

FARMER PARTICIPATORY VARIETY TRIALS CONDUCTED IN VIETNAM

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ABSTRACT

Cassava varieties, previously selected by various institutes and Universities for having high fresh root yields and starch contents, were evaluated and selected by farmers on their own fields with the help of researchers and local or provincial extensionists who participated in the Farmer Participatory Research (FPR) project to improve the sustainability of cassava production in Vietnam.

In FPR variety trials conducted in 24 locations in the north, central and southern regions of Vietnam from 1998 to 2001, 60-100% of farmers preferred KM94 cultivar. More specifically, in the north, 60-100% of farmers preferred KM94, KM60 and KM98-7, because of their high root and starch yields making them suitable for industrial usage. In the central part of the country, the new variety KM98-1 was preferred by 100% of farmers, because of high yield and low cyanogenic potential, making this variety suitable for both factory use and human consumption. Besides KM98-1, farmers also liked KM98-5, KM94 and KM99-5. In the south, 71-100% of farmers preferred KM98-5, while others also liked KM94, KM98-1, SM937-26 and KM140-2. Particularly, KM140-2 had a very high root and starch yield in 2001, higher than KM98-5. So, the promising line KM140-2 will be further tested and evaluated by farmers in different communities having different environments before being released as a new variety.

There are six steps in the process of building capacity for farmers to conduct FPR variety trials: 1. Discuss with farmers the objective of conducting these trials; 2. Study tour to visit research organizations where varieties are being developed; 3. Discuss again and decide on the activities to be undertaken; 4. FPR training; 5. Farmers establish and take care of trials on their own fields under the guidance of researchers; and 6. At time of harvest a field day is organized to evaluate the varieties and to select the most promising ones. A workshop may be organized at the research sites to discuss the results and lessons learned, to get feedback from farmers so as to further develop more suitable varieties. For research and sustainable development of high yielding cassava cultivars, the participation of farmers in varietal evaluation and selection is an essential part of the process, while it empowers farmers to contribute to their own and their community's development.

INTRODUCTION

Vietnam produces annually more than 2 million tonnes of cassava fresh roots and is ranked 13th in terms of cassava production in the world. In Vietnam, cassava has great potential, both for domestic consumption and for export. In the early part of the 21st Century, cassava is changing from being a food crop to a cash crop, and both the farmers and the Vietnam government are showing more interest in the crop. There are seven main exported products of cassava, including starch and modified-starch (Pham Van Bien *et al.*, 2001).

Most cassava in Vietnam is produced by smallholder farmers. As such, research on breeding and selection of cassava varieties that have high starch yield is important to enhance the adoption of good varieties and sustainable development. The Farmer

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Participatory Research (FPR) methodology can be used to meet the needs of farmers. Farmers conduct trials by themselves, while researchers help and give advice. When farmers participate in cassava varietal evaluation, they will ask many questions and select those varieties that are well adapted in their own fields. What and how to manage, monitor and evaluate for high yield and income? What are the benefits in term of selection and evaluation of the cassava breeding methodology? How can they apply the methodology in their field? ... No researchers can answer these questions as well as farmers, who have lived a long time in their regions. In Vietnam, farmers themselves will decide which new cassava varieties should be expanded in the different regions.

In this paper we present the results of Farmer Participatory Research on cassava variety trails in three regions of Vietnam. It was found that in the north, 60-100% of farmers at the project sites preferred KM94, KM60 and KM98-7. In the central part of the country, the new variety KM98-1 was preferred by 100% of farmers. Besides KM98-1, farmers there also liked KM98-5 and KM94. In the south, 60-71% of the farmers preferred KM98-5, KM94, KM98-1, SM937-26 and KM140-2.

The process of building capacity for farmers to conduct FPR variety trials includes six steps, in which the level of participation of farmers increases from low to high. From our results and discussions about this paper, we concluded that the FPR project, funded by the Nippon Foundation and coordinated by Reinhardt Howeler and other CIAT scientists, has been very useful for developing and disseminating high yielding cassava varieties and more sustainable production practices in Vietnam.

OBJECTIVES.

To select cassava varieties with high fresh root yield and high starch content by farmers on their own fields with the help of researchers and local or provincial extensionists in three regions: north, central and south Vietnam.

To improve farmers' capacity to select and develop new cassava varieties.

METHODOLOGY.

- Establish groups of farmers interested in cassava varietal evaluation
- Farmers and researchers together discuss and plan the research
- Visit demonstration plots and train farmers and local extensionists
- Set up FPR trials by farmers with the help of researchers
- Monitor and evaluate at field days/workshop to select the most promising varieties.
- Expand new varieties selected by farmers to different areas

RESULTS AND DISCUSSION.

FPR variety trials were conducted in 24 locations in the north, central and southern regions of Vietnam from 1999 to 2002.

