ACHIEVEMENTS AND LESSONS LEARNED IN THE NIPPON FOUNDATION CASSAVA PROJECT IN ASIA

Reinhardt H. Howeler[1]

ABSTRACT

Towards the end of the first phase (1994-1998) of the Nippon Foundation project on "Enhancing the Sustainability of Cassava-based Cropping Systems in Asia", many farmers in the 2-3 project's pilot sites in China, Indonesia, Thailand and Vietnam had adopted the use of new cassava varieties, more balanced fertilization, planting of contour hedgerows of vetiver grass, *Tephrosia candida*, pineapple, *Leucaena leucocephala* or *Gliricidia sepium* to control erosion, while in Vietnam many farmers had started to intercrop cassava with peanut or black bean. The adoption of these practices, however, was still limited to rather small areas.

Towards the end of the 4th year of the second phase (1999-2003) of the project, adoption of the farmer selected improved practices is spreading like wildfire in the 50-plus pilot sites in China, Thailand and Vietnam, and beyond. In Thailand more than 865 farmers have now planted about 130 km of vetiver grass contour hedgerows in their cassava fields to control erosion in over 900 ha. Several communities have set up their own vetiver grass nurseries to supply planting material to those farmers that want to expand their hedgerows. Most farmers in those sites are applying chemical fertilizers high in N and K, and some are planting green manures or applying animal manures in addition to chemical fertilizers. Practically all cassava farmers are now planting new varieties, mainly KU 50, Rayong 5 and Rayong 90.

In Vietnam, new high-yielding varieties are now planted in about 1,244 ha in the 25 pilot sites, and in an estimated 90,000 ha nationwide. In addition, at least 689 farmers in the pilot sites are intercropping cassava with peanut or black bean in north Vietnam and mainly with maize in south Vietnam. Most farmers in the pilot sites have started to apply chemical fertilizers high in N and K, in addition to the traditional practice of applying pig manure. Moreover, 222 farmers have planted about 100 ha with contour hedgerows of *Tephrosia candida*, vetiver grass, pineapple or *Paspalum atratum* to reduce erosion.

In China, farmers are concentrating on the adoption of new varieties, but in some sites in Hainan, farmers have also adopted the planting of vetiver hedgerows to reduce erosion.

During the process of developing the methodology and implementing the project the following lessons were learned:

-Farmers base decisions about the adoption of new practices mainly on the ability of those practices to increase net income. Thus, soil conservation practices are seldom adopted by themselves, but only in combination with other practices that increase income. Trial results should thus be expressed in terms of realistic estimates of gross and net income.

-Some incentives in kind may be necessary and justified to achieve more widespread adoption of soil conservation practices that benefit both farmers and society at large.

-Farmers must first become aware of the extent of soil erosion and its impact on soil productivity before they will invest in soil conservation practices. The conducting of FPR erosion control trials on their own fields allows them to observe the extent of soil erosion and the effectiveness of various simple production practices in reducing soil losses by erosion.

-Farmers like to experiment with new varieties and new practices and are more than willing to help disseminate the improved practices to other farmers in their community and beyond.

-Local officials and community-based self-help groups should be active partners in the project.

-Training of researchers, extensionists and key farmers in the FPR approach is essential, and is a highly effective way to expand the project to new sites in order to reach more people.

[1] CIAT Regional Cassava Office for Asia, Dept. of Agric., Chatuchak, Bangkok 10900, Thailand.

INTRODUCTION

The Nippon Foundation supported cassava project in Asia started in 1994 with the objective to enhance the adoption by cassava farmers of soil conservation practices that would prevent or reduce erosion and make cassava production more sustainable. To achieve that objective the project used a farmer participatory research (FPR) approach, involving farmers directly in the development of location-specific erosion control practices that were not only effective in reducing erosion, but also easy to manage and to incorporate into the existing farming systems. The first phase of the project (1994-1998) was executed in close collaboration with research and extension institutions in China, Indonesia, Thailand and Vietnam. At the end of that first phase, many farmers in the pilot sites of the project had selected and then adopted the best new varieties, more balanced fertilizer application, various types of erosion control measures, and, in some cases, especially in Vietnam, intercropping with peanut or black bean.

