated at the following government stations:

- Indrapuri, Aceh. Producing seed of *Leucaena leucocepala* (local and k636).
- Serading, Sumbawa, NTB. Producing seed of *Stylosanthes guianensis* CIAT 184 and *Gliricidia sepium* Retalhuleu.
- Kabaru, Sumba, NTT. Producing seed of *Leucaena leucocephala* K636, *Gliricidia sepium* Retalhuleu and Belen Rivas.
- Pelaihari, South Kalimantan. Producing seed of *Centrosema pubescens* CIAT 15160, *C. macrocarpum* CIAT 25522, *Paspalum atratum* BRA 9610 and *Cratylia argentea* CIAT 18516.

Other Activities

Farmer Participatory Research Training Courses

Two training courses on FPR were conducted, one at Samarinda, East Kalimantan, and the other at Sungei Putih, North Sumatra. The courses were fully funded by FSP. Funding covered travel expenses, food, lodging and training materials.

FPR Training course in East Kalimantan

Date: 3-16 March 1996

Venue: Wisma Asih Manuntung, Samarinda

Participants: Thirteen field technicians and field extension workers from the provinces in which FSP conducted regional evaluation, namely: Aceh (1), North Sumatra (1), North Sulawesi (1) Central Kalimantan (3) East Kalimantan (7) plus one person from the Directorate General of Livestock Production, Jakarta.

Trainers: Tatang Ibrahim, Peter Horne and Maimunah Tuhulele

Participatory diagnosis: Conducted at Sepaku II, with farmer group, Lestari, chaired Mr. Soeharto. The farmers expressed a need for forage species.

Participatory evaluation: Conducted at Makroman, with Maju the farmer group, chaired by Mr. Ruslan. Preferred forages were *Paspalum atratum, Brachiaria decumbens, B. humidicola* and *Stylosanthes guianensis* CIAT 184.

FPR Training course in North Sumatra

Date: 21 July – 4 August 1996

Venue: Balai Latihan Perkebunan Sei Karang, Deli Serdang, North Sumatra.

Participants: Fourteen field technicians and field extension workers from Aceh (4), North Sumatra (9), and North Sulawesi (1); one person from the Directorate General of Livestock Production, Jakarta; one researcher from Animal Research Center, Ciawi, West Java.

Trainers: Tatang Ibrahim, Peter Horne and Maimunah Tuhulele

Participatory diagnosis: Conducted at Pulau Gambar with the women's group Teratai Putih. The group members expressed a need for new forage species for their sheep.

Participatory evaluation: Conducted with the same group at Sungai Putih Research Center. Farmer's preferred *Arachis* sp. ex. Maiwa, *Stylosanthes guianensis* CIAT 184, *S. guianensis* CIAT 21, *S. scabra* cv. Siran, *Centrosema macrocarpum* CIAT 15014 among herbacious legumes, and *Paspalum atratum*, *Andropogon gayanus* and *Brachiaria decumbens* among grasses.

Summary

- Participants of both courses expressed a keen interest in this new approach. Some participants compared their own experiences with farmers, and realized the inadequacy of their previous approach of working with farmers.
- Farmers were reluctant to express their feelings at the beginning. But the tools, such as mapping and brainstorming, stimulated them to "think aloud". Even shy members came forward to participate in mapping.
- The most useful and difficult part was participatory diagnosis. It helps us to understand farmers need and to simplify the planning process.
- We need more training courses of FPR for more field technicians and extension workers.
- There should be an evaluation of the changing of attitudes of the participants, and maybe a refresher course.

Study Tour

Participation of the coordinator in the study tour in Australia. Several reseach stations, private farms and forage seed laboratories were visited in Queensland and in the Northern Territory (17 March – 6 April 1996).

Regional Training Course

Participation of Mrs. Maimunah Tuhulele, Dr. Tatang Ibrahim and Prof. I.K. Rika in the Regional Workshop and Training Course for Trainers on Forage Agronomy Seed Production and Seed Supply Systems" in Thailand from 21 October – 12 November 1996.

Problems Encountered

1. Field personnel and farmers involved in FSP have limited knowledge and experience with forages
2. High cost of transportation for monitoring project activities.

Participatory Research on Forages with Smallholder Farmers in North Sumatra, Indonesia

Tatang M. Ibrahim[1]

Introduction

Many agricultural technologies are available to improve animal productivity on farms, however, they are generally not used by farmers. The reason for this is that farmers are often treated as labourers or technicians for experiments. The experiments are created by researchers who do not know the needs of farmers, so once the experiment is complete, farmers return to their traditional ways because the new technology does not address their needs. If new technologies are to be adopted by farmers, they need to be fully involved and have control in all stages of the development of the technology.

Participatory research (PR) is an approach where farmers are fully involved in all stages of research conducted on their lands. Their involvement begins with participatory diagnosis (PD), where problems are identified and alternative solutions are discussed and formulated. In order to find out the most appropriate way to solve the problems, alternative solutions may need to be evaluated through experimentation. To do the experiments properly, it is necessary to have participatory planning (PP) where members of the farmer group share ideas and decide how to run the experiment and who will be responsible for each aspect of it. Researchers and extensionists act as facilitators and sources of technological information, when its needed. This role can also be filled by skilled and experienced key farmers. The planned activities are implemented by the farmers themselves. The role of researchers and extensionists is limited to ensuring that the trial is acceptable scientifically. At the end of the experiment, participatory evaluation (PE) is conducted. At this point farmers select the best solution for their problems.

With PR, the best solutions for the farmer-identified problems are decided by the farmers. This means that adoption of the new technology is far more likely to occur. In Indonesia, a program was designed to familiarize farmers with PR so they would be actively involved in finding solutions for their problems. This report describes the implementation of PR in North Sumatra.

Aims

1. To train extensionist in PR and develop forage technologies with farmers.
2. To establish a demonstration site for forage improvement for smallholder farmers through the use of PR. Farmers will identify their forage needs and search for suitable technologies to meet these needs and so enable them to support ruminant production in North Sumatra.

[1]Assessment Institute for Agricultural Technology, Medan, North Sumatra, Indonesia.

Methodology

In Sumatra, FSP activities are located in the grazing land ecosystem of Tapsel in North Sumatra and Aceh Besar in Aceh Province. Recently the women's group "Teratai Putih" in Pulau Gambar, North Sumatra has started to evaluate forage technologies. They live in a lowland rice ecosystem.

In Aceh, the FSP researcher for North Sumatra supported the project by providing temporary supervision to establish several forages for testing.

After using PD to identify problems and alternative solutions, PP was used to plan and agree to "what", "where", "when", "who is doing what" and "how" things should be done. Advise on forage technologies and planting material were supplied by the FSP. Participatory evaluation was conducted so that farmers could give their opinions on germination and early growth of forage species tested. Later, PE was used to evaluate adaption and growth of forage. Once every two weeks, technicians visited the cooperating farmers during their weekly meeting to discuss forage problems of the group. At the end of the first cycle of PE the group was able to select forage species for development in their area, based on the farmers' own criteria. PR activities did not end here. Evaluation revealed the need for further technologies and so another cycle of PR. The program is well on the way: Farmers participating actively in the search and evaluation of forage technologies that match their need to improve forage quality and quantity and so support ruminant production in North Sumatra. To them, PR has become a way of life. The group is able to identify and to find solutions to their problems with technological assistance from researchers, extensionists and key farmers.

There are two on-farm sites in North Sumatra. The lowland ecosystem site Pulau Gambar (Site 1) is located in in Deli Serdang, about 10 km from Sei Putih. It is characterised by high population and irrigated and rainfed lowland rice farming systems. A women's group was chosen because, as they were in the WILD (women in livestock development) program, 7 of them had received 5 ewes (sheep) per family (credit) from the Sei Putih Research and Assessment Institute for Agricultural Technology (Sei Putih RAINAT) and showed interests in growing forages for their animals. The climate at this site is similar to Sei Putih, with an annual rainfal of 1800-2000mm, evenly distributed through the year. Land is limited, and forages are collected from rice bunds and under plantations some 3 km away.

The second site, representing a grazing land ecosystem, is at Marenu site in South Tapanuli. This site is a transmigration area established in 1995. 100 newly settled families each received 27 sheep consisting of 2 males and 25 females, 0.5 ha of King grass, and 0.5 ha for housing, barn and food crops. Soils are acid, infertile ultisols. Rainfall is high (2500-3000 mm per annum) but uneven in distribution. The wet season is from December to March and it is much drier from April to November. The driest months are from July to October.

Results and Discussions

Site 1: Pulau Gambar, Deli Serdang

Participatory Diagnosis

Forty women farmers were involved in PD conducted at the site during the PR training course in July 1996. Validation of the PD occurred in October 1996 at the same location and was attended by 33 farmers (32 women plus 1 man). The farmers were able to prioritize problems and to draw a flow diagram of problems and solutions in relation to their animal husbandry. They felt that they needed to plant forages to supplement natural feed resources during the rice planting season or to cut the time consumed for collecting forages (Figure 1).

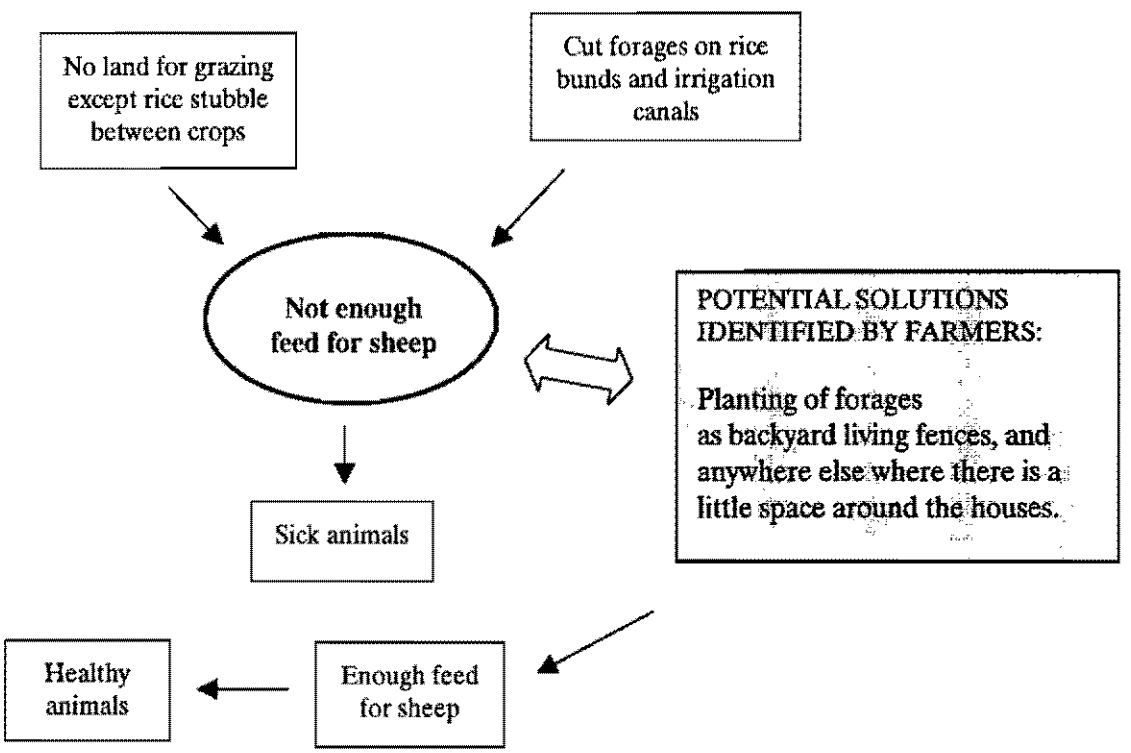

Figure 1. Flow diagram of problems and potential solutions, identified by farmers in Pulau Gambar.

Participatory Planning

In October 1996, a participatory planning meeting was held involving 26 farmers of Teratai Putih group. Only 11 of them wanted to plant forages. These 11 farmers owned ruminants while the others had no animals. However, everyone in the group was interested in forages. For those who wanted to plant forages, the choice of species differed between farmers but in general they

were interested in planting grasses: *Paspalum gueonarum* (7 farmers), *Brachiaria brizantha* (4 farmers), *Brachiaria dictyoneura* (3 farmers), *Pennisetum* hybrid (King grass, 2 farmers), and tree legumes: *Gliricidia sepium* (7 farmers). It was agreed that planting material would be provided by the FSP.

Participatory Experiment

There were 10 farmers (all women) involved in planting forages. Prior to forages selection, the 10 farmers had been to Sei Putih research station evaluate forages in the nursery during a PR training course. One farmer (man) from Teratai Putih joined the group after this and also planted forages. All the farmers were given planting material according to their request. Due to the limited land available, farmers planted the forages beside the house fences, under trees in the back yard or between banana plants.

Participatory Evaluation

Forages varied in their performances. Many of the planted forages are already used to feed sheep and goats. Four farmers had problems with excessive shade from trees and 1 farmer had problems with water logging. In these cases growth was poor. Farmers are now looking for species which are better adapted to shading and poor drainage.

Site 2: Marenu, South Tapanuli

Participatory Diagnosis

The first PD was conducted in August 1996. 60 farmers were involved and everyone agreed that they needed to have forage species that would survive during the dry season (Figure 2). Animals were grazed whenever possible and this was supplemented by cutting forages. Farmers had to go 3-5 km from their houses to collect forages along the river when the growth of their own king grass was slow during the dry season. Wild pigs were also problems for the farmers. Validation of the PD was undertaken in November 1996 and involved 40 farmers (10 farmers per technician-RT) and the original conclusions were upheld.