1. FPR cassava trials in the north of Vietnam

In north Vietnam these trials were conducted by researchers of the Root Crops Research Center of the Vietnam Agricultural Sciences Institute (VASI) together with farmers in Thach That district of Ha Tay province, and by researchers of Thai Nguyen University of Agriculture and Forestry (TUAF) in 2000 and 2001. **Figure 1** and **Table 1**

show the results. So far, farmers in Ha Tay province have selected eight varieties, i.e. KM94, KM60, KM98-7, KM21-10, SM2220-11, OMR38-71-12, OMR37-52-6 and OMR37-52-8.

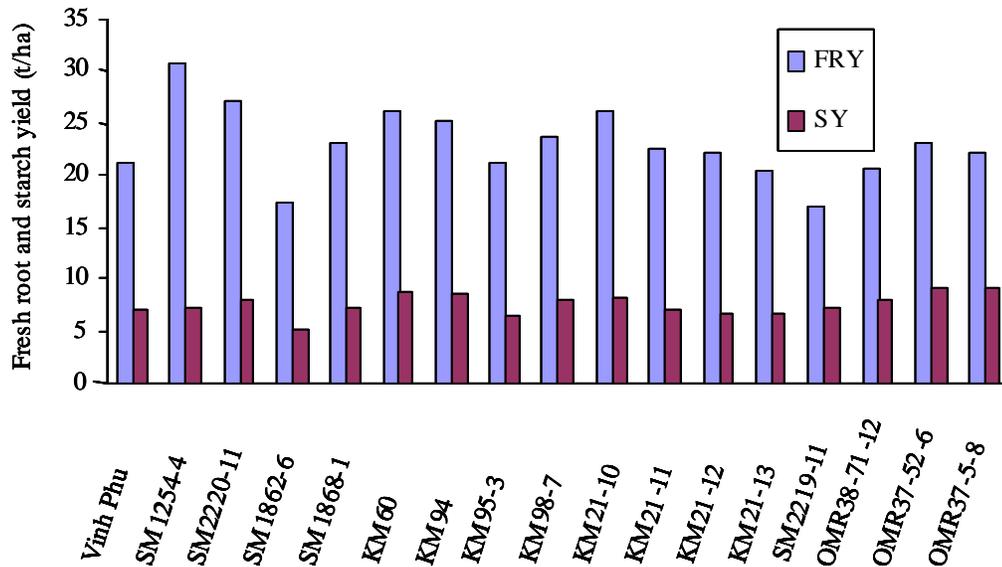


Figure 1. Average fresh root and starch yields of cassava varieties tested in Hatay and Thai Nguyen provinces in north Vietnam, from 1999 to 2001

OMR37-52-6, OMR37-52-8, KM60 and KM94 produced the highest starch yield (SY): 9.2, 9.1, 8.7 and 8.4 t/ha, and the highest fresh root yield (FRY): 23.1, 22.2, 26.3 and 25.3 t/ha, respectively. These were followed by KM21-10, SM2220-11 and KM98-7, which had starch yields ranging from 8.0 to 8.3 t/ha and fresh root yields from 23.6 to 27.2 t/ha. Especially, KM94 and SM2220-11 had high starch yields of 9.6 and 9.2 t/ha, and fresh root yields of 31.2 and 32.3 t/ha, respectively, in 1999. Some other varieties also produced high starch yields, like KM98-7; KM60, OMR37-52-6 and OMR37-52-8, which produced 10.1, 9.7, 9.2 and 9.1 t/ha, respectively in Thai Nguyen province in 2001 (**Table 1**). Thus, these eight varieties will be introduced to FPR trials in others locations.

Subsequently, KM94, KM98-7 and KM60 were further tested in FPR trials and were preferred by 65-100% of farmers in north Vietnam (**Figure 2** and **Table 2**). A total of 12 varieties have been tested in FPR trials in 12 communes, including some new lines as well as local varieties (Xanh Vinh Phu and SC 205 = bamboo leaf) from 2000 to 2002. The results in **Figure 2** and **Table 2** show that most of the farmers preferred the high yielding cultivars such as KM60, KM98-7 and KM94, which produced on average 30.9, 30.3 and 29.2 t/ha, respectively, in 10-12 locations. These varieties have about 50% higher fresh root yields than the local varieties. Farmers also like some of the newest varieties that were introduced in the trial in 2002: SM215-4-5, KM108-2 and KM104-4. Those had root yields ranging from 32.0 to 37.8 t/ha. In particular, the fresh root yield of KM94 reached 42.8 t/ha in Thach Hoa commune in 2000, and 40 t/ha in Van Yen district in 2001. KM60

Table 1. Average fresh root yield (FRY) and starch yield (SY) of various cassava varieties grown in variety trials conducted by VASI in Ha Tay and by Thai Nguyen University in Thai Nguyen from 1999 to 2001.