In the second phase of the project (1999-2003), the FPR methodologies developed earlier were used in an increasing number of pilot sites, about ten in China and 20 each in Thailand and Vietnam for a total of about 50 sites. Expanding to new sites every year was possible by increasing the number of collaborating people and institutions in each country, and by training of more and more researchers, extensionists and key farmers in cassava production technologies and farmer participatory methodologies. **Table 1** shows that during the nine years of the project, from 1994 to 2002, 17 training courses were held for government officials at various levels, and for key farmers in the selected pilot sites, with a total of 560 people participating in these courses.

Table 1. FPR training courses conducted as part of the Nippon Foundation project from 1994 to 2002.

Country	Year	Type of training course	Location	Number of participants
China	1998	Researchers and extensionists	Danzhou	27
	2001	Researchers, extensionists and farmers	Danzhou	32
				59
Indonesia	1998	Researchers and extensionists	Malang	31
Thailand	1994	Training-of-trainers in FPR methodologies	Rayong	29
	1997	Researchers and extensionists	Paakchong	28
	1999	Researchers and extensionists	Prachinburi	28
	2000	Farmers and local extensionists	Huay Bong	51
	2001	Researchers and farmers on vetiver grass	Khaw Hin Sorn	47
	2002	Researchers and extensionists of LDD	Huay Bong	30
	2002	Farmers and local extensionists	Khon Kaen	31
				244
Vietnam	1997	Researchers and extensionists	Thai Nguyen	28
	1999	Researchers and extensionists	Ho Chi Minh	29
	2000	Farmers and local extensionists	Thai Nguyen	29
	2001	Farmers and local extensionists	Ho Chi Minh	24
	2001	Farmers and local extensionists	Hue	29
	2002	Farmers and local extensionists	Van Yen	53
	2002	Farmers and local extensionists	Hue	34
				226
Total number of participants				**560**

Implementation of the Second Phase of the Project

As indicated earlier (Howeler, 2007), the main objective of the second phase was to achieve widespread adoption of soil conservation practices as well as other practices that would increase farmers' yields and income in order to offset some of the costs associated with soil erosion control. To achieve this objective, the project had to expand rapidly to more sites, involve more farmers in conducting FPR trials and to focus more and more on effective ways to disseminate the farmer-selected technologies to more farmers outside the pilot sites, using various farmer participatory extension (FPE) methodologies. During the second phase the project is being implemented by three research institutions in China, five research and extension institutions in Thailand, and six research institutes and universities in Vietnam. In all three countries these institutes in turn worked closely with district and subdistrict (or commune) officials as well as with village leaders to implement the project and conduct the trials.

While initially farmers wanted to conduct FPR trials mainly on new varieties, fertilization, erosion control and intercropping, once those issues were resolved and the selected varieties and practices adopted, farmers also wanted to conduct FPR trials on chemical and organic fertilizers, green manures, weed control, plant spacing, leaf production, and even pig feeding with ensiled or dried cassava roots or leaves. **Table 2** shows that in the three countries during the first four years of the second phase of the project, farmers conducted a total of 910 FPR trials, mostly on new varieties but also many trials on erosion control and fertilization as well as on other topics of interest.

As the project expanded to new sites every year, the various steps in the FPR process – from problem diagnosis to evaluating a range of treatments in demonstration plots, to testing and evaluating in FPR trials, and finally selecting the best practices for adoption (Howeler, 2007) – were repeated in each new site. But instead of working with individual farmers, it was found to be much more efficient to work with organized groups of farmers, such as the "Cassava Development Villages" in Thailand, or the district, commune or village committees in Vietnam and China.

Farmer Participatory Extension (FPE) Methodologies

While the conducting of FPR trials was becoming more and more efficient, the number of farmers that could be reached directly through this approach was still rather limited. The FPR approach needed to be combined with various methods of farmer participatory extension (FPE) in order to reach more farmers and disseminate the selected technologies more widely. Thus, farmers in the older sites became the "teachers" for those in the newer sites through various FPE activities, such as:

1. Cross-site visits

Farmers that had already conducted FPR trials and had already selected and adopted new varieties and production practices, would serve as hosts for farmers from new sites, explaining how they had done the trials, why they had selected certain treatments, and then show in the field the new varieties and practices that they had adopted. These cross-visits by farmers from new sites to older sites and the farmer-to-farmer extension was a very effective way of convincing those new farmers to conduct their own trials or to adopt

the farmer selected practices in their production fields. For instance, seeing the vetiver grass contour hedgerows growing in a farmers field and seeing the natural terraces being formed by these hedgerows is more convincing to farmers than listening to researchers or extension workers describe the benefits of the same practice in a small plot. Seeing the effectiveness of the hedgerows with their own eyes convinced many farmers to take home bundles of vetiver plants for multiplication in their own village and for future planting in their own fields.

