PRACTICES AND PROGRESS IN FARMER PARTICIPATORY RESEARCH IN CHINA

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ABSTRACT

The FPR project in China is a cooperative project between CIAT and CATAS, and is financially supported by the Nippon Foundation of Japan. This paper mainly describes results of the FPR trials conducted in Hainan province of China and discusses the function of FPR in the transfer of cassava technologies, existing problems and future development prospects.

The project involves the following aspects of research: variety trials, soil and water conservation and fertilizer management. Contour barriers of tropical grass and legume species, and intercropping with peanut and other legume crops have been shown to be effective in protecting the soil from erosion. Results based on trials conducted at CATAS from 1995 to 1999 indicate that hedgerows of vetiver grass, *Clitoria ternatea, Chamaecrista rotundifolia, Indigofera endecaphylla, Arachis pintoi*, *Tephrosia candida, Ananas comosus* and *Brachiaria decumbens* decreased dry soil loss (5-30 t/ha) by 65-94%, compared to the check treatment which had a dry soil loss of 85 t/ha.

FPR trials conducted by farmers in their own fields indicate that cassava intercropped with peanut and planting vetiver grass as contour barriers was the best practice: dry soil loss decreased by 28-57% compared to the check treatment, and increased income by 3,300 Yuan/ha. This practice has been widely adopted by farmers in the pilot site of Kongba village in Baisha county of Hainan, and is being disseminated to neighboring villages by farmer-to-farmer extension.

During 1995-1999, more than 41 promising clones have been tested in 38 farmers' fields; they were harvested and evaluated by farmers themselves. Results show that SC8013 and OMR33-10-4 outyielded the check variety SC205 by 13.1% and 34.4%, respectively. However, there were no significant differences among varieties in terms of soil erosion control. It is very easy for farmers to select and adopt their favorate varieties through their own participation. This approach will enhance the dissemination of new varieties and technologies.

Fertilizer trials were conducted in 14 farmers' fields using 12 treatments. The results show that all the treatments with fertilizers produced higher yields than those without fertilizers, and that application of 300 kg/ha of a special fertilizer (No. 3) increased the yield by 33% and gross income by 22%. This result will help convince farmers to apply fertilizers to their cassava fields in the future.

INTRODUCTION

Since the 1970s farmer participatory research (FPR) has been used in many agricultural areas in the world, including farmer participatory research as well as extension. Researchers and farmers conduct a participatory diagnosis, select the experiments they want to do, they participate in the selection of treatments and conduct the trials, evaluate the research results and apply the selected technologies.

As part of the FPR project, funded by the Nippon Foundation in Japan and coordinated by CIAT, CATAS has conducted farmer participatory cassava research and extension in Kongba and Dapulin villages of Baisha county in Hainan, China since 1994.

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The objectives are to accelerate the development and extension of improved varieties and efficient cassava production practices through farmer participation, to reduce erosion, maintain soil productivity and increase the income of cassava farmers in China (Zhang Weite *et al*., 1998; CATAS/CIAT, 1998; Howeler and Henry, 1998).

FPR Methodologies

A Rapid Rural Appraisal (RRA) was conducted in Hainan by CATAS and CIAT in Aug 1994. The main causes of low cassava yields in Hainan were identified to be the existence of only few and old varieties, insufficient application of fertilizers or FYM, extensive cultivation and serious erosion. From the RRA we selected Kongba and Dapulin villages in Baisha county, Hainan, to conduct farmer participatory research during 1995-1999. We organized a farmer training course and farmer fields days at CATAS, mainly to train farmers in FPR methodologies and cassava production technologies. Farmers also visited several cassava variety trials, the long-term fertilizer trial and the erosion control demonstration plots at CATAS.

Farmers selected the type of trials themselves. They were most interested in new varieties, in fertilizer application and in erosion control. CATAS provided technical assistance and supplied the basic planting materials. All trials had only one replication, and usually had the same treatments, so different farmers could be considered as replications. Not only the collaborating farmers but also other nearby farmers were invited to participate together in FPR planting and harvests, assessing the farmers' opinions about cassava yield, intercrop yield, dry soil loss etc. in the FPR trials. Farmers would then select the best improved varieties or other treatments to be included in next year's trials.

