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RETA 5866: Fourth Agriculture and Natural Resources Research at CGIAR Centers: Developing Sustainable Forage Technologies for Resource-Poor Upland Farmers in Asia



Forages for Smallholders Project

Six-Monthly Report, 1 July – 31 December 2002

R. Roothaert, P. Asis, L.H. Binh, R. Bosma, E. Gabonada, F. Gabunada, Ibrahim, P. Kerridge, Y. Kexian, T.T. Khanh, E. Magboo, L. Moneva, G. Nakamanee, C. Phaikaew, J. Saguinhon, J. Samson, and V.H. Yen



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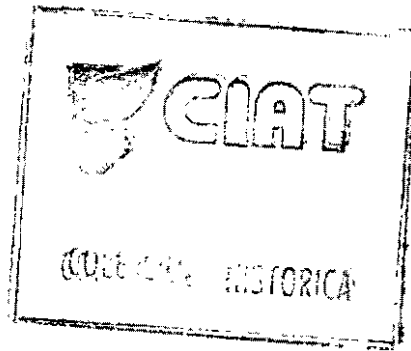
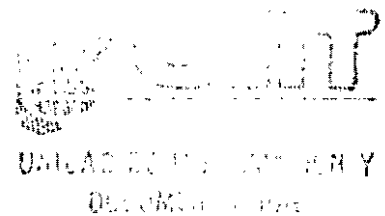


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Cover photo: A farmer and a field worker in Cagayan de Oro, Philippines, examine the fodder tree seedlings that were produced in the farmer's nursery (*photo R. Roothaert*).

Summary of Activities

Targets for research activities, publications, dissemination, multiplication systems, and capacity building were set by all member countries at the beginning of the year, based on the site workplans. Achievements against set targets have been presented in this report. The achievements have been satisfactory, and in many cases exceeded the targets. Number of articles published were slightly lower than expected due to staff coordinators' and facilitators' constraints in Indonesia and Thailand. The same constraints also resulted in fewer participatory diagnosis exercises, but overall, the numbers of new farmers planting improved forages were higher than expected this year. Investments in capacity building in previous years have contributed to this positive result. More than 2000 farmers and 120 technicians were trained this year. These numbers include participants who attended more than one course, therefore the numbers are not absolute. There was a higher production than expected in terms of both seed and vegetative planting materials by farmers. There have been increases in networking at field level in various activities including training.

Impact studies were conducted in Vietnam and the Philippines. Results show substantial financial benefits for farm households that have cultivated and used improved forages for 2-3 years. The best way to attribute these benefits to forages was to express them in terms of labour income per day worked in the livestock systems. The income per day worked almost tripled. Time efficiency of the new forage systems has improved remarkably. Saved time benefited women and children more than men in Vietnam. The introduction of new forages had a gender effect in the Philippines: the involvement of women and children in tasks like herding and cutting diminished, and men were responsible for more livestock tasks. A large increase in the number of animals owned by early adopters resulted in the need for greater labour input. This created labour in rural areas and reduced labour migration by young people. The introduction of cutting and carrying reduced the destruction of crops by grazing animals and affected social life in villages where herding was previously conducted on communal rangelands. Several recommendations are made on the basis of this study, in terms of training on feeding practices, reduction of mortality of goat kids, the implications of traditional systems livestock in trust, and improved marketing systems of livestock.

New extension booklets were published and distributed to field workers in six countries. One publication was made available in English, Chinese, Thai, Lao, Vietnamese and Indonesian. One paper was presented at the 'Cordillera Highland Agricultural Resource Management' (CHARM) end of project workshop to assess ways of continuing impacts of CHARM through other institutions and projects. Visits by CIAT staff were made to all member countries at least once. Training workshops were held in Indonesia and in China on participatory monitoring and evaluation, for researchers, field workers and key farmers. Workplans were developed and monitoring exercises have started in the field. Philippines and Vietnam are in a more advanced stage in terms of monitoring and evaluation, providing in depth information on the impacts of forages. A study tour was held in Mindanao with two CIAT scientists from Colombia and Uganda. Results are being written up. An orientation visit was conducted in Cambodia, to better understand the implementation methods of the new RETA 'Livelihoods and Livestock Systems Project'. The proposal of this project has been developed and approved by ADB.

1. Project background.

The project "RETA 5866: Fourth Agriculture and Natural Resources Research at CGIAR Centers: Developing Sustainable Forage Technologies for Resource - Poor Upland Farmers in Asia", in short called the "Forages for Smallholders Project" (FSP), started in January 2000. It is funded by the Asian Development Bank for a period of three years. The goal of the project is: "to improve the livelihood of upland farmers by enhancing available feed sources to increase livestock production and strategic use of grasses and legumes to conserve soil and to enhance nutrient management (ADB¹, 1999). The participating countries are China, Indonesia, Lao PDR, Philippines, Thailand and Vietnam.

Objectives and outputs

The objectives of the project are to:

- Develop sustainable forage technologies for resource-poor farmers in upland farming systems in Asia.
- Strengthen the capacity of National Agricultural Research Systems in the Bank's Developing Member Countries to develop and deliver these technologies to farmers.

The project has five outputs:

1. Productive and sustainable forage technologies for upland farming systems developed and tested by farmers.
2. Forage technologies extended to other farmers using participatory approaches for scaling-up from farm level to the community and provincial levels.
3. Effective local seed and planting material multiplication systems established and operational.
4. Capability in DMCs for developing and disseminating forage technologies using farmer participatory approaches (FPA) strengthened.
5. Network for sharing information among NARSs and in the region continued based on the Southeast Asia Feed Resources Research and Development (SEAFRAD) and electronic communications.

¹ Asian Development Bank 1999. Proposed Technical Assistance for the Fourth Agriculture and Natural Resources Research at CGIAR Centres. Manila, Philippines.

The FSP is co-ordinated by the Centro Internacional de Agricultura Tropical (CIAT), which is part of the Consultative Group on International Agricultural Research (CGIAR). The implementing agencies in the participating countries are:

China	Tropical Pasture Research Centre (CATAS), Hainan
Indonesia	Dinas Peternakan, Samarinda and Directorate General of Livestock Services (DGLS), Jakarta
Lao PDR	National Agriculture and Forestry Research Institute, NAFRI, Vientiane
Philippines	Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), Los Baños, Visayas State College of Agriculture (ViSCA) and Department of Agriculture, Region 10
Thailand	Department of Livestock Development, Ministry of Agriculture and Cooperatives, Bangkok
Vietnam	National Institute of Animal Husbandry (NIAH), Ministry of Agriculture and Rural Development (MARD), Hanoi

The project operates in 12 focus sites (table 1), which had been originally developed in an earlier project funded by AusAID.

Table 1. Focus sites in the FSP and dominant farming systems

Country	Province	Focus district/ municipality	Dominant farming system
Indonesia	East Kalimantan	Makroman, Samarinda	Rain fed lowland, intensive sedentary upland.
		Sepaku II, Pasir	Extensive sedentary upland, grasslands.
Lao PDR	Luang Phabang	Xieng Ngeun	Extensive sedentary upland, short rotation slash and burn.
	Xieng Khouang	Pek	Short rotation slash and burn, intensive sedentary upland (rice), grasslands
	Savannakhet	Savannakhet	Grasslands
Philippines	Misamis Oriental	Cagayan de Oro	Extensive sedentary upland
	Bukidnon	Malitbog	Extensive sedentary upland.
	Cebu and Leyte	Cebu City, Tabango	Intensive and extensive sedentary upland
Vietnam	Daklak	M'Drak	Extensive sedentary upland, grasslands.
	Tuyen Quang	Tu Quan, Phu Lam, Duc Ninh	Intensive sedentary upland.
Thailand	Nakornratchasima	Sung Nuen	Extensive sedentary upland.
China	Hainan	Baisha, Danzhou and Ledong	Extensive sedentary upland.

2. Achievements against targets in 2002

At the beginning of the year, every national FSP team set quantifiable targets for experimentation, dissemination, planting materials, and training activities. In most countries, national targets were subdivided for provinces or districts, and achievements were reported on those levels (Table 2). For the purpose of clarity, data are combined and presented by country in this report.

Table 2. Levels for reporting within countries.

<i>Country</i>	China	Indonesia	Philippines	Thailand	Vietnam
<i>Provinces or Districts</i>	Hainan	Pasir	Cagayan de Oro	Pakchong	Tuyen Quang
		Balikpapan	Malitbog	Sungnuen	Daklak
		East Kutai	Impasugong	Sikhew	
		Central Kutai	Manolo Fortich	Dankhuntod	
		Bulungan	Cebu		
		Samarinda	Leyte		
		Berau			

The achievements of the project in 2002 have been satisfactory, and in many cases exceeded the targets (Tables 3 - 6). The total number of experiments that were planned for 2002 according to various site workplans were 146; most of these were carried out (Table 3). In addition to the experiments listed here, there are many informal farmer initiated and farmer led experiments. It is difficult to monitor all spontaneous research activities, but experiences are recorded during field visits. Experiments often lead to short publication in the SEAFRAD newsletter. There was a slight underachievement in terms of articles produced. Indonesia didn't produce any. It has been a busy year for the national coordinator in Indonesia since he was promoted to a new post at a new district in East Kalimantan Province. Unfortunately, other staff in East Kalimantan are not able to write in English.

Table 4 presents the targets and achievements in dissemination activities for 2002. Some achievements were higher and others were lower than the targets. In Thailand and Indonesia fewer participatory diagnosis exercises were conducted than planned. This in turn affected the number of new farmer groups formed. In Indonesia the lower activity was probably due to the transfer of the national coordinator and the resulting reduction of facilitation in these activities. In Thailand, both implementing partners have started a PhD study and have spent much time in Japan for this purpose. It is remarkable though that the number of cross visits organised in Indonesia were above expectations. One can conclude that the organisation of cross visits in E. Kalimantan has been decentralised and can continue in the absence of the national coordinator. The total number of new farmers planting forages in 2002 was slightly more than planned. Dissemination activities resulted in higher than expected numbers in Philippines and Vietnam. The total number of farmers that are still cultivating forages is more than 4700, 11% more than expected.

Table 3. Summary experiments carried out and articles written.

Country	Target/achieved	No. of farmers carrying out experiments	No. of Seafrad articles contribution
China	T	30	4
	A	30	4
Indonesia	T	17	3
	A	31	0
Philippines	T	41	8
	A	30	6
Thailand	T	3	1
	A	3	1
Vietnam	T	55	2
	A	45	1
Total target		146	18
Total achieved		139	12
% Achieved		95	67

Table 4. Summary of achievements in dissemination in 2002

Country	Target/achieved	No. of PD ² s conducted	No. of farmers partic. in PDs	No. of new groups	No. of cross visits organised	No. of farmers partic. in cross visits	No. of new farmers planting forages	No. of total farmers planting forages in 2002
China	T	7	105	7	15	75	100	173
	A	7	109	8	14	81	97	176
Indonesia	T	24	430	36	23	389	200	946
	A	9	269	14	29	278	183	929
Philippines	T	30	340	23	29	640	383	1205
	A	33	355	27	60	674	721	1663
Thailand	T	8	120	8	18	175	295	449
	A	1	15	1	3	100	195	276
Vietnam	T	52	1330	0	40	650	550	1656
	A	51	1400	2	35	700	660	1737
Total target		121	2325	74	125	1929	1806	4302
Total achieved		101	2148	52	141	1833	1856	4781
% achieved		83	92	70	113	95	103	111

² Participatory Diagnosis

Table 5. Summary of achievements in forage multiplication systems in 2002

Country	Target/ achiev- ed	New groups produ- cing planting materials			New individual farmers producing planting materials			Quantity of splits and cuttings	Quanti ty of seeds (kg)	No. of new on- farm tree seedling nurse- ries
		Veget ative	Seeds	V'tive + seeds	Vege- tative	Seeds	V'tive + seeds			
Vietnam	T	0	0	0	11	13	5	560,000	50	2
Vietnam	A	5	65	40	3	3	10	10,000,000	155	1
Indonesia	T	25	3	8	202	5	15	263,000 splits and 46 bags	11	11
Indonesia	A	11	28	0	0	0	0	1,400,000	0	3
Thailand	T	0	0	0	0	0	0	0	400	0
Thailand	A	0	0	21	0	0	0	0	512	0
China	T	5	0	0	45	20	0	35,000	2,000	10
China	A	5	0	0	45	20	0	50,000	3,100	12
Philippines	T	12	54	14	2	2	7	90 sacks and 3,000 splits	11.5	19
Philippines	A	31	36	21	211	37	16	136 sacks and 81,000 splits	231	13
Total target		42	57	22	260	40	27		2050	42
Total achieved		52	129	82	259	60	26		3998	29
% achieved		124	226	373	100	150	96		195	69

There have been good results in the establishment of multiplication systems (Table 5). A remarkable performance is seen in the number of farmers producing seeds. In previous years these numbers had been very low, and hence the low targets for 2002. Seed production is difficult and requires a combination of correct crop management, seed harvesting skills, and favourable climatic conditions. Farmer trainings sessions organised by FSP have apparently paid off and resulted in group efforts to produce seeds. Vegetative propagation is still the most common method for individual farmers though.