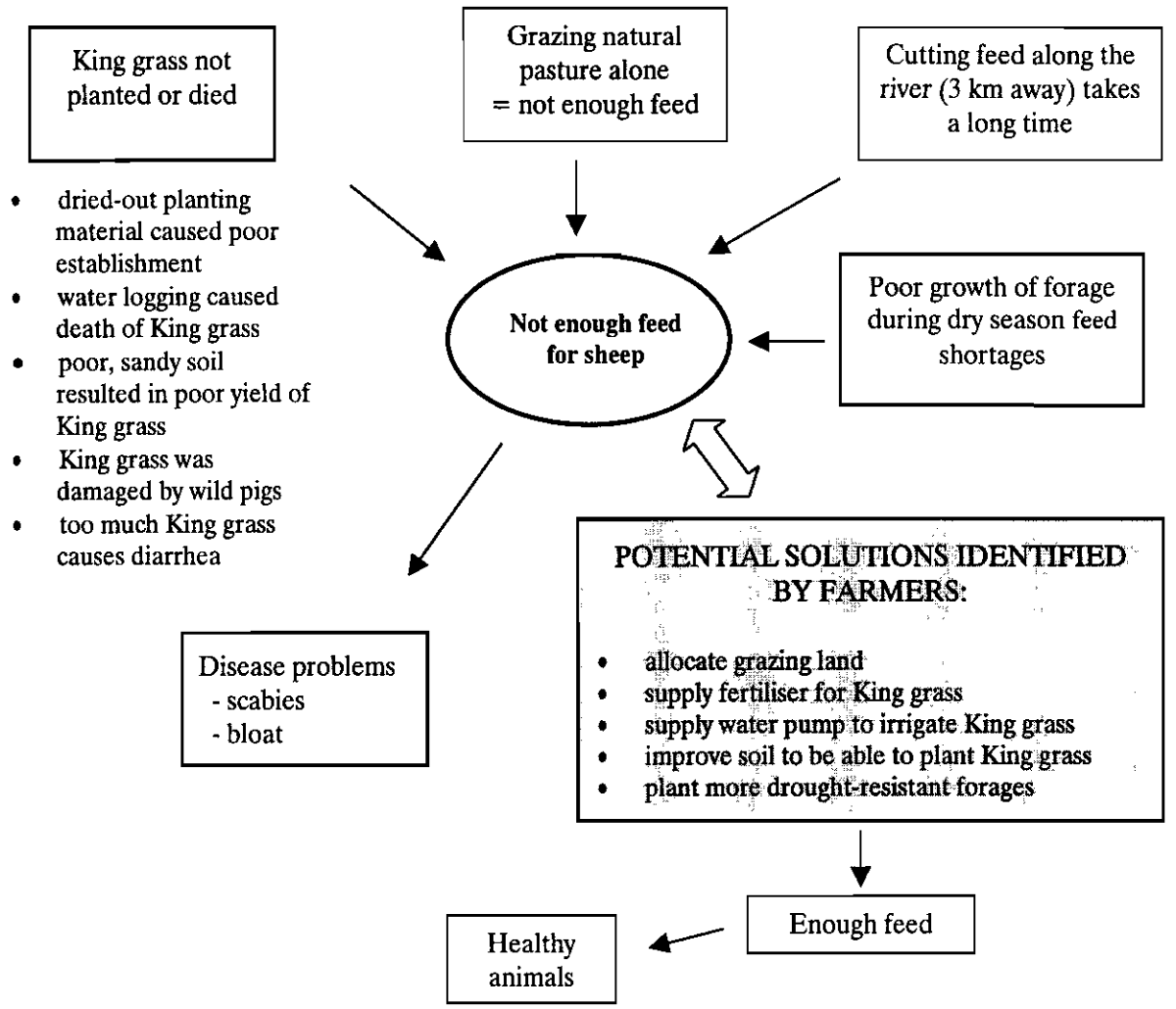

Figure 2. Flow diagram and potential solutions, identified by farmers in Marenu, Tapsel.

Participatory Planning

Farmers agreed that they had to plant drought-tolerant species. They agreed to plant the following forages by the end of November 1996. *Andropogon gayanus* CIAT 621, *Paspalum atratum* BRA 9610, *Gliricidia sepium* Belen Rivas, *G. sepium* Monterico and *G. sepium* Retalhuleu. Pigs would be controlled by living fences or hunting.

Participatory Experiment

Due to the limited amount of planting material (and to reduce risk exposure) only a few farmers within each RT group planted forages. There were 7 farmers in RT-I, 6 farmers in RT-II, 4 farmers in RT-III and 6 farmers in RT-IV, giving a total of 23 farmers. Each farmer was responsible for planting the 2 grasses and 3 lines of *Gliricidia* with help from other farmers within

the same sub-group. Forages were planted in a small nursery and transplanted to plots of 4x6 = 24 m^2 (grasses) and 5 m row (*Gliricidia*) with 3 replications. One of the farmers, at his own request, had been given planting materials of *Paspalum atratum* BRA 9610, *P. atratum* cv. Pantaneira, *P. guenoarum*, *Brachiaria humidicola* cv. Tully, *B. brizantha* (purple stem ex. Sei Putih), *B. brizantha* (hairy stem ex. Seit Putih), *B. dictyoneura* and seeds of *Leucaena leucocephala* and *Calliandra calothyrsus* in December 1995.

Participatory Evaluation

The forages which had been planted in December 1995 grew well and the grasses were cut and fed to sheep, which found them palatable.

Germination and early growth of the 2 grasses and 3 lines of *Gliricidia*, planted in November 1996, were evaluated by farmers at the end of December 1996. *Andropogon gayanus* CIAT 621 did not grow while *P. atratum* BRA 9610 and 3 lines of *Gliricidia* grew well but with variation between farmers. Germination rates for *P. atratum* seeds were 38%(±19%) for RT2, 39%(± 11%) for RT3 and 27%(± 22%) for RT4. They were higher, 54%(±13%), for RT1. Germination rates for the three lines of *Gliricidia sepium* also varied between RTs. It was better at RT 3 and 4 (range 42-65%) compared to that at RT 1 and 2 (33-43%).

Constraints

Participatory Diagnosis

The farmers' experience in dealing with government agencies affected the expectations of the group. Farmers were used to being given money by the government to pay expenses required in conducting research or in distributing planting material. Farmers found it difficult to suddenly being asked their opinion. They expected to have a passive role. This obviously had to be changed. Though farmers were hesitant and skeptical at the beginning, they quickly appreciated being involved and many participated actively by the end of the first day. Initially, it was difficult to use open-ended questions.

Participatory Planning

Matching theory to practice was difficult. It was hard for the farmers to understand that the experiment designed for the group was for them. Many farmers prefer to do experiments individually. However, they liked to have assistance from other farmers in preparing the experimental plots.

Participatory Evaluation

This was the most successful step. Farmers participated whole heartedly and their criteria for selecting the best species were identified. During this step it is important that the farmers are free from group pressures so that they can express their opinion freely.

Future Plan

1. Establishing further experiments and monitoring in Marenu.
2. Monitoring and supervision on forage production at Pulau Gambar.
3. Training of technicians and farmers in forage agronomy and seed production .

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Collaborative Forage R&D Program in the Philippines – The Forages for Smallholders Project

E. C. Magboo[1], F. G. Gabunada, Jr.[2] and P. S. Faylon[1]

Highlights of Accomplishment for 1996

The activities of FSP-Philippines in 1996 included farmer evaluation of forages, participatory diagnosis, establishment of regional evaluation sites, development of multiplication areas and on-farm seed production of *Stylosanthes guianensis* CIAT 184.

	Gamu, Isabela	Agplipay, Quirino	Argao, Cebu	PCA, Davao	USM, N. Cotabato	Matalom, Leyte	Cagayan de Oro	CMU, Bukidonon	Camalig, Albay
Selection of forages (regional evaluation)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Site selection for on-farm evaluation				✓	✓	✓	✓	✓	
Farmer evaluation of forages				✓		✓	✓		
Species multiplication at sites	✓	✓				✓	✓		
Seed production	✓	✓							
Training	✓	✓		✓	✓	✓	✓	✓	

Two new regional evaluation sites were established. These were in Cagayan de Oro and at the Philippine Coconut Authority's Davao Research Center, Davao City in Mindanao. These two sites have good soil and sufficient rainfall (2000mm/year) for forage growth. A list of species evaluated at these sites is given in Appendix 1.

On-farm evaluation of species in Matalom, Leyte and Cagayan de Oro moved from cooperative testing to individual on-farm testing. Two new sites were established at M'lang and Carmen, both in North Cotabato. Farmer participatory diagnosis was conducted at these sites in late August 1996.

Seed increase and multiplication areas were developed at in all sites. The most popular species being *Brachiaria decumbens*, *B. humidicola*, *Pennisetum purpureum* (Napier), *Setaria sphacelata*

[1]Livestock Research Division, PCARRD, Los Baños, Laguna, Philippines.
[2]Forages for Smallholders Project, CIAT, c/o IRRI, Los Baños, Philippines.

and *Stylosanthes guianensis* CIAT 184 (Stylo CIAT 184). Hopefully, in 1997, we will have sufficient planting materials to expand the multiplication areas.

In Isabela and Quirino, farmer began to produce small amounts of Stylo 184 seed. The farmers' responses were very encouraging. We hope to maintain their enthusiasm until seed production becomes a viable commercial enterprise. This is an ambitious project, but we believed that it is a achievable in the very near future.

The high point of the year was a farmers training course on Stylo CIAT 184 seed production, which we ran just after our workshop in Thailand. Feedback from farmer- trainees was tremendously heartwarming. The most common questions were "*Are you sure that you will buy all the Stylo seeds we produce?*" "*How much will you pay for it?*", "*Where else can we sell it?*". The marketing of stylo seed is the greatest challenge to us at the moment.

Finally, some FSP collaborators in the Philippines went overseas to increase their knowledge of forages. Mr. F.G. Gabunada and Mr. E.C. Magboo joined a study tour in Australia (17 March to 6 April 1996) and they also attended the Regional Workshop on Forage Agronomy and Seed Production" in Thailand (21 October to 12 November 1996). Mr. Alex Castillo from the Bureau of Animal Industry, Department of Agriculture also participated in the latter.

FSP sites activities and collaborators are detailed below:

Cagayan Valley Integrated Agricultural Research Center, Livestock Experiment Station, Gamu, Isabela

Collaborators: Mr. Vicente Pardinez
Mr. Sergio Darang

Agroecosystem: Upland cropping

Accomplishments/activities conducted in 1996:

1. Regional evaluation of forages with potential for seed production (Appendix 1).
2. Seed production increased 4 grasses and 2 legumes species (1000 m^2 per species). These were:

   Grasses - *B. decumbens* cv. Basilisk, *B. humidicola* cv. Tully, *B. brizantha* CIAT 6780, *Andropogon gayanus* CIAT 621

   Legumes - *Stylosanthes guianensis* CIAT 184, *Centrosema pubescens* CIAT 15160
3. The recorded seed yield for Stylo CIAT 184 was 8 kg/1000m^2 (January – February 1996).
4. Conducted simple cutting experiment on 4 grasses. The data will be consolidated and analyzed during the 1st quarter of 1997.
5. Expanded Stylo CIAT 184 planted on-station (4 to 5 hectares) for seed production.

6. Initiated on-farm seed production of Stylo CIAT 184. Three farmers were involved in this in 1996. The first harvest of seed will be in January – February of 1997. Each farmer planted 1000m^2.
7. Conducted farmers/technicians training on "Stylo CIAT 184 Seed Production". Six farmers and 14 on-station personnel attended the two-day training course (Appendix 2).

Proposed activities for 1997 – 98

1. Focus on strengthening Stylo CIAT 184 seed production.
2. Conduct short term experiments and gather information on stylo leaf meal production.
3. Package information on stylo CIAT 184 and leaf meal production for promotion to smallholder farmers.
4. Organize and analyze data/information on the cutting experiment conducted in relation to flowering and seed production of grass species.
5. Initiate on-farm site evaluation of forages using the FPR approach (target: 2 sites).

Cagayan Valley Upland Research Outreach Site, Aglipay, Quirino

Collaborators: Mr. Charles Cabaccan
Mr. Renato Pascua

Agroecosystem: Upland Cropping

Accomplishment/activities conducted in 1996

1. Regional evaluation of forages with potential for seed production (Appendix 1)
2. Seed production increased for 4 grasses and 2 legumes (the same species as previous site above).
2. The recorded seed yield for Stylo CIAT 184 was 7 kg/1000m^2 in 1996.
3. Conducted simple cutting experiments on 4 grasses in relation to time of flowering and seed set.
4. Initiated on-farm seed production of Stylo CIAT 184. Three farmers were involved in this in 1996. First harvest of seed will be in January – February 1997.
5. Participated in farmers/technicians training on "Stylo CIAT 184 Seed Production" at Livestock Experiment Station in Gamu, Isabela. Three farmers and three technical staff from the station attended the training.

Proposed activities for 1997 – 98

1. Focus on strengthening Stylo CIAT 184 seed production.
2. Organize and analyze data/information on the cutting experiments already conducted.
3. On station seed increase for Stylo CIAT 184 and 4 species of Brachiaria.

Camalig, Albay

Collaborator: Mr. Alex Castillo, BAI

Agroecosystem: Plantation System (Coconut)

Accomplishment/activities conducted in 1996

1. Set up a research managed plot experiment, on the coconut farm of a farmer cooperator in Camalig, Albay, to study the response of grass-legume combination to cutting regimes. The grass species being used are *Brachiaria decumbens and B. humidicola* while the legume is *Centrosema* pubescens (Regional evaluation of forages – Appendix 1).

Proposed actitvities for 1997 – 98

1. Maintain and continue data collection of the existing plot experiment.
2. Explore the possibility of setting up on-farm evaluation using FPR approach (at least one site).

Southern Cebu Farming System Research And Development Station, Argao, Cebu

Collaborators: Mr. Ronnie Jamola
Ms. Alicia Cosep

Agroecosystem: Upland Cropping

Accomplishment/activities conducted in 1996

1. Established forage evaluation multiplication and demonstration plot on station (Napier and *Andropogon gayanus*). Relatively poor soil condition (calcareous), coupled with small amount of planting materials hampered the establishment of substantial forage multiplication areas on the station (Appendix 1).
2. Stylo did not perform well and was dropped from the trials. The area was calcareous and this might have influenced the poor performance of Stylo.
3. Established a networking relationship with a farmer organization (Mag-uumad Foundation Inc.) for on-farm evaluation of forages and commercial production of forage seeds.

Proposed activities for 1997 – 98

1. Maintain and enhance networking relationship with MFI for possible expansion of activities on:

- On-farm evaluation of forages
- Seed production
- Tree-legume trials

ViSCA, Matalom, Leyte

Collaborators: Dr. Edwin Balbarino
Mr. A. P. Obusa

Agroecosystem: Upland cropping (hilly land)

Accomplishment/activities conducted in 1996

1. Evaluated forage species planted in initial testing and multiplication areas (Appendix 1).
2. Planned for individual farmers' on-farm testing.
3. Started on-farm testing by individual farmers.

Proposed activities for 1997 – 98

1. Maintain and complete on-farm testing.
2. Conduct participatory evaluation.

City Veterinary Office, Cagayan De Oro City

Collaborator: Dr. Perla T. Asis, City Veterinary Office

Agroecosystem: Upland Cropping

Accomplishment/activities conducted in 1996

1. Evaluated species planted in regional evaluation and multiplication areas (Appendix 1).
2. Trained farmers on the characteristics of different forages. There were about 50 participants.
3. Established on-farm testing by individual farmers.

Proposed activities for 1997 – 98

1. Maintain and complete on-farm testing sites.
2. Conduct participatory evaluation.

Philippine Coconut Authority, Davao Research Center, Davao City

Collaborators: Dr. Severino S. Magat
Mr. Junaldo Mantequilla

Agroecosystem: Plantation System (Coconut)

Accomplishment/activities conducted in 1996

1. Established a regional evaluation sites for 13 grass cultivars/species and 25 leguminous cultivars/species (Appendix 1).

Proposed activities for 1997 – 98

1. Maintain the existing evaluation plots and cull non-adaptable species/cultivars.
2. Establish multiplication areas for the planned on-farm testing using FPR approach.
3. Conduct FPR at a minimum of 2 sites.

University of Southern Mindanao (USM), M'lang and Carmen, North Cotabato

Collaborators: Prof. Cornelio P. Subsuban
Mr. Jeffrey Rabanal

Agroecosystem: Upland Cropping

Accomplishment/activities conducted in 1996

1. Selected 2 sites for regional and on-farm testing of forages (Appendix 1).
2. Conducted participatory diagnosis on the 2 sites : (a) Aroman, Carmen, North Cotabato and, (b) Pag-asa, M'lang, North Cotabato.

Proposed activities for 1997 – 98

1. Maintain and complete on-farm testing sites.
2. Establish forage multiplication areas on-station and on-farm.
3. Conduct initial participatory evaluation at the test sites.