Demonstration plots on erosion control at CATAS

Tropical pastures, peanut and other legume crops have been used as barriers or intercrops for protecting the soil from erosion in demonstration plots laid out on 5-10% slope in CATAS from 1996 to 1999. **Table 1** indicates that vetiver grass, *Clitoria ternatea*, *Chamaecrista rotundifolia*, *Indigofera endecaphylla*, *Arachis pintoi*, *Tephrosia candida*, pineapple and *Brachiaria decumbens* CIAT 606 were all very effective in decreasing soil loss by erosion. Dry soil loss (5-30 t/ha) decreased by 65-94% compared to the check treatment (85-107 t/ha). Some of these treatments became more effective in controlling erosion over the years.

Vetiver grass contour barriers were found to be very effective in reducing erosion in cassava fields. However, vetiver has two limitations: it can not be used to any great extent as animal feed, and its vegetative propagation is costly and cumbersome. To overcome these problems, a preliminary trial on the use of various grasses for erosion control barriers was installed at CATAS during 1998/99 in order to evaluate the competition between cassava and the grass. Preliminary results, shown in **Table 2**, indicate that vetiver grass, lemon grass and hybrid elephant grass might be recommended for erosion control barriers.

FPR Erosion Control Trials

There were a total of 27 farmers participating in 17 erosion control trials in cassava fields during 1995-1999 (**Table 3**). Three kinds of treatments were used: 1) only intercrop,

Table 1. Demonstration plots on erosion control conducted on 5-10% slope at CATAS during 1996-1999.

	1996			1997			1998			1999			Average	
Treatments[1)]	Dry soil loss (t/ha)	Root yield (t/ha)	Inter crop yield (t/ha)	Dry soil loss (t/ha)	Root yield (t/ha)	Inter crop yield (t/ha)	Dry soil loss (t/ha)	Root yield (t/ha)	Inter crop yield (t/ha)	Dry soil loss (t/ha)	Root yield (t/ha)	Inter crop yield (t/ha)	Dry soil loss (t/ha)	Root yield (t/ha)
Check, no hedgerows	106.5	24.2		85.2	30.8		85.6	25.3		97.8	19.9			
*Lablab purpureus**	83.6	14.2	1.30[2)]	45.2	32.2	0.10[4)]								
*Canavalia ensiformis**	42.9	11.8	1.60[2)]	33.0	28.4	0.08[4)]								
*Phaseolus aureus**	74.6	14.2	1.84[2)]	28.5	32.6	0.08[4)]								
*Crotalaria mucronata**	127.4	11.8	0[3)]	50.2	17.5	0[2)]								
*Indigofera endecaphylla**	77.5	13.0	0.24[4)]	76.4	29.8	0.10[4)]				24.4	24.0	0[2)]		
*Clitoria ternatea**	83.3	10.5	0[2)]	28.5	30.4	0.10[4)]	15.2	26.4	0[4)]	14.6	28.7	0[2)]	35.4	24.0
*Chamaecrista rotundifolia**	107.6	23.0	0[3)]	38.1	27.8	0.12[4)]	45.4	23.1	0[4)]	17.3	23.1	0[2)]	52.1	24.3
*Stylosanthes guianensis**[5)]	74.1	14.2	0[3)]	36.9	24.3	0[2)]	31.4	23.4	0[2)]	18.4	21.6	0[2)]	40.2	20.9
*Tephrosia candida**	158.0	15.5	0[3)]	46.7	20.6	0[2)]	13.0	19.4	0[2)]	20.5	22.0	0[2)]	59.6	19.4
*Desmodium ovalifolium**	152.8	16.7	0[3)]	46.8	22.8	0[2)]	44.9	21.2	0[2)]	34.1	21.4	0[2)]	69.7	20.5
Pineapple*	90.4	18.7	0.24[4)]	43.2	24.4	0[2)]	27.8	23.2	0[2)]	18.1	22.9	0[2)]	44.9	22.3
Vetiver grass*	129.9	15.5	0.23[4)]	52.2	29.2	0[2)]	18.9	24.1	0[2)]	20.2	25.4	0[2)]	55.3	23.6
*Brachiaria decumbens**[6)]	120.0	14.2	0.24[4)]	63.7	19.8	0[2)]	14.3	18.6	0[2)]	16.3	18.0	0[2)]	53.6	17.7
*Arachis pintoi**	100.7	19.2	0[3)]											
Sweetpotato*	96.1	15.5	0.25[4)]											
King grass*							39.4	22.4	0[4)]	12.4	19.6	0[2)]		
Sugarcane*							35.0	21.4	0[2)]	27.3	23.8	0[2)]		
*Arachis pintoi***				12.4	30.0		5.2	18.2		5.6	13.4			
*Indigofera endecaphylla***				32.0	29.0		16.8	24.1		21.6	22.8			
Contour ridge	81.1	15.0												