Table 2. Number of FPR trials conducted during the first four years of the 2nd phase of the Nippon Foundation Project in China, Thailand and Vietnam.

Country	Type of FPR trial	1999	2000	2001	2002	**Total**
China	Varieties	9	9	20	69	**107**
	Erosion control	3	5	8	17	**33**
	Fertilization	-	-	-	4	**4**
	Intercropping	-	-	-	9	**9**
	Pig feeding	-	-	-	59	**59**
		12	**14**	**28**	**158**	**212**
Thailand	Varieties	11	16	16	19	**62**
	Erosion control	14	10	6	-	**30**
	Chemical fertilizers	16	6	23	17	**62**
	Chem.+org fertilizers	-	-	10	11	**21**
	Green manures	-	-	13	11	**24**
	Weed control	-	-	17	5	**22**
	Plant spacing	-	-	3	-	**3**
	Intercropping	-	-	16	7	**23**
		41	**32**	**104**	**70**	**247**
Vietnam	Varieties	12	31	36	47	**126**
	Erosion control	16	28	29	30	**103**
	Fertilization	1	23	36	24	**84**
	Intercropping	-	14	32	31	**77**
	Weed control	-	3	-	-	**3**
	Plant spacing	-	1	7	19	**27**
	Leaf production	-	-	2	2	**4**
	Pig feeding	-	-	11	16	**27**
		29	**100**	**153**	**169**	**451**
Total		**82**	**146**	**285**	**397**	**910**

2. Farmer field days

At the time of harvest of the FPR trials, a farmer field day is organized at the subdistrict, district or provincial level. At the subdistrict level, farmers from the village and surrounding communities are invited to come, see and evaluate the treatments in all the trials. Usually, the central part of each plot had already been harvested on the day before the field day, but the pile of harvested roots with a sign indicating the yield and starch content was left in the center of each plot. Farmers visiting the trial can note down the yields, and they were asked to score each treatment, based on their own criteria, as either 1 = very bad, 2 = OK or 3 = very good. After farmers have visited and evaluated treatments in all the trials, the average results of the trials, together with data on gross income, production costs and net income obtained for each treatment, are presented and discussed

with farmers. Finally, for each treatment farmers are asked to raise their hands to indicate if they consider the treatment "very good". The number of raised hands gives an indication which varieties or practices farmers consider most useful. **Table 3** is an example of the type of results presented and discussed, and the farmers' preferences for particular treatments. Based on these preferences farmers may want to retest some of the best treatments next year, or they may already start to adopt the selected variety or practice in their production fields.

Table 3. Effect of various crop management treatments on the yield of cassava and intercropped peanut as well as the gross and net income and soil loss due to erosion in a FPR erosion control trial conducted by six farmers in Kieu Tung village of Thanh Ba district, Phu Tho province, Vietnam in 1997 (3rd year).

Treatment[1)]	Dry soil loss (t/ha)	Yield (t/ha) cassava	Yield (t/ha) peanut[1)]	Gross income[2)]	Product. costs	Net income	Farmers ranking
				(mil. dong/ha)			
1. C monocult., with fertilizer, no hedgerows (TP)	106.1	19.17	-	9.58	3.72	5.86	6
2. C monocult., with fert., *Tephrosia* hedgerows	32.5	23.33	-	11.66	4.54	7.12	4
3. C+P, no fertilizer, no hedgerows	103.9	13.08	0.70	10.04	5.13	4.91	5
4. C+P, with fertilizer, no hedgerows	64.8	19.23	0.97	14.47	5.95	8.52	-
5. C+P, with fertilizer, *Tephrosia* hedgerows	40.1	14.67	0.85	11.58	5.95	5.63	3
6. C+P, with fertilizer, pineapple hedgerows	32.2	19.39	0.97	14.55	5.95	8.60	2
7. C+P, with fertilizer, vetiver hedgerows	32.0	23.71	0.85	16.10	5.95	10.15	1

