IMPROVING THE SUSTAINABILITY OF CASSAVA-BASED CROPPING SYSTEMS IN ASIA: A FARMER PARTICIPATORY APPROACH TO TECHNOLOGY DEVELOPMENT AND DISSEMINATION

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OBJECTIVES

Cassava (*Manihot esculenta* Crantz) is the third most important agricultural crop grown in southeast Asia. It is an upland crop, generally grown by small farmers on poor soils and in areas with a prolonged dry season. When grown on slopes, even on very gentle slopes, it can cause serious erosion.

Research has shown that soil losses due to erosion can be markedly reduced by simple agronomic and soil conservation practices. However, these are seldom used by farmers as farmers may be unaware of the seriousness of soil erosion, they do not know how to control erosion, or they consider the recommended practices unsuitable, too expensive or too labor intensive. In order to develop the most suitable soil conservation practices for a particular region and to enhance their widespread adoption, a bottom-up approach was used, in which farmers participate in all steps of the process, from diagnosing the problem, suggesting and testing solutions on their own farms, selecting the most suitable practices and disseminating their experiences to other farmers. This is called Farmer Participatory Research (FPR) and Extension (FPE), also known as Farmer Participatory Technology Development (FPTD).

MATERIALS AND METHODS

A Farmer Participatory Approach

In this approach farmers are directly involved in all aspects of the process, from diagnosis, selection of promising options, testing those options on their own fields (FPR trials), selecting the most suitable treatments, scaling up to production fields and extending their experiences to other farmers (FPE). Farmers make all decisions, while researchers and extensionists facilitate the process and provide alternative options and germplasm for testing.

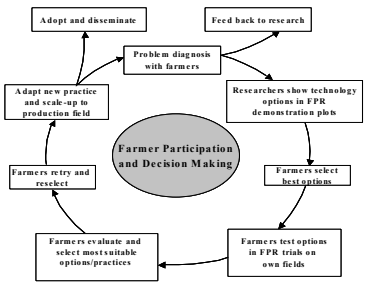

Figure 1. Farmer participatory model used for the development of sustainable cassava-based cropping systems in Asia.

Farmer selected practices are disseminated to other farmers by:

1. cross visits of farmers from new sites to those of older sites.
2. field days at time of harvest of FPR trials to evaluate and discuss the results.
3. large-scale field days with many participating farmers, school children, government officials and press/TV.
4. setting up of community-based groups to help each other implement the selected soil conservation practices.
5. pamphlets, videos, TV programs, newspaper articles, etc.

Partnerships

The project has been funded by the Nippon Foundation in Tokyo, Japan from 1994 to 2003. It is implemented by the CIAT Cassava Office for Asia in Bangkok, in collaboration with national institutions in Thailand, Vietnam, China and Indonesia.

Pilot sites

The first phase (1994-1998) of the project was conducted in 2-3 pilot sites each in Thailand, Vietnam, China and Indonesia; the second phase is being conducted in over 50 sites (villages) in Thailand, Vietnam and China.

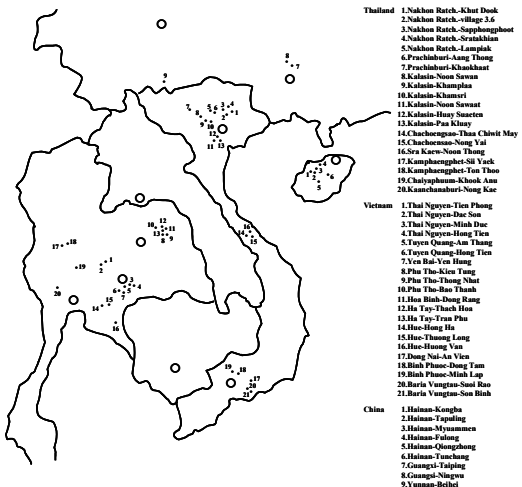

Figure 2. Location of FPR pilot sites in Thailand, Vietnam and China in 2001.

Conducting FPR trials

Soil losses due to erosion can be measured on farmers' own fields using a simple methodology; this involves installing of plastic-covered channels below each plot to trap eroded sediments, while runoff water is allowed to seep away through small holes made in the plastic. The sediments are collected and weighed, after which moisture content is determined to calculate the dry soil loss per ha in each treatment.