[1)]Check = cassava monoculture; * = cassava + intercrop+hedgerows; ** = forage species used both as hedgerow and live mulch.
[2)]peanut intercrop, [3)]soybean intercrop, [4)]sesame intercrop, [5)]CIAT 184, [6)]CIAT 606.

Table 2. Preliminary trial on the use of vegetative barriers for erosion control[1)]conducted on 6-8% slope at CATAS during 1998 and 1999 (Average of two years).

Hedgerow species	Cassava yield							Dry grass yield				Evaluation of hedgerows
	A	B	C	D	E	F	Total	G	H	I	Total	
	(kg/row)						(t/ha)	(kg/row)			(t/ha)	
1. Vetiver grass	43	49	30	39	53	43	36.8	19	8	11	5.4	very good
2. Dwarf elephant grass	39	30	36	25	33	18	25.9	17	14	25	8.0	very good
3. Common elephant grass	38	31	29	22	33	30	26.2	17	14	24	7.9	very good
4. King grass	33	39	24	30	44	26	28.0	45	31	42	16.9	very good
5. Sugarcane	31	32	27	30	36	36	27.5	-	-	-	-[2)]	very good
6. *Brachiaria ruziziensis*	35	42	36	30	37	32	30.3	16	11	14	5.9	bad
7. *Brachiaria decumbens*	30	45	31	29	44	29	29.7	16	10	15	5.9	good
8. *Brachiaria brizantha* CIAT 26110	38	46	36	29	47	21	31.0	12	9	23	6.3	good
9. *Paspalum atratum*	47	35	36	28	46	31	31.9	10	9	16	5.0	bad
10. *Panicum maximum* TD 58	24	44	15	19	30	22	22.0	32	20	25	11.0	very good
11. Lemon grass	48	50	28	46	45	45	37.5	10	4	9	3.3	bad
12. Hybrid elephant grass	35	44	35	42	37	47	34.3	16	6	9	4.4	bad
Average	**37**	**41**	**30**	**31**	**40**	**32**	**30.1**	**19**	**12**	**19**	**7.3**	

[1)] Three rows of cassava were grown between two rows of grass; 1 meter space between two cassava rows and 0.5 meter between cassava row and grass row. The six cassava rows were harvested separately (10 plants in each row). The grass species (except sugarcane) were cut back at 30 cm above the soil whenever necessary. A-F and G-I are from top row to bottom row.

[2)] Sugarcane was stolen before harvest.

Table 3. Results of FPR erosion control trials conducted on 8-9% slope at Kongba and Dapulin villages, Baisha county, Hainan from 1996 to 1999.

Treatments[1]	Dry soil loss	Root yield (t/ha)	Intercrop yield	Gross income[2]	Production costs[3] (Yuan/ha)	Net income[3]
1996 Check[4]	82.4	17.0	0	5,100	0	5,100
1996 C+Stylo. CIAT184+maize[5]	61.7	20.7	0	6,210	1,350	4,860
1996 Check	124.7	13.5	0	4,050	0	4,050
1996 C+contour ridging	77.0	15.2	0	4,560	500	4,060
1996 C+*Indigofera*+soybean	96.9	16.5	0	4,950	1,350	3,600
1996 C+vetiver grass+peanut	89.6	14.0	0.63	7,350	1,350	6,000
1997 Check	114.4	20.9	0	6,270	0	6,270
1997 C+Stylo. CIAT184+peanut	131.2	19.8	0.63	9,090	1,350	7,740
1997 C+Stylo. CIAT184+sesame	73.4	18.0	0	5,400	1,350	4,050
1997 C+vetiver grass+sesame	62.5	18.8	0	5,640	1,350	4,290
1997 C+vetiver grass+peanut	59.7	21.3	0.66	9,690	1,350	8,340
1998 Check	40.9	27.2	0	8,160	0	8,160
1998 C+vetiver grass+peanut	17.4	24.7	0.07	7,790	1,350	6,440
1998 C+vetiver grass	9.6	28.8	0	8,640	360	8,280
1998 C+sugarcane+peanut	35.3	27.5	0.07	8,600	1,350	7,250
1998 C+sugarcane	32.2	26.4	0	7,920	300	7,620
1999 Check	25.7	23.7	0	7,110	0	7,110
1999 C+vetiver grass[5]	8.9	23.9	0	7,170	360	6,810