Other Activities

1. Mr. E.C. Magboo attended the FSP study tour in Australia. They visited several research stations, private farms and forage seed laboratories in Queensland and in Darwin (17 March to 6 April 1996).
2. Mr. F.G. Gabunada and Mr. A. Castillo and Mr. E.C. Magboo attended the "Regional Workshop and Training Course for Trainers on Forage Agronomy, Seed Production and Seed Supple Systems" in Thailand from 21 October to 12 November 1996.
3. Dr. P.S. Faylon, Dr. W.W. Stür, Mr. F.G. Gabunada and Mr. E.C. Magboo attended the 2nd National Grassland Congress in the Philippines on 24 – 26 September 1996.

   They presented two papers:

   - Forage evaluation and technology promotion in the Philippines : recommended and promising forages in support to the ruminant livestock industry (P.S. Faylon and E.C. Magboo); and
   - Integrating forages into smallholder agriculture using farmer participatory research (E.C. Magboo, F.G. Gabunada, and W.W. Stür).
4. Four farmers from MFI, Cebu City visited FSP-IRRI, Los Baños, Laguna from June 1 to 4, 1996. They were given an orientation seminar and a chance to choose forages they wanted from the experimental field.
5. Trainees, who were part of PCARRD's training course on "Research Techniques in Animal Science R&D", visited the experimental field in July 1996.
6. The ILRI mission to the Philippines, headed by Dr. C. Devendra, visited FSP-IRRI, Los Baños and FSP sites in Cagayan de Oro.

Problems Encountered

The greatest problem in the implementation of FSP in the Philippines is the lack of manpower and facilities. Most of the trained personnel are working at universities and central offices of the government. They have wide areas of concern and responsibility and can give only low priority to forage R&D. Low government budgetary support for the forage research and development program, is also an issue.

Appendix 1. Regional evaluation of forages in the Philippines.

Species	Site						
	Gamu	Matalom	Aglipay	Cagayan de Oro	PCA, Davao	USM	CMU
Grasses							
Andropogon gayanus CIAT 621	✓	✓	✓	✓		✓	
Brachiaria brizantha CIAT 6780	✓	✓	✓	✓	✓	✓	✓
Brachiaria brizantha CIAT 16827							
Brachiaria brizantha CIAT 26110		✓	✓	✓	✓		
Brachiaria brizantha CIAT 16318		✓					
Brachiaria decumbens cv. Basilisk	✓	✓	✓	✓	✓	✓	✓
Brachiaria dictyoneura CIAT 6133		✓	✓	✓	✓	✓	
Brachiaria humidicola CIAT 16886		✓					✓
Brachiaria humidicola CIAT 26149							✓
Brachiaria humidicola cv. Tully	✓	✓	✓	✓	✓	✓	✓
Brachiaria ruziziensis (ex.) Thailand							✓
Panicum maximum CIAT 6299		✓		✓	✓	✓	
Panicum maximum cv. Tanzania				✓			
Panicum maximum T58					✓		
Paspalum atratum BRA 9610		✓		✓	✓	✓	
Paspalum guonoarum BRA 3824				✓			
Pennisetum purpureum cv. Capricorn		✓		✓	✓		
Pennisetum purpureum (Local)		✓		✓	✓	✓	
Pennisetum hybrid cv. Mott (Dwarf Napier)		✓		✓	✓	✓	
Pennisetum hybrid(Florida Napier)	✓	✓		✓	✓		
Pennisetum hybrid (King grass)				✓	✓	✓	
Setaria sphacelata var. Splendida (ex.) Indonesia		✓		✓	✓	✓	
Setaria sphacelata (Golden Timothy)					✓		
Stenotaphrum secundatum cv. Floratam					✓		
Legumes							
Arachis pintoi CIAT 22160	✓	✓	✓	✓	✓	✓	
Arachis pintoi CIAT 18748			✓				✓
Arachis pintoi CIAT 18744			✓	✓			✓
Arachis pintoi CIAT 17434			✓				✓
Arachis pintoi CIAT 18750			✓				✓
Arachis glabrata IRFL 3014	✓						
Arachis glabrata IRFL 3112					✓		
Aeschynomene histrix CIAT 9690		✓					

Species	Site						
	Gamu	Matalom	Aglipay	Cagayan de Oro	PCA, Davao	USM	CMU
Calopogonium muconoides CIAT 17856					✓		
Centrosema acutifolium CIAT 5277		✓		✓	✓	✓	
Centrosema pascuorum cv. Cavalcade					✓		
Centrosema pubescens CIAT 15160	✓	✓	✓	✓	✓	✓	
Centrosema pubescens (local)					✓		
Centrosema macrocarpum CIAT 25522				✓	✓		
Clitoria ternatea						✓	
Desmanthus virgatus (ex.) IRRI		✓		✓		✓	
Desmanthus virgatus CPI 40071					✓		
Desmodium heterophyllum CIAT 349				✓	✓		
Desmodium ovalifolium CIAT 13305					✓		
Desmodium rensonii (ex). MBLRC		✓		✓	✓	✓	
Lablab purpureus cv. Highworth						✓	
Lablab purpureus cv. Rongai						✓	
Macroptilium gracile cv. Maldonado					✓		
Macroptilium atropurpureum cv. Siratro						✓	
Mucuna pruriens CIAT 9349					✓		
Pueraria phaseoloides CIAT 7182					✓		
Pueraria phaseoloides CIAT 8042					✓		
Pueraria phaseoloides CIAT 9900				✓			
Pueraria phaseoloides (local)					✓		
Stylosanthes guianensis CIAT 184	✓	✓	✓	✓	✓	✓	
Stylosanthes guianensis cv. Cook	✓	✓	✓	✓	✓	✓	
Tree legumes							
Calliandra calothyrsus (ex) Indonesia		✓		✓	✓		
Flemingia macrophylla CIAT 17403		✓					
Gliricidia sepium (local)					✓		
Gliricidia sepium Monterrico		✓			✓	✓	
Gliricidia sepium Retalhuleu		✓			✓	✓	
Gliricidia sepium Belen Rivas		✓			✓	✓	
Leucaena diversifolia (ex) MBRLC		✓			✓	✓	
Leucaena leucocephala K636		✓			✓	✓	
Leucaena leucocephala (local)		✓		✓	✓	✓	
Leucaena pallida CQ 3439					✓	✓	
Sesbania grandiflora (ex.) Indonesia				✓			

Appendix 2. Hands-on training in seed production of *Stylosanthes guianensis* CIAT 184

A two day hands-on training course in seed production of *Stylosanthes guianensis* CIAT 184 was conducted on 28-29 November 1996 at the Cagayan Valley Integrated Agricultural Research Center – Livestock Experiment Station (CVIARC – LES) in Gamu, Isabela. It was attended by 20 trainees : 13 staff of research outreach stations in Cagayan Valley Regional Department of Agriculture, six farmers and one staff member from the local government unit of Maddela, Quirino (Table 1).

Table 1. Participants of the hands-on training course.

Name	Address
Farmers:	
Marcelino G. Pabro	Songsong, Gamu, Isabela
Adriano A. Nepacina	Songsong, Gamu, Isabela
Jaime Natividad	Songsong, Gamu, Isabela
Celso Albano	Maddela, Quirino
Marcos Bunagan	Maddela, Quirino
Elpedio Bunagan	Maddela, Quirino
Non-farmers:	
Demetrio D. Tang	Cagayan Breeding Station, Solana, Cagayan
Arsenio M. Apostol Jr.	CV-UpHilROS, Tapaya, Bagabag, N. Viscaya
Paterno C. Maiso Jr.	Cabagan Breeding Station, Cabagan, Isabela
Ernesto I. Tan-om	LGU, Maddela, Quirino
Eduardo Y. Guzman	CV-UPROS, Aglipay, Quirino
Alberto B. Ventura	CV-UPROS, Aglipay, Quirino
Renato P. Pascua	CV-UPROS, Aglipay, Quirino
Fidel L. Bartolome	CVIARC-LES, Gamu, Isabela
Macario M. Zipagan	CVIARC-LES, Gamu, Isabela
Juanito P. Sacasac	CVIARC-LES, Gamu, Isabela
Gerald Belisario	CVIARC-LES, Gamu, Isabela
Nicolas B. Carlos	CVIARC-LES, Gamu, Isabela
Godofredo C. Saguing	CVIARC-LES, Gamu, Isabela
Eugenio P. Caro	CVIARC-LES, Gamu, Isabela

The topics covered were stylo seed crop management, seed harvesting and processing (Appendix 2). Group discussion and practical sessions were the methods used for training.

The first day was devoted to discussions about Stylo 184 and seed production management from site selection to harvesting. The remaining part of the day was spent in the field doing practical on harvesting of the Stylo 184 crop, and having a feedback session. The second day was devoted to a short discussion on seed processing and storage.

This was then followed by a practical session on seed processing and storage. The remaining part of the day was devoted to a feedback session.

Group discussion consisted of the trainees sharing their experiences, mostly in local crop management practices which were similar to that for Stylo. The resource person facilitated discussion using issues as starters. After each topic, the discussion was summarized and keypoints were presented. The relationship of the management of Stylo to the local crops was emphasized. Slides, actual specimens and videos were shown, to facilitate discussion.

For topics that required new skills such as harvesting and processing, practical sessions were completed. These involved actually working in the field using real specimens.

Feedback sessions were held from time to time. These were used to help assess what the trainees understood and what they had missed during discussions and practical sessions. This activity also enabled the trainees to brainstorm and discussed how they would apply what they had learned to their own situations.

The trainees commented that the training made them more confident in managing their stylo as a seed crop. Participants were very interested in how and where they could market Stylo seed and leaf meal.

The FSP in Lao PDR – Progress and Plans

Viengsavanh Phimphachanhvongsod[1]

Introduction

Lao PDR is a landlocked and mountainous country, with a total area of 237,000 km^2 and a population of 4.2 million. Approximately 85% of the population practice agriculture in various forms, primarily irrigated rice, rainfed rice, intensive upland cropping and shifting cultivation.

Smallholder farmers manage >99% of the livestock in Lao PDR. These livestock, especially the large animals (primarily cattle and buffalo), play a vital role in farm activities, providing draft power, income, livelihood security, manure and food. Livestock management practices are based on few or no external inputs. Locally-available inputs (such as rice straw and tree leaves) are sometimes utilised. Usually, animals graze on communal land (forests, grasslands, roadsides) and are either penned at night or simply left to roam.

Livestock production systems

Although the livestock production systems of Lao PDR are characterised by great diversity, there are four broad categories:

Livestock in association with lowland agriculture

These systems are dominated by intensive rice cultivation and livestock play a vital role in providing draft power, manure and stubble-recycling. The opportunities for forage development in these systems are often limited by lack of land for planting forages.

Livestock associated with long-rotation shifting cultivation systems

In these areas (predominantly in the north of the country), livestock producers often use very low input systems of livestock management. Frequently, buffalo and cattle are allowed to graze in the mountains and forest year-round. They are only brought back irregularly for work or sale.

The opportunities for forage development in these systems appear limited, as farmers perceive few problems in the existing feed resource. However, in some areas there is growing activity at farm level to sell livestock to neighbouring countries (especially Thailand, Vietnam and China). In these situations, livestock management systems are likely to change rapidly and a demand for forages may emerge.

[1] Department of Livestock and Fisheries, Ministry of Agriculture and Forestry, Vientiane, Lao PDR.

Livestock in association with short-rotation shifting cultivation systems

In these areas (principally the central north; Luang Phabang, Xieng Khouang), few forests remain. The agricultural systems are under increasing pressure from shortening fallow cycles and increasing populations. Livestock, especially in remote areas, are a major buffer against calamity in the household or community. There are few other commodities that can be produced with little labour and resources, that can be sold at any time and that are relatively easy to get to market (no matter how far it may be).

In these systems, the opportunities for forage development appear to be very high. Many farm communities are recognising both the value of livestock in maintaining their livelihoods but also the need for better livestock management. Interest in managed-forages is already high, with farmers in some areas already attempting to manage their feed resources by cultivating grasses.

Livestock associated with the sandstone mountains and Pek savannas

These areas (in the southern provinces) are typified by very poor soils, long dry seasons and low population densities. The livestock management systems are based on extensive grazing.

The opportunities for improvement with forages appear limited, partly because the existing feed resource (though poor) is extensive and partly because farmers are heavily occupied with trying to support their fragile agricultural livelihood. However, the government is trying to promote livestock production for smallholders in these areas.

In the past, livestock production has also been promoted on the rich soils of the Bolovens Plateau, in southern Lao PDR, but this is no longer the case as the area is being set aside for horticulture, forestry and reservoir catchment.

Across all these systems, the common problems experienced by farmers in raising livestock are:

- Disease.
- Lack of feed throughout the dry season.
- Lack of feed at critical times during the wet season (such as planting and harvesting), when there is not enough labour to care for animals but animals must be kept penned to prevent damage to crops.
- Loss of animals to thieves and predators, while grazing far from villages.
- Damage to other farmers' fields, causing conflicts in villages.

Activities of the FSP in Lao PDR

	Sites[1]				
	NS	HK	HP	O	C
Selection of Forages					
Nursery evaluation	✓	✓		✓	✓
Regional evaluation	✓		✓		
Site Selection for FPR					
Secondary data		✓	✓	✓	✓
Participatory diagnosis		✓	✓		✓
Species Multiplication for on-farm experimentation	✓				
Seed production					
Government stations	✓				
Farmer training					
Agronomy and utilisation			✓		

[1]Sites:
NS = Nam Suang (Vientiane Municipality)
HK = Houay Khot (Luang Phabang province)
HP = Houay Pai (Luang Phabang province)
O = Oudomxay province
C = Champassak province

Selection of Forages

This has been the main activity of the project since it began in Lao PDR in 1995. The goal is to identify broadly-adapted forage species at four sites, representing different soil and climatic conditions in Lao PDR:

- Oudomxay represents the mountainous northern areas with moderately fertile soils, cool winters and a dry season that is not too severe.
- Luang Phabang represents the mountainous central-northern areas with moderately fertile soils, a longer dry season than Oudomxay and winters that are mild.
- Nam Suang represents the acidic, infertile soils of much of the alluvial floodplains of the Mekong river. The dry season is long and severe for plant growth.
- Champassak represents the lowland Pek savannas with infertile soils, a long dry season and high temperatures year round.

The environmental characteristics of the sites are presented in Table 1. The number of accessions being evaluated at each site is:

Site	Number of accessions
Oudomxay	40
Luang Phabang	60
Nam Suang	89
Champassak	54

Table 1. Environmental characteristics of the forage selection sites.

Site	Altitude (m)	Rainfall (mm)	Length of dry season (months < 50mm rainfall)	Temperature (°C)		Soil pH (in H_2O)
				ax	in	
Oudomxay	1100	1700	5	3	38	5.0-6.5
Luang Phabang	600	1700	6	5	38	5.0-7.0
Nam Suang	170	2000	6	7	42	4.5-5.0
Champassak	200	1700	6-7	13	39	5.0-5.5

The sites at Nam Suang and Luang Phabang were established in May 1995. The sites at Oudomxay and Champassak were established in June 1996. Each site will be monitored monthly for two years.

The most promising species at each site are presented in Table 2. The information from Oudomxay and Champassak must be treated with caution, as these sites are only 6 months old.

Site selection for Farmer Participatory Research

Site selection for FPR has focussed initially on the provinces where the nursery evaluations are taking place and where local agriculture officers have identified areas where they think there is potential for forage development. Of these, the most promising sites so far appear to be in Luang Phabang (for reasons mentioned earlier). We plan to investigate these more-closely in early 1997 with the aim of commencing FPR in at least two districts in mid 1997.