Varieties	Ha Tay									Thai Nguyen			Average	
	Root yield (t/ha)			Starch yield (t/ha)			Harvest index (HI)			FRY	SY	HI	FRY	SY
	1999	2000	2001	1999	2000	2001	1999	2000	2001		2001			
Xanh Vinh Phu	-	-	19.6	-	-	5.6	-	-	0.62	23.2	8.6	0.56	21.4	7.1
SM1254-4	33.3	28.0	-	7.8	6.9	-	0.68	0.72	-	-	-	-	30.7	7.4
SM2220-11*	<u>32.3</u>	22.1	-	<u>9.2</u>	6.7	-	0.58	0.57	-	-	-	-	27.2*	8.0*
SM1862-6	17.3	-	-	5.1	-	-	0.58	-	-	-	-	-	17.3	5.1
SM1868-1	21.5	24.5	-	6.5	8.0	-	0.56	0.57	-	-	-	-	23.0	7.3
KM60*	28.7	-	-	7.7	-	-	0.64	-	-	23.8	<u>9.7</u>	0.57	26.3*	8.7*
KM94*	<u>31.2</u>	27.2	22.9	<u>9.6</u>	8.8	7.2	0.58	0.69	0.60	19.8	8.1	0.56	25.3*	8.4*
KM95-3*	23.8	21.5	23.1	6.4	6.3	6.6	0.54	0.54	0.62	16.9	6.3	0.49	21.3*	6.4*
KM98-7*	-	22.2	22.7	-	6.7	7.2	-	0.57	0.68	25.8	<u>10.1</u>	0.63	23.6*	8.0*
KM21-10*	-	-	26.3	-	-	8.3	-	-	0.68	-	-	-	26.3*	8.3*
KM21-11	-	-	22.5	-	-	7.1	-	-	0.68	-	-	-	22.5	7.1
KM21-12	-	-	22.3	-	-	6.8	-	-	0.63	-	-	-	22.3	6.8
KM21-13	-	-	20.5	-	-	6.7	-	-	0.59	-	-	-	20.5	6.7
SM2219-11	-	-	-	-	-	-	-	-	-	17.1	7.2	0.48	17.1	7.2
OMR38-71-12	-	-	-	-	-	-	-	-	-	20.8	8.0	0.58	20.8*	8.0*
OMR 37-52-6*	-	-	-	-	-	-	-	-	-	23.1	<u>9.2</u>	0.61	23.1*	9.2*
OMR 37-52-8*	-	-	-	-	-	-	-	-	-	22.2	<u>9.1</u>	0.60	22.2*	9.1*

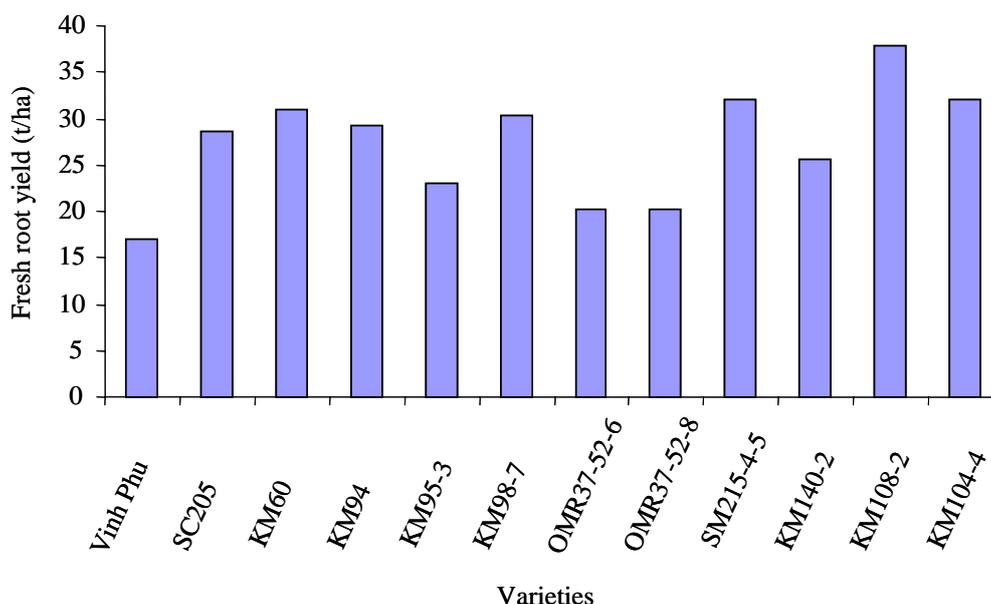


Figure 2. Average fresh root yields of cassava varieties tested in FPR trials conducted in 12 locations in north Vietnam from 2000 to 2002.

produced 37.4 t/ha in Thach Hoa in 2000 and KM 98-7 yielded 33.3 t/ha in Pho Yen district of Thai Nguyen province in 2001.