Table 6. Summary of capacity building in 2002.

Country	Target/ achiev- ed	No. of farmer training courses or field days conducted	No. of farmers participate d in training courses or field days	No of techni- cians' training courses	No. of techni- cians attended training course
China	T	5	130	1	10
China	A	7	146	2	8
Indonesia	T	3	425	8	38
Indonesia	A	6	126	4	18
Philippines	T	39	970	10	47
Philippines	A	22	947	9	62
Thailand	T	4	100	1	5
Thailand	A	2	100	1	5
Vietnam	T	30	650	1	20
Vietnam	A	57	1632	2	35
Total target		81	2275	21	120
Total achieved		94	2951	18	128
% achieved		116	130	86	107

Many course were conducted to train farmers, especially in the Philippines and Vietnam (Table 6). Although there were a fewer courses for technicians than planned, the number of technicians trained was higher than planned. It indicates that courses have become more effective and been able to deal with more participants. The details about locations of the courses, the dates, course duration, numbers of participants of various levels, and the organisers of the course are presented in Appendix 1. Due to investments in networking which resulted in many shared activities at the sites, many project staff and farmers have been able to enjoy training courses organised by other organisations. The details are presented in Appendix 2. The dimension of shared training activities in the Philippines has been impressive.

Networking has also resulted in many other activities. A good collaboration has been established with ICRAF in Mindanao, Philippines. There are also many shared field activities with various Institutions of the Department of Agriculture. Through this form of collaboration, the expected reach of improved forage technologies as well as participatory methods have stretched far beyond what is measurable by FSP. Appendix 3 summarises the diversity of collaborative activities. At higher management level, good collaboration has been established with ILRI – Asia.

3. Other activities

An impact study was conducted in Mindanao, Philippines, from April 25 to May 22, and in Tuyen Quang, northern Vietnam, from May 25 to June 22, 2002. A consultant from the Netherlands, Roel Bosma, was hired to implement the study with the national partners at the sites. The goals of this study were:

- To assess the financial and social benefits of forage technologies developed through participatory research with FSP;
- To calculate the costs of actual feeding practices and to compare them with theoretical feed requirements;
- To train farmers and field workers in the use of i) girth tape measures (cattle) and spring balances (goats) for live-weight assessment and ii) body condition scoring;
- To assess the effects of forage contour row spacing (Malitbog, Philippines).

The study used methodologies similar to the ones that were used in the study on 'Economic and social benefits of new forage technologies in East Kalimantan, Indonesia'. The latter study has been published as CIAT Working Document 190.

In the Philippines, improved forage species increased animal production, improved soil conservation and saved farmers time. Net yearly income per household from animal production increased from \$54 to \$157 in the farming community at Malitbog, and from \$68 to \$503 in Cagayan de Oro. The average net income from animal production increased from \$0.44 to \$1.06 per day of labour in Malitbog, and from \$0.40 to \$1.34 in Cagayan de Oro. Planting forages in contour lines increased crop production slightly and contributed another \$22.50 to yearly income. The reduction in labour requirements allowed households to make \$36 per year from other activities. The drop in labour time enabled households with low labour and land availability to acquire animals, and other more lucrative farmers to increase their herd size or extend their crop activities.

The introduction of new forages had a gender effect in the Philippines: the involvement of women and children in tasks like herding and cutting diminished, and men were responsible for more livestock tasks. A large increase in the number of animals owned by early adopters resulted in the need for greater labour input. This created labour in rural areas and reduced labour migration by young people. The introduction of cutting and carrying reduced the destruction of crops by grazing animals and affected social life in villages where herding was previously conducted on communal rangelands.

In Vietnam, improved forage systems also had a pronounced effect on income levels and welfare. Net income from ruminant-fish production systems increased from \$99 to \$199 per year. Converted to net income per day of labour spent in the systems, the rates increased from \$0.33 to \$1.13 for the ruminant system and from \$ 0.80 to 2.33 for the fish system. Saved time also allowed households to increase their income from other, mainly agricultural, activities. This contributed to an additional yearly income of \$52 per household. Overall, the financial situation improved due to increased income from investments in tree crops, but the percentage contribution of livestock to total livelihood actually decreased. Forages increased net income per household from pig production, but not the return from labour.

Positive gender effects were more significant in Vietnam. Women and children benefited most from the reduction in time spent cutting, carrying and herding. They used this extra time for educational and cultural activities. Poorer farmers who depended more on livestock due to small land area, benefited most from the improved forages. Improved forages allowed them to keep large ruminants—increasing their income from livestock—and intensify their production systems. Other positive effects on rural development included a reduction in the number of farming conflicts, rehabilitation of barren land and reduced use of pesticides.

The adoption of new forage was highly dependent upon the livestock dispersal and credit programs in Mindanao, affecting further adoption and scaling-out negatively in one municipality. In Tuyen Quang province, the scaling-out of improved forage technologies was not influenced by livestock distribution schemes. The many advantages and favourable socio-economic conditions associated with the adoption of *Panicum maximum* systems, enhanced an autonomous farmer-to-farmer process of scaling-out. However, the introduction of other species and accessions still needs a structured extension system.

Several recommendations are made on the basis of this study. All farmers cultivating forages need training on ruminant nutrition and the importance of consistent feeding practices. The causes of high mortality in goat kids requires more research. Further study is needed to produce more accurate girth–liveweight tables for local livestock species. The traditional *alima* system, whereby animals are given in trust, is an obstacle to equal income distribution and ought be revised to increase the share of benefits going to caretakers. People without long term rights to land use could not profit from forage systems: there is an urgent need to provide land rights to the landless. The project should work with farmers owning small livestock, as an alternative to working with farmers who receive large livestock through dispersal and credit schemes. There is scope for better market orientation for smallholder livestock producers, particularly in the Philippines.

The full report will be published as CIAT working document no. 191.

4. Publications

The new publication 'Developing forage technologies with smallholder farmers - How to grow, manage and use forages' has been translated and published in English, Vietnamese, Indonesian, Lao, Thai and Chinese. The booklet is aimed at field workers and provides practical guidelines for growing and managing forages. This booklet, the new publication on 'Calliandra for livestock', and the 'Proceedings of the Third Regional Meeting of the Forages for Smallholders Project held at the Agency for Livestock Services of East Kalimantan, Indonesia' have been sent to targeted users throughout the region.

Books

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Two radio interviews with project staff were recorded and broadcast in East Kalimantan, Indonesia, reaching farmers in all rural areas, 2000.

5. International travel of project staff

Dates (2002)	Traveller	Countries visited	Purpose
26 Jan – 5 Feb	FSP delegates from all member countries	Lao PDR	Third annual planning meeting of FSP
11-14 March	R. Roothaert	Thailand	Regional livestock research priority setting workshop, FAO- ILRI
18-23 March	R. Roothaert, J. Samson	Mindanao, Philippines	Finalise workplans and review research process
3 - 12 April	R. Roothaert, N. Johnson	Lao PDR, Vietnam	To plan monitoring and evaluation systems, and to prepare socio- economic study
9 – 15 April	J. Samson	Indonesia	To conduct a workshop on Participatory Monitoring and Evaluation
14 – 18 April	P. Kerridge	Philippines	To assist in writing new ADB proposal
2 – 7 June	R. Roothaert	Lao PDR, Vietnam	To attend CIAT regional meeting in Lao and visit field sites in Vietnam
8 - 19 July	R. Roothaert, J. Samson	Hainan, China	To conduct a workshop on Participatory Monitoring and Evaluation
6 – 10 Aug	R. Roothaert, S. Kaaria, R. Delve	Philippines	To conduct field study on information flows
19 – 24 Aug	P. Kerridge	Vietnam	To evaluate and facilitate on-going research at Tuyen Quang and Daklak
6 – 10 Oct	R. Roothaert, R. Lefroy	Cambodia	To discuss with NARS implementation of new RETA proposal

6. Human resources

FSP co-ordinators and counterparts

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Dr. Rod Lefroy, Coordinator CIAT – Asia, Vientiane, Lao PDR
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7. Appendices

Appendix 1. Training courses and number of people trained.

Country and Province	Name of training course conducted by FSP	Location	Date started	Length (days)	No. of field workers and officers	No. of researchers	No. of farmers	Course organiser (person)
<i>Indonesia – East Kalimantan</i>	PME	Samarinda	09-Apr-02	10	22			country coordinator
	Training of key farmer in forage agronomy	Sepaku and Samboja	29-Jun-02	3			15	field worker
	Training in Animal Nutrition	Samboja	Jul-02	3			15	field worker
	Training on body weight	Loakulu	Jul-02	2			15	field worker
	Training of Bokasi	Makroman	17 June	2			15	field worker
	Forage development	Samarinda	August 02	12	15		0	FSP coordinator
	Makroman	17 June	2 days		0	15	field worker	Makroman
<i>Thailand – Nakornratchasima</i>	Forage Agronomy	Pakchong	21-May	2			50	Ganda, Supachai
	Forage utilization field day	Pakchong	23-May	2			50	Ganda, Supachai
<i>Vietnam - Daklak</i>	Tech. Training on forage technology	Tay nguyen university	12-May	7	12	6	4	Truong tan Khanh, Van Tien Dung

Appendix 1. Training courses in 2002

Country and Province	Name of training course conducted by FSP	Location	Date started	Length (days)	No. of field workers and officers	No. of researchers	No. of farmers	Course organiser (person)
	development and PM&E							
	4 farmer training courses in Ea Kar district on forage agronomy + 2 Field days	Village No2- Cu Ni, Ninh Thanh, M Oa, Vilage No 4 - Cu Hue, Xuan Phu, E Ao	03-Jun	2			115	Nguyen Van Ha, Khanh
	4 farmer training courses in Ea Kar district on forage agronomy + 3 Field days	Village No 6, No10 - Eadien commune, Village No 1, 6 - Ealai, Ea Mlay, Cu Mta	05-Jun	2			135	Le Van Thieu, le Thi Tuyet, Khanh
	4 farmer training courses in Ea Kar district on forage agronomy + 3 Field days	Hoa Khanh, Nam Dong, Hoa Phu, Ea Tling, Tam Thang	07-Jun	2			140	Nguyen Dinh Thu, Dung
	4 farmer training courses in Ea Kar district on forage agronomy + 3 Field days	Ea Huar, Tan Hoa, Ea Bar and Cuor Knia	09-Jun	2			140	Nguyen Van Duong
	1 farmer training courses + Field day	Ea Rieng commune	17-Jun	2			25	Hien, Khanh
	1 farmer training course	Ea Kao	19-Jun	1			25	He, Khanh

Appendix 1. Training courses in 2002

Country and Province	Name of training course conducted by FSP	Location	Date started	Length (days)	No. of field workers and officers	No. of researchers	No. of farmers	Course organiser (person)
	9 Courses on forage agronomy	Ham yen, Yenson district	20-Apr. 19-Jun	1 day/course	26		270	Mrs.Huong, Mr.Dzung
	5 training courses on seed production	Phulam, Tuquan, Ducninh, HoangKhai, KyLam of SonDuong district	Sept. and Oct.	1/2 day	1		50	Mrs. Yen, Mr. Binh
	20 training courses on animal feeding and management	Na Hang, Yen Son, Ham Yen districts	Jul. and Aug.	1/2 day			330	Mrs.Minh, Mrs Huong, Mr.Dzung andYen
	6 field visits	Son duong, Yen son, Ham yen district	May and Jun.	1 day			178	Mrs. Yen and Mrs. Huong
<i>Philippines – Cagayan de Oro</i>	Farmers' seminar on forage production	Cagayan de Oro	June 2002	1			188	Perla Asis
	Animal Nutrition/ Forage Agronomy	Lumbia	16 Jan	1			18	Asis/Nec Ragasajo
	Goat Raising/Forage Agronomy	Iponan	10 Apr	2			13	Asis/Nestor Nacalla, 4-H Club Pres.
	Basic Forage Agronomy	Besigan	23 Apr	1			25	Asis
	Basic forage Agronomy	Langag, Dansolohon	24 Apr	2			14	Asis & La Victoria
	Kabir Raising	Midkewan, Bayanga	16 May	1			24	Asis