The prospects for on-farm work in Champassak are not high, but will be investigated in visits during 1997. The prospects for on-farm work in Oudomxay will not be investigated until early 1998.

Table 2. Promising species at each site.

Species	Site			
	O	LP	NS	C
Andropogon gayanus cv. Kent			✓	
Brachiaria decumbens cv. Basilisk	✓	✓	✓	✓
Brachiaria brizantha (various accessions)	✓	✓	✓	✓
Brachiaria humidicola cv. Tully, CIAT 6133			✓	
Digitaria milanjiana cv. Jarra		✓	✓	
Panicum maximum CIAT 6299, TD 58	✓	✓	✓	✓
Paspalum atratum BRA 9610	✓			✓
Paspalum guenoarum BRA 3824	✓			
Urochloa mosambicensis cv. Nixon, CPI 60147		✓	✓	
Aeschynomene histrix CIAT 9690	✓			✓
Arachis pintoi CIAT 22160				✓
Desmodium rensonii CPI 46562	✓			
Centrosema acutifolium CIAT 5277			✓	
Centrosema pubescens CIAT 15160	✓			✓
Macroptilium gracile cv. Maldonado				✓
Stylosanthes guianensis CIAT 184	✓	✓	✓	✓

Sites[1]
O = Oudomxay province
LP = Luang Phabang
NS = Nam Suang
C = Champassak province

An additional promising area has come to our attention in Xieng Khouang province, where a German rural development project (GTZ NAWACOP) is working with farmers who have expressed a need for better feeding of their livestock. We will investigate this area with the possibility of starting on-farm work there in May 1997.

Seed multiplication

To support the planned on-farm work, a seed multiplication site was established at Nam Suang, with 14 promising species. These are:

Arachis pintoi CIAT 18748, 18744, 18750, 22160
Centrosema acutifolium CIAT 5277
Centrosema pubescens CIAT 15160
Desmodium rensonii CPI 46562
Flemingia macrophylla CIAT 17403
Stylosanthes guianensis CIAT 184

Andropogon gayanus cv. Kent
Brachiaria brizantha CIAT 16835, 26110
Brachiaria humidicola CIAT 6133
Panicum maximum CIAT 6299
Paspalum atratum BRA 9610

As the site was established late in the rainy season because of two early establishment failures, there has been little seed production this year.

Farmer training

Farmer training days were organised on two occasions in Luang Phabang province(1-2 October and 3-4 October), at which 33 farmers attended from 2 districts where we intend to commence FPR (Chomphet and Luang Phabang districts).

The farmers were given information about the species and their management. They were also keen to take seed and planting material to try, despite the lateness of the season. They were keen on *Brachiaria brizantha*, *Brachiaria decumbens*, *Brachiaria ruziziensis* and *Panicum maximum*, as all could be used for cut-and-carry feeding.

It is going to be essential to organise more training activities like this for farmers as we expand our FPR activities. In future, training needs to happen in the villages, as they are far from town making it difficult for target farmers to attend.

Forages for Smallholders Project in Thailand

C. Phaikaew, K. Klum-em[1] and G. Nakamanee[2]

Introduction

Cattle numbers in Thailand have been increasing rapidly over the last decade, from 4 million heads in 1984 to 7 million in 1994. This has resulted in a large demand for pasture but, because of the climate, native pastures are usually low yielding and produce poor quality forage. To overcome these problems new pasture species have been introduced and management guidelines have been developed for their use. R&D activities over the past year have been aimed at increasing the availability of adapted forages and delivering them to smallholder farming systems.

FSP Activities in Thailand (1996)

Activities in Thailand in 1996 associated with the Forages for Smallholders Project (FSP) include: evaluation of seed production for a range of *Brachiaria* accessions; distribution of forages to smallholders; an in-country course in farmer participatory research (FPR); and a regional workshop and training course for trainers on "Forage Agronomy and Seed Production".

Evaluation of *Brachiaria* accessions for seed production

For the past 20 years ruzi grass (*Brachiaria ruziziensis)* has been the dominant pasture species in Thailand due to its high seed yield and ease of establishment. Nevertheless, it is not productive during the dry season.

Brachiaria decumbens has been an outstanding species in many agronomic trials and furthermore it has good dry season growth. However, its use is constrained by low seed yield and poor seed quality.

The approach taken in the present study was to screen a large range of *Brachiaria* accessions for their seed production potential. Accessions with promising seed yields will be further tested for their adaptation with particular emphasis on dry season performance.

The experiment was conducted at Pakchong Animal Nutrition Research Center, Nakornratchasima, in northeast Thailand (14°, altitude = 330 m). Average annual rainfall is 1,100 mm, most of which falls from May-October. Mean daily temperature is 23.9°C and mean relative humidity 69%. The soil is a red clay - clay loam with a pH ranging from 5.8 to 6.4. Organic matter is 2.6%, available P is 5.7 ppm and available K is 245 ppm.

Twenty nine accessions of *Brachiaria* (Table 1), introduced from CIAT, were grown at the site along with *B. ruziziensis, B. decumbens* cv. Basilisk and *B. humidicola* cv. Tully. Because of the

[1] Division of Animal Nutrition, Department of Livestock Development, Bangkok , Thailand.
[2] Pakchong Animal Nutrition Research Center, Nakornratchasima, Thailand.

limited amount of seed available, seeds were pre-germinated in polythene bags in May 1996; futher seed of accessions which failed to germinate in May were germinated in July and seedlings were transplanted to the field in August. Plots were arranged in randomized complete blocks with 3 replications. Each plot contained 9 plants arranged in a 0.4 x 0.4 m grid pattern. Plot size was 1.6 x 1.6 m. Compound fertiliser (15-15-15) at 312 kg/ha and urea at 62.5 kg/ha were applied at planting.

Flowering date, number of inflorescences and seed set were recorded. Seed yield is currently being assessed and seed quality will be determined when all seed has been harvested.

Results

Due to late planting and the small number of seedlings, there are only preliminary results at this stage.

Nineteen accessions started to flower by early December. There was a large variation in the intensity of flowering: to date (18 January 1997) B. *decumbens* CIAT 26297 is the most prolific and *B. decumbens* CIAT 26112, *B. brizantha* CIAT 16835 have fewest flowers. All flowering accessions set seed.

Plots will be cut back in May 1997 and fertiliser will be applied after cutting (62kg/ha of urea). Flowering date, number of inflorescences, seed set, seed yield and seed quality will be recorded. This experiment will be continued for one and a half years (two cycles of seed production).

Five accessions appear to be good seed producers. These are *B. brizantha* CIAT 667, 6387 and 16463, and *B. decumbens* CIAT 16497 and 26297. However, information from another experiment has shown that if they are planted at the begining of the rainy season *B. brizantha* CIAT 6780, 16835 and 26110 are also good seed producers.

Country seed production systems

In 1996, there were 1,358 tonnes of forage seed available for supply from the Thai Department of Livestock and Development (Tables 2 and 3). Government stations produced 222 t, village farmers 600 t, commercial hybrid seed produces 369 t, and 167 t was carried over from the 1995 seed stock. Commercial seed, bought from private companies, was used to help flood-damaged areas in 1995.

Table 1. Performance of *Brachiaria* species evaluation for seed production at Pakchong Animal Nutrition Research Center in 1996.

Species	CIAT accession number	Flowering[1]	Flowering date	Seed Set (%)
Brachiaria brizantha	667	2	30 Nov.	63.1
Brachiaria brizantha	6387	4	29 Nov.	60.3
Brachiaria brizantha	6780	0	-	-
Brachiaria brizantha	16288	1	2 Dec.	83.3
Brachiaria brizantha	16306	0	-	-
Brachiaria brizantha	16307	0	-	-
Brachiaria brizantha	16309	0	-	-
Brachiaria brizantha	16311	1	30 Nov.	32.8
Brachiaria brizantha	16319	0	-	-
Brachiaria brizantha	16444	1	30 Nov.	72.7
Brachiaria brizantha	16463	3	30 Nov.	79.6
Brachiaria brizantha	16464	1	30 Nov.	74.9
Brachiaria brizantha	16472	4	30 Nov.	32.8
Brachiaria brizantha	16488	0	-	-
Brachiaria brizantha	16549	3	30 Nov.	58.4
Brachiaria brizantha	16799	1	30 Nov.	79.9
Brachiaria brizantha	16827	1	30 Nov.	25
Brachiaria brizantha	16829	1	30 Nov.	85.5
Brachiaria brizantha	16830	0	-	-
Brachiaria brizantha	16835	1	11 Dec.	50
Brachiaria brizantha	26110	0	-	-
Brachiaria brizantha	26566	0	-	-
Brachiaria decumbens	Brazil	0	-	-
Brachiaria ruziziensis	Thailand	1	11 Dec.	78
Brachiaria decumbens	cv. Basilisk	2	30 Nov.	53.1
Brachiaria decumbens	16497	4	29 Nov.	57.9
Brachiaria decumbens	26112	1	5 Dec.	88.2
Brachiaria decumbens	26297	4	15 Dec.	48.9
Brachiaria humidicola	cv. Tully	0	-	-
Brachiaria humidicola	6133	0	-	-
Brachiaria humidicola	26149	0	-	-
Brachiaria jubata	26188	2	29 Nov.	72.4

[1] Visual rating scale 0-4: 0 = no flowering; 4 = dense flowering.

Table 2. Forage seed available from the supply of the Thai Department of Livestock Development in 1996 (tonnes).

Seed Producers	Grasses	Legumes	Total Seed
On-stations	195	27	222
By Farmers	400	200	600
1995 Seed stock	134	33	167
Commercial Seed	369	-	369
Total	1,098	260	1,358

FPR Training In-Country Course

In 1996, a training course on "Participatory Research with Farmers in Forages" was conducted at Pakchong Animal Nutrition Research Center, from 19-29 February. Fourteen researchers and 8 scientists from the Animal Nutrition Division attended The workshop was jointly sponsored by FSP and the Department of Livestock Development (DLD). A training course on "Transferring Technology with Farmers Participation in Feed Resourses" was held at Khon Kaen Animal Nutrition Research Center, from 1 - 8 August, 1996. Fifteen technicians from the Animal Nutrition Research Centers and Animal Nutrition Stations in Region 2, 3 and 4 attended. This course was a follow-up to the tranining course on "Participatory Research with Farmers in Forages." It was fully funded by DLD.

FSP Workshop and Training Course

The 1996 Regional Workshop and Training course on "Forage Agronomy, Seed Production and Seed Supply Systems" was held at Khon Kaen and Pakchong Animal Nutrition Research Centers, Thailand, from 21 October to 12 November 1996. This workshop was for training trainers, the aim being to develop training modules for the participant to use in subsequent in-country training courses. There were 22 participants, from Laos, Vietnam, Philippines, Indonesia, Malaysia, China, Bhutan and Thailand.

Planned Activities for 1997

- Continue *Brachiaria* spp. evaluation for seed production at Pakchong Animal Nutrition Research Center
- Multiply accessions of *Brachiaria* spp. with promising seed yields for evaluation of dry season performance.
- Conduct farmer training course on forage agronomy and utilisation.
- Commence multi-location species trials.

Table 3. Production (tonnes) of forage seeds by the DLD stations and farmers in Thailand in 1996.

Species	On-station	By Farmers	Total
Grasses			
Brachiaria ruziziensis	123	324	447
Panicum maximum	37	76	113
Paspalum plicatulum	23	-	23
Sorghum	9	-	9
Other grasses[1]	3	368[3]	371
Legumes			
Stylosanthes hamata cv. Verano	19	179	198
S. guianensis cv. Graham	0.5	-	0.5
Leucaena leucocephala	0.6	-	21.3
Centrosema pubescens	2.3	-	2.3
Other legumes[2]	2.2	-	2.2
Total	221	968	1,189

[1]Includes Setaria, Gamba, Signal, Hamil and common Guinea grass.
[2]Includes *Desmanthus virgatus*, Siratro, Pigeon pea and small quanitities of *Arachis pintoi*, Wynn cassia, *Aeschynomene* and sunhemp.
[3]Commercial seed from private companies used for flood-damaged areas including: Jumbo (314t) Nutrifeed (5t) and Superdan (50t).

Farmer Participatory Research on Forage in Matalom, Leyte

F.G. Gabunada[1], Jr., E.A. Balbarino [2]and A.P. Obusa[2]

Introduction

Matalom, Leyte is located in the Eastern Visayas region of the Philippines. The upland areas in Matalom have clay soils with pH ranging 4.8 to 8.0. Agriculture is basically of the smallholder and subsistence type, with farmers selling whatever little surplus they produce. Upland rice is cultivated in the undulating acid soil areas located at lower elevations, while corn is the main crop in the calcareous, higher pH soils located in the more hilly and higher parts.

A crop-fallow rotation cropping system is used. Farmers raise carabaos, cattle and goats mainly by grazing native vegetation in vacant/fallow land. These animals play a major role as draft animals (carabao) and provide a cash reserve for household and emergency needs. Farmers in the area are starting to experience problems related to feeding their animals.

Farmer participatory research (FPR) on forages in Matalom was started in the late part of 1995. The major activities undertaken so far include participatory diagnosis, establishment of initial testing and multiplication plots by farmers, participatory planning and setting-up of individual on-farm trials.

All these activities were completed small groups of farmers who organized themselves into "*alayon*" (labor-exchange groups). A total of 26 *alayon* groups exist in Matalom. These small groups meet regularly with the help of the Farm and Resource Management Institute (FARMI) of the Visayas State College of Agriculture (ViSCA). They are involved in activities related to upland agriculture and agroforestry aimed at developing technologies and improving their livelihood.

This paper describes our experiences and what we learnt when conducting FPR on forages in Matalom, Leyte.

Participatory Diagnosis

Process

Participatory diagnosis (PD) was undertaken at one acid-soil (San Salvador) and one calcareous-soil (Hitoog) area in July 1995. This was part of a training course on participatory research with forages and aimed to:

a) gain an understanding of the farming system,

b) identify farmers' perceived problems in relation to livestock,

[1]Forages for Smallholders Project, CIAT c/o IRRI, Los Baños, Philippines
[2] FARMI, ViSCA, Baybay, Leyte, Philippines

c) understand the interaction of factors involved in the problem, and

d) identify farmer-perceived opportunities for solving these problems.

With the facilitation of the PR trainees, the farmers used participatory mapping, and made seasonal calendars to describe their farming system. This was followed by a discussion of the livestock system, during which the farmers analyzed their problems, identified coping mechanisms and opportunities for solving the problems. The farmers drew flow diagrams in analyzing their problems. Perceived solutions were also discussed and prioritized by the farmers.

Results

Farmers identified feed unavailability, especially during the dry season, as a major limitation to raising livestock. In analyzing the relationships of the factors involved in the problem, farmers were able to identify opportunities to improve their situation (Figure 1). These include planting forages and learning new production technologies, particularly those related to feeding.

Validation of the PD results revealed more details of the feed availability problem. Farmers who had planted forages felt that these were still insufficient for their animals. The situation was aggravated by the increase in the intensity of cropping and in the increase in animal population.

With this information, farmers identified ways in which to integrate forages on their farms. These included using forages as contour hedgerows and fencelines as well as establishing forages in blocks for cut-and-carry and grazing. They also considered the possibility of using forages for soil fertility restoration in fallow areas.