2. FPR cassava variety trials in the central part of Vietnam

Hue University of Agriculture and Forestry (HUAF) evaluated and selected good cassava cultivars with farmer participation in Hong Ha, Thuong Long and Huong Van communes in Thua Thien Hue province in the central part of Vietnam. Researchers at the University discussed with participating farmers how to conduct FPR cassava trials and organized field days/workshops in the field. Farmers selected the best varieties and decided which ones should be expanded. The results are presented in **Figure 3** and **Table 3**. The following varieties produced both high fresh root yield (FRY) and starch yield (SY): KM98-1, KM94, SM1447-7, SM937-26, KM108-2 and KM140-2. KM98-1 had an average FRY of 31.2 t/ha and SY of 8.6 t/ha, while KM94 had a FRY of 27.5 and SY of 8.1 t/ha. These two varieties have been tested by farmers for many years from 1998-2002. In 2002 farmers also liked some of the new varieties like KM108-2 and KM140-2. In particular, in 2000/01 KM98-1 reached FRY of 34.8 t/ha and SY of 8.8 t/ha on fallow soils in upland areas; this variety was preferred by 100% of farmers, because of its high yield and low cyanogenic potential, making this variety very suitable for both factory use and human consumption of minority people living in upland areas. Thus, KM98-1 and KM94 were selected for adoption and dissemination by farmers in Central Vietnam. And farmers are showing much interest in the new varieties KM108-2 and KM140-2 in the region. But, those new varieties should be evaluated for a few more years in different environments before being released.

Table 2. Fresh root yields of various cassava varieties grown in FPR trials conducted by farmers in 12 locations in north, Vietnam from 2000 to 2002.

Varieties	Thach Hoa		Tran Phu		Tien Phong		Thong Nhat		Thuong Am		Son La	Pho Yen	Am Yhang	Hong Tien	Van Yen	Minh Duc	Bao Than	Av.	Farmers' preference
	'00	'02	'00	'01	'00	'01	'00	'01	'00	'01	'00	'01	'01	'01	'01	'02	'02		
Xanh Vinh Phu	17.0	18.5	-	24.2	22.8	14.0	12.0	12.0	13.2	-	18.7	12.5	25.5	-	11.5	20.0	17.1	20-30	
SC205 (La Tre)	-	-	26.4	-	30.1	18.0	23.0	23.0	-	22.	-	-	-	24.9	-	-	28.5	25-35	
KM60*	<u>37.4</u>		30.3	28.4	26.9	20.0	25.0	-	19.8	30.	-	25.0	28.6	37.0	-	-	30.9*	65-100	
KM94*	<u>42.8</u>	31.7	33.3	27.6	29.8	22.5	26.5	26.5	21.0	32.	23.7	26.0	33.8	<u>40.0</u>	21.0	28.7	29.2*	71-100	
KM95-3	32.9	-	21.3	26.3	30.5	14.0	14.0	14.0	19.8	24.	25.0	22.0	23.6	-	30.0	-	22.9	0	
KM98-7*	-	-	31.2	30.1	31.9	24.0	20.0	20.0	26.4	-	<u>33.3</u>	25.0	25.1	-	25.0	-	30.3*	70-100	
OMR37-52-6	-	-	-	-	-	-	-	18.0	-	-	25.3	-	24.4	-	13.5	-	20.3	0	
OMR37-52-8	-	-	-	-	-	-	-	18.0	-	-	23.7	-	22.7	-	16.5	-	20.2	0	
SM215-4-5*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32.0	32.0*	100	
KM140-2	-	25.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25.6	0	
KM108-2*	-	37.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	37.8*	100	
KM104-4*	-	32.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32.0*	100	

Table 3. Fresh root yield (FRY) and starch yield (SY) of cassava varieties grown in FPR trials conducted by farmers in three locations in Thua Thien-Hue province from 1999 to 2002.

Locations	Hong Ha				Thuong Long		Huong Van			Average		Farmers' preference (%)	Potential usage
	1999/00		2000/01		2001/02		HCN	FRY	SY	FRY	SY		
Varities	FRY	SY	FRY	SY	FRY	SY	HCN	FRY	SY	FRY	SY		
Nep (local)	26.9	8.0	15.6	5.0	17.9	5.3	85	16.6	4.2	19.3	5.6	50-67	food
Xanh Vinh Phu	28.3	8.5	24.2	7.4	21.7	5.7	110	21.5	5.8	23.9	6.9	35-37	food, feed
KM94*	29.2	8.8	24.9	7.9	28.0	8.0	202	27.8	7.7	<u>27.5</u>	<u>8.1*</u>	40-91	starch
KM98-1*	31.8	<u>9.5</u>	<u>34.8</u>	<u>8.8</u>	29.1	8.2	115	28.9	7.8	<u>31.2</u>	<u>8.6*</u>	100	food, feed, starch
SM1447-7*	32.1	8.2	-	-	24.0	7.2	135	-	-	28.1	7.7 *	37-51	feed, starch
SM937-26*	-	-	30.3	9.2	26.4	7.3	165	25.5	6.8	27.4	7.8 *	37-67	feed, starch
KM98-5	-	-	-	-	29.0	8.1	177	23.4	6.1	26.2	7.1	36-50	feed, starch
KM21-12	-	-	-	-	-	-	-	26.1	6.7	26.1	6.7	0	feed, starch
KM111-1	-	-	-	-	-	-	-	21.2	5.1	21.2	5.1	0	feed, starch
KM108-2*	-	-	-	-	-	-	-	29.3	7.9	29.3	7.9*	60-85	feed, starch
KM140-2*	-	-	-	-	-	-	-	29.6	7.6	29.6	7.6*	60-85	feed, starch
KM98-7	-	-	-	-	-	-	-	26.7	6.8	26.7	6.8	30	feed, starch