[1)] Fertilizers = 60 kg N + 40 P_2O_5, + 120 K_2O/ha; all plots received 10 t/ha pig manure
TP=farmer traditional practice

[2)] Prices: cassava (C) dong 500/kg fresh roots
peanut (P) 5000/kg dry pods
1US$ = approx. 13.000 dong

Source: *Thai Phien et al., 1998; Howeler et al., 2001.*

If organized at the provincial level the field day may attract over a thousand visitors, including high government officials, many farmers from various districts, school children and newspaper or TV reporters. Farmers from the village where the field day is being held may explain the results of their own FPR trials or show how the selected treatments have been adopted in their field. Farmers may also be interviewed for newspaper reports or TV programs. This an excellent way to reach a large number of farmers and disseminate widely the importance of erosion control and other practices that can increase farmers' yields and income.

3. Cassava Development Villages

In Thailand the project could reach even more farmers by the setting up of "Cassava Development Villages", organized by the Dept. of Agric. Extension with Thai government funding. In those pilot sites where farmers and local extension workers were keen to participate in the project, the farmers were encouraged to organize a community-based self-help group, with at least 40 members, elect their own leaders, and design their own by-rules about members' duties and benefits. Once organized each "Cassava Development Village" received a certain amount of fertilizers to be used for cassava production by the members; the value of these fertilizers plus a small interest, need to be paid back to the managers of the village's rotating credit fund at the time of the cassava harvest. The money returned to the fund could then be lent out to others for the purchase of fertilizers or other production inputs the following year. By organizing these self-help

groups and training the local extension workers together with the groups' leaders it became much easier to reach a large number of farmers and to conduct a large number of FPR trials. Some of these "Cassava Development Villages" also established their own vetiver grass nurseries, so that vegetative planting material was always available when needed to plant more contour hedgerows.

4. Training of "FPR teams"

One way of increasing the efficiency of conducting the FPR trials is to train "FPR teams" in each pilot site. The team consists of a subdistrict extension agent and 2-3 key farmers of the village who are keen to participate in the project. Every year these teams from each new pilot site join a 4-day training course to learn about and discuss various cassava technologies, as well as farmer participatory methodologies and simple experimental techniques in order to help other farmers set out and conduct FPR trials. The various teams learn from each other and each team goes home with new ideas and with renewed enthusiasm to improve cassava production in their village.

5. Posters, booklets, pamphlets, videos etc.

Information about the new varieties or improved production practices can also be disseminated through posters, booklets, pamphlets etc.

A video about the farmer participatory approach, made by DOAE in Thailand, was also a good media to spread the knowledge about soil conservation practices, and the FPR and FPE approach used in the project. The video can be shown in farmers' meetings, to extension workers, and also in schools in rural communities.

Detailed descriptions of the implementation of the project in each country are reported by Watananonta *et al*. (2007), Vongkasem *et al*.(2007), Nguyen The Dang (2007), Nguyen Thi Cach *et al*. (2007), Tran Thi Dung and Nguyen Thi Sam (2007), Tran Ngoc Ngoan and Howeler (2007), Li Kaimian *et al*. (2007) and Tian Yinong (2007).

ACHIEVEMENTS

During the 4th year of the second phase of the Nippon Foundation project, many farmers in the pilot sites and far beyond had started to adopt some of the tested technologies.

In China, new varieties, mainly the breeding lines ZM 9057 and OMR 33-10-4, tested and selected by farmers in Kong Ba village and recently released as SC 5 and SC 6, respectively, are now widely grown in Hainan province, while the newly released varieties GR 891, GR 911, SC 124 and Nanzhi 199 were tested and are now widely grown in Guangxi province. The total area under new varieties is not well known, but is estimated at about 30,000 ha. Some farmers have adopted the planting of vetiver grass hedgerows to control erosion, but that practice is not wide-spread as farmers are not yet convinced that it will lead to increased yields and income (Li Kaimian *et al*., 2007; Tian Yinong *et al*.,2007).

In Thailand the area under new varieties increased from about 300,000 ha in 1994 (Rojanaridpiched *et al*., 1998) to about 1 million ha or 98% of the total cassava growing area in 2002/03. While the main "improved varieties" in 1994 were Rayong 3 and Rayong 60, in 2003 these had been largely replaced by Kasetsart 50, Rayong 5 and Rayong 90.