Lesson learnt

1. Participatory diagnosis was facilitated by good interpersonal relationships between the farmers and the field workers, and by the existence of *alayon* groups. The latter were also very useful in the subsequent validation of results.
2. PD enabled farmers to analyze their situation and identify opportunities for improvement.
3. The findings of PD needed to be validated with the farmers. This allowed participants to refine their understanding of the problem and modify what they planned to do. Problem definition and refinement needed be an iterative process.

   For instance, validation of the PD results in San Salvador with an *alayon* group revealed that some members had obtained cattle loans and had started planting forages, however, they felt that these were not sufficient. Furthermore, the problem of feed scarcity was not confined to the dry season (Figure 2). Another PD validation done in Montealegre revealed that uncontrolled grazing and burning were also contributing to the problem with feed supply (Figure 3).

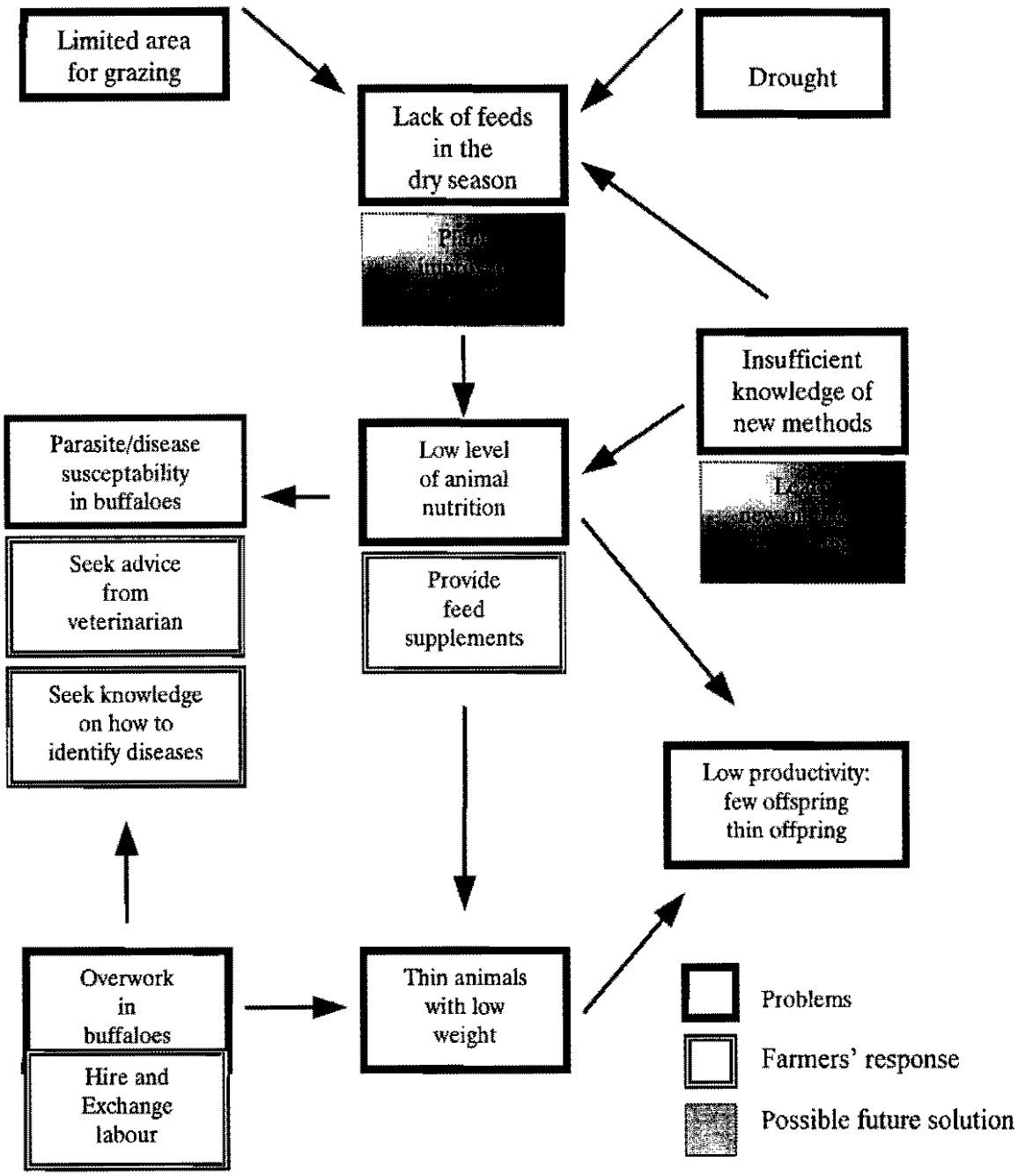

Figure 1. Feed resources problem diagnosis by smallholder farmers in Matalom, Leyte Philippines.

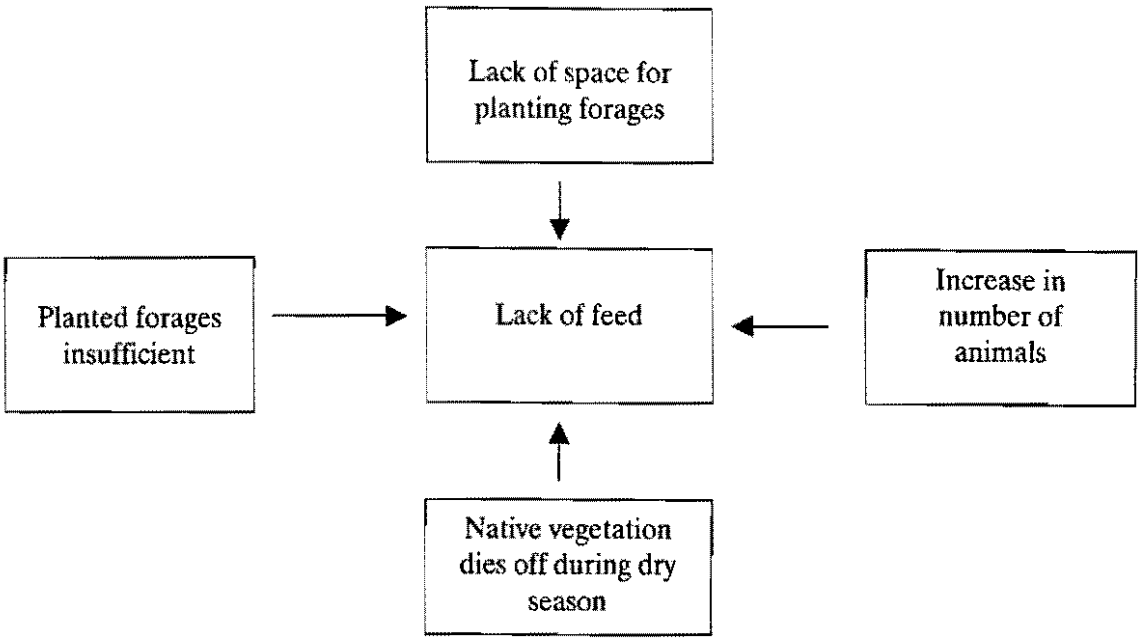

Figure 2. Farmers'analysis of the feed scarcity problem, San Salvador, Matalom, Leyte

4. Some lessons learn about participatory mapping included the following:

- Problems arose if the farmers came from only one section in the village, as was the case in some *alayon* groups. In these cases, mapping was possible only for the areas with which the farmers were familiar. The presence of village officials, who were knowledgeable about the whole village was helpful in adding more information than could be gathered from the farmers alone.
- When mapping, the reference points on the map should be sufficient to make it understandable to the participants and adequate for the purpose for which the map is made. Not all houses and farms need to be included if this will make the map confusing.
- Farmers found it difficult to map areas where there was multiple land use. For example, it was difficult to indicate where upland rice or corn areas were located as the cropping system involved crop-fallow rotation where a specific area was under fallow at one time and planted to crops at another. Similarly, if farmers planted different crops within one area, either together or in short-term succession, they found this difficult to map.
- When mapping it is best to focus on aspects which are stable, i.e. broader categories. For instance, in a mapping activity in Montealegre, farmers were able to divide their village into (a) areas where crops are planted, (b) areas which were too steep for crops but good enough for grazing, and (c) areas which were too steep for both grazing and cropping.

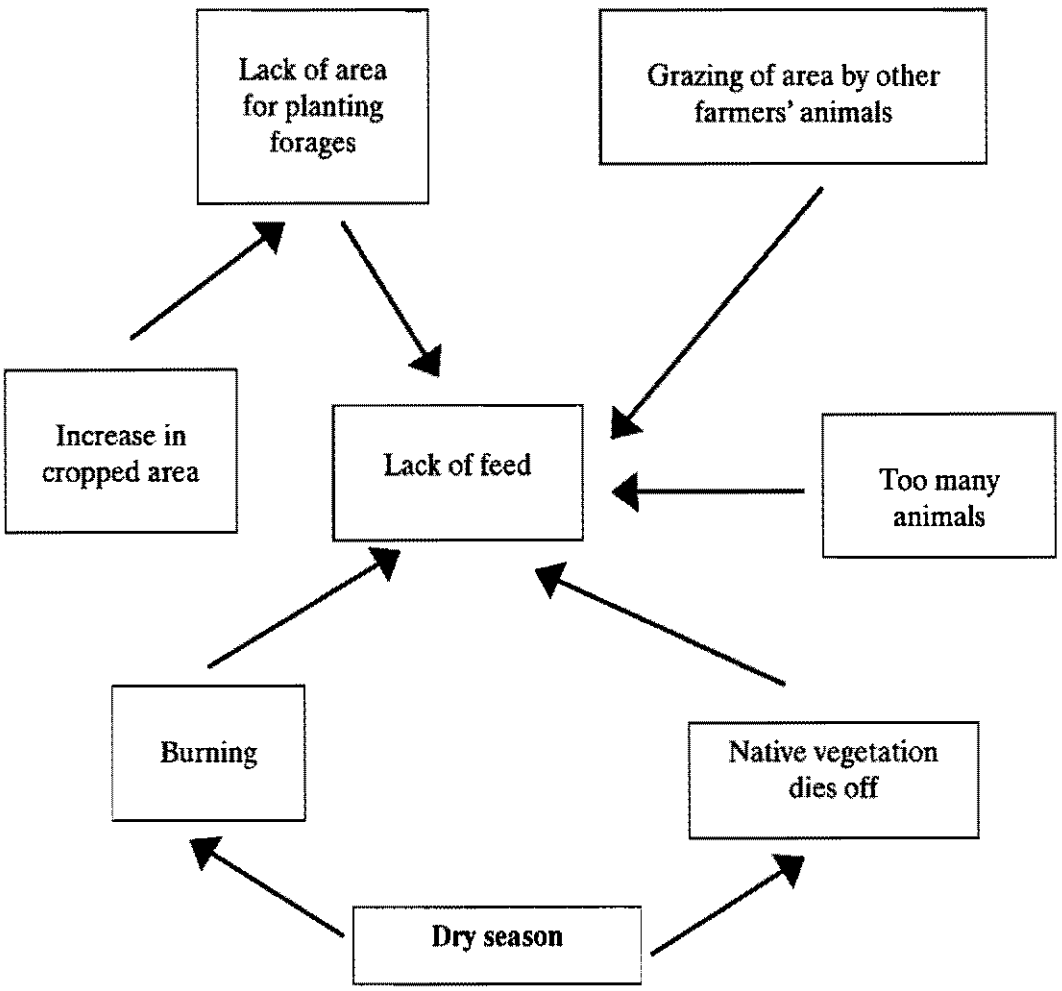

Figure 3. Farmer's analysis of the feed scarcity problem in Montealegre Matalom, Leyte

Initial Testing and Multiplication of Forages by Farmers

Process

During the *alayon* meetings, farmers expressed interest in testing forages on their farms. Two issues came up during these meeting :

a) *Limited amount of planting material available* – Because of this, members agreed that initially, only a few of them would receive planting material. The recipient would carry out the tests and then share planting materials from his plot with the other members. Often the *alayon* chose the leader as the one to receive the first planting material.

b) *Deciding with the farmers on what species to try* – Initially farmers wanted the field workers to make this decisions but they were made to understand that they had to select the species themselves. In order to do this, they were shown the forages at the field office. It was made clear that the forages were unlikely to perform as well on their farms, hence the need for them to perform testing. They discussed how to integrate forages into their farm system and what species could be used for what purposes.

Two *alayon* groups wanted to test a set of forages. One was located in Barangay San Salvador (low fertility soil, pH around 5). The other was in Barangay Montealegre (more fertile soil, pH 6.5). Each *alayon* agreed to provide a communal area for testing, fencing and labor for establishment and maintenance of the plots. Planting materials and technical advice on management were provided by the FSP. The cost of fencing and some funds for labor was provided by the FSP.

The field worker visited the farmers who received forages and asked them for their comments on the species. He also recorded his own observations of the plants.

In the dry season after the species were established, two alayon groups were involved in an initial evaluation session. This was part of a meeting for planning of individual on-farm trials. The farmers were divided into small groups of three and asked open-ended questions in order to elicit their comments for each of the species.

Results

Twenty seven farmers (from 18 *alayon* groups) tested the forages on their farms. Their comments (Appendix 1) fall into three categories: (a) germination or establishment, (b) vigor and growth, and (c) palatability to animals.

The *alayon* members' comments on the species (Appendix 2 and 3) were broader and included the following:

a) ease of establishment – included germination and survival (for vegetative materials),

b) maintenance – ease of weeding and ability to compete with weeds,

c) growth performance – ability to grow, vigor, spread, leafiness, tillering ability and reaction to dry periods,

d) regrowth – ability to produce tillers and leaves after cutting or grazing,

e) feed potential – amount of feed produced, palatability, ease of cutting and other characteristics such as succulence and hairness,

f) adaptability to local condition – whether the forage survived and did well, and

g) potential uses – for grazing, cut-and-carry, soil fertility, erosion control or fencelines.

Lesson learnt

a) Some of the farmers who received seeds as planting materials did not plant the species. Some species did not grow, this involved both seed and vegetative material. It is therefore, necessary to ensure that materials given to farmers are planted and do grow. A replanting

program needs to be undertaken when necessary. This means that the farmers must be accessible to field workers. Participation or non-participation at the practical level helps to determine which of the interested farmers have the capability of doing on-farming testing.

b) The small amount of planting material available to the farmers affected both the amount of forages planted and their ability to transplant. It is therefore important to establish a multiplication area of sufficient size and accessibility before the start of on-farm testing.

c) The farmers each planted only a few hills of each species. Thus, the species could only be tested as feed and not for other intended uses. Because of this, the farmers' comments were limited.

d) Farmers included previous knowledge in their comments/evaluation of species being tested, for example in their comments on the uses of *Gliricidia sepium* and *Leucaena leucocephala*. This has advantages but might pose danger if a different accession of the local species is being evaluated.

e) Some farmers' comments were vague (e.g. "good feed can improve soil fertility", etc.). In these cases, there is a need for further probing and clarification.

Participatory Planning for On-Farm Testing with Individual Farmers

Process

The two *alayon* groups and the alayon leaders met with field workers to plan individual on-farm trials. The activity consisted of :

1) Validation of problem and further analysis of the feed availability problem and possible solutions. The options for integrating forages into the farming system were discussed.