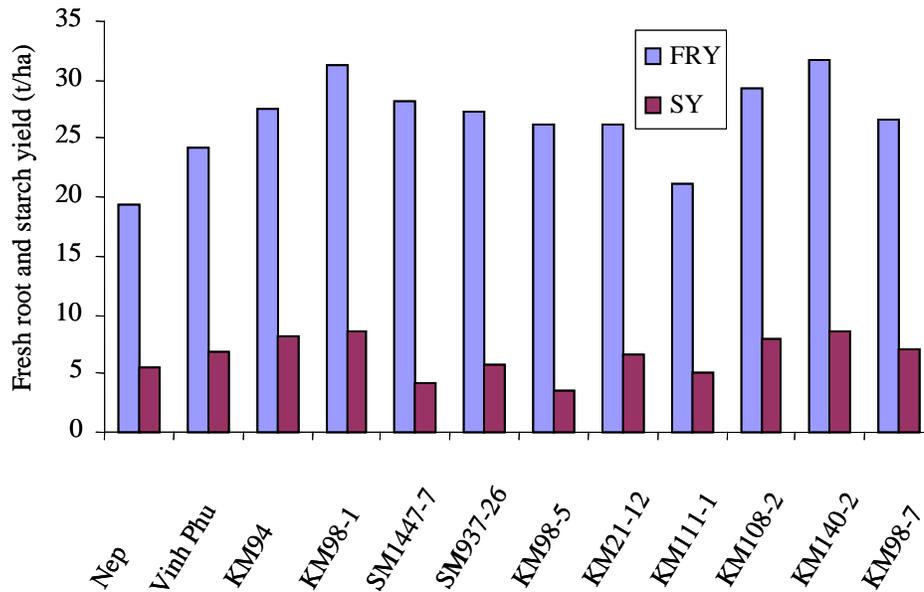


Figure 3. Average fresh root and starch yields of cassava varieties tested in FPR trials conducted in three locations in the central part of Vietnam from 1999 to 2002.

3. FPR cassava variety trials in the south of Vietnam

Researchers at Hung Loc Agricultural Research Center (HARC) of the Institute of Agricultural Sciences (IAS) of South Vietnam have been very successful in the breeding and selection of new cassava varieties. HARC helped to set up FPR trials in various communities in south Vietnam.

From 1999-2000, HARC researchers selected some good varieties with high starch and fresh root yields and introduced these for evaluation by farmers (**Figure 4** and **Table 4**). These are KM94, KM98-5, KM98-6, KM98-1, KM98-2, KM60, SM937-26 and KM98-4, which produced on average 11.1, 11.4, 11.0, 9.8, 9.9, 9.5, 9.5 and 9.1 tonnes of starch/ha and fresh root yields of 40.9, 38.6, 36.8, 34.9, 33.2, 32.3, 34.1 and 42.5 t/ha, respectively.

These varieties were subsequently evaluated in FPR trials by farmers in nine locations in south Vietnam from 2000-2002. The results are presented in **Figure 5** and **Tables 5** and **6**. The data show that 71-100% or 60-100% of farmers preferred KM98-5 and KM98-1, because KM98-5 had a high SY of 10.7 and high FRY of 42.3 t/ha, while reaching 54.7 t/ha FRY and 14.3 t/ha SY in An Vien commune in 2000 (**Table 5**); these results for KM98-5 were repeated in 2001 (**Table 6**). **Tables 5** and **6** show that KM98-1 had similarly high yields, followed by KM94 and KM60. Some good new varieties are KM140-2, KM140-4 and KM108-2 recently evaluated and selected by 50-66% of farmers at 7 locations in the South (**Table 6**). In particular, KM 140-2 reached a SY of 12.4 t/ha and a fresh root yield of 45.3 t/ha in 2001/02 in An Vien commune.

So, in general, KM98-5, KM94 and KM98-1 have been preferred by farmers in south Vietnam. And KM140-2 and KM140-4 are promising cultivars that will be further tested in more locations with different environments before being released.

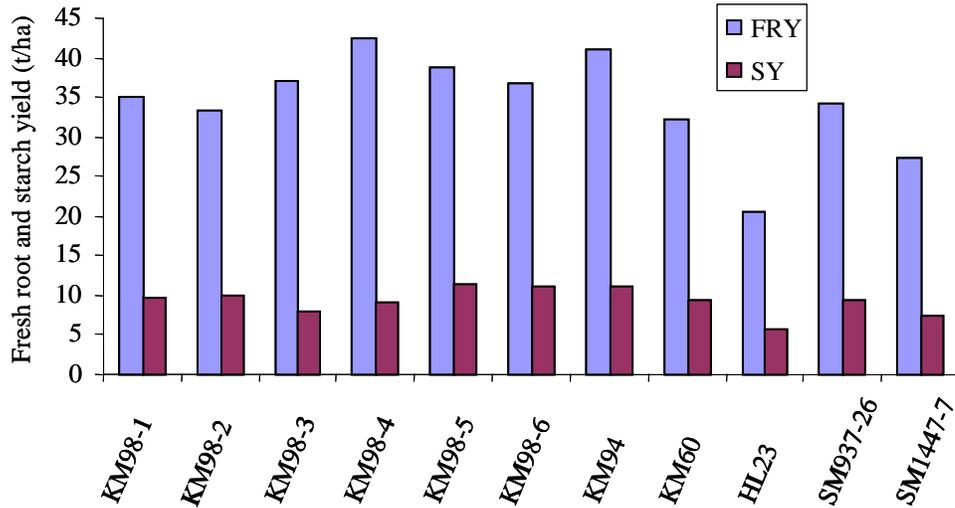


Figure 4. Average fresh root and starch yields of cassava varieties tested by farmers and Hung Loc researchers in south Vietnam in 1999/00 and 2000/01.