[1]C = cassava

[2]Price: cassava roots = 300 Y/t, peanut = 5000Y/t. Maize, soybean and sesame were stolen or damaged by animals.

[3]Barrier maintenance and intercrop costs only; net income is gross income minus barrier maintenance and intercrop costs.

[4]Check is cassava monoculture without any ridges, barriers or intercrops.

[5]Average of 3 replications (3 farmers); other treatments are average of 4 replications (4 farmers).

2) only hedgerows, and 3) intercrop and hedgerows together. Most of the treatments reduced soil erosion and increased cassava yields; net income was also increased due to the additional income from the intercrop. The best intercrop (without hedgerows) was peanut in 1995, which decreased soil loss (42.8 t/ha) by 35.7% compared to the check treatment (66.6 t/ha); it also increased cassava yield (46.2 t/ha) by 17.9% compared to the check (39.2 t/ha). Total net income increased 45.9% after adding the income from the sale of peanut (3300 Y/ha). This practice has spread since 1996.

In 1998 the best hedgerow (without intercrop) was vetiver grass, which decreased dry soil loss by 76.0% and increased cassava yield by 5.9% compared to the check. The best erosion control practice was to combine hedgerows and intercropping, especially using vetiver grass hedgerows and intercropping with peanut; in 1996/97 dry soil loss decreased by 28-48%, cassava yields increased by 2.4-4.5% compared with the check while there was additional income from peanut (3300 Y/ha). The effectiveness of hedgerows in erosion control increased over the years and resulted in the formation of 30 cm high terraces in cassava fields after two years; the soil just above the vetiver hedgerow became thick and soft, fertile and wet, which was beneficial for obtaining high yields.

The results of the farmers' evaluation (**Table 4**) indicate that farmers were most interested in contour barriers of vetiver grass together with intercropping with peanut. The advantages of these erosion control practices were that they reduced erosion, increased yield and added value.

Table 4. Participatory evaluation of various erosion control practices by farmers in Kongba and Dapulin villages, Baisha county, Hainan, China in 1998.

	Effective erosion control	High yield	High income	Less weeds	Others	**Total**
Cassava+vetiver grass+peanut	9.4	7.7	6.1	5.5	5.2	**33.9**
Cassava+sugarcane+peanut	4.6	5.1	5.9	4.2	5.5	**25.3**
C+vetiver grass	8.2	3.7	2.1	1.1	2.3	**17.4**
Others	6.8	5.1	4.2	3.3	4.0	**23.4**
Total	**29.0**	**21.6**	**18.3**	**14.1**	**17.0**	**100.0**

FPR Variety Trials

A total of 38 farmers participated in the testing of 41 improved varieties during 1995-1999. The results, shown in **Table 5**, indicate that most of the improved varieties produced significantly higher yields than the local check variety SC205, especially SC124, SC8013, OMR33-10-4 and ZM9244, which outyielded SC205 by 42.5%, 13.1%, 34.4% and 60.5%, respectively. Many improved varieties have now been disseminated by farmers themselves.

The results of an evaluation of improved varieties by farmers (**Table 6**) indicate that farmers were mainly interested in cassava yield, wind and drought resistance, because Hainan has often dry weather when planting and strong typhoons. Farmers were not interested in starch content because factory owners only pay by weight but do not measure starch content. The preferred varieties were SC8013, SC124 and OMR33-10-4.