2) A farmer training session during which information on the different forages was discussed.

3) Solicitation of volunteers interested in trying on their own farms. The farmers identified the species for the trial and methods of integration, as well as the land they would use. These were listed down and schedules of activities agreed.

4) Farmers willing to try at least four species were identified. Most of the farmers wanted to try only one or two species.

Two groups of farmer-experimenters were identified: (a) free experimenters and (b) collaborative experimenters. The major difference between the two groups was that free experimenters chose the species and design on their own. The collaborative experimenters accepted species other than the ones they chose, had a minimum plot size and a design agreed upon with the field worker. This group received financial assistance with some of their labor and fencing expenses.

The following criteria were considered in selecting collaborative experimenters :

a) Location – the preferred location was one which could be easily seen by others and which was accessible to the field worker.

b) Willingness and capacity of the farmer to conduct the trial – the farmer had to have the necessary amount of time, labor, area and expressed interest for doing the trial, not just at the start but for the whole experiment.

c) Usefulness of the option tested to the farmer – this included ownership of animals and the farmer's plan to expand the area planted with forage on his own in the future.

d) Credibility, leadership and ability to spread results and information learnt during the experiment to other farmers.

e) Communication and observational skills – The farmer needed to be observant and capable of expressing his observations, even if he felt that what he said might not be acceptable to staff.

5) The plans for the collaborative experiment were presented during a meeting with alayon leaders. Interested farmers were then asked if they would join the project. Other farmers who might be interested were identified by the group and the field workers visited them later. The area, species and design were discussed with the farmers and a schedule of activity was drawn up and agreed.

Results

Thirty three farmers were interested in trying to grow forages on their farms. The ways they could be used and grown identified by the farmers as :

a) Grazing areas,

b) Cut & carry, planted in hedgerows,

c) Cut &carry, planted in backyard plots, and

d) fencelines.

Lesson learnt

1. Farmers tended to choose species related to those they already knew. They often chose Florida Napier which they had observed to be better than common Napier grass. This suggests that they need to be shown other species and options.
2. The growing of species for on-farm testing should be undertaken in an area where the species are easily visible to the farmers, for farmers could not remember species which they had been introduced at sites away from their farms.

Establishment of Individual On-Farm Trials

Process

Farmers who wanted to take part in the trials we followed up at meetings and with individual visits. Once a farmer told the field workers that he was ready, the site was checked and the design and schedule of activities were finalized. Planting was then completed by the farmer with the help of the field worker. The field workers made visits to the farmers to check for problems and discuss what else needed to be done, e.g. replanting and weeding, etc.

Results

On farm testing with individual farmers started in November. Nine free-experiments, located in four villages, have been established. Seven collaborative experiments (4 cut-and-carry and 3 grazing) have also been established. Monitoring and replanting was carried out.

Lessons learnt

1) Often the activities agreed upon during planning were not carried out. The reasons for this included lack of adequate moisture and conflict with other on-farm activities. The field worker needs to be punctitious in his follow-up in order to ensure that planting planting materials are planted as planned. It is also important to refer to the seasonal calendar during the planning stage.

2) Farmers sometimes realized that the schedule of activity had to be changed to make it more successful or appropriate. For example, farmers, who wanted to try species as hedgerows, decided that they would establish the forages at the start of the cropping season, so that weeding could be done at the same time as the weeding for the crop and unwanted grazing could also be minimized. They also decided to establish the hedgerow species vegetatively rather than from seed to make weeding easier. Constant interaction between the field workers and the farmers is the only way for field workers to learn about these ideas.

3) When planting trials which involved mixing of a grass and three legumes in one plot, some farmers found interplanting complicated. They wanted to plant one species per a row instead of planting each of the three legume species alternately in one row. This suggests that there is a need to either simplify the treatment or explain more fully to the farmer how planting should be done.

   This is an example of a researcher intervention which is new to the farmer but technically reasonable to the field worker. It also illustrates the importance of field worker involvement during the establishment phase.

4) Providing farmers with money to help with fencing and labor costs facilitated the establishment of collaborative experiments. These experiments often had costs beyond those that farmers could afford.

Summary and Conclusion

Farmer participatory work on forages in Matalom started in late 1995. To date the following tasks have been completed: (a) participatory diagnosis, (b) initial testing and multiplication of forages by farmers, (c) participatory planning for on-farm testing, and (d) establishment of on-farm trials. Generally farmers first tried out and observed the attributes of the species before they tested selected species in their farms.

Our experience with this project highlights the need for continuing definition and refinement of problems and possible soultions. Validation of participatory diagnosis results need to be integrated into other activities. Sufficient secondary data are necessary to ensure that discussions are appropriately focused during participatory diagnosis.

The availability of planting material is another major consideration when working with farmers on forages. Effective multiplication and delivery systems are needed so that forages can be available in sufficient quantities at the right time.

Skill in evaluation is an essential need for field workers, so that they can identify the farmers' criteria for selecting forages.

It is essential to work with existing groups in the community. Small farmers consider livestock as secondary to crops. Farmers are not interested in being involved solely in forage activities. Forage work should therefore be part of a set of farmers' activities, some of which are more important than others. Finding multiple uses of forage would enhance its importance and, thus, farmer interest.

Good working relationships with the farmers are very important when using farmer participatory research. Relationships can be improved by being open and sharing ideas and resources.

In farmer participatory research it is vital to recognize and learn from previous experiences and mistakes. A smallholder farming system is dynamic, requiring an approach which is open to change and iterative. This implies sharing the risks and experiences with the farmers.

Appendix 1. Comments of individual farmers on the species they tested.

Species	Soil Type	Researcher's Observations			Farmers' Comments
		% Germination	% Cover	Vigor	
Aeschynomene histrix CIAT 9690	acid calcareous	0 0			
Arachis pintoi CIAT 22160	acid calcareous	50 90	60 90	poor moderate	not growing well not growing well
Centrosema acutifolium CIAT 5277	acid calcareous	85 30	75 10	moderate poor	leaves are yellowish performance not good
Centrosema pubescens CIAT 15160	calcareous	30	15	poor	leaves yellowish
Desmanthus virgatus CPI 40071	acid	50		moderate	green color, good feed for cattle
Desmodium rensonii ex. Davao	acid calcareous	20 70		poor moderate	leaves yellowish; not good no comment; still too small
Flemingia macrophylla CIAT 17403	acid	0			
Stylosanthes guianensis CIAT 184	acid calcareous	80 5.5	30 20	moderate poor	palatable to ruminants not growing well
Andropogon gayanus CIAT 621	acid calcareous	0 60		moderate	good performance-green leaves
Brachiaria brizantha CIAT 6780	acid acid calcareous	82 55 60		good moderate moderate	palatable to carabao good feed fast growth

Appendix 1. Comments of individual farmers on the species they tested (continued)

Species	Soil Type	Researcher Observations			Farmers' Comments
		% Germination	% Cover	Vigor	
Brachiaria decumbens cv. Basilisk	acid calcareous	0 0			
Brachiaria dictyoneura CIAT 6133	acid	0.5		poor	did not establish from cuttings
Panicum maximum CIAT 6299	acid calcareous	0 0			
Pennisetum purpureum cv. Capricorn	calcareous	75		good	eaten by cattle and carabao; not goats
Florida Napier	calcareous calcareous calcareous calcareous	35 40 85 85		moderate moderate good good	good growth palatable to ruminants good for ruminants good performance; healthy
Setaria sphacelata var. Splendida	calcareous calcareous calcareous	65 80 95		moderate good good	very palatable to goats good; very palatable to ruminants good growth

Appendix 2. San Salvador (acid soil) alayon members' comments on the species planted in their initial testing area.

Species	Positive Comments	Frequency	Negative Comments	Frequency
Aeschynomene histrix CIAT 9690	Palatable to cattle	1	Produces only little amount of feed	2
	Can improve soil fertility – leaves shed	3	Slow growth	2
			Does not branch out	1
			Thin	1
Arachis pintoi CIAT 22160	Dense roots can prevent erosin	1	Cannot be relied as feed source due to little herbage	3
	Can spread only when grazed	1	Cannot satisfy animal immediately	1
	Very palatable – eaten even if short	1	Too little herbage produced make it unsuitable for large ruminants	1
			Few leaves, not sufficient for feeding	1
			Needs to plant a big area to get enough feed	1
			Turns yellow during dry periods	1
Centrosema acutifolium CIAT 5277	Good growth performance	1	Dies out when grazed	1
	Spreads fast	1	Plenty of roots making the soil hard	1
	Very leafy	1	Difficult to eradicate if soil will be recultivated	1
	Shed leaves can add to soil fertility	1	Slow to regrow after grazing	1
			Cannot compete with other weeds; needs weeding	1

Appendix 2. San Salvador (acid soil) alayon members' comments on the species planted in their initial testing area (continued)

Species	Positive Comments	Frequency	Negative Comments	Frequency
Centrosema pubescens CIAT 15160	Spreads fast Can restore soil fertility when dense Vary palatable to carabao Succulent – good feed Grows fast	1 1 1 2 1	Difficult to weed because of twining growth habit	1
Desmanthus virgatus CPI 40071	Good feed for goats	1	Not reliable feed source Slow growth Produces little amount of herbage	1 2 2
Desmodium rensonii ex. Davao	Good feed for goats	1	Slow growth Yellow leaves Not healthy Cannot be harvested frequently Not adapt to soil condition Do not survive in dry periods Only young leaves eaten by carabao Not much eaten by carabaos compared to native grasses	2 1 2 1 1 1 1 1
Flemengia macrophylla CIAT 17403	Good growth Dark green leaves Many broad and thick leaves Produce large amount of animal feed Tall Can be used as contour hedgerow Lush and vigorous	1 1 1 1 1 1 1	Only young leaves will be eaten by animals Coarse	1 1

Appendix 2. San Salvador (acid soil) alayon members' comments on the species planted in their initial testing area (continued)

Species	Positive Comments	Frequency	Negative Comments	Frequency
Brachiaria brizantha CIAT 6780	Grows vigorously at the start	1	Leaves turn yellow at dry season	1
	Competes well with weeds	1	Makes soil more infertile	1
	Leaves are not rough, thus easy to do weeding	1	Wilts even if soil is wet	1
			When mature, leaf production is poor	1
	Can be eaten by carabao	1	Poor regrowth after grazing	1
Brachiaria decumbens cv. Basilisk			Produces only little amount of feed	1
			Poor growth and survival from rootstock	1
Brachiaria humidicola CIAT 16886	Good for grazing	2	Difficult to eradicate	1
	Leaves not course/hard	1	Large area needed if used for feeding	1
	Competes well with weeds	2		
	Withstands heavy grazing	1		
	Good for ruminants	1		
	Spreads fast	1		
	Easy to establish	1		
	Becomes dense fast	1		
	Prevents ground from becoming muddy	1		
	Leaves don't dry up easily	1		
Panicum maximum CIAT 6299	Produces plenty of feed – big leaves	3	Not palatable when mature	1
	Produces lots of tillers	1	Leaves sharp and rough	1
	Easy to weed	1	Matures fast	1
	Competes well with weeds	1	Slow growth	1
	Easy to established vegetatively	1	Leaves dry - may not tolerate drought	1

Appendix 2. San Salvador (acid soil) alayon members' comments on the species planted in their initial testing area (continued)

Species	Positive Comments	Frequency	Negative Comments	Frequency
Paspalum atratum BRA 9610	Good/lush growth Leaves are green	4 1	Leaves and stem are hard – may not be palatable Matures and becomes unpalatable fast Not mush is eaten by cattle	2 1 2
Pennisetum purpureum cv. Capricorn	Good feed for carabao Animal feed easily gets full Reliable feed source Reliable tillers fast when pruned Can last long - perennial	3 1 2 2 1	Mature leaves not very palatable Dies off if left unpruned	1 1
Florida Napier	Good feed for cattle and carabao Animal fed easily gets full All parts of the plant can be eaten when young Healthy Vigorous stem Broad leaves Doesn't mature fast Regrows fast when cut	3 2 1 1 1 2 1 1		

Appendix 2. San Salvador (acid soil) alayon members' comments on the species planted in their initial testing area (continued)

Species	Positive Comments	Frequency	Negative Comments	Frequency
Setaria sphacelata var. *Splendida*	Soft and succulent	2	Larger area is needed to supply enough feed for animals compared to Napier grass	1
	Can be chopped for feeding	1		
	Preferred by animal	1		
	Good for grazing	1		
	Utilization is maximized if grazed	1		
	Vigorous/good growth	3		
	Produce young shoots vigorously	1		
	Easily established from cuttings	2		
	Competes well with weeds	1		
	Resistant to drought	1		

Appendix 3. Montealegre (slightly acid soil) alayon members' comments on the species planted in their initial testing area

Species	Positive Comments	Frequency	Negative Comments	Frequency
Arachis pintoi CIAT 22160	Can control weeds once it attains complete cover	1	Dominated by weeds	1
			Slow growth	2
	Can improve soil fertility	1		
	Once it thickens, prevents soil erosion	1		
	Can be planted under coconut, abaca, banana	1		
Centrosema acutifolium CIAT 5277	Good for interplanting with guinea grass	1	Dominated by weeds	1
			Poor survival	1
	Good if planted with species where it can twine	1	Growth not good	1
			Not adapted to the area	1
Desmanthus virgatus CPI 40071	Good as contour hedgerows	1	Small stems	1
	Adapted to the area	1	Slow growth	1
	Similar to Leucaena leucocephala	1		
	Good feed	1		
Desmodium rensonii ex. Davao	Good growth	1		
	Leafy	1		
	Good as contour hedgerows	3		
	Competes well with weeds	1		
	Can improve soil fertility	1		
	Good for feeding	1		

Appendix 3. Montealegre (slightly acid soil) alayon members' comments on the species planted in their initial testing area (continued)

Species	Positive Comments	Frequency	Negative Comments	Frequency
Gliricidia sepium ex.(Local)	Can improve soil fertility Easy to establish Grows fast Useful as fence Good source of firewood Has medicinal properties Provides shades Does not compete with bananas Good feed for animals	3 2 1 2 2 1 1 1 1	Causes diarrhea when fed to goats	1
Stylosanthes guianensis CIAT 184	Dense growth Not pale Can improve soil fertility Can control erosion – to strong base Can control weeds Easy to establish Good animal feed Vary palatable	1 1 2 1 2 1 1 1	Difficult to eradicate	1
Andropogon gayanus CIAT 621	Good feed when young	1	Hairy but not sharp Poor growth Poor tillering Not adapted to the soil	1 2 1 1

Appendix 3. Montealegre (slightly acid soil) alayon members' comments on the species planted in their initial testing area

Species	Positive Comments	Frequency	Negative Comments	Frequency
Brachiaria brizantha CIAT 6780	Good feed Big leaves and good herbage yield Good growth Can also be grazed Competes with weeds Can control erosion because it is dense	1 1 1 1 1 1		
Brachiaria decumbens cv. Basilisk	Good for grazing Makes the soil fresh – lodges to act as mulch	1 1		
Brachiaria humidicola CIAT 16886	Denser than Axonopus compressus (native grazing species) Good in lawns Can control soil erosion Good animal feed Can be used grazing	2 1 2 1 1	Not very fast spread	1

Appendix 3. Montealegre (slightly acid soil) alayon members' comments on the species planted in their initial testing area

Species	Positive Comments	Frequency	Negative Comments	Frequency
Panicum maximum CIAT 6299	Good growth	2		
	Fast regrowth	1		
	Produces good amount of feed	2		
	Good tillering	2		
	Easy to establish	1		
	Good animal feed	1		
	Big leaves	1		
	Not hairy	2		
	Plenty of leaves	1		
	Good for cut and carry	1		
	Good for erosion control	1		
	Controls weed	1		
Pennisetum purpureum cv. Capricorn	Good as contour hedgerows	2	Hairy	2
	Provides good amount of feed	1	Not adapted to the area	1
	Competes with weeds	1		
	Good for cut and carry	1		
	Good animal feed	1		
	More tillers than ordinary Napier grass	1		
Setaria sphacelata var. *Splendida*	Not hairy	1	Slow growth	2
	Leaves not sharp	1	Cannot withstand grazing	1
	Long leaves	1		
	Can control erosion if planted dense	1		

10785U

Experiences with On-Farm Forage Evaluation on the East Coast of Peninsular Malaysia

Aminah[1], C.C. Wong[2] and C.E. Mohd Yusof[1]

Introduction

Forage research and development has been conducted on Peninsular of Malaysia for over two decades. Since 1972, over 700 grasses and tropical legumes have gone through the process of evaluation. The genera which have been evaluated include: *Brachiaria, Cynodon, Digitaria, Panicum, Paspalum, Pennisetum* and *Setara* for grasses, and *Stylosanthes, Centrosema, Desmodium, Calopogonium, Cajanus, Pueraria, Cassia, Desmanthus, Leucaena, Vigna* and *Zornia* for legumes (Wong et al. 1982).