Appendix 1. Training courses in 2002

Country and Province	Name of training course conducted by FSP	Location	Date started	Length (days)	No. of field workers and officers	No. of researchers	No. of farmers	Course organiser (person)
	Animal nutrition Feeding System Hands-on Body weight estimation	Lumbia	21 May	1			40	Asis & Bosma
	Basic Forage Agronomy	Pamalihi, Pagatpat	17 Jun	2			30	Asis & Payla
	Cattle Fattening Animal Nutrition Feeding System Forage Agronomy	Mambuaya	20 Jun	1			17	Asis & Elorde
	Cattle Fattening Animal Nutrition Feeding System Forage Agronomy	Bayanga	26 Jun	1			20	Asis
	Idem	Balkingon	2 Jul	1			23	Asis & Paasa
	Basic Forage Agronomy	Midkewan, Bayanga	3 Jul	2			23	Asis & La Victoria
	Cattle Fattening Animal Nutrition Feeding System Forage Agronomy	Tumpagon	8 Jul	1			26	Asis & y Dapanas
	Idem	San Simon	14 Aug	1			16	Asis & Paasa
	Idem	Pigsag-an	15 Aug	1			16	Asis, Dapanas
	Idem	Tagpangi	16 Aug	1			46	Asis & Rey

Appendix 1. Training courses in 2002

Country and Province	Name of training course conducted by FSP	Location	Date started	Length (days)	No. of field workers and officers	No. of researchers	No. of farmers	Course organiser (person)
	Idem	Dansolihon	24 Aug	1			17	Dapanas Asis & La Victoria FSP
<i>Philippines - Bukidnon</i>	Forage Agronomy Training	Siloo, Maltibog	7 Jan	2			43	FSP
	Soil & Water Conservation Training	San Migara, Malitbog	25 March	1			19	FSP
	Livestock weight using girth measurement training	Poblacion, Malitbog	20 May	1			35	FSP
	Forage Agronomy Training	Samolo, Malitbog	27 June	2			20	FSP
	Livestock Production Training	Omagling, Malitbog	19 Feb	2			25	FSP
	Integrated Farming system and forage development seminar	Sayawan, Impasugong	15 Jul	2	8	0	72	LGU- Impasugong
	Idem	Cawayan, Impasugong	11 Aug	2	8	0	74	LGU- Impasugong
	Idem	San Antonio, Impasugong	13 Aug	2	8	0	37	LGU- Impasugong
	Adoption and Promotion of Conservation Farming	Sungca, Lantapan	9 Sep	1	8	0	30	ICRAF, Lantapan & FSP Impasugong

Appendix 1. Training courses in 2002

Country and Province	Name of training course conducted by FSP	Location	Date started	Length (days)	No. of field workers and officers	No. of researchers	No. of farmers	Course organiser (person)
	Technology							
	Proper Handling of Fertilizer & Pesticide	Cag. De Oro	10 Oct	2	1	0	0	FPA Region 10
	Forage Agronomy Training	Cagayan de Oro	16 Sep	5	4	0	0	FSP Central
	Goat Production and Management Training	Omagling, Malitbog	19 Feb	2	7	0	25	FSP/MAO
	Idem	Bagyangon, Malitbog	20 Aug	2	5	0	40	FSP/MAO
	Draft Animal Health management training	Siloo, Malitbog	22 Nov	1	4	0	38	FSP/MAO
	Feeds and feeding of draft animal training	Siloo, Malitbog	16 Dec	1	1	0	25	FSP/MAO
	Forage-Crop-Livestock Integration Training	Impahanong, Malitbog	7 Aug	2	7	0	35	FSP/MAO
	Monitoring & Evaluation Workshop	Patong, Malitbog	9 Jun	1	3	0	25	FSP/MAO
	Cross visit to ICRAF, Claveria	B. Dambaan, Tabugan, Larapan	23 Jul	1	2	0	25	FSP/MAO - Malitbog
	Cross visit to ICRAF, Claveria	C. Kalipay, Mabuhay, Bagyangon	15 Aug	1	1	0	48	FSP/MAO - Malitbog
	Cross visit to	D. Kuyahon/	30 Jul	1	1	0	37	FSP/MAO -

Appendix 1. Training courses in 2002

Country and Province	Name of training course conducted by FSP	Location	Date started	Length (days)	No. of field workers and officers	No. of researchers	No. of farmers	Course organiser (person)
	ICRAF, Claveria	Impahanong						Malitbog
	Cross visit to ICRAF, Claveria	E. Samplano	22 Aug	1	1	0	45	FSP/MAO - Malitbog
	Cross visit to ICRAF, Claveria	F. Pigsuguan/Bontongon	13 Sep	1	2	0	40	FSP/MAO - Malitbog
	Cross visit to ICRAF, Claveria	G. Sumalsag	27 Sep	1	2	0	38	FSP/MAO - Malitbog
	Cross visit to ICRAF, Claveria	H. Manalaga/Bagong Silang	16 Oct	1	2	0	40	FSP/MAO - Malitbog
	Cross visit - Forage and Goat house of bagyang	San Migara	8 Dec	1	3	0	40	FSP/MAO - Malitbog
	Cross visit to Mindanao Baptist Rural Life Center (MBLRC)	Bansalan, Davao	6 Nov	3	3	0	6	FSP/MAO - Malitbog
	Idem	Bansalan, Davao	12 Nov	3	3	0	5	FSP/MAO - Malitbog
	Cross visit to Mag-uugmad Foundation	Guba, Cebu City	3 Dec	4	4	0	3	FSP/MAO - Malitbog
	Idem	Guba, Cebu City	14 Dec	4	4	0	3	FSP/MAO - Malitbog
China - Hainan	Monitoring and evaluation Workshop	CATAS, Danzhou	9 July	7	3	15	12	Yi Kexian

Appendix 2. Other training courses in 2002

Appendix 2. FSP partners trained by other organisations in 2002.

Country	Name of training course conducted by FSP	Location	Date started	Length (days)	No. of field workers and officers	No. of researchers	No. of farmers trained	Course organiser (person)
Vietnam	Training on forage agronomy for farmer (Funded by PARC project)	Buon Don, Daklak	12 Jun	2	2	0	12	Nguyen Van Duong and Khanh
	4 Training courses on forage agronomy and animal management	Hoang Khai, Noibinh, Doican, Ankhang communes, T. Quang	5 Sept.	1	4		200	Agricultural extension center and FSP
Thailand	Beef fattening	Lopburi province, Nakornratchasima	22 Apr	3			20	Viroch Kukuntod, Dept. of Public welfare BENRO
Philippines	Technology of Participation-I	Bohol, Phil.	13 March	3	1			BENRO
	Technology of Participation-II	Boracay, Phil.	6 May	3	1			BENRO
	Farm Planning & Budgeting	Davao City, Phil.	2 June	3	2			DAR/ADB
	Integrated Rural Accessibility Planning	Malitbog	5 June	1	1			LGU-Malitbog
	2nd International Course on Participatory Research	Los Banos	4 March	18		2		CIP-UPWARD

Appendix 2. Other training courses in 2002

Country	Name of training course conducted by FSP	Location	Date started	Length (days)	No. of field workers and officers	No. of researchers	No. of farmers trained	Course organiser (person)
	and Development							
	Cattle Fattening LARA/DA CVO	DA,NOMIARC Malaybalay, Bukidnon	9 May	2	2		24	Dr. Elvito Tac-an, Mr. Lorono Speaker
	Soil and water conservation/Hands-on Training CVO/ICRAF	F.S. Catanico	25 July	2	2		20	Dr. Perla t. Asis, CVO & Pada, ICRAF
	Fodder Trees Production CVO/NDA	Calinan, Davao City	30 July	2	2	6	14	Bongabong, N DA & Asis, CVO (resource speaker)
	Soil and water conservation/Hands-on Training CVO/ICRAF	Pagalungan	13 Aug.	2			15	Asis, CVO & Pada, ICRAF
	Training Course On Forage Development and Management DA/NOMIARC LGU Lanao del Norte	NOMIARCH/ DA	12 Nov.	3	17			Tac-an, Mr. Lorono & Asis & Nacalaban (speakers)
	Forage Agronomy Training	CDO	12 Dec	3	25	-	-	DA-RFU-10
	Cross-visit to Forage Soil Co.	San Miguel	23 Aug	1	25	-	-	City Vet-CDO
	Potato and Camote Candy Processing	Bukidnon	15 Jul	2	3	0	48	LGU-Impasugong
	Squash Processing/Mongo	Malaybalay	12 Sep	2	1	0	0	DA Provincial

Appendix 2. Other training courses in 2002

Country	Name of training course conducted by FSP	Location	Date started	Length (days)	No. of field workers and officers	No. of researchers	No. of farmers trained	Course organiser (person)
	Processing Extension Development Course	City Musuan, Bukidnon	25 Sep	3	2	0	0	Office, ATI-CMU,
	Post Harvest Handling and Processing of High Value Commercial Crops	Salungan, Malaybalay City	15 Nov	2	1	0	15	DA NOMIARC RFU 10 Dalungan,
	Handling and Packaging of Vegetable Production	Manolo Fortich, Bukidnon	18 Sep	3	1	0	0	LGU-manolo fortich & DA-RFU 10 Cag. de Oro
	Integrated sustainable diversified agriculture	Kibenton, Impasugong	9 Dec	2	2	0	0	NGO-Kaanib foundation & LGU
	Integrated sustainable diversified agriculture	Hogpa, Impasugong	16 Dec	2	2	0	0	NGO-Kaanib foundation & LGU
	Potato and Camote Candy Processing	Tagaytay, Cavite City	24 May	4	2	0	0	DA Central Office & ATI

Appendix 3. Organisations that FSP has collaborated with in 2002.

Country	Name of organisation	Type of organisation	Place, Province	Activities in common with FSP
Philippines	Department of Agriculture	Research Institute	Cagayan de Oro City, Misamis Oriental	Forage Agronomy Training course and livestock projects
	Department of Agrarian Reforms	Research Institute	Cagayan de Oro City, Misamis Oriental	Livelihood project for the farmer collaborators
	ICRAF	Research Institute	Claveria, Misamis Or.	Soil and Water Conservation Project
	Philippine Coconut Authority	Research Institute	Misamis Oriental	Coconut-livestock integration
	Provincial Government of Bukidnon	Research Institute	Malaybalay, Bukidnon	Farmers Field Day/Livelihood Projects/Agri-fair
	Municipality Government of Malitbog, Bukidnon	Government agency	Malitbog, Bukidnon	Farmers Field Day/Livelihood Projects/Agri-fair
	Bukidnon Environment & Natural Resources Office	Government agency	Malaybalay, Bukidnon	Training on Technology of Participation
	DASVM-VISCA	College - department	Leyte, Eastern Visayas	forage plots for instructional purposes (college students in agriculture)
	Department of Agriculture Region 10	Research Institute	Cagayan de Oro City, Misamis Oriental	Forage Agronomy Training course and livestock projects
	Department of Trade and Industry Region 10	Research Institute	Cagayan de Oro City, Misamis Oriental	Livelihood project for the farmer collaborators
	Department of Agrarian Reforms Region 10	Research Institute	Cagayan de Oro City, Misamis Oriental	Livelihood project for the farmer collaborators
	ICRAF	Research Institute	Claveria, Misamis	Soil and Water Conservation Project