FPR fertilizer trials

The results of soil analysis (**Table 7**) indicate that the Fe, Al and B contents of the soil had increased but that the contents of OM, P, K, Ca, Mg, Cu and Zn had decreased 38-54% after two years of cassava cropping, and were near or below the nutritional requirements of cassava. Continuous cropping of cassava would likely lead to a significant response to application of fertilizer or FYM.

Table 5. Results of 38 FPR cassava variety trials conducted by farmers in Kongba and Dapulin villages, Baisha county, Hainan, China during 1995-1999.

	Average cassava yield (t/ha)									
	1995		1996		1997		1998		1999	
Varieties or clones	Variety	Check*	Variety	Check*	Variety	Check*	Variety	Check*	Variety	Check*
SC8013	34.2[6]	35.4	22.8[3]	18.2	23.0[3]	17.3	-	-	-	-
SC8002	27.3[4]	36.8	16.4[3]	18.2	20.9[1]	14.3	-	-	-	-
OMR33-10-4	39.5[2]	30.9	18.3[4]	16.1	19.5[2]	15.6	42.5[1]	31.3	27.8[2]	15.9
ZM8641	23.4[2]	35.1	19.1[2]	22.8	-	-	-	-	29.0[3]	17.9
SC124	38.7[2]	33.0	22.5[1]	9.5	-	-	-	-	-	-
ZM9076	48.8[1]	30.9	20.0[1]	9.5	-	-	-	-	-	-
ZM9036	44.4[1]	33.5	-	-	15.6[1]	17.0	-	-	-	-
ZM8639	30.2[2]	33.6	-	-	36.3[1]	20.9	-	-	-	-
ZM9038	34.8[2]	35.0	-	-	-	-	-	-	-	-
ZM9057	35.1[3]	33.9	-	-	-	-	-	-	-	-
ZM9066	32.1[1]	37.4	-	-	-	-	-	-	-	-
SM1592-3	32.0[1]	42.9	-	-	-	-	-	-	-	-
CMR34-11-3	-	-	17.6[3]	18.2	21.2[3]	17.3	28.8[1]	31.3	-	-
ZM9315	-	-	-	-	24.8[2]	18.9	-	-	-	-
ZM9274	-	-	-	-	24.8[2]	18.9	-	-	-	-
ZM94107	-	-	-	-	26.7[2]	18.9	-	-	-	-
OMR35-70-7	-	-	-	-	29.3[1]	20.9	-	-	-	-
ZM9244	-	-	-	-	47.4[1]	20.9	32.5[3]	27.7	26.0[4]	17.4
CMR36-34-6	-	-	-	-	-	-	38.8[2]	26.9	-	-
ZM94127	-	-	-	-	-	-	29.4[2]	26.9	-	-
ZM93164	-	-	-	-	-	-	36.3[4]	28.6	-	-
ZM9127	-	-	-	-	-	-	34.9[5]	28.2	-	-
ZM9426	-	-	-	-	-	-	27.3[3]	27.7	-	-
ZM93253	-	-	-	-	-	-	29.0[3]	27.7	-	-
ZM9394	-	-	-	-	-	-	28.4[5]	28.2	20.4[4]	16.5
ZM93236	-	-	-	-	-	-	28.7[4]	27.4	19.2[4]	16.5
ZM94209	-	-	-	-	-	-	31.7[3]	26.7	18.8[2]	17.3
CMR36-63-6	-	-	-	-	-	-	30.0[3]	27.7	26.9[1]	21.9
OMR36-05-7	-	-	-	-	-	-	34.7[4]	27.9	27.2[3]	14.7
OMR36-05-9	-	-	-	-	-	-	32.1[5]	26.9	21.6[3]	15.8
35-70-6	-	-	-	-	-	-	-	-	28.4[3]	16.1
35-70-1	-	-	-	-	-	-	-	-	22.1[3]	20.0
36-40-9	-	-	-	-	-	-	-	-	31.5[2]	23.4
37-102-12	-	-	-	-	-	-	-	-	45.0[1]	30.6
93274	-	-	-	-	-	-	-	-	25.1[2]	21.9
95125	-	-	-	-	-	-	-	-	17.6[2]	15.9
95111	-	-	-	-	-	-	-	-	21.3[2]	18.8
9242	-	-	-	-	-	-	-	-	20.0[2]	17.6
95038	-	-	-	-	-	-	-	-	25.4[2]	21.9
93252	-	-	-	-	-	-	-	-	25.7[3]	24.8
95027	-	-	-	-	-	-	-	-	28.1[3]	20.9

[1] to [6] are average cassava yields of 1 to 6 farmers, respectively.