Among these species Signal grass (*Brachiaria decumbens*), African Star grass (*Cynodon nlemfuensis*), MARDI Digit (*Digitaria milanjiana*, also referred to as *D. setivalva), guinea* grasses *(Panicum maximum*), napier grasses (*Pennisetum purpureum*), Paspalum (*Paspalum plicatulum*) and Kazungula Setaria (*Setaria sphacelata* c.v Kazungula) were most promising as forage and fodder plants. Stylo (*Stylosanthes guianensis*) was productive and persistent, while *Leucaena leucocephala* was promising as a fodder tree legume (Wong et al. 1982). Two of the species (Guinea and napier) were classified as traditional fodder, as farmers have grown them for years (Wong 1989).

Efforts to transfer forage technology to smallholders has been emphasized by researchers and extension from various agencies. For example, Hassan and Izham (1983) conducted on-farm research to determine adaptation of various species to on-farm conditions and they reported that high yields were obtained from *Digitaria milanjiana, Panicum maximum, Brachiaria decumbens, Pennisetum purpureum* and *Leucaena leucocephala* cv. Peru. However, in their study, *Stylosanthes guianensis* cv. Schofield and *Desmodium* did not survive. The experimental plots in this study were used as demonstration sites for farmers in neighboring areas.

Wong (1989) discussed some of the developmental constraints in transferring forage technology. These included land constraints for fodder/forage crop cultivation as farmers preferred to use their land for high value crops rather than for growing fodder. In this case, the technology which was developed did not meet the needs of the farmers. Futhermore, the cost of fodder/forage establishment was high. The smallholders had access to natural green feeds in plantations, though they sometimes had to travel some distance to collect the forages.

The main reason for the farmers not adopting the forage materials was the lack of close rapport between researchers, extension workers and farmers.

[1] MARDI, Kubang Keranji, Stesen Penyelidikan Padi, Khota Bharu, Malaysia.
[2] MARDI, Livestock Research Centre, Kuala Lumpur, Malaysia.

This shows that there is a need to continuously evaluate the role of improved forages at the farm level. To be more effective, researchers should turn to farmer participation in research planning, implementation and evaluation, as it is not possible to identify livestock technologies suitable for smallholder farmers without considering farmers' perceptions and needs (Horne 1996).

The aim of this paper is to discuss of some promising forage species tested on farmers' land.

Materials and Methods

The study was conducted in 1993-1996 in Kelantan, on the east coast of Peninsular Malaysia. Here, farmers experience monsoonal rain following a dry period from October to March. This study was made in conjunction with the Forage Seeds Project (FSP), which provided forage materials and some fund for forage establishment at farm level as reported by Chen et al. (1994). Two sites were selected, one on abandoned padi land and the other under coconut plantations on a sandy soil. Both farmers reared beef cattle. They were told of the importance of the program and the methodology of forage evaluation.

Farmer A rented abandoned padi land and practiced a cut-and-carry system for forage. Farmer B practiced free grazing under his coconuts and fed cut fodder to his animals when forage under the coconuts was scarce. Each farmer had 20 cattle.

Soil types, management practice and farmer's preference were considered when making recommendations about forage species to be grown at the two sites. The species chosen and areas planted are shown in Table 1.

Forage species were planted using cuttings and rooted tillers with a basal fertilizer of 60 kg/ha N, 30 kg/ha P and 30 kg/ha K application prior to planting. Farmer A applied maintenance fertilizer of 200 kg/ha N, 50 kg/ha P and 100 kg/ha K annually. Farmer B used sheep droppings.

Forage yield was recorded at 6-weekly intervals from fixed plots of $16m^2$ at Farm A and $18m^2$ at Farm B. Harvesting of the fixed plots for forage yield and forage sampling was done by MARDI staff. The rest of the plots was cut and maintained by the farmers. Forage samples were taken for dry matter determination and chemical analyses. The farmers met frequently with MARDI staff who discussed the experiment with the farmers and advised them on forage management.

Table 1. Forage species planted by farmers.

	Species planted	Area planted (m^2)
Farmer A (total area available: 1.5 ha)	*Pennisetum* hybrid (dwarf)	680
	Pennisetum purpureum	1,360
	Paspalum atratum BRA 9610	340
	Brachiaria ruziziensis	680
	Panicum maximum cv. Vencedor	340
	Stylosanthes guianesis CIAT 184	680
	Pennisetum hybrid (King grass)	3,200
Total area planted		7,280
Farmer B (total area available: 4 ha)	*Pennisetum* hybrid (dwarf)	18
	Brachiaria humidicola	18
	Digitaria milanjiana (MARDI Digit)	18
	Setaria sphacelata var. Splendida	18
	Setaria sphacelata cv. Kazungula	18
	Panicum maximum cv. Vencedor	18
	Pennisetum hybrid (King grass)[1]	3,300
	Brachiaria humidicola[2]	16,200
Total area planted		19,600

[1]Planted in the second year
[2]Established after evaluation program

Results and Discussion

Farmer A

All the introduced species survived, except for *Stylosanthes guianensis* CIAT 184 which disappeared after the second cuttings in the first year (Table 2), however, it came back a few months later and grew well when uncut. *Pennisetum* hybrid (dwarf) and *P. purpureum* showed very poor growth performance in the second year. *Paspalum atratum* BRA 9610, and *B. ruziziensis* (Ruzi grass) survived but their dry matter yield dropped in the second year. *Panicum maximum* cv. Vencedor survived and produced well in the second year. King grass (*Pennisetum* hybrid) which was introduced in the second year gave very high dry matter yield in the first year but data for a second year are not yet available (Table 2).

Among the species, Farmer A preferred Ruzi grass, King grass and Vencedor Guinea because these species gave high yield and were liked by his cattle. *Paspalum atratum* BRA 9610 was less acceptable to his cattle. Napier and Dwarf Napier had very high crude protein content and was liked by the farmer (Table 3) but did not persist. The poor performance of Napier could have been due to water logging, which remained in the plot during heavy rain in the wet season. Dwarf Napier grew poorly after several cuttings.

To date, Farmer A still maintains *Paspalum atratum* BRA 9610, Ruzi grass, Vencedor Guinea and King grass in his farm. *Paspalum atratum* BRA 9610 and Ruzi grass have very low crude protein contents only 7.2% and 8.5%, respectively (Table 3). The crude protein content of the latter was even lower than the 11.0% reported by Wong et al. (1982). This could be corrected through proper N fertilizer application.

Table 2. Yield of species evaluated on farm A.

Species	Dry matter yield (t/ha)	
	Year 1	Year 2
Dwarf napier	20.6	6.1[1]
Napier	20.8	2.7[2]
Paspalum atratum BRA 9610	23.2	11.2
Ruzi grass	24.6	18.4
Vencedor Guinea	14.9	16.4
King grass	-	30.0
Stylo CIAT 184	-	-

[1]Total of 3 harvest
[2] Total of 2 harvest

Table 3. Proximate analysis of forages species evaluated.

Species	M	CP	F	ADF	NDF	EE	Ash	GE
	%	%	%	%	%	%	%	Cal/g
Dwarf napier	93	17.2	31	57	-	1.9	-	3916
Napier	95	10.6	40	49	84	2.0	1.4	4140
Paspalum atratum	93	7.2	36	48	81	1.3	2.1	4104
Ruzi grass	93	8.5	37	38	79	1.7	1.9	4229
Vencedor Guinea	96	10.2	41	47	84	2.1	1.6	4273
King grass	95	9.6	40	49	89	2.1	1.6	4262

Farmer B

One year after introduction, only *Brachiaria humidicola* and Vencedor Guinea remained in Farm B. The dry matter yields for both these species were also comparatively high in the first year (Table 4). Similarly, the mean percentage of ground cover was highest for Humidicola (83%) followed by Vencedor (53%), whereas it was below 50% for other species (Table 4). Vencedor Guinea started to die out later, so only Humidicola seemed to be adapted to the sandy soils in this area. This supports an earlier finding by Wong et al (1993). Using another area on Farm B, the area planted with Humidicola was increased to about 1.6 ha (Table 4). The growth of King grass on Farm B was also promising, but not as good as King grass growth on Farm A.

Table 4. Percentage of ground cover and yield of species evaluated at farm B on the end of the year 1.

Species	Ground cover (%)	Dry matter yield (t/ha)
Dwarf Napier	17	8.0
Humidicola	83	12.0
MARDI Digit	33	8.8
Setaria Splendida	15	8.9
Setaria Kazungula	26	8.9
Vencedor Guinea	53	8.9
King grass	Average	10.3
Humidicola (additional area)	Good	

Recommendations for Forage Improvement

1. Forages identified at on-station level have to be evaluated at farm level to ensure they fulfil the needs of the local smallholders.
2. Proper forage management skills such as cutting intervals, and fertliser application have to be taught to farmers to ensure production of forages.
3. Visits and discussion can help to solve some of the problems encountered at farm level.
4. Farmers should also be introduced to high protein forages, such as shrub legumes to improve the feed.

Conclusion

Both farmers appreciated the superiority of introduced forages with regard to high productivity and acceptability by their animals. Though planted onproblem soils, Humidicola and Ruzi grass survived. Proper management at farm level needs further investigation to ensure persistence of the species.

Acknowledgements

The authors are thankful to Dato' Md. Sharif Ahmad, Director General and to Dr. Mohd Ariff Omar, Director of Livestock Research Centre, MARDI for their permission to present this paper and the Southeast Asian Regional Forages Seeds project for their support of the on-farm trial. Thanks are also due to Forages for Smallholders Project for sponsoring this trip.

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Phosphorus Application Increases the Yield of *Stylosanthes guianensis* in Hainan

Qi Zhiping, Tang Sumei and Hong Caixang[1]

Introduction

Stylosanthes guianensis is one of the highest yielding legumes in Hainan, China, where yields of 15 t/ha have been recorded. In general, *Stylosanthes* spp. are tolerant of low P soils, however, adequate amounts of P are required for high yields. The availability of P is low in soils derived from granite where *S. guianensis* is widely grown. Therefore, fertilizer experiments and nutrient diagnosis were carried out on these soils to determine optimum rates of P fertilization for *S. guianensis.*

Materials and Methods

Stylosanthes guianensis was grown on a lateritic soil derived from granite. The soil chemical properties were: soil pH=5.3; organic matter =1.3%; total N = 0.07%; available N = 79 mg/kg, total P = 0.025%; available P = 7.9 mg/kg; available K = 40 mg/kg.

The fertilizer treatments used in both pot and field experiments were 0, 10, 20 and 40 kg/ha P applied as superphosphate. A randomized complete block design was used with 3 replications.

Seeds were soaked in hot water at 80°C for 3-5 minutes to reduce hard-seededness and then coated with a 'special purpose fertilizer' containing N, P, K and trace elements. An amount of 5 kg soil, passed through a 5 mm sieve, was used for the pot experiments. In the field experiments, nodulated seedlings were transplanted 35 days after sowing. Experiments were conducted over two years.

Plant samples were analyzed by routine analytical methods.

Results

Yield

The effects of fertilizer P application on height and root and shoot yield for the pot, and yield for the field experiments, are shown in Table 1.

[1]Tropical Pasture Research Center, CATAS, Hainan, P.R. China

Table 1. The effect of added P on height and yield of *S. guianensis* in pot and yield in field experiments.

Fertilizer P kg/ha	Pot			Field
	Plant height	Root yield	Shoot yield	Shoot yield
	cm	g/pot	g/pot	kg/ha
0	11.6	1.9	8.1	5370
10	12.4	2.4	9.3	6220
20	14.1	2.8	10.8	7310
40	21.1	3.2	12.4	8030

There were highly significant differences between treatments (P = 0.01). Yields were increased by a similar amount with added P fertilizer in both pot and field experiments. The increase was 15, 33, and 52% in pot and 16, 36 and 50% in field, for the 10, 20 and 40 kg/ha P treatments, respectively. Thus the proportional rate of yield increase with added P was similar from 0-10 and 10-20 but not as great at the highest level of P application (40 kg/ha).

Forage quality

The effects of P fertilizer application on shoot quality of *S. guianensis* are shown in Table 2.

Table 2. Effects of added fertilizer P on herbage quality of *S. guianensis.*

Fertilizer P kg/ha	P %	Protein %	Cellulose %	Fat %	Ash %
0	0.09	15.3	30.7	2.3	8.7
10*	0.10	15.6	35.1	2.3	7.7
20	0.13	16.0	30.1	2.7	8.7
40	0.14	16.9	27.9	2.8	7.9

*equivalent to 24 kg/ha P_2O_5

The P concentration (r=0.68**) and protein concentration (r=0.79**) were significantly increased by P fertilizer application. Higher P and protein concentrations increase the quality of the forage for animal production.

Diagnosis of P nutrition of *S. guianensis*

The increases in yield and protein concentration are related to an increase in P concentration of the plant. Hence it is important to be able to diagnose the P status of the plant. Sampling time and plant part were considered in developing a diagnosis.

Plant part. It was considered that, as all the plant is utilized for animal feed, it was best to sample the whole plant rather than plant fractions.

Sampling time. Plants that were transplanted to the field in May 1995 were sampled during a period of vegetative growth (9 Aug 1995) and at flowering (12 Nov 1995). Nutrient concentrations were determined and then statistically analyzed by an analysis of variance.

There was no significant difference in the time of plant sampling on P and K concentration, while N, Ca and Mg concentration changed (P=0.05) with the age of plant.

Diagnostic indices

Plant samples were collected from Dong Fang, San Ya, Bai Sha, Wengchang and CATAS in Hainan, where average yields were 15 t/ha. They were analyzed chemically for P, K, N, Ca and Mg and then statistically analyzed to determine the variation. The results are shown in Table 4.

Table 4. Nutrient concentration (%) of *S. guianensis* sampled from different sites.