Appendix 3. Collaborating organisations in 2002

Country	Name of organisation	Type of organisation	Place, Province	Activities in common with FSP
			Or.	
	ICRAF-Visayas	research institute	Leyte, Eastern Visayas	promotion of soil and water conservation practices (contour hedgerows)
	National Dairy Authority	Research Institute	Cagayan de Oro City	Dairy Cattle project for FSP farmer collaborators
	Natural Resources	Research Institute	Cagayan de Oro City	Soil and Water Conservation Project
	PCC at VISCA	government agency - agriculture	Leyte, Eastern Visayas	dissemination of forage planting materials to carabao raisers
	Philippine Carabao Center	Research Institute	Musuan, Bukidnon	Dairy Buffalo Project for FSP farmer collaborators
	Philippine Coconut Authority	Research Institute	Misamis Oriental	Coconut-livestock integration
	Provincial Government of Bukidnon	Research Institute	Malaybalay, Bukidnon	Farmers Field Day
	Department of Animal Science and Veterinary Medicine, Leyte State University	University	Baybay, Leyte	Implementation of FSP in Leyte and Cebu
	Philippine Carabao Center at LSU	Government organisation	Baybay, Leyte	Dairy Buffalo Project for FSP farmer collaborators
	Women's Health and Safe Motherhood	Non-government organisation	Malitbog, Bukidnon	Women groups
	Department of Environment and Natural Resources	Government organisation	Malaybalay, Bukidnon	Farmer extension
	Agricultural Training Institute	Government organisation	Musuan, Bukidnon	Training of farmers
	City Government of Malaybalay	Government organisation	Malaybalay, Bukidnon	
	Northern Mindanao Integrated Agricultural Research Center, DA-RFU 10	Government organisation for research	Malaybalay, Bukidnon	Production of planting materials

Appendix 3. Collaborating organisations in 2002

Country	Name of organisation	Type of organisation	Place, Province	Activities in common with FSP
	Large Animal Raisers Association for Northern Mindanao	Non-government organisation	Cagayan de Oro City, Misamis Oriental	Field days
Indonesia	BPLP Training Center	Training Center	Samarinda, East Kalimantan	Training for Field Worker
	Deliveri	Livestock Project	TanahGrogot, Pasir District, East Kalimantan	Training for Field Worker in PRA
	Care International	NGO	East Kalimantan ,Samarinda	Field day ,forage species plots in Marangkayu
	Kutai Barat Agriculture Services	government agency - agriculture	Kutai Barat,Melak	Preparing planting material for farmers test
Thailand	Division of Self Help Land Settlement Department of Public Welfare Ministry of Labour and Social Welfare	Government	Pakchong, Nakornratchasima	Beef fattening Project
Vietnam	NIAH	Research	Ha Noi	Coordinator
	Tay Nguyen University	University	Buon Ma Thuot, Daklak	Manager
	DARD in Buon Don and Cu Jut Districts	Government	Daklak Province	Supervisor and Development workers
	DARD	Government	Tuyen Quang Province	Supervisor and Development workers
	Extension Office in M'Drak, Ea Kar, and Cu Jut Districts	Government	Daklak Province	Supervisor and Development workers
	DARD in Daklak Extension Office in Daklak	Government	Daklak Province	Supervisor

Appendix 3. Collaborating organisations in 2002

Country	Name of organisation	Type of organisation	Place, Province	Activities in common with FSP
	Daklak province	Government	Daklak Province	Supervisor
	Head of fish farmer group in Buong Mathuot (Nguyen thi He)	Farmer groups	Daklak Province	Development worker
	Head of fish farmer group in Ea Rieng commune, Krong Bach District (Nguyen Thi Hien)	Farmer groups	Daklak Province	Development worker
	Yen Son cattle development center	Government	TuyenQuang province	Supervisor
	Extention office in Yenson, Hamyen, Nahang	Government	TuyenQuang province	Development workers
	Son Duong cattle development center	Government	Sonduong district, Tuyequang province	Development workers
	Head of farmer group of cattle production (Mrs. Doan Thi Lan)	Farmer groups	Phulam of Yenson district	Development workers
	Head of farmer group of fish production (Mr. Dao Viet Truong)	Farmer groups	Tuquan of Yenson district	Development workers
	Head of farmer group of fish production (Mrs. Le Xuan Binh)	Farmer groups	Ducninh of Hamyen district	Development workers
China	Farmer Centered Research Network, China(FCRNC)	NGO	China Agricultural University, Beijing	Exchanging and sharing the experiences in Farmer's Participatory Research in China and abroad

Appendix 4. Trip report Hainan, China, 8 – 19 July 2002

Ralph Roothaert and Jindra Samson

Objectives:

- To conduct a workshop on Participatory Monitoring and Evaluation (PME) for researchers and field workers of the Forages for Smallholder Project (FSP).
- To review and advise on research activities in Hainan.

Summary

The workshop was conducted successfully, and was appreciated by all participants. Difficulties were the large number of participants and shortage of translators. It was the fourth country where the course was conducted. The course material would benefit from compilation in ring binders with clear instructions for participants and facilitators, similar to the training material of the course on 'Participatory research and forage agronomy'. A good impression was obtained about farm activities during the field days. Farmers have been experimenting with forage options for about two years. There is great diversity in the use of forage, for many animal types, feed, seed production, and cover crops. The results of the survey that was designed during the workshop will yield very valuable information about adoption in Hainan. The FSP national coordinator, Yi Kexian, has been overwhelmed with responsibilities for CATAS, and as a result some research results for FSP have not been reported. The situation is expected to improve with immediate effect as a new assistant for Yi, Mr. Tang Jun, was appointed while I was there. This report includes suggestions for implementation of on-farm research activities which had been planned for 2002.

PME workshop

The opening session of the workshop coincided with the opening of the new office building and field demonstration site of the Tropical Pasture Research Institute, and the two events were combined. Many high officials were invited such as the Vice Governor and the Vice president of Senate. Thirty four people participated in the workshop, while Yi Kexian, Jindra Samson and conducted the course. Twelve of the participants were farmers. As usual, the course was conducted in English and Chinese simultaneously. The spirit was very high, and the participants were interested and committed. Although the course lasted 7 days non stop, nobody bothered about working during the weekend. During the evaluation, several people suggested that they would have appreciated a longer workshop. The group was very big, which resulted in problems during all exercises. An ideal size for a course such as this one would be a maximum of 20 participants. Twelve participants were farmers. Although it can be useful to have innovative and representative key farmers in participatory courses, in this case the course was less appropriate for them. It is unlikely that any of the farmers attending will facilitate or conduct open group discussions, formal interviews, case studies or regular visits in the future; or analyse and report data from monitoring and evaluation exercises. Nevertheless, the farmers appreciated the chance to participate in the course tremendously, and they were eager students.

As this was the fourth time the course was conducted (after Vietnam, Philippines and Indonesia), it provided a chance of continuous improvement. A detailed report about the workshop is available from j.samson@cgiar.org.

The Forages for Smallholders Project in Hainan

The two days in the field for the exercises of the PME workshop provided a good chance to assess the progress of FSP in Hainan. Two counties were visited, Baisha and Ledong. In Wentou village, Baisha, 15 out of the total of 18 farm households are experimenting with forages. Farmers have expanded stylo 184, *Brachiaria* hybrids and *Panicum maximum*. Although two years ago there seemed a lot of potential for intensive goat feeding in the village, there are now only two farmers with goats. The forages are more commonly fed to rabbits, pigs and buffaloes. In the other village Zhi Zhong, in Ledong county, mostly stylo 184 was adopted, *Macroptilium gracile*, and some *Melinis minutiflora*. Farmers produce forage seeds for sale. Some farmers fed forages to buffaloes, chickens and ducks. The forage areas per farmer were much larger in Ledong (up to 0.5 ha) than in Baisha, but in Baisha more use was made for animal production purpose. The two systems differ a lot; the villages would benefit from key farmers of each village visiting each other and evaluating each other's forage systems.

When farmers were asked about the impacts of forages, many mentioned benefits such as higher reproductive rates of animals, and higher farm incomes. When specifically asked about environmental impacts, farmers couldn't answer. It might be a bit too early to assess impact of a forage project that has just started on-farm about two years ago in China. Farm land is generally flat, so forages on contours would have little effect on soil and water conservation. However, two farmers in Ledong answered that forages had negative impacts. One farmer said that manure of buffaloes pollutes the water and kills young fish. Another farmer said that cultivation of stylo causes low soil fertility. These are interesting observations and should be taken seriously. Excessive manure in a small pond could pollute the water, but the opposite scenario is likely to be more common. In fact, many farmers in Southeast Asia use manure of livestock to fertilise the water, since this stimulates populations of water insects that serve as feed for fish. In the case of stylo, it adds nitrogen to the soil, but it might deplete the soil of phosphorous and potassium, if all biomass is removed and no manure returned. If these are the limiting elements, the farmers might have a good case. Farmers in Ledong seemed to have less knowledge about multiple use of forages, and optimal management systems. Field workers here need to organise farmer training sessions to address a variety of issues (**Action: Zhou**). Farmer cross visits to other places will expose farmers to new practices such as fertilising fish ponds with manure. Some farmers in Ledong plant stylo in young mango orchards or rubber plantations for the purpose of weed control, soil improvement and feed supply.

Workplan

Yi and I reviewed research activities planned for 2002 in Hainan. I reminded Yi that some experiments have been going on for more than 2 years, but no updates on results have been submitted. Although the practice at CATAS is to analyse and report everything at the end of a project, in the case of FSP it is required that we have a progress report every 6 months. The design of the experiment on shrub legumes had been modified taking my recommendation into account; four species and accessions have been planted in blocks rather than lines, to minimise competition among species, caused by roots and shading of the more aggressive species. The four species and accessions are: *Flemingia macrophylla* (2 accessions), *Leucaena leucocephala* (Salvador?) and *Cratylia argentea*. Harvest data have been collected of the original trial on many trees and shrubs, but they have not been analysed yet. Nutritive analysis was not carried out because of temporary breakdown of equipment. Yi plans to have data of this experiment analysed and reported before the end of July (Action: Yi).

Although the climatic and soil conditions are very good for *Gliricidia sepium*, it is a virtually unknown plant on the island. It has a lot to offer to farmers as they are requesting species that can form live fences to protect their forage plots. CATAS started some multiplication plots with mixed results; the trees don't produce seeds, and the cuttings don't root. I suggested to use bigger cuttings, at least 3 cm in diameter, and at least 50 cm long, and planting them at least 15 cm deep.

A preliminary report on the evaluation of 22 accessions of *Stylosanthes guianensis* was written in Chinese. The report covers productivity and anthracnose resistance of 7 early flowering varieties. *S. guianensis* GC 1578, *S. guianensis* cv. Reyan No.5, and *S. guianensis* GC 1576 are the most promising accessions after one year of observation. Yi and I translated the report in English. It can be obtained from Yi or me upon request.

FSP-Hainan experienced problems with on-farm evaluation of forage species. The objective of obtaining yield and dry season performance data, was not achieved. Farmers did not record data, and when technicians came to assist, forage was already harvested and used before they came. These are not unfamiliar problems with on-farm experimentation. If we require data from farmers, we need to discuss with them about the objectives and methods. I discussed one method with Yi:

- Reduce the number of farmers from 15 to 5 enthusiastic ones.
- Focus on King grass and *Leucaena leucocephala* for live fencing, and forage production.
- Demarcate a length of 5 m of King grass and 5 m of *Leucaena*, with 5 replicates. Ideally, each farmer has both species.
- Discuss with the farmers that the demarcated 5 m should not be used for regular feeding. Instead, farmers need to harvest the 5 m lines every 2 months during the rainy season and every 3 months during the dry season. Fresh biomass yields needs to be weighed, separated into edible and woody material, and recorded in individual farm record sheets. Farmers would receive a small salary for this equivalent to the wage for labourers for half a day, for every harvests and recording. For the first harvest, the farmers would need assistance from FSP technicians.

Another experiment with farmers intends to observe stylo intercropped in young fruit and rubber plantations. Ground cover and fodder yield can be recorded by technicians. We discussed methods to measure effect on soil fertility. One practical way is to demarcate

small plots (4 x 4 m) on a farm where stylo has been grown for 2 or 3 years, clear the plot and grow a crop of maize or upland rice in the plot. Grain yield or total biomass needs to be recorded. At the same farm, a similar plot needs to be cultivated on an area where no stylo was previously cultivated. The yields of the two plots would give an indication of the effect of stylo on soil fertility. The experiment needs to be repeated on 5 farms, in the same village, during the same season (**Action: Yi**).

In Wentou village, there are two farmers with more than 15 rabbits, and two farmers with goats. They can be assisted with animal feeding trials. On every farm, two or three goats or rabbits need to be fed with a mixture of improved grass and legumes, and two or three goats or rabbits need to be fed with natural vegetation. Liveweights and time needed for harvesting fodder need to be recorded regularly. Farmers can be compensated by FSP for the lack of weight gain of slower growing animals (**Action: Yi**).