*Check is SC205

Table 6. Evaluation of improved varieties by farmers at Kongba and Dapulin villages, Baisha county, Hainan, China in 1998.

	High yield	Typhoon tolerance	Drought tolerance	Easy to harvest	Poor soil tolerance	Good plant type	High starch	**Total**
SC8013	16.0	11.3	8.3	4.4	5.4	3.4	1.6	**50.4**
SC124	8.5	0.8	3.1	2.9	2.7	0.4	0.8	**19.2**
OMR33-10-4	2.5	1.5	1.6	2.0	0	0.7	0	**8.3**
ZM8639	2.9	1.3	0.5	1.3	0	1.5	0	**7.5**
SC205	4.4	2.0	3.4	1.8	1.8	0.5	0.7	**14.6**
Total	**34.3**	**16.9**	**16.9**	**12.4**	**9.9**	**6.5**	**3.1**	**100.0**

Table 7. Results of soil analyses at Kongba village, Baisha county, Hainan, China in 1995 and 1997.

		(%)	(ppm)	(%)	(me/100 g)			(ppm)			
	pH	OM	P	Al	K	Ca	Mg	Cu	Zn	Fe	B
Requirements	4.5-7.0	2.0-4.0	4-15	<75	0.15-0.25	1.0-5.0	0.4-1.0	0.3-1.0	1.0-5.0	10-100	0.5-1.0
January, 1995	4.55	4.8	17.6	33.2	0.28	1.44	0.72	0.24	1.51	15.7	0.33
January, 1997	4.48	2.7	9.4	56.5	0.16	0.82	0.33	0.14	0.94	33.5	0.50

A total of 14 farmers participated, conducting 13 fertilizer trials from 1995 to 1997. There was little response to fertilizer application because the soils were quite fertile in the first year in 1995 (**Table 7**). But there were responses to fertilizer application in the second and third year (**Table 8**). The combinations of two nutrients (NP, PK and NK) increased yields but decreased net incomes, while the application of complete NPK fertilizer both increased yield and net income. No. 3 special fertilizer increased cassava yields by 33.3% and increased net income by 22.2%. Some farmers also applied either compound NPK or No. 3 special fertilizer on a larger scale in their production fields in 1997. The two types of fertilizers increased cassava yields by 51-54% and increased the net income by 35-37%.

Achievements of FPR

According to statistics of Hainan province for 1999 about 1500 ha of cassava fields (about 500 farmers) benefitted directly and more than 3500 ha also benefitted indirectly from FPR during 1995-1999 (**Figure 1**), adding a total of 12,000 t of fresh cassava roots and 3.8 million Yuan for Hainan farmers. In addition, in 1999 about 800 ha of cassava production fields were planted with various improved technologies by farmers in collaboration with CATAS (**Table 9**).

FPR also seems to have a good future in Guangxi and Yunnan provinces: 80 ha of contour barriers of pineapple have been planted on steep slopes in Honghe district of

Yunnan province in 1999, and a total of 30,000 ha have now been planted with improved varieties by farmers in south China.

Table 8. Average results of four FPR cassava fertilizer trials conducted at Kongba village, Baisha county, Hainan, China in 1996 and 1997.