This rapid dissemination of new varieties was achieved through the efforts of many government and non-government organizations, especially DOAE and TTDI, but the Nippon Foundation project also contributed by the widespread testing of new varieties in FPR trials in about 20 pilot sites.

Moreover, by 2002, about 856 farmers had planted a total of 130 km of contour hedgerows of vetiver grass in 943 ha of cassava fields, while many farmers had adapted the use of NPK compound fertilizers, especially those high in K; some farmers applied chemical fertilizers in combination with chicken manure or they intercropped *Canavalia ensiformis* as a green manure (Vongkasem *et al.*,2007).

In 2002 a Participatory Monitoring and Evaluation (PM & E) was conducted in four pilot sites where the project had been active for some years. Using various farmer participatory evaluation techniques, farmers were asked to estimate the extent of adoption of various new technologies in their own cassava fields. **Table 4** shows that in all four villages new varieties had been adopted in 100% of the cassava area, chemical fertilizer use ranged from 79 to 100%; of the area; planting of vetiver grass contour hedgerows ranged from 20 to 55%; green manures from 0 to 50%; and intercropping had not been adopted at all as most farmers don't have the labor to attend to intercrops.

Table 4. Extent of adoption[1)] of various cassava technology components in four pilot sites in Thailand in 2002 as a result of the Nippon Foundation project.

Technology component	Baan Khlong Ruam Sra Kaew		Thaa Chiwit Mai Chachoengsao		Sapphongphoot Nakhon Ratchasima		Huay Suea Ten Kalasin	
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Varieties	480	100	469	100	396	100	228	100
Chemical fertilizers	480	100	469	100	364	92	180	79
Vetiver grass hedgerows	139	29	94	20	218	55	89	39
Green manures	72	15	0	0	0	0	114	50
Intercropping	0	0	0	0	0	0	0	0

[1)] Estimated by farmers in each site during Participatory Monitoring and Evaluation (PM&E) in Aug 2002.

Source: *K. Klakhaeng, personal communication, 2002.*

In Vietnam it is estimated that in 2002 new varieties, mainly KM 94, had been planted in 95,000 ha, corresponding to 33% of the total cassava area. **Table 5** shows how the adoption of new varieties and production practices in the project pilot sites increased year by year, especially the adoption of new varieties. By the end of 2002, 2,717 farm households had adopted new varieties in a total of 1,244 ha; over 1000 farmers had adopted the use of cassava root and leaf silage for pig feeding; 689 farmers were intercropping cassava with peanut or blackbean in 42 ha; 222 farmers were planting hedgerows of *Tephrosia candida*, pineapple, vetiver grass or *Paspalum atratum* to control erosion in about 100 ha; and 157 farmers were using more balanced fertilization in 26 ha. The total increase in gross income due to the higher yields obtained was 4,116 mil dong or US$ 274,400 or about $ 57.- per household (Tran Ngoc Ngoan and Howeler, 2007).

The adoption of new varieties and improved production practices can have a profound impact on cassava yields obtained and the farmers' net income. **Table 6** shows how the adoption of new technologies in Tien Phong village increased every year, resulting

in markedly increased yields and a tripling of the total net income from cassava in the community between 1994 and 2001, even though these new technologies had been adopted in less than 20% of the cassava area.

Table 5. Trend of adoption of new cassava technologies in the Nippon Foundation project sites in Vietnam from 2000 to 2002[1)].

	Number of households adopting			No. of ha	Increase in gross income
Technology component	2000	2001	2002	2002	(mil. dong)
1. New varieties	88	447	2,717	1,244	3,650
2. Improved fertilization	64	123	157	26	57
3. Soil conservation practices	62	200	222	99	118
4. Intercropping	127	360	689	42	143
5. Pig feeding with cassava root silage	-	759	1,027	-	148
					4,116 [2)]

[1)] Number of project sites: 1999 = 9; 2000=15; 2001=22; 2002=25
[2)] 4,116 mil. dong = US$ 274,400
Source: *Tran Ngoc Ngoan and Howeler, 2007.*

Table 6. Impact of the Nippon Foundation project on the livelihoods of farmers in Tien Phong village of Pho Yen district, Thai Nguyen, Vietnam.

