

PRESENT SITUATION OF CASSAVA PRODUCTION AND THE RESEARCH AND DEVELOPMENT STRATEGY IN VIETNAM

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ABSTRACT

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 North Vietnam, cassava is grown for food and animal feed by small farmer households. However, in South Vietnam cassava has become a cash crop and is an important raw material for cassava processing factories, which have a total annual processing capacity of one million tonnes of fresh roots. The main constraints in cassava production in Vietnam are fluctuating prices as well as marketing problems, and slow adoption of new varieties and improved technologies in remote areas. Low soil fertility in cassava growing areas is also an important problem, as is the lack of processing facilities.

Cassava research in Vietnam has made remarkable progress since 1988 when Vietnam began its cooperation with CIAT and started taking part in the Asian Cassava Research Network. Further progress in cassava production was achieved when Vietnam established its Cassava Research and Extension Network, in close cooperation with starch processing factories, especially Vedan Vietnam Enterprise Corp. Ltd. New high yield cassava varieties (KM94, KM60 SM937-26, KM98-1, KM95-3, KM95) and more sustainable production practices (fertilizer application, intercropping or rotation with beans or peanut, erosion control and weed control) has increased the economic effectiveness of cassava production, especially in the Southeastern region. In order to transfer new technologies to cassava households, Farmer Participatory Research (FPR) was conducted in mountainous and hilly areas of North Vietnam. The first phase of this project was quite successful. Presently, the second phase has expanded into the Central Coastal and Southeastern Regions. The use of cassava roots and leaves for animal feed are also being studied. Biotechnology has initially been applied in lysine and modified starch processing.

Our cassava research strategy for the future consists of the following: further advances in cassava breeding and in production practices; improving soil fertility of cassava growing areas; planning and establishing production areas for processing factories; developing post-harvest technologies, and expanding markets for cassava products. The development of high starch and high yield varieties and the adoption of sustainable cassava production practices will help to maintain total cassava production while the growing areas can be reduced. This will create a strong incentive for the development of cassava industrial processing and diversification of end-products, in order to satisfy the increasing