[1)]Plot border of sheet metal, wood or soil ridge to prevent water, entering or leaving plots.

[2)]polyethylene or PVC plastic sheet with small holes in bottom to catch eroded soil sediments but allow run-off water to seep away. Sediments are collected and weighed once a month.

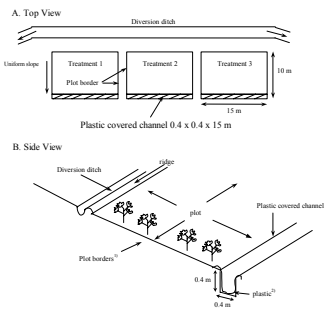

Figure 3. Experimental lay-out of simple trials to determine the effect of soil/crop management practices on soil erosion.

To get farmers interested in conducting FPR erosion control trials, and to develop an integrated package of suitable practices, other types of FPR trials are conducted in the community simultaneously, such as evaluations of varieties, fertilizers, green manures, intercropping systems, weed control, etc. (Table 1).

Table 1. Number and types of FPR trials conducted in 2001 in Thailand, Vietnam and China.

Type of trial	Thailand	Vietnam	China
Erosion control	6	30	8
Varieties	16	37	20
Fertilization	23	40	-
Intercropping	16	27	-
Plant spacing	3	8	-
Green manures	13	-	-
Organic manures	10	-	-
Weed control	17	11	-
Pig feeding	-	-	-
Total	104	153	28

IMPORTANT FINDINGS

1. With the help and encouragement from researchers and extensionists, farmers are capable and interested in conducting FPR trials on their own fields.
2. Practices selected by farmers from their FPR trials are effective and most suitable for the local bio-physical and socio-economic conditions; they also fit well in their current production practices. This enhances adoption.
3. Testing of yield-increasing technologies such as new varieties, fertilization and cost-effective weed control are good "entry points" for testing soil conservation practices, as the latter done in isolation seldom show significant short-term economic benefits.
4. By conducting FPR erosion control trials on their own fields, farmers become aware of the seriousness of soil losses due to erosion and realize that some simple practices are highly effective in reducing erosion and may actually increase yield or income.

5. A simple economic analysis of FPR trial results, including gross income, production costs and net income of each treatment is essential for enhancing adoption, as farmers base decisions about which practices to adopt mainly on their effect on net income
6. Farmer-to-farmer extension during cross-visits and field days is most effective in disseminating improved production practices.

ADOPTION

Table 2. summarizes which practices have been most widely adopted in the four countries where the project was conducted.

Table 2. Technology components selected from FPR cassava trials conducted from 1994 to 2002 and adopted[1)] by farmers in four countries of Asia.

Technology	China	Indonesia	Thailand	Vietnam
Varieties	SC 5 (ZM9057)*** GR 911** SC 6 (OMR33-10-4)** ZM8002*	Faroka*** 15/10* OMM90-672*	Kasetsart 50*** Rayong 72** Rayong 5* Rayong 90*	KM 94*** KM 98-1** KM 60* KM 98-7*
Fertilizer practices	chicken manure+ 15-5-20+Zn*	cattle manure 10 t/ha (TP)+90N+36P_2O_5+ 100K_2O*	15-15-15*** or 15-17-18* 312 kg/ha	Pig manure(10 t/ha) (TP)+80N+40P_2O_5+ 80K_2O*
Green manures	-	-	*Canavalia*	-
Intercropping	monoculture(TP) C+maize** C+peanut** C+melon/pumpkin**	C+maize(TP)	monoculture(TP) C+maize(TP)	monoculture(TP) C+taro(TP) C+peanut*** C+black bean*
Soil conservation	vetiver barriers** plastic mulch**	*Gliricidia* barriers** *Leucaena* barriers* contour ridging**	vetiver barriers***	*Tephrosia* barriers** pineapple barriers** vetiver barriers* *Paspalum* barriers*

[1)] * some adoption; ** considerable adoption; *** widespread adoption; TP = traditional practice

In 2001, 622 farmers in Thailand had planted a total of **123 km of vetiver grass hedgerows** to control erosion in cassava fields. In north Vietnam farmers continue to expand contour hedgerows of *Tephrosia candida* and pineapple, while in south Vietnam they prefer planting vetiver grass or *Paspalum atratum.*

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