Table 4. Results of cassava variety trials conducted by researchers at Hung Loc Agric. Research Center in Dong Nai province, south Vietnam, in 1999 and 2000.

Varieties	1999			2000			Average	
	Root yield (t/ha)	Starch yield (t/ha)	Harvest index	Root yield (t/ha)	Starch yield (t/ha)	Harvest index	Root yield (t/ha)	Starch yield (t/ha)
KM98-1*	43.1	12.4	0.74	26.6	7.2	0.79	34.9	9.8*
KM98-2*	39.6	12.1	0.59	26.7	7.7	0.71	33.2	9.9*
KM98-3	36.9	11.5	0.59	-	-	-	36.9	8.1
KM98-4*	42.5	9.1	0.58	-	-	-	42.5	9.1*
KM98-5*	46.0	13.0	0.58	31.2	9.8	0.70	38.6	11.4*
KM98-6*	46.9	13.7	0.58	26.7	8.2	0.71	36.8	11.0*
KM94 (Control*)	48.5	12.3	0.57	33.2	9.9	0.67	40.9	11.1*
KM60 (Control*)	38.0	11.3	0.59	26.5	7.6	0.70	32.3	9.5*
HL23 (Control*)	25.4	7.0	0.45	15.3	4.3	0.63	20.4	5.7
SM937-26*	-	-	-	34.1	9.5	0.71	34.1	9.5*
SM1447-7	-	-	-	27.2	7.5	0.71	27.2	7.5

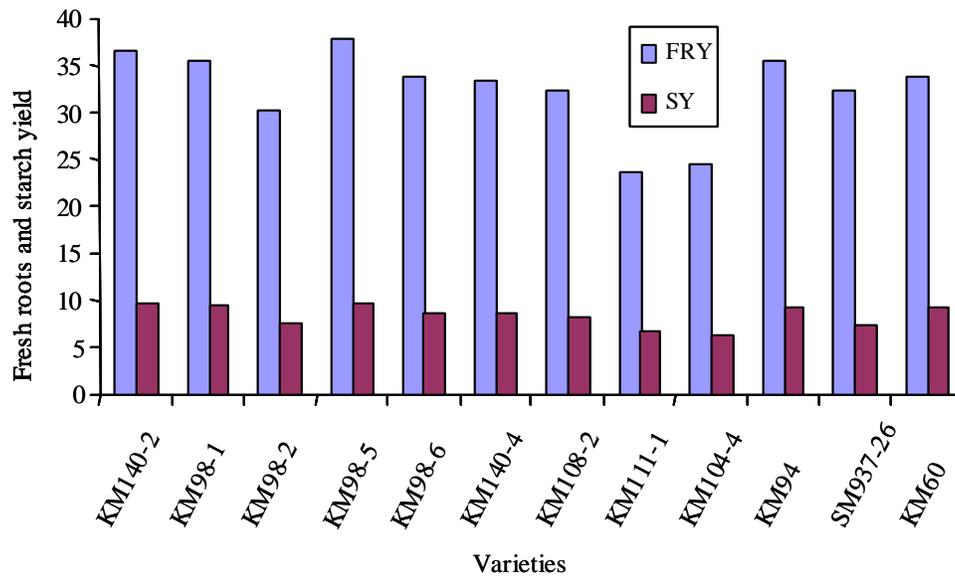


Figure 5. Average fresh root and starch yields of cassava varieties tested in FPR trials conducted in nine locations in south Vietnam from 2000 to 2002.

We may ask the question: what are the most suitable cassava varieties for all of Vietnam? There are seven varieties that have been tested and selected in many locations in Vietnam. Of these, KM60 and KM94 have been widely disseminated during the past 5-7 years in our country. They have become the check varieties with which to compare the new ones. **Figure 6** shows that for the whole of Vietnam KM98-1 and KM98-5 have produced the highest FRY and may be considered equal in starch yield with the two check varieties. Presently, KM94, KM60, KM98-1 and KM98-5 are widely disseminated. And recently, KM140-2 has become a very promising clone.

Table 7 shows the average farmers' preference for cassava varieties evaluated in FPR trials in 24 locations in Vietnam from 1999 to 2002. Most farmers liked KM98-1, KM94, KM140-2 and KM108-2. Those varieties were preferred by 72.5 to 80.3% of farmers who conducted and evaluated these trials; these were followed by KM98-5, KM98-7, KM60 and SM937-26. It has recently been estimated that the total area of new varieties in Vietnam has reached about 90,000 ha in 2002.