	P	K	N		Ca		Mg	
			veg[1].	rep[2].	veg.	rep	veg.	rep.
Mean	0.24	1.22	2.1	2.8	1.15	1.46	0.68	0.57
S	0.10	0.34	0.5	0.2	0.15	0.17	0.11	0.08
CV	44	27	22	8	13	12	17	16
N	29	19	19	11	11	11	11	11

[1]veg. = vegetative growth stage;
[2]rep. = reproductive growth stage

The P concentrations can be considered sufficient, that is, they were as high or greater than the highest average concentration recorded in the pot and field experiments with 40 kg/ha added P (Table 2). They were similar to those reported by Andrew and Robbins (1969a) and McIvor (1984) for P concentrations of plant shoots. The K concentrations were also above the critical level for plant growth (Andrew and Robbins, 1969b).

Phosphorus fertilizer rate for *S. guianensis* production in Hainan

Application of P fertilizer is a key to production of *S. guianensis* in Hainan. A linear regression model was fitted to the data for the field experiment which resulted in the relation $y = 5324 + 1745x + 50.5x^2$, where y = yield and x = P fertilizer expressed as P_2O_5 (r = 0.99 with an F value of 18.85**). Fertilizer P applied at the rate of 110 kg/ha P_2O_5 (47 kg/ha P) would give the maximum yield of 8088 kg/ha. Half this amount 52.5 kg/ha P_2O_5 (22.5 kg/ha P) would give 90 percent of the maximum yield and 23.2 kg/ha P_2O_5 (10 kg/ha P) would give 80 percent. In these soils, 65 percent of the maximum yield was obtained without any addition of fertilizer P, which indicates that *S. guianensis* is an efficient legume in obtaining P in low P soils. On the other hand, this research also illustrates the principle that high increases in legume yield can be obtained with relatively small fertilizer P application.

From the viewpoint of economic benefit, we consider that 52.5 kg/ha P_2O_5 (giving 90% of maximum yield) is an optimum application for growing *S. guianensis* for feed meal or seed production. This is equivalent to 320 kg/ha of single superphosphate/ha, with a concentration of 7 % P or 16.3 % P_2O_5. Sixty-three percent of the upland area in Hainan has soils with less than 10 mg/kg available P. Thus the results of this research have considerable significance for Hainan agriculture.

Conclusions

Application of P fertilizer can significantly increase yield and protein concentration of *S. guianensis* in lateritic soils derived from granite, an application of 20 kg/ha P gave 90% of maxiumum yield. For optimum growth, a diagnostic index or critical value for P concentration is 0.14% P in the whole plant. Plants can be sampled during an advanced vegetative stage or when flowering provided that rapid growth is still occurring, i.e. growth is not restricted by lack of moisture. Phosphorus deficient soils are widespread in Hainan and hence the regression relation established here should have considerable application.

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The Use of Improved Grasses and Legumes in Guandong

Lu Xiaoliang[1]

Guandong produces five million tonnes of meat per annum even though the average farm size is only 0.4 ha. Many farmers have to buy forages from other provinces because of the shortage of forages in Guandong.

Evaluation of improved grasses began in 1981. Some varieties evaluated included the grasses – *Setaria sphacelata* cv Kazungula, *Melinis minutiflora* and *Paspaplum wettsteinii*, and the legumes – *Chamaecrista rotundifolia* cv. Wynn, *Desmodium intortum* cv. Greenleaf, *Macroptilium atropurpureum* cv. Siratro, *Stylosanthes guianensis* CIAT 184, cv. Cook, cv. Graham, *S. hamata* cv. Verano and *S. scabra* cv. Seca. *Stylosanthes* spp. (stylo) became widely adopted for inter-cropping in orchards and on steep land and were used to produce feed meal.

It was estimated that 200,000 ha of improved grasses and legumes were grown in the province at the end of 1995. Inter-cropped stylo accounted for 80% of this area. Hay production on 15,000 ha of highly improved land yielded 16 t/ha giving an income of 6,590 RMB/ha which is 15-40 times that from unmanaged hilly grassland. It is estimated that 1,300,000 ton of hay have been produced in the Province over recent years.

The reasons for growing improved forages are to increase soil fertility and control soil erosion, increase income from orchard areas by inter-cropping forage and for feed meal production, with the manure from animals being used as a fertilizer for crops.
Management of improved forages focuses on improving quality by frequent cutting. Average crude protein and crude fiber concentrations in 23 stylo samples from well managed fields were 18 and 31%, respectively, whereas the average protein and crude fiber values of 17 samples of stylo cut at a late stage of growth were 12 and 39%, respectively. Thus, we have changed our management from cutting stylo at the bud and flowering stage to cutting it when it reaches a height of 60-70 cm. This has improved its value for use in pig and poultry feed.

Improved forages are utilized by direct feeding, cut for fodder, as meal and as conserved forage. By 1995, there were 795 machines for cutting forage for meal production and 200,000 tonnes of leafmeal were produced.

In Guandong, there is now good acceptance of growing improved forages for animal feed. Incorporation of forages in the cropping cycle is beneficial both from the viewpoint of good management of resources and it is highly profitable.

[1]Department of Animal Science, South China Agricultural University, Guangzhou, P.R. China.

107807

Discussion on SEAFRAD – the South East Asian Forage and Feed Resources Network

summarized by P.C. Kerridge

Introduction

SEAFRAD was conceived in 1989 at a Regional Meeting in the Philippines. It became a reality through funding provided by AusAID under the FSP.

Those who initiated the FSP considered the focus or objectives of SEAFRAD would be similar to those of the FSP:

- Improved feed resources for livestock in small holder farming systems to increase the cash resources of farmers
- Introduction of legumes and grasses into farming systems to improve soil fertility and sustain overall farm productivity and profit in the longer term.

The founders assumed that these objectives can be more easily be met through regional collaboration or networking.

We now wish to re-consider what are the functions of a network that will ensure sustainability of the network when FSP funds are no longer available. It is common experience that networks disappear once a sponsoring agency withdraws funding.

Hence it is an appropriate time to ask the questions:

1. What benefits can a network provide its members?
2. How can a network continue to meet the needs of members in the long-term?

Contribution by FSP members

The Regional Meeting of the FSP, held at CATAS in January 1997 put these questions to the group present:

What benefits can a network provide its members?

- Helps to create linkages between members in the region
- Provides global information about forages to members of the network
- Alllows members to share information
- Facilitates exchange of new accessions and varieties of forages

- Speeds up technology transfer to farmers by exchange of information on new techniques developed by others e.g. seed production.

How can a network continue to meet the needs of members in the long-term?

The issue was largely considered to revolve around funding. Suggestions were:

- Seek funds from other source.
- Make it self funding through business arrangement or sponsorship
- Have representatives subscribe to the network
- Have internal regional funding through government allocations to a network
- Have rotation for responsibility with host country providing funds

Others realized that it was also a question of governance:

- Re-form the network around a regional council with a board of trustees or directorship

Contributions by others involved in networks outside the region

Suggestions were sought from persons who had been involved in other networks.

Correspondents answers are summarised below:

What benefits can a network provide its members?

1. Primary focus should be on resources for research with collaboration on a set of research priorities developed jointly with ownership of these objectives
2. Sharing of information becomes the instrument to unsure equal access to results
3. Success for individuals comes through recognition by others as an important resource person for the region.
4. Personal contact and confidence in each other is essential in getting effective collaboration.
5. Networks help isolated researchers to define their own goals relevant to their situation.
6. Contacts through a network help in developing funding proposals for research as well as meetings
7. Coordination is a difficult question. Rotation of responsibility every year means that experience is not taken advantage of and may lead to instability. On the other hand rotation leads to improved ownership of a network.

(N.B. In the experience of others the newsletter or communication in itself is secondary and an outcome of other objectives.)

How can a network continue to meet the needs of members in the long-term?

1. Members need to identify with objectives and feel responsible for the network
2. Develop strong national networks and distribute newsletters within each country
3. Ensure that the network does not become a 'club' with only the same persons participating and using it to fulfill personal ambitions
4. Encourage contact between smaller working groups of scientists in related areas (e.g. seed production, selection of new germplasm, FPR) with contact maintained by e-mail or mail.
5. National governments need to recognize that national research will benefit by international collaboration and provide resources for regional collaboration
5. Continuation without funding is possible by minimizing costs:

    - rotation of hosting of meetings with host institution meeting local expenses and
    - others paying their own travel.

6. There is a need to win political support from government leaders in each country but the network representatives should be coordinated by recognized professionals.

Discussion

The SEAFRAD representatives present considered that in Asia each country needed to set its own objectives rather than all working to a common objective. However, being aware of what others were doing in the region helped in setting particular country objectives.

Thus the network should mainly exist for exchange of new germplasm, technology and information. However, linkages between researchers and extensionists working in the same area should be encouraged in addition to contacts at meetings.

Networks provided the opportunity for exchange of researchers and extensionists between countries.

Other suggestions were to have a wide sustaining memberhip and to form a foundation.

However, it was recognized that there was a need to maintain a high profile of the network and ensure recognition before government leaders in each country. Could the network operate in associaiton with other regional fora?

Program of the Meeting

19 January 1997 (Sunday)

Participants arrive Haikou and travel to CATAS (3 hours by car)

20 January 1997 (Monday)

0800-0830	Opening Ceremony
0830-0900	Introduction (aims of the meeting and the program)

Country Presentations

0900-0930	Mr. Liu Guodao(FSP Activities in China)
0930-1015	Viengsavanh Phimphachanhvongsod (The FSP in Lao PDR – Progress and Plans)
1015-1030	Break
1030-1115	Le Hoa Binh (The FSP in Vietnam – Progress and Plans)
1115-1200	Eduedo Magboo (Collaborative Forage R&D Program in the Philippines - The Forages for Smallholders Project)
1200-1300	Lunch
1300-1330	Chaisang Phaikaew (Forages for Smallholders Project in Thailand)
1330-1415	Maimunah Tuhulele (Progress Report on the FSP in Indonesia)
1415-1445	New germplasm available A discussion of which new forages are showing promise in nurseries and on-farm trials
1445-1515	SEAFRAD and networking A discussion of how the SEAFRAD network can become self-sustaining
1515-1530	Break
1530-1700	Field visit

21 January 1997 (Tuesday)

Experiences with FPR

0800-0930	Review of the previous day's country presentations and a general discussion of what we have achieved and what direction we should take in the future.
0930-0945	Break
0945-1045	Case study of experiences in FPR from Matalom (Papang)
1045-1200	Other experiences in FPR: Philippines (Eduedo Magboo) Laos (Phonepaseuth Phengsavanh Indonesia (Maimunah Tuhulele) Indonesia (Tatang Ibrahim) Malaysia (Wong Choi Chee) Vietnam (Le Van An)

1200-1300	Lunch
1300-1500	Discussion of FPR methodology (strengths, weaknesses, future directions) (i) Diagnosis (including common factors that are important for forage development) (ii) Planning and conducting on-farm work (iii) Evaluation
1500-1515	Break
1515-1545	Secondary information Discussion of what is relevant secondary information and data for our forage development activities.

22 January 1997 (Wednesday)

0800-1500	Field visit (Stylosanthes seed and leaf-meal production)
1500-1700	Final Discussion and Planning (in Lingshui)

23 January 1997 (Thursday)

0800-1200	Travel to Haikou
1300-1700	Free time in Haikou

24 January 1997 (Friday)

Return home

List of Participants

China

Liu Guodao,
Huang Huide,
Jiang Houming,
He Huaxian,
Baichang Jun,
Wei Jiashao,
Jiang Changshum,
Mi Qiung,
Wang Shenxian,
Nai Jianqiao,
Zhou Jiasuo,
Wang Dongjing,
Zhou Hanling,
Zhen Zibing,
Wang Wengzhuang,
Tropical Pasture Research Center
Chinese Academy of Tropical Agriculture Sciences
Danzhou 571737
Hainan, P.R. China
Tel: (86 890) 300440, 300370
Fax: (86 890) 300157, 323776

Sun Xiaoxi
Hainan Government
Haifu Road
Haikou, Hainan
P.R. China

Lu Xiaoliang
South China Agriculture University
Wushan, Guangzhou
Guangdong, P.R. China

Wen Jikun
Cattle Production Center
Xiaoshao, Kunming
Yunnan, P.R. China

Indonesia

Maimunah Tuhulele
Bina Produksi,
Directorate General of Livestock Services
Departemen Pertanian
Jalan Harsono, RM 3
Ragunan, Jakarta Selatan 12550
Indonesia
Tel/Fax: (62 21) 781 5686

Erik Nursahramdani
Head of East Kalimantan Livestock Services,
Jln Bhayangkara No.54
Samarinda, East Kalimantan
Indonesia
Fax: (62-541) 36228

Tatang Ibrahim
IP2TP Sei Putih
P.O. Box 1
Galang 20585
Sumatra Utara
Indonesia
Tel: (62 61) 958270
Fax: (62 61) 958013

Laos

Viengsavanh Phimphachanhvongsod
Department of Livestock and Fisheries
PO Box 6766
Vientiane, Lao PDR
Tel:(856 21) 222796
Fax: (856 21) 222797

Phonepaseuth Phengsavanh
Department of Livestock and Fisheries
PO Box 6766
Vientiane, Lao PDR
Tel: (856 21) 222796
Fax: (856 21) 222797

Malaysia

Wong Choi Chee
Livestock Research Division
MARDI
P.O. Box 12301 GPO
50774 Kuala Lumpur
Malaysia
Tel: (60 3) 943 7380
Fax: (60 3) 948 5053

Philippines

Francisco Gabunada Jr.
CIAT
CIAT c/o IRRI
PO Box 933
1099 Manila
Philippines
Tel: (63 2) 845 0563
Fax: (63 2) 845 0606

Eduedo C. Magboo
Livestock Research Division
PCARRD
Los Baños, Laguna 4030
Philippines
Tel: (63 94) 5360014 to 19

Thailand

Chaisang Phaikaew
Division of Animal Nutrition
Department of Livestock Development
Phayathai Rd. Rajthewee
Bangkok 10400,
Thailand
Tel/ Fax: (66 2) 2511941

Ganda Nakamanee
Pakchong Animal Nutrition Research Centre
Pakchong, Nakornratchasima 30130
Thailand
Tel: (66 44) 311612

Vietnam

Mr. Ngo Van Man
University of Agriculture and Forestry
Thu Duc-Hochiminh City
Vietnam

Le Van An
University of Agriculture and Forestry
24 Phung Hung Street
Hue, Vietman
Tel: (84 54) 825439
Fax: (84 54) 824923

Le Hoa Binh
National Institute of Animal Husbandry
Chem - Thuy Phuong
Tu Liem, Hanoi
Vietnam
Tel: (84 4) 8343267
Fax: (84 4) 8344775

Forages for Smallholders Project

Dr. Bryan Hacker
CSIRO Division of Tropical Agriculture
306 Carmody Rd.,
St Lucia, Qld 4067
Australia
Tel: (61 7) 3214 2210
Fax: (61 7) 3214 2288

Dr Peter Kerridge
Sustainable Systems for Smallholders
CIAT
Apartado Aéro 6713
Cali, Colombia
Tel: (57-2) 445 0000
Fax: (57 2) 445 0273

Werner Stür
Forages for Smallholders Project
CIAT c/o IRRI
PO Box 933
1099 Manila
Philippines
Tel (63 2) 845 0563
Fax: (63 2) 845 0606

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