			Cassava yield (t/ha)					
	No. of farmers	Cassava area (ha)	new varieties	Vinh Phu[2)]	Gross income	Product. costs	Net income	Total net income
					(mil. dong/ha)			(mil. dong)
1994[1)]								
Traditional	115	50		8.5	3.40	2.93	0.47	23.50
2000								
New varieties	25	1.31	30.9	21.5	15.46	4.36	11.10	14.54
Intercropping	37	2.59	29.3	-	18.70	5.16	13.54	35.07
Erosion control	4	0.20	24.7	-	14.59	5.46	9.13	1.83
Total	*66*	*4.10*						*51.44*
2001								
New varieties	89	4.70	28.5	22.7	14.26	4.36	9.90	46.53
Intercropping	40	3.38	26.2	-	16.94	5.16	11.78	39.82
Erosion control	4	0.20	-	-	-	-	-	1.83
Total	*133*	*8.28*						*88.18*

[1)] data from RRA conducted at the start of the project in 1994
[2)] traditional variety
Source: *Nguyen The Dang, personal communication, 2002.*

LESSONS LEARNED

After conducting the project for nearly nine years there are several important lessons that we have learned:

1. Farmers must become aware of the extent of soil losses by erosion and the effect on yield before they will adopt soil conservation practices. By doing FPR erosion control trials on their own fields, farmers can see with their own eyes how much soil is lost

every year, and how some simple agronomic or soil conservation practices can markedly reduce those losses.

2. Farmers are only interested in testing technologies that are clearly superior to what they are doing now. The combined use of high-yielding varieties with adequate fertilization, weeding and erosion control will often double or triple yields as compared to the traditional practices. Under those circumstances farmers will be keen to participate in the project and to help others in adopting these new technologies.
3. New varieties and other agronomic practices that increase yields are good entry points for the testing and adoption of soil conservation practices. Promoting only soil conservation is an uphill battle as farmers generally do not see the immediate economic benefits of those practices and are thus not interested in adopting them.
4. Researchers and extensionists should not recommend or promote any particular variety or practice; they should present farmers with a range of options and then let farmers choose; value their knowledge, culture and local experience.
5. Farmers base their decisions about adoption mainly on the potential economic benefits obtained. For that reason, the results of trials should not only indicate agronomic aspects like yield, starch content or soil loss, but also the estimated gross income obtained from selling the crop(s), the production costs of each treatment and the net income, as shown in **Table 3**. Based on those data, farmers can make intelligent choices.
6. Seeing the adoption of soil conservation practices in other farmers' fields is more convincing to farmers than listening to researchers or extension workers, or visiting researcher-managed demonstration plots.
7. Training of a large number of researchers, extension workers and key farmers is crucial for being able to extend the FPR approach to many sites and for achieving widespread adoption.
8. Local officials and community-based self-help groups should be actively involved in the project.
9. Some incentives in kind may be necessary to achieve wide-spread adoption of soil conservation practices; this is justified because these practices usually require additional labor or money while they benefit not only the farmers but also society at large.
10. A project like this should start small and then extend to more sites only after the methodology has been worked out, and after people have been trained and feel comfortable with the FPR approach.
11. The farmer participatory approach will become institutionalized only after administrators become convinced of its effectiveness. This can be achieved through seminars and workshops, but is most convincing when it is seen being practiced by farmers in the field.

REFERENCES

Howeler, R.H. 2007. Sustaining cassava farmers and our earth: background of the Nippon Foundation project in Asia. *In:* R.H. Howeler (Ed.). Cassava Research and Development in Asia: Exploring New Opportunities for an Ancient Crop. Proc. 7th Regional Workshop, held in Bangkok, Thailand. Oct 28-Nov 1, 2002. (this Proceedings)

Howeler, R.H., Thai Phien and Nguyen The Dang. 2001. Sustainable cassava production on sloping land in Vietnam. *In:* Proc. Workshop on Training, Research and Technology Transfer Needs

for Sustainable Development on Sloping Land in Vietnam, held in Hanoi, Vietnam. April 10-12, 2001. pp. 59-80.