People met

Professor Chen Quibo, Vice President of CATAS and SCUTA

Dr. Zhou Jiannan, Dep. Director and Ass. Professor, Foreign Affairs Office, CATAS

Dr. Li Kai Mian, Deputy Director, Tropical Field Crops and Animal Husbandry Research Institute, CATAS

Dr. Liu Guodao, Associate Professor and Director, Tropical Field Crops and Pasture Research Institute

Mrs. Zhang Ying Cui, Associate Professor, Institute of tropical and Subtropical Cash Crops, Yunnan Academy of Agricultural Sciences.

Mr. Yi Kexian, Associate Professor, Tropical Pasture Research Centre

Mr. Zhou Hanlin, Assistant researcher, CATAS

Mr. Tang Jun, Assistant researcher, CATAS

Appendix 5. Trip report Daklak, Vietnam, 19-21 August 2002

Peter Kerridge

Field visits were made to M'Drak and Ea Kar districts on 19 August and discussions held with Truong Tan Khanh on 20 and 21 August on workplan achievements and his thesis research. It had been raining heavily for a week before the visit and prior to this there had been a dry spell following the commencement of the rains in May with many crops suffering drought stress. We briefly visited a cross section of 12 farms, impassable roads prevented visits to some areas.

M'Drak District was a focus site in the initial FSP project (1996-1999), and though many farmers were evaluating forages by 1999, a large impact was not evident, in part, because cattle still had access to large areas of natural grazing land. Cattle were valued for the manure they produced and improved forages allowed farmers to stall cattle and collect this manure, often for sale. In addition, farmers were reporting benefits of having improved forages for allowing cows with calves to be kept near the house, and for sick animals. Some poorer farmers, with little land and no labor for herding cattle on natural grazing lands, were actively planting areas of improved forage. At this stage, most forages were grown in smaller plots and cut and fed to cattle.

In the new phase (2000-2001) funded by ADB, greater emphasis was placed on dissemination to new areas, monitoring and evaluation, impact studies, and some applied research on specific topics that had arisen as a result of earlier experience, 1995-1999. This report follows the workplan being implemented for the several components in the project.

1. Continuing development of forage technology

The main species being used in the continuing evaluations are *Brachiaria brizantha* and *B. decumbens*, *B. ruziensis*, *Panicum maximum*, *Paspalum atratum*, *Arachis pintoi*, Stylo 184, *Gliricidia sepium* and *Leucaena leucocephala*.

There has been a large change in management in M'Drak from utilizing forages for 'cut-and-carry' to grazing. A limitation with grazing is that fences are desirable but still too expensive for many small farmers; hence they tether the cattle. Cattle grazing improved pasture that contained some legume blocks were in very good condition. Another change has been an increase in the use of planted forages for feeding fish, and to a lesser extent, pigs. Farmers who are cutting forages for feeding fish are fertilizing the grass as there is a need for more feed.

Evaluation is continuing in the following areas:

i) *Use of Arachis for grazing.* *Arachis pintoi* has established and persisted well under grazing. Four farmers in Cu Roa commune, M'Drak, with access to larger areas of natural pasture and larger herds (15 cattle) favor *Arachis* over Stylo 184 and other grasses. This is because it is palatable all year round, and produces high amounts of forage, whereas the Stylo 184, which is not so palatable in the wet season, tends to dominate. The grasses did not establish or persist in these particular natural pasture areas. The vigor of *Arachis* was variable at different sites at the time of the visit, in some situations it was green and vigorous and in others was still yellow and appeared to be recovering from the dry season.

ii) *Sowing strips of improved pasture in natural grassland in comparison with full replacement.*

Different species were sown separately, that is with no close association of grass and legume. That is, for both systems there are separate blocks of grasses and legumes, which are commonly grazed. This has resulted in overgrazing and disappearance of the more palatable and higher fertility demanding *Panicum maximum*. *B. brizantha* and *B. decumbens* are the preferred grasses for grazing; *B. ruzienisis*, producing poorly during the dry season. *Paspalum atratum* is not very palatable and tends to become rank and ungrazed in the wet season although farmers remarked it was the most productive grass in the dry season. Both Stylo 184 and *Arachis* persist well. Stylo 184 is highly valued as a dry season feed but is grazed less in the wet season. It is interesting that Stylo 184 has persisted well in blocks under continuous grazing where there is also access to grasses. Stylo 184 dominates the area where it is sown. In some cases seed has washed down slope and it has become established in *Brachiara brizantha* plots. Sowing Stylo 184 in blocks seems a good method of managing the legume rather than sowing in association with a grass where it may either dominate with less vigorous grasses or not compete with the more vigorous ones. It is recommended that associations, i.e. mixtures, of *Arachis* and the brahiarias should be evaluated where the forages are grazed.

Experience with the method of establishment varies with different farmers. Farmers with smaller areas of land, and with no access to natural grassland, prefer complete replacement of the native grassland, dominated by *Imperata*, to sowing in strips. Those with larger areas consider strip planting is preferable. The movement of grasses and legumes beyond the strips is being measured. The results are quite variable. The reason is not immediately clear but would appear to be influenced by the intensity of grazing. In all cases, establishment was poor where the sown species were not protected initially from grazing (3 months protection from grazing was the time period evaluated).

iii) *Evaluation of Stylo 184 and Arachis as cover legumes in coffee.*

Stylo 184 is the preferred legume as it is easier to manage. Farmers utilize it for feeding livestock, mostly pigs. It is used for making leaf meal or sometimes fed green. It is easy to cut, regenerates quickly, controls weeds and soil erosion. Farmers find that where they grow stylo they do not need to renew the circle hollows around coffee trees used for irrigation. The only problem that occurs is where farmers did not cut the stylo, it could cover the coffee trees.

Few farmers expressed an interest in continuing with *Arachis* as a cover crop. It establishes very quickly, assisted by the fertilizer and irrigation applied to the coffee. It is good for control of erosion and weeds but is difficult to cut large quantities for feeding and very difficult to eradicate.

iv) *Demonstration of using tree legumes.*

The use of *Gliricidia* was successfully demonstrated in an on-station experiment but the idea has not been adopted by farmers. There are already large amounts of leucaena in Ea Kar, where it has been used as a shade for coffee and support for pepper. There are plans to work with farmers in feeding this leucaena to cattle in association with roughages. A *Bauhinia* species, similar to that which occurs in the forest in Laos, was growing well at the university and could be multiplied and evaluated on-farm for dry season feeding.

v) Fattening cattle

Three fattening demonstrations have been established in Ea Kar, one on a better-off farmer, one with a farmer in the poor wealth group and one with minority villager. The idea is that farmers purchase cattle in poor condition, keep them for 3 months and then sell them to other farmers or the abattoir. There have now been 3 cycles but data was not seen. We visited the better-off farmer who is growing improved grasses and legumes between his pepper. He had previously been a cattle trader and was obviously an astute buyer and seller of cattle. This farmer has a total area of 6000 m² on fertile soil, 5000 m² planted to pepper.

vi) Feeding experiment

Cross-bred cattle, 8-10 mth old and 160 kg liveweight, were fed different rations over 3 months to compare the cost of alternative feeds for fattening. These liveweight gains are rather low for cross-bred cattle (Drought master, Red Belmont), which might be expected to gain 1 kg liveweight/day.

Treatments	Cut grass consumed kg/day	Concentrate consumed kg/day	Liveweight gain kg/day	Profit/head/ day Dong
Stall fed only, grass and concentrate fed day and night	17	3.9	0.75	-200
Grazing during day, and mixture of grass and legume (1/3) fed ad lib + 0.5 kg concentrate at night	8.6	0.5	0.54	4000
Grazing during day + 0.5 kg concentrate at night	0	0.5	0.38	3800
Grazing during day + grass and concentrate fed ad lib at night	5.8	1.25	0.56	3700

Cost cut grass - 200 Dong/kg; concentrate, 1500 Dong/kg; 1 USD = 15,500 Dong

vii) New brachiarias

These had only been planted two months on a farmer's field, on fertile soil, and were being supervised by a student doing practical training. There were no outstanding differences between the various varieties and accessions, all being well established and leafy. A suggestion is to increase the areas of new brachiarias, as material becomes available, and continue to evaluate over an extended time for seasonal dry matter production and seed production.

2. Dissemination

Dissemination of the improved forage systems, developed in the focus villages in M'Drak during 1996-1999, was commenced in 2000 in M'Drak district and in an adjacent district, Ea Kar. M'Drak is one of the poorest districts with 30 percent minority population and with extensive natural grasslands. Ea Kar has more intensive agriculture and was chosen because it is adjacent to M'Drak and thus convenient to organize farmer-to-farmer visits. In 2002, dissemination activities are now taking place in 5 Districts, many of which include communes with minority groups.

During the first phase of the project, 1995-1999, Khanh and university colleagues worked directly with the leaders of the focus communes in M'Drak. However, when there was a need to go into a program of extension in the ADB-funded project, then the University handed over responsibilities for dissemination to the Extension Service, providing technical support and assisting in conducting courses. However, the

University has continued to take the lead in applied research and locates students in the communes to provide support and gain experience.

Targets are set at the request of ADB and included in the workplan for each major FSP site. Khanh has set up a separate contract and workplan with the head of the extension service in each district with agreed targets for numbers of communes in which the project will work and the number of farmers. However, targets are not set for the number of PD's and field days. District heads provide a short monthly report and a full report of all new farmers and areas of forages planted every three months.

The following are some comments on the new districts where dissemination has taken place since 2000.

Ea Kar. Forages were first introduced in Cuni commune, Ea Kar, following a visit and rapid PRA by Truong Tan Khanh, Ralph Roothaert and Peter Kerridge in March 2000. This was followed by farmer-to-farmer visits to farmers in M'Drak and a training course in using participatory approaches for introduction of forages for the three district extension staff in June 2002. The Head of the Extension Service in Ea Kar, Nguyen Van Ha, was a participant and has become a strong advocate of a demand-driven approach and the use of improved forages for livestock improvement. Some interesting points in forage development are:

- Forages were being evaluated just as coffee prices were falling rapidly (Daklak is the main producer of coffee in Vietnam). Increasing livestock production was seen as an alternative enterprise providing diversification. On many farms, even on the more fertile soils, it was observed that coffee has been taken out and replaced with maize and forages.
- Farming is more intensive than in M'Drak and there is not much natural grazing land.
- The introduction of forages commenced with farmer-to-farmer visitation and demonstrations of forage species for which planting material was provided.
- Farmers interested in evaluating forages have to purchase seed or stem cuttings from other farmers. The main species options being disseminated to farmers are *B. brizantha*, *P. maximum*, *P. atratum* and Stylo 184 (*B. decumbens*, *B. ruzizensis*, *Setaria* and *Gliricidia* were initially offered but not widely adopted)
- The priority for use of improved feed are for cattle and fish, and then secondly, for pigs and goats. Grass is the sole feed for carp other than some concentrate when fingerlings are small. Pigs are fed meal made from stylo or guinea, the meal often being cooked, while some stylo is fed green.
- Dissemination activities are being carried out in all 10 communes and 2 towns of Ea Kar with some 300 farmers officially associated with the project. In Cuni, where the forage activities commenced, some 40 farmers are growing forages, 8 specializing in selling stem cuttings and 2 in producing seed. Other communes with larger numbers of farmers growing forages are Ea kmouth, Xuan Phu and Cu Hue.
- Forage areas are 300 m² to 6000 m² mainly under a 'cut-and-carry' system
- Presently there is a large business in selling cuttings both to farmers inside and outside the Province.
- Farmers are being encouraged to produce seed of Stylo at US12/kg, which should result in an appropriate local production technique being worked out.
- Wide publicity has been given to forages through farmer-to-farmer and extension-farmer visits, television, simple leaflets on management and publicity boards being erected where farmers are evaluating forages.

Buon Don. Selected to link with the Conservation Park Project with the idea of ensuring that there is viable development around the Park. One of three communes is from a minority group (Ede)

Cu Jut. The Provincial Office of DARD, requested the project work in this district as it is an area for livestock production close to Ban Ma Thout city.

Krong Pak. The ENDA project requested involvement as they are involved in providing credit to farmers, in this case a minority group.

Buon Ma Thout district. The University were asked to assist after a Fish Company collapsed. The FSP is involved in growing forages for fish while other specialists from Tay Nguyen university are providing assistance in other fields.

3. Multiplication

As mentioned previously, considerable attention is being given to vegetative multiplication more than 30 tons of grass cuttings being produced for sale (One farmer sold enough cuttings to buy two head of cattle). This multiplication is done individually though with assistance of the extension service or project in marketing large quantities of cuttings.