FARMER CAPACITY BUILDING THROUGH FARMER PARTICIPATORY RESEARCH (FPR) ABOUT SELECTION AND DEVELOPMENT OF NEW CASSAVA VARIETIES

Farmer capacity building is a process through which farmers and researchers help each other in order to improve their knowledge and management skill by conducting cassava research for sustainable development.

Table 5. Fresh root and starch yields (t/ha) of cassava varieties tested in FPR trials conducted by farmers in four locations in south Vietnam in 2000.

Varieties	An Vien		Hill 61		Phuoc Long		Thu Duc		Average		Farmers' preference (%)
	FRY	SY	FRY	SY	FRY	SY	FRY	SY	FRY	SY	
KM98-5	54.7	14.3	36.9	10.0	29.0	7.7	48.7	-	42.3	10.7	71 - 100
KM98-1	47.3	12.8	38.9	10.7	28.3	7.5	42.3	-	39.2	10.3	71 - 100
SM937-26	45.0	12.7	33.7	9.3	-	-	38.8	-	39.2	7.3	0
KM98-6	43.1	11.0	33.9	8.8	24.7	5.9	-	-	33.9	8.6	0
KM98-2	33.6	8.6	31.9	8.5	25.1	5.8	-	-	30.2	7.6	0
KM94 (Control)	40.9	11.3	36.6	10.2	26.1	7.1	57.6	-	40.3	9.5	65 - 100
KM 60 (Control)	34.2	8.6	33.7	9.5	-	-	-	-	34.0	9.1	30 - 50

Table 6. Fresh root and starch yields (t/ha) of cassava varieties tested in FPR trials conducted by farmers in seven locations in south Vietnam in 2001 and 2002.

Varieties	An Vien (2001)		Hill 61 (2001)		Hung Thinh (2001)		Truong Hoa (2001)		Dong Tam (2002)		Minh Lap (2002)		Suoi Rao (2002)		Average		Farmers' preference (%)
	FRY	SY	FRY	SY	FRY	SY	FRY	SY	FRY	SY	FRY	SY	FRY	SY	FRY	SY	
KM140-2*	45.3	12.4	34.4	9.0	38.7	9.5	30.7	8.9	-	-	-	-	33.5	9.1	36.5	9.8*	60 - 85
KM98-5*	48.7	12.8	29.7	7.9	35.2	7.1	-	-	28.1	-	29.6	-	30.6	8.3	33.7	9.0*	60 - 85
KM98-1*	43.2	10.4	28.7	7.3	33.7	8.0	-	-	29.5	-	26.4	-	29.9	7.9	31.9	8.4	50
KM140-4	-	-	32.9	8.6	37.2	9.0	28.8	7.9	-	-	-	-	34.8	9.4	33.4	8.7*	50 - 66
KM108-2*	39.2	8.5	35.6	10.0	27.1	6.9	-	-	-	-	-	-	28.1	7.4	32.5	8.2	50
KM111-1	23.3	9.6	17.7	4.4	28.3	6.7	22.2	6.3	-	-	-	-	27.4	7.2	23.8	6.8	0
KM104-4	-	-	17.4	4.7	22.8	5.9	-	-	-	-	-	-	33.2	8.7	24.5	6.4	0
KM94 (Control)	38.5	8.8	30.9	8.4	33.2	8.4	27.7	8.2	24.2	-	23.3	-	35.9	9.9	30.5	8.7*	50
SM937-26	-	-	-	-	-	-	-	-	27.1	-	24.4	-	-	-	25.8	-	-

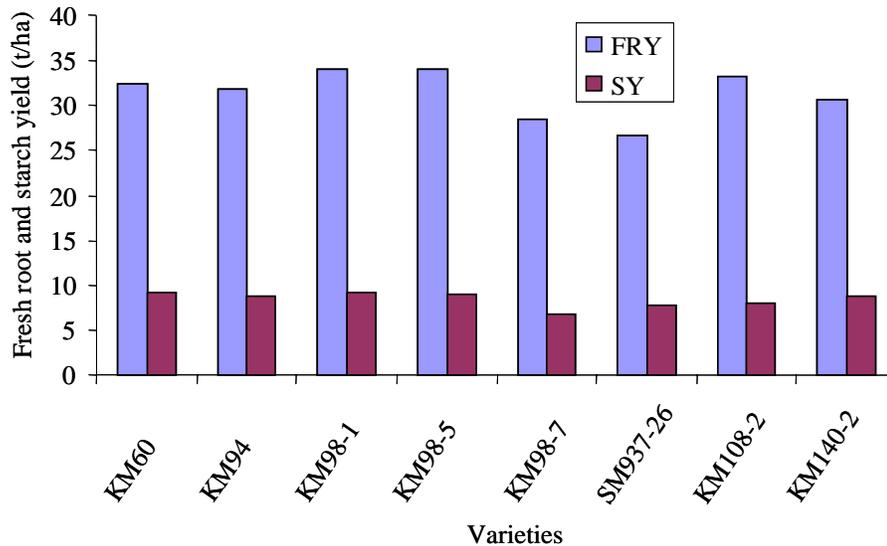


Figure 6. Average fresh root and starch yields of cassava varieties tested in FPR trials conducted in 24 locations in Vietnam from 1999 to 2002.