Li Kaimian, Ye Jiangqiu, Huang Jie and R.H. Howeler. 2007. Farmer participatory research (FPR) in the Nippon Foundation cassava project in Hainan province of China. In: R.H. Howeler (Ed.). Cassava Research and Development in Asia: Exploring New Opportunities for an Ancient Crop. Proc. 7th Regional Workshop, held in Bangkok, Thailand. Oct 28-Nov 1, 2002. (this Proceedings)

Nguyen The Dang. 2007. Farmer participatory research (FPR) on soil erosion control and fertilizer use for cassava in Vietnam: 1999-2002. *In:* R.H. Howeler (Ed.). Cassava Research and Development in Asia: Exploring New Opportunities for an Ancient Crop. Proc. 7th Regional Workshop, held in Bangkok, Thailand. Oct 28-Nov 1, 2002. (this Proceedings)

Nguyen Thi Cach, Trinh Thi Phuong Loan, Huang Van Tat, Tran Ngoc Ngoan, Nguyen The Dang, Nguyen Viet Hung, Hoang Kim, Pham Van Bien, Nguyen Huu Hy, Vo Van Tuan, Thai Phien, Tran Thi Dung and Nguyen Thi Sam. 2007. Farmer participatory variety trials conducted in Vietnam. *In:* R.H. Howeler (Ed.). Cassava Research and Development in Asia: Exploring New Opportunities for an Ancient Crop. Proc. 7th Regional Workshop, held in Bangkok, Thailand. Oct 28-Nov 1, 2002. (this Proceedings)

Rojanaridpiched, C., S. Phongvutipraphan, P. Poolsanguan, K. Klakhaeng, V. Vichukit and E. Sarobol. 1998. Varietal improvement and dissemination by Kasetsart University, The Thai Tapioca Development Institute, and the Dept. of Agricultural Extension. *In:* R.H. Howeler (Ed.). Cassava Breeding, Agronomy and Farmer Participatory Research in Asia. Proc. 5th Regional Workshop, held in Danzhou, Hainan, China. Nov 3-8, 1996. pp. 55-68.

Thai Phien, Tran Duc Toan, Tran Minh Tien and Le Thi Dung. 1998. Management of cassava-based cropping systems on sloping lands in northern Vietnam. Annual Report for 1997 of the Nippon Foundation project. (unpublished)

Tian Yinong, Li Jun and Liu Jianping. 2007. Farmer participatory research (FPR) in the Nippon Foundation cassava project in Guangxi and Yunnan provinces of China. *In:* R.H. Howeler (Ed.). Cassava Research and Development in Asia: Exploring New Opportunities for an Ancient Crop. Proc. 7th Regional Workshop, held in Bangkok, Thailand. Oct 28-Nov 1, 2002. (this Proceedings)

Tran Ngoc Ngoan and R.H. Howeler. 2007. The adoption of new technologies and the socio-economic impact of the Nippon Foundation cassava project in Vietnam. *In:* R.H. Howeler (Ed.). Cassava Research and Development in Asia: Exploring New Opportunities for an Ancient Crop. Proc. 7th Regional Workshop, held in Bangkok, Thailand. Oct 28-Nov 1, 2002. (this Proceedings)

Tran Thi Dung and Nguyen Thi Sam. 2007. Farmer participatory research (FPR) trials on cassava intercropping in Vietnam. *In:* R.H. Howeler (Ed.). Cassava Research and Development in Asia: Exploring New Opportunities for an Ancient Crop. Proc. 7th Regional Workshop, held in Bangkok, Thailand. Oct 28-Nov 1, 2002. (this Proceedings)

Vongkasem, W., K. Klakhaeng, K. Srakaew, R. Sewatasai, W. Watananonta and R.H. Howeler. 2007. Farmer participatory extension (FPE) methodologies used in the cassava project in Thailand. *In:* R.H. Howeler (Ed.). Cassava Research and Development in Asia: Exploring New Opportunities for an Ancient Crop. Proc. 7th Regional Workshop, held in Bangkok, Thailand. Oct 28-Nov 1, 2002. (this Proceedings)

Watananonta, W., W. Vongkasem, K. Klakhaeng and R.H. Howeler. 2007. Farmer participatory research activities in the Nippon Foundation cassava project in Thailand. *In:* R.H. Howeler (Ed.). Cassava Research and Development in Asia: Exploring New Opportunities for an Ancient Crop. Proc. 7th Regional Workshop, held in Bangkok, Thailand. Oct 28-Nov 1, 2002. (this Proceedings)