Treatment[1)]	Root yield 1996	Root yield 1997	Root yield Avg.	Gross income[2)]	Fertilizer costs[2)]	Net income[3)]
	(t/ha)			(Yuan/ha)		
Check	13.5	22.5	18.0	5,400	0	5,400
NP	14.0	24.0	19.0	5,700	705	4,995
NK	15.8	25.5	20.7	6,210	885	5,325
PK	14.7	21.8	18.3	5,490	495	4,995
NPK	17.4	26.1	21.8	6,540	1,035	5,505
FYM	17.0	25.5	21.3	6,390	525	5,865
Compound	17.1	26.0	21.6	6,480	840	5,640
No. 3 Fertilizer	19.2	28.7	24.0	7,200	600	6,600
No. 4 Fertilizer	17.6	25.2	21.4	6,420	600	5,820

[1)] N=225 kg/ha of urea (42%N); P=225 kg/ha of SSP (16% P_2O_5); K = 225 kg/ha of KCl (60% K_2O); FYM = 15 t/ha of farm-yard manure; Compound = 300 kg/ha of 15:15:15; No 3. Fertilizer =300 kg/ha of special fertilizer consisting of 78% compound 10:5:15, 1% Zn and 21% chicken manure; No 4. Fertilizer = 300 kg/ha of special fertilizer consisting of 86% compound 10:5:20, 1% Zn and 13% chicken manure.

[2)] Prices:

cassava	Y 300/tonne	KCl	Y 1.5/kg	No. 3 Fertilizer	Y 2.0/kg
urea	2.4/kg	Compound	2.8/kg	No. 4 Fertilizer	2.0/kg
SSP	0.7/kg	FYM	35/tonne		

[3)]Net income is gross income minus fertilizer costs.

Table 9. Extent of adoption of various improved practices selected through FPR in Hainan in 1999.

Variety/practice	Area of adoption (ha)
SC124	200
SC8013	150
OMR33-10-4	80
Other improved varieties	170
Cassava special fertilizer	15
Contour barriers of vetiver grass	2
Contour barriers of sugarcane	3
Improved practices	180
Total	**800**

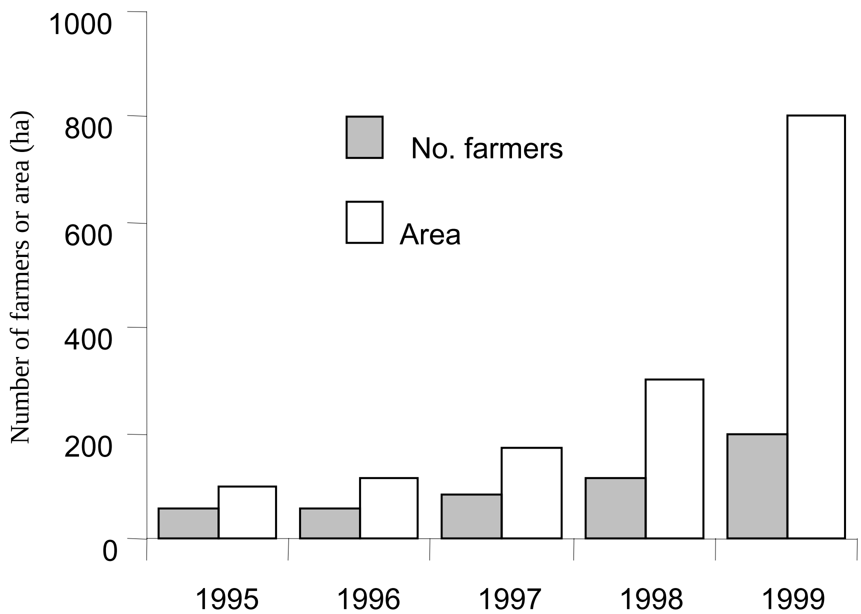

Figure 1. Number of farmers and planted area in Hainan that benefitted from FPR during 1995-1999.

CONCLUSIONS

Farmer Participatory Research (FPR) has promoted friendship between researchers and farmers, and combined the theoretical knowledge of researchers with the rich experience of farmers. This has stimulated the participatory development and extension of improved varieties and efficient cassava production practices. But there are some problems:

1. Farmers liked planting the improved varieties, but they generally ignored controlling erosion and applying manures or fertilizers.
2. The local governments did not always support FPR because they did not recognize the importance of it. Local officials should be directly involved in FPR so they gain a better understanding of the process.
3. Experimental plots were scattered over a wide area and farmers always changed the treatments, uniform standards were difficult to maintain and data were easily lost. It needs more guidance and management from researchers and collaborating technicians.

We will organize an FPR network in China and train more people in FPR methodologies in the future, accelerating the dissemination of improved varieties, special cassava fertilizers and erosion control practices.

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