Seed production is in its infancy as there has not been any technical input. However, farmers are being provided an incentive to produce seed with a price of \$12/kg. Some farmers are getting good recovery of seed from Stylo 184 but have not worked out a technique to readily separate seed from soil. It was suggested that they try a method using centrifugal action or a fan that would propel the seed further than the sand particles, e.g. as used in cleaning rice seed.

Some farmers are successfully producing Stylo from cuttings by planting directly into the soil. One woman we spoke with said there was no problem provided that the cuttings were watered daily, hence required a lot of labor. It may be worthwhile adopting the technique used to strike tree cuttings with misting created under a plastic shelter.

One technique that has been observed on several farms was to make efficient use of scarce seed of grasses and legumes by planting the seed first into a seedbed and then transplanting.

4. Training

Training continues to be a major part of the overall activities. 600 farmers have been trained in association with field day activities. A workshop was held for Provincial, District and University staff in which the morning session was devoted to talks about technical aspects of forage production and the afternoon session devoted to short talks by extension agents and farmers to the Provincial and University staff.

5. Communication activities

The main communication activities originate from the District Extension Office. Some of these are broadcast to Provincial and even National audiences. This has resulted in Districts, other Provinces and even private companies requesting input from project staff.

6. General observations and comments

6.1 Progress and Process. There was strong political pressure for the FSP and the Tay Nguyen University to be involved in the large scale cattle production company project when the project commenced in 1995. The project resisted saying it wanted to work with small farmers. The cattle project, which achieved some success in the multiplication and distribution of cattle has ceased operations but the forage systems being developed by small farmers are now stabilising and spreading.

Progress was slower in M'Drak than expected, and the project staff considered both the technology and the use of participatory approaches were fragile and needed continued mentoring. Initially, the farmers who had large numbers of cattle expressed an interest in improved forages. But they found that the amount of forage they could plant (up to 2000 m²) involved too much work in cutting and was not enough for grazing. The rate of adoption only increased as forages began to be used for more intensive purposes, feeding fish, feeding to cows with young calves, providing night time feed when animals were stalled, in particular, for those with fewer animals and without the resources to look after animals under grazing.

Although there was some reluctance to move to Ea Kar, in this district, where agriculture is more intensive, forage adoption was more rapid. It also coincided with having staff who were now well trained and with more confidence. However, even in Ea Kar, there was initially pressure to introduce forages through a model farm in each commune. Khanh resisted this pressure and encouraged larger numbers of farmers to evaluate forages. Success with this latter approach led to a change in thinking by policy makers on how to introduce new technologies.

In typical gesture of appreciation, extension heads in M'drak and Ea Kar said they were very thankful to the project and when asked why said:

- i) they were shown a new method of working with farmers,
- ii) for training of district staff in forage technology, and
- iii) an alternative and viable new enterprise for farmers

Some suggestions made to the Extension staff were:

- i) that they should still consider improved forages as a complementary feed resource to crop residues, natural forage (including trees)
- ii) As more farmers wanted to introduce forages, more use should be made of experienced farmers as farmer extensionists.
- iii) avoid the temptation to proceed to the development of a dairy industry without full analysis of the consequences.

On the University side, there has been a considerable achievement in handing over the main responsibilities to Provincial and District staff, but maintaining involvement in technical input and training.

The University has found it more effective working with the Extension than the Agriculture Sections in DARD. Also whereas extension in Districts was previously managed from the Province, there has now been change to where Districts now have the responsibility for setting their own plans and paying district staff.

6.2 Publicity. The publicity of forage activities in Daklak on national TV resulted in Khanh being asked to be a consultant on forages for dairy cattle production in Ho Chi Minh. Ea Kar district organized the sale of 30 tons of grass cuttings to HCM in 2002 and there is a firm contract for another 20 tons in 2003. Seed is also under contract, at Dong 2m/kg (USD13/kg -surprising considering it could be bought from Thailand for \$5.00/kg plus freight). Advisors of foreign-financed projects have been making extended visits to Daklak to look at experience in introducing forages to farmers.

6.3 Financial input. The project has made a large impact with little financial input. In fact it was so small in the earlier phase (of the order of \$1500-\$2000/year) that

University officials discouraged collaboration. The current input is some 10 times as much and considered adequate.

6.4 The farmers. The Project is now working with a wide range of farmers, including those from minority groups. This will be very important in the next project as the focus will be on improving livelihoods and not just forages and livestock production.

6.5 Demand There is now a large demand to go into livestock production not only from the viewpoint of diversification but also in the market. The cattle price doubled last year in Daklak is now 25,000 Dong/kg liveweight for laisin (crossbred cattle) and 20,000 Dong/kg liveweight for normal yellow cattle. As a result of the high price of livestock and the need to sell cattle to pay for debts incurred in going into coffee production, livestock numbers decreased from 120,000 to 87,000 in the province. There is a real danger that too many young females may be being slaughtered.

6.5 Additional comments from farm visits. The enthusiasm of farmers and extension staff is noteworthy. Extensionists allowed farmers to tell of their own experience. Farmers showed a remarkable degree of perception of the merits of different grasses and legumes and on management. Many would make excellent farmer extension workers. Some of them have the maturity and experience to contribute as members of an agroenterprise facilitation unit.

Farms where forages were being planted had diverse enterprises, coffee, irrigated rice, maize, cassava, fruit trees, cattle, pigs, fish

Research areas: We discussed several areas where more applied research is needed

- Aim to get more legumes into forages grown for cattle fattening
- Continue to introduce and demonstrate the use of shrub legumes, including leucaena which is grown on the better soils and the indigenous *Bauhinia* (that is growing in the University grounds)
- Plant some demonstrations of mixtures of *Brachiaria* and *Arachis* under grazing
- Compare advantage of different widths of strips sown in natural grassland
- Continue with evaluation of new *brachiarias*
- Work with particular farmers on measuring and increasing yield of stylo seed production
- Analyse data on cattle fattening demonstrations in Ea Kar

Personnel met during the visit;

M'Drak District

- Nguyen Van Thieu, Head of District extension
- Le Thi Tuyet
- Tran Thi Nghiem

Ea Kar District

- Nguyen Van Ha - District Head of extension
- Hoang Corg Nhien - extensionist
- Mr Hong, Secretary, People's Committee

Farmers - Cu Roa Mrs Phuong, Mr Dang,

Mrs Buon, Mr Ty, Mr Su

Tay Nguyen University

Truong Tan Khanh - Project Manager and lecturer in Animal Nutrition
van Tien Dung - Coworker of Khanh and lecturer in Animal Nutrition

Appendix 6. Trip Report Tuyen Quang, Vietnam, 22-24 August 2002

Peter Kerridge

The visit was made with Mr Le Hoa Binh of the National Institute for Animal Husbandry, Hanoi, who is national coordinator for the Forages for Smallholders Project.

The Forages for Smallholders Project (1995-1999) began evaluating forages in Tuyen Quang in 1997 in association with the Provincial Department of Agriculture and Rural Development and the Vietnam-Swedish Mountain Development Project under the local leadership of Mrs Vu Hai Yen, a livestock officer. There was widespread adoption of forages by small farmers, in particular, for feeding fish. Forage technology development, dissemination, multiplication, training and network activities have continued under ADB funding of the RETA project - "Developing Sustainable Forage Technologies for Resource-Poor Upland Farmers in Asia". Ralph Roothaert recently organized for a consultant, Roel Bosma, to undertake an analysis of the financial and social benefits of new forage introduction and subsequent technology changes. The survey suggests that 2-4 years after adoption of new forage systems, the mean income for ruminants and fish increased from 97,000 to 254,000 VND/mth/household member (USD6-17). This report will be available from Dr. Roothaert. The successful development of integrated forage systems on smallholder farms is most likely one reason that led to the recent importation of 780 pure bred Friesian-Holstein cows (in calf) from Australia as a nucleus for a dairy industry. However, many consider this is being done too rapidly as there is no prior experience of handling pure bred temperate dairy cattle in the hot humid tropics in this Province.

In Tuyen Quang, field visits were made to two sites where the imported Friesian-Holstein cattle are being housed in Yen Son district and to some small farmers in Phu Lam commune in the same district. Discussions were held with Mrs Vu Hai Yen and Mr Le Hoa Binh about progress and plans for project activities in the remainder of 2002. Mrs Yen has been given the main responsibility for looking after the imported dairy cattle and this limits the time she can spend directly with the FSP project. Also discussions were held with officials of the provincial office of DARD and Mr Bui Huu Vien, Secretary, Yen Son District Communist Party, a veterinarian, who appears to be overseeing the establishment of the dairy industry in Yen Son.

There had been extensive flooding in Tuyen Quang town the previous week but farm activities were not much disrupted. As there have been several other visits by project staff and other visitors to Tuyen Quang this year, this report will concentrate more on achievements that have been made in relation to the FSP workplan.

1. Continuing development of forage technologies

The following activities are being carried out in 2002:

i) *Evaluation of Stylo 184, S. hamata, V. unguiculata, Wynn cassia, Arachis pintoi as covers.*

The 5 legumes were planted by 5 farmers in Aug/Sep 2001. The district extensionist collects notes from farmers. The following table summarizes the information obtained.

Criteria used by farmers	Stylo 184	S. hamata	Vigna	Wynn cassia	Arachis
Cover	***	***	****	***	***
Leaf production	***	**	***	*	**
Vigor	***	**	***	**	**
Palatability	***	***	*	**	***
Seed production	*	***	****	***	*
Regrowth	**	*	*	*	**

* poor, **average, ***good, ****excellent

Farmers have said they are most interested in increasing the Stylo 184 and *Vigna unguiculata*. Wynn cassia produces too little green fodder.

ii) *Introduction of shrub legumes for shade, and in boundary areas as fence lines*

Five farmers are comparing *Gliricidia*, *Leucaena* and *Calliandra*.

Criteria used by farmers	<i>Gliricidia</i>	<i>Leucaena</i>	<i>Calliandra</i>
Establishes quickly	**	*	*
Vigor	***	**	**
Leaf production	***	**	**
Seed production good or easy to multiply	*	***	*
Palatability	*	***	**
Good for use in fence lines	***	**	*

Farmers prefer the *Gliricidia* and *Leucaena* because the *gliricidia* is easy to establish from stem cuttings and cattle do not damage it. *Leucaena* is considered good because of higher palatability and high seed production which makes it easy to expand. With *Calliandra*, growth is slow and there is low acceptability; seed production is low and so it is hard to multiply.

We noticed *Erithrina* spp. being grown by several farmers as a fence line. It has spines so the animals do not damage it and leaves can be fed to animals. It establishes easily by cuttings. One farmer has *Erithrina* and *Gliricidia*, and likes both of them.

A suggestion is to produce a leaflet on the use of shrubs for use in fence lines and for animal feed. Yen also says one is needed for Stylo 184.

iii) *A study of the natural feed resource in the forest reserves as a complimentary feed to improved forages*. This study is being carried out by a lecturer from Thai Nguyen University under supervision of Ralph Roothaert. A report is not available yet.

iv) *Selection of forage species for pigs and fish*

Five farmers are evaluating 4 feed sources for pigs while another group are evaluating improved grasses for fish production.

Evaluation of feeds for pigs

Criteria	Stylo 184	<i>Ramia bohemeria</i>	<i>Trichantera gigantea</i>	Sweet potato
Pig				
Growth	***	***	***	***
Leaf production	**	***	***	***
Palatability	**	***	**	***
Multiplication	*	***	***	***

Sweet potato is used more by farmers than the other species as they can use the root, stem and leaves. *Ramia* has dual use as some farmers dry and use or sell at 20,000 VND/kg) for making glutinous rice cakes for festival occasions. *Trichantera gigantea* is useful because it can grow under shade of fruit or other trees.

The reason for replacement of traditional green feed by Stylo 184 or other forages for pig production is not clear. Roel Bosma noted that farmers did not notice any effect on production and labor saving is not as clear as in the case of cattle and fish. One farmer, Mrs Lan, preferred Stylo 184 to sweet potato for the reason that she could grow it on steep slopes and it helped in conserving the soil. She also concentrates on beef production and can use the stylo for both cattle and pigs.