Table 7. Average farmers' preference for cassava varieties tested in FPR trial in 24 locations in Vietnam from 1999 to 2002.

Variety	Farmers' preference (%)
KM98-1	80.3
KM108-2	73.9
KM94	73.8
KM140-2	72.5
KM98-5	67.0
KM98-7	66.7
KM60	61.3
SM937-26	52.3

The process of capacity building for farmers to conduct FPR cassava variety trials includes the following steps (**Figure 7**):

1. Objective understanding (Passive participation)
2. Study tour/visit experiments (Information supplying-Some participation)
3. Discuss and farmers decide about activities (Partial participation)
4. Implementation planning and Training (Equal participation)
5. Setting out and taking care of trials by farmers with help of researchers (Active participation)

6. Evaluation and selection of promising varieties at field day/workshop in the commune (Participatory activity)

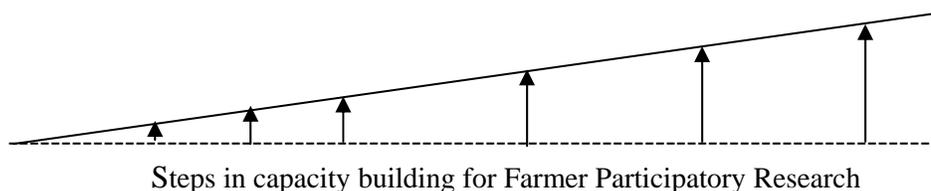


Figure 7. Extent of farmer participation during the various steps of FPR varietal evaluation.

Farmers decide which cassava varieties to expand in their fields. So farmers should clearly understand the objectives of conducting these trials and the steps in the process of conducting research.

Farmers receive information in order to clearly understand the research objectives. So, we organize a study tour to visit research trials where varieties are being developed so they can select those that seem most suitable.

The FPR program's activities are important for conducting the trials in their fields. Researchers facilitate the discussion with farmers to decide on the activities to be undertaken. They know what should be done in participatory cassava research, such as following the experiment's lay-out plan, fertilizer application, weeding etc.

Before farmers can set up and conduct trials by themselves, they need to be trained in the process of doing varietal evaluation trials. Researchers train farmers and village extensionists, who can then advise farmers and monitor the cassava variety trials.

For active participation in research, farmers are asked to take care of their trials on their own fields under the guidance of researchers or extensionists. After the training course, farmers carry out the implementation plan by themselves, such as fertilizer application, weeding, and hilling up...on time

At time of harvest, a field day is organized to evaluate the varieties and to select the most promising ones. A workshop may be organized at the research sites to discuss the results and the lessons learned, to get feedback from farmers, so as to further develop more suitable varieties. For research on sustainable development of high yielding cassava varieties, the participation of farmers in variety evaluation and selection is an essential part of the process, while it empowers farmers to contribute to their own and their community's development.

CONCLUSIONS

In the north of Vietnam: Cassava varieties selected for having high fresh root yields and starch content by farmers in 12 locations in Thai Nguyen, Tuyen Quang, Phu Tho, Ha Tay and Hoa Binh provinces include KM94, KM60, KM98-7, KM21-10, SM2220-11, OMR38-71-12, OMR37-52-6 and OMR37-52-8. Of these, KM94, KM98-7 and KM60 were preferred by 65-100% of farmers and were further disseminated.

In the central part of Vietnam: Cassava varieties were first evaluated by researchers in HUAF and the best were introduced to farmers for testing on their own fields. KM98-1 was the variety preferred by 100% of farmers, because of high yield and low cyanogenic potential, making this variety suitable for both factory use and human consumption. Besides KM98-1, farmers also liked KM98-5 and KM94, while they have also become interested in KM108-2 and KM140-2.

In the south of Vietnam: KM98-5, KM94 and KM98-1 were the preferred varieties; these were further expanded by farmers in the south. KM140-2 and KM140-4 are promising cultivars that will be further tested in more locations with different environments.

In Vietnam as a whole, most farmers like KM98-1, KM94, KM140-2 and KM108-2. These varieties were preferred by 72-80% of farmers, followed by KM98-5, KM98-7, KM60 and SM937-26. The areas planted with KM94 and KM60 have expanded rapidly every year, followed by KM98-1 and KM98-5. Recently, KM140-2 has been introduced as a new promising clone.

2. PRINCIPLES OF FARMER PARTICIPATORY RESEARCH

- Farmers and researchers should work together as both have useful and complementary skills and knowledge
- The FPR trials should be simple and with relatively few treatments (3-5) so that farmers can easily monitor and evaluate the various treatments
- Give farmers the opportunity to make their own evaluations and selections
- Train farmers in simple analytical skills
- Build farmer's self-confidence in research as it empowers farmers to contribute to their own and their community's development.

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