Evaluation of feeds for fish

Farmers have chosen improved forages for fish production because of the time saved in collecting the feed (1/3 of the time required) and because the higher quality can result in larger fish being produced more quickly. While cassava leaf is fed for fish production, grass is easier to produce and available on continuous basis. More people are expanding fish production now they can grow improved grasses. Fish production is becoming more intensive. Farmers are now keeping 700 or 1000 fingerlings whereas only kept 500 were kept previously. It was mentioned that the same thing was happening in Ea Kar in Daklak Province. Tuyen Quang officials said it was because the district extension leader there, Mr Ha, had come to a training course in Tuyen Quang and had transferred the idea to Ea Kar!!

This evaluation (see table) is essentially assessing farmers preferences for different improved forages. Farmers seem to prefer the *Panicum* for fish production and are expanding this more than the other species. A few farmers are expanding *Paspalum* because of good dry season production but few will expand *Setaria* or *Brachiaria* for fish production.

Criteria	<i>Panicum</i>	<i>Paspalum</i>	<i>Setaria</i>	<i>Brachiaria</i>
Growth	***	***	**	**
Leaf production	***	***	***	**
Palatability	****	**	***	*
Multiplication	****	***	**	*
Floats on surface of water	***	**	***	*

v) Utilization of maize for feeding cattle

Maize is normally planted in January February for feeding in March and April. However, for feed production in the dry season, October to March, it will be planted in the lower areas where more moisture is available. It can be planted after rice is harvested. It can

be harvested 60 days after planting. This year 50 ha was planted with maize for feeding cattle. Farmers like it because utilization is very high and it is an alternative feed in the drier and cooler times of the year. Also seed is cheap and easy to produce. Young corn cobs can be eaten or sold for consumption.

vi) Observations from farmers on value of forages for feed, in particular, with respect to quality and on relation between area of forage planted and livestock production.

In discussions with Mrs Lan, a key farmer who coordinates a forage working group, she said that she only plans to keep four cows. She initially received one cow and has produced five offspring in 4 years, one from the first heifer calf. She sold one bull and will sell any offspring in future. Four breeding cows can be supported on 6500 m² improved forage (5000 m² pure forage plots and another 1500 m² estimated to be planted in odd areas around the farm) plus occasional access to forest land. The cattle only graze in the forest land when the children and others have time to herd them there.

There is other information that 500 m² forage is required for 2000m² fish pond.

vii) Monitoring and Evaluation

Almost 100 farmers in Yen Son and Son Duong districts are involved in the M&E exercise being supervised by Ralph Roothaert and Jindra Sampson. They have been visited once in March/April, are keeping records and will be visited again in October when the data will be given to the project coordinator. **(Binh and Yen to follow up)**

2. Dissemination of forages in Tuyen Quang.

Probably the more important point to note here is that forages are being adopted spontaneously by new farmers without the intervention of the district extension service. There are probably more farmers adopting and multiplying forages than being recorded by District Extension staff.

The 'village' working groups, that were initially set up in 1997, but which have gradually expanded their activities are likely to be an important element in not only dissemination but in assisting new farmers, purchasing inputs, and even marketing. Mrs Lan, a key farmer and leader of a working group in Phu Lam commune, accompanied us on a visit to various farmers in the commune. One better-off farmer, who has buffalos, and is now planting forages with the thought of fattening cattle, said that he would rely on those with more experience in the working group to assist him in buying his cattle. Other farmers are being contracted to produce feed for the imported dairy cattle that are still being held on state farms. This is being done by extension workers through the forage working groups. It would be interesting to undertake a survey of how these groups have developed and what are the potential roles for these groups. There are other working groups on fruit trees and forestry and they appear to operate independently of the state. However, in the case of forages there is some minimal support given to the key farmers who lead the group and the group for activities. I can sense that Mrs Yen has more interest in working with farmers through these groups than in having to look after imported dairy cattle on state farms! It would be useful to write a short paper on the functioning of these working groups **(Binh and Yen to follow up)**

Activities to be completed under Dissemination this year include:

- i) a description of species and forage systems in those communes or villages where forages are well established and

ii) a summary of the exchange of ideas that takes place during farmer visits. Mrs Yen plans to do this when older farmers visit new groups of farmers during visits to be organized later this year. **(Binh and Yen to follow up)**

3. Multiplication activities

The amount of vegetative planting material produced for sale so far this year was 10 ton in Yen Son, 3 ton in Son Duong and 6 ton in Ham Yen district. Additionally, a considerable amount of cuttings are distributed informally between farmers. It is interesting that whereas Tuyen Quang and Daklak used to estimate the amount of material as individual sets, it is now by weight. For Panicum, there are 15 triplets/kg kg and for Paspalum 30 cuttings/kg or sufficient for 10 holes. Price received varies between VND1500-2000/kg.

So far, seed has only been produced from *Vigna unguiculata* to date (23 kg).

4. Training

So far, 12 training events were held for farmers which were attended by 400 persons. Further training events are planned in forage agronomy and animal management.

The training course for technicians will now be held in early October. There will also be a training course for farmers in seed production in October. **Mr Binh proposes to assist Mrs Yen** in both these events.

Mrs Yen plans to attend the English course in Laos from October-November provided that Mr. Vien gives final permission.

5. Networking

There have been delays in making reports on time to the project coordinator. Mr Binh agrees that it is his main responsibility to obtain information from the site managers and send to the coordinator. This is particular important in the case of Mrs Yen who cannot communicate clearly in English.

6. General observations

i) Visit to see the imported Friesian-Holstein cattle

There obviously have been considerable problems with the cattle adjusting to the new conditions. I did not ask about mortalities but there are still a considerable number of animals in poor condition and a large number of abortions have occurred. However, the housing conditions, the feeding system and the attendance to the cattle is of a high standard, much better than I have seen in other situations in Asia where such cattle were imported. There is no doubt that this new endeavor is receiving high priority and adequate investment. Persons have been brought from other areas in Vietnam where there are dairy cattle to assist in training staff and overseeing the daily routines. The cattle will be maintained on these state farms for the present and only later on will there be distribution to small farmers. The main problem will be the cattle coping with the high humidity and temperature.

I suggested that it might be more economical to use cross-bred animals because of the higher risk of mortality with pure bred cattle. There was no disagreement but the aim seems to be to go with the purebred cattle for government stations and breeding purposes. I saw from leaflets that they aim to import semen from the US and Canada.

Mr Vien plans for 10,000 head of dairy cattle in Tuyen Quang by 2005. There is talk of a linkage with Nestle for marketing but no serious discussions have been held yet.

2. Rations

The ration is based on Napier grass (42 days) with some guinea (35 days) which looks much higher quality. Napier was said to weaken under a shorter cutting period.

Average daily rations (kg)

	Milking animals	Pregnancy Phase II	Pregnancy Phase I
Grass	48	48	44
Concentrate	3	1.2	0.8
Cassava	2	2	0.7
Molasses	1.5	1.5	1.0

The concentrate I saw had only 15% protein, with max fiber of 10% and moisture of 13%.

I suggested that the concentrate may be a bit low in protein, that they may need to increase the energy fed to give high milk yields, and that they should be feeding concentrate on performance. I recall that Atherton dairy farmers in Queensland achieved 15 l/milk/day on very high quality kikuyu/desmodium pasture and lifted this to 25 l/day with concentrate. However, 42 day old Napier with lots of stem and high moisture is probably far inferior to a high quality legume grass mixture. My estimate would be that it probably only provides energy for 10+ l/day. What is your experience Carlos?

Whatever, this burgeoning dairy industry is going to dominate cattle production in Tuyen Quang for a while. It was interesting when I asked Mrs Lan and some other farmers were they interested into going into milk production, they said NO thanks.

2. Visit to small farms in Phu Lam

I asked to see farmers that I had not visited before. However, the situation was very similar to those farms we saw during Doug Pachico's visit. Forages are well established, farmers are confident in handling them. More farmers are becoming interested in cattle fattening (yellow cattle) though growing grass for fish is still very important. Farmers want some diversification but not too much. For example, Mrs Lan is replacing some rice and maize fields with forages for cattle fattening. There is more of an interest being taken in feeding legumes, in particular, leucaena.

Some new farmers are growing forages specifically to sell for the dairy cattle (VND 150/kg). And they are doing this on waste and border areas or under trees. This suggests that there may be some scope for specialization in the future, e.g. farmers raising dairy heifers or growing legume concentrates as is now being practiced in Thailand.

3. Discussions

I propose to write a separate memo on observations for start up of the new Agroenterprise and IFAD projects but a few comments.

Province

Mr Vu Do, Vice Director, DARD and Mr Tanh, Head of Technology Development, were very supportive of the new Agroenterprise Project and asked questions on how it might operate. I mentioned that we would be looking for persons to attend an Agroenterprise course to be held in Ho Chi Minh City in March, and that we would be prepared to support an appropriate person to attend an English course in Laos in November. (Binh suggested a Mrs Phouang who worked previously with the Sida project).

Yen Son District

Mr Bui Huu Vien, Secretary, Yen Son District Communist Party, made some general comments other than in relation to the dairy cattle. He favors agriculture development that is more specialized rather than the present diversified farming. Hence dairying and tea production on separate farms. Some communes might be encouraged to specialize in particular commodities (reminiscent of what is being discussed in Thailand wrt sub-district production units). Working groups would be set up for business. He did indicate there were many minority communes but did not offer any solution to these. They are aware that there will need to be more land allocated in minority villages.

CIAT is likely to have 3 projects operating in Tuyen Quang and I had thought that it might be a good idea to operate out of the Yen Son district office. However, my current feeling is that it may be better to locate in the provincial office. There is room available.

FSP

Le Hoa Binh will follow up with and assist Yen in seeing that the workplan targets are achieved.

Appendix 7. Trip report Cambodia, 6 - 10 October 2002

Ralph Roothaert and Rod Lefroy

Objectives:

To identify national partners in Cambodia for the implementation of the new ADB project: 'Improving Livelihoods of upland farmers using participatory approaches to develop more efficient livestock systems'.

People met:

Terry O'Sullivan, CAAEP, Phnom Penh
Eric Craswell, CARDI Assistance Project, Phnom Penh
Grahame Hunter, HCS, Phnom Penh
Cham Phaloeun, CARDI, Phnom Penh
Hun Yadana, CARDI, Phnom Penh
Seng Vang, CARDI, Phnom Penh
Som San, NAHPIC, Phnom Penh
Khieu Borin, UTA and DAHP, Phnom Penh
Sen Sovann, Deputy Director DAHP
Marie Kim Leng, IRRI, Phnom Penh
Luot Phuong, Director, DAFF, Battambang Province
Lex Freeman, CAAEP, Battambang
Ouk Chheng, CAAEP, Battambang

Summary

We had talks with representatives of the Cambodia Australia Agriculture Extension Project (CAEEP), University of Tropical Agriculture Fdn. (UTA), Cambodian Agricultural Research and Development Institute (CARDI), and the Department of Animal Health and Production (DAHP). All four organisations have strengths and weaknesses, and there is no ideal partner that could implement the project alone. Our preferred option is a combination of CARDI and CAEEP, but CARDI's manner of collaborating with partners needs to be closely mentored. A feasible alternative would be DAHP with CAEEP. Possible focus sites are in the northwest (most likely the provinces of Battambang and Banteay Meanchey, but possibly parts of Pursat and Siem Reap), and in the south (in the provinces of Kampot, Kampong Speu, and/or Takeow). The more isolated and poorer areas in the northeast, near Rattanokul, and the more difficult areas of annually inundated land around the Tonle Sap lake could be introduced later. There are good possibilities to link with development projects of ADB, World Bank, and IFAD.

CAAEP, Phnom Penh, 7 Oct.

We had a meeting with the team leader of Cambodia Australia Agriculture Extension Project (CAAEP), Terry O'Sullivan, who briefed us on the background of his project. CAAEP is funded by AusAid and works in 13 provinces, which are located in the lowlands around the Tonle Sap lake and river, the Northeast and the South. It is estimated that 90 % of Cambodia's population lives in these 13 provinces.

Provinces in Cambodia consist of about 7 districts each. There are about 8 communes per district, and every commune consists of several villages.

The rest of the country (about 75 % of the land in 8 rural provinces) is forest or deforested land, thinly populated, and vastly deprived of infrastructure and government facilities. CAAEP's main objective is to strengthen the national extension system, to pave the way for innovations to reach the rural poor.

The low lands of Cambodia are often flooded for a duration of several months a year (Sept – Nov). Farmers normally produce one crop of rain fed rice per year, and cultivate vegetables on residual moisture. The nation is largely self sufficient in rice, but doesn't export any agricultural products.

Cattle suffer during the time of rice cultivation, when crop residues have been consumed, and rice fields and bunds are not available for grazing. Cattle and buffaloes are in poor condition at the time when they are needed for ploughing. There is a private farm south of Phnom Penh (Kampot province) that buys cattle from the lowlands, fattens them, and exports them to Malaysia.

The World Bank has approved funding of US\$ 10,000 for each commune that is able to develop a 'Commune Development Plan' or "Siela", which is part of a devolution process that needs to be incorporated into district profiles and provincial plans. The 'Agricultural Production Improvement Programme (APIP) of the World Bank covers agronomy (not much has happened), soils, administration and livestock.

ADB will contribute US\$ 8 million loan starting in 2004 for the provinces where CAAEP operates.

IFAD provides expenses for the field programme of CAAEP in six provinces, while AusAID covers the other 7 provinces and the technical assistance for all 13 provinces. Responsibility for the 13 provinces is covered by four extension advisors based in the provinces (2 to 3 provinces per person) and people in the main office in Phnom Penh. There are 86 districts, each with five field workers, who receive a supplementary salary and motorcycle allowance.

University of Tropical Agriculture Fdn. (UTA), 7 Oct.

Mr. Kieu Borin showed us the campus of UTA, which is located at the front of the Royal Cambodia University, 10 km out of Phnom Penh. Reg Preston, one of the founders, was abroad. UTA is conducting excellent research on animal nutrition and a bit on forage agronomy and biogas. It has 5 local MSc students at the moment, but room for 15. Computer aided programmes are an important focus of the training programme, and computer and internet facilities are well developed. UTA depends on other universities to issue degrees. Ongoing experiments include forages such as cassava leaves, mulberry, rice straw, *Ipomoea aquatica*, palm oil, fish meal and rice bran. Feeding trials are conducted with cattle, goats, pigs, ducks and chickens. Rather innovative research was conducted on breeding fly larva for poultry feed. It was interesting to note that goats could feed on 100% fresh cassava leaves, local or commercial varieties, without any toxic effects from HCN precursors. There could be detoxifying micro-organisms present in the rumen.

UTA is strong in research but doesn't have any contacts with farmers or extension organisations. They have a small, but effective laboratory.

CARDI, 8 Oct.

The Cambodian Agricultural Research and Development Institute (CARDI) has seven key programmes: plant breeding, soil and water research, agricultural engineering, plant protection, agronomy and farming systems, socio-economics, and training and information. CARDI was established to conduct research on rice related topics. The present vision is to diversify, and one of the priorities is to acquire expertise in animal science. Management is thinking of recruiting a scientist in this field, who would then join the 'agronomy and farming systems (AFS)' programme. The head of AFS, Ms. Phaloeun, had some reservations about starting research on forages in her programme. She had seen failures of previous projects, which over sowed communal areas and roadsides with forages, which gradually deteriorated. In her own research she found that there were no good niches for forages in the rice based system, and that seed supply was a major bottle neck. However, we were able to discuss the potential for those areas that were bordering the upland systems, where farmers would have both rice fields and small portions of higher land, on which their homes were normally located. Ms. Phaloeun indicated that Kampot or Kampong Cham Provinces would be appropriate places to locate the ADB project. The first has high density of people and cattle, and farmers are a bit richer than elsewhere. The latter has high numbers of cattle, and a large proportion is upland.

CARDI has satellite stations in Preah Vihear and in Pailin. Neither of these have offices built on them yet, nor do they appear to have high potential for collaboration with the project.

Department of Animal Health and Production, 8 Oct.

Ralph met with Dr. Som San, Chief of the Investigation Centre of DAHP. The centre has 22 staff, all vets. They are currently involved in production of animal vaccines and animal health programmes, and have few activities in animal production. They are very keen to engage more in animal production research, but operational funding is lacking.

Mekong River Commission, 8 Oct.

Rod visited the MRC to discuss prospects for MRC involvement with the Water Challenge Programme. In a very brief exchange with the CEO, Joern Kristensen, it was clear that the Water CP did not feature very large on the MRC agenda, although he would meet with Frank Rijsberman the following week at the Water Dialogue meeting in Hanoi. Other discussions were held with Mok Solieng (regarding the proposals developed during the January MRC-CGIAR meeting), Steve Carson (on the Basin Development work and chances of links to the Water CP – which seems unlikely), and Robyn Johnstone (regarding the Water CP and access to data collated by MRC). With Robyn's assistance, a request for a copy of the MRC core dataset was initiated.

CARDI-AP and other HCS projects

We met with Eric Craswell, the project leader of the CARDI Assistance Project, and Grahame Hunter, the project director of AQIP, CARDI-AP, and CAAEP. The CARDI-AP project is an AusAID funded project aimed at capacity building within CARDI, in management, administration, and research. CARDI-AP runs a small project, the Cambodia Agricultural Research Fund (CARF) with funds from ACIAR, which assesses

research project submissions from Cambodian researchers and provides small research grants. If this system of identifying and funding research projects works well, there is a possibility that ADB (and later other donors) may provide funds directly to CARF, as a partial alternative to developing projects in-house. As capacity building and diversification are aims of CARDI-AP, they have indicated they could provide on-the-ground support for the new ADB project within CARDI, and Grahame added that CAEPP could do the same in the field.

CAEPP, Battambang, 10 Oct.

There are four provinces in the Northwest that are targeted for 'pilot participatory community planning': Pursat, Battambang, Vianteay Meanchey, and Siem Reap. Two new ADB funded programmes will start here: Northwest Irrigation Sector and Northwest Rural Development. CAEPP phase I had carried out some development activities with forages such as stylo 184, paspalum, napier, guinea, wynn cassia, desmanthus and clitoria. CAEPP distinguishes two classes of poor farmers: the poor and the poorest. In addition to advice, CAEPP provides inputs to the poorest farmers such as seeds, tools, and fertilisers. The other class of poor farmers are involved in activities to improve rice production, and get basic advice on pig and poultry production.

The Agricultural Extension Program Advisor, Lex Freeman, showed us a forage nursery and a forage production plot near the Extension and DAHP offices in town, and took us on a field trip. *Leucaena Taramba* (synonym of K636) and hybrid KX2 were planted at the nursery. They had overcome seed production problems of KX2 by marcotting, with 100 % success rate. Propagation by direct cuttings was only successful during the rainy season. At the forage production plot of the provincial office of AHP, we saw a show case of a well functioning fodder bank for cut and carry, based on napier var. Mott, intercropped with desmanthus, centrosera, stylo, and clitoria. Plots of guinea and leucaena were also present. Desmanthus was at its best, and regenerating through profuse seed shedding, and resprouting well from cut plants.

At Kampongchelong village, a farmer called Rendrad show us her forage plot with napier cv. Mott, leucaena Taramba and guinea, which she had planted a month ago. She had not fed anything to her cattle yet, but she had protected the plot with an old fish net, because her chickens were eating the forage. This observation led us to the opportunities of forage production for chickens and pigs. Her main crop was rice (~6t from 2ha: enough for her family and some for sale), but she also had an orange orchard, vegetables, sweet potato, and flowers. The main animal protein is fish from the river of purchased – chicken is rarely eaten, but sold to buy fish. Orchards are very common in the area, and were covered with natural grass. Legumes in orchards would be a niche, benefiting both crops and livestock.

We visited an advanced pig farmer with 30 sows who had his own feed mill. Composed feed consisted of locally purchased maize, rice bran, and dried fish, and imported packets of minerals and vitamins; *Ipomoea aquatica* was fed as a supplement. He cultivated rice, flowers, *I. aquatica* and vegetables. He was interested to grow forages that could reduce his feed costs, and he also needed more advise on the ideal ration formulation for pigs.

Strategies for implementation of ADB - RETA 'Livelihood and livestock systems project'

Option 1

CARDI would be a logical partner in Cambodia to implement the RETA project; it is well recognised within Cambodia as its national institute for agricultural research. Its other advantage is that it has wide experience with on farm research, and we expect that the institute is familiar with participatory approaches. CARDI appears a bit reluctant though to collaborate with other national institutes or organisations, but we think that it is an area that CARDI will inevitably have to deal with, if they want to implement their new approach for businesslike operation and diversification of research. Eric Craswell, who advises on CARDI's management capacity building, is willing to strongly facilitate CARDI's relations with partners.

The national coordinator of the RETA project for Cambodia could potentially be someone of the AFS programme of CARDI, perhaps a newly recruited animal scientist, on CARDI's payroll. It would be an advantage to have a link with CAEEP, to be able to use the well developed network of field workers. CAEEP is in agreement, although they expect some inputs in return from RETA in the form of capacity building for their field staff. They are interested in using the forages handbooks and translating them into Khmer.

It would also be advantageous to have a link with UTA, as they can provide good expertise in animal production research. A possibility that was discussed was to provide scope for UTA students to do their practical on-farm work through CARDI and CAEEP.

Option 2

An alternative would be to give the national coordinator ship to DAHP. They have the mandate to work with field staff, and they have good links with CAEEP. It would provide them with sources to finally implement research on animal production, which they have long been eager to do. However, the focus of DAHP, and the experience and training of most of the staff is in animal health, not production.

Option 3

Although more complicated in terms of the number of partners, another possibility is that the project is located with CARDI, but with strong links to DAHP (both nationally and in the provinces), with the Department of Extension, through CAEEP, and with strategic inputs from UTA. This could work if CARDI is enthusiastic, and CARDI-AP and CAEEP management are willing to keep a careful eye on the management.

Focus sites

Suitable focus sites for the project are:

- Northwest region – in the four provinces of Battambang and Banteay Meanchey, Pursat and Siem Reap, many farmers have small areas of uplands that would be appropriate for forage production. In addition, in some of the steeper areas,

particularly in Banteay Meanchey, forages have been used effectively in soil conservation

- South and SSW of Phnom Penh – in the provinces of Kampot , Kampong Speu and Takeow, there is potential for slightly larger areas of forage production, particularly in Kampong Speu, where many farmers have grazing areas at a distance from their rice production areas. In Kampot there is greater commercial animal production.

Lower priority areas:

- Northeast – this area is poorer, has a greater number of ethnic groups, a lower population density, and poor infrastructure. While this is closer to the focus of CIAT it will be a difficult area in which to work, especially as none of the national partners have worked in these areas.

There would be advantages in having two focus sites, at least at an initial stage, to increase the chances for identifying the place with highest potential for integrating forage option in smallholder upland systems. From the very start of the project there will be a need for intensive phase of participatory diagnoses and planning, in villages with different farming systems.

Appendix 8. Common and botanical names of forages mentioned in text

Botanical name	Common name
<i>Andropogon gayanus</i>	Gamba
<i>Arachis pintoi</i> CIAT 22160	Arachis
<i>Brachiaria brizantha</i>	Brizantha
<i>Brachiaria decumbens</i> CIAT 606	Signal
<i>Brachiaria dictyoneura</i>	
<i>Brachiaria humidicola</i> var. Yanero	Yanero
<i>Brachiaria humidicola</i> var. Tully	Tully
<i>Brachiaria ruziziensis</i>	Ruzi
<i>Calliandra calothyrsus</i>	Calliandra
<i>Centrosema macrocarpum</i>	Centrosema
<i>Centrosema pubescens</i>	Ucayali
<i>Cratylia argentea</i>	Cratylia
<i>Desmanthus virgatus</i>	Desmanthus
<i>Desmodium rensonii</i>	Desmodium
<i>Flemingia macrophylla</i>	Flemingia
<i>Gliricidia sepium</i>	Gliricidia
<i>Gliricidia sepium</i> accession Retalhuleu	Retalhuleu
<i>Leucaena leucocephala</i> variety K 636	Leucaena K636
<i>Leucaena trichandra</i>	Leucaena trichandra
<i>Morus alba</i>	Mulberry
<i>Panicum maximum</i>	Guinea
<i>Panicum maximum</i> CIAT 6299	Tobiata
<i>Panicum maximum</i> T 58	Purple guinea
<i>Paspalum atratum</i> BRA 961	Paspalum
<i>Pennisetum purpureum</i>	Napier
<i>Setaria sphacelata</i> - Nandi	Nandi
<i>Setaria sphacelata</i> var. <i>splendida</i>	Splendida
<i>Stylosanthes guianensis</i> CIAT 184	Stylo
<i>Sesbania grandiflora</i>	Turi
<i>Sesbania rostrata</i>	
<i>Sesbania sesban</i>	
<i>Trichantera gigantea</i>	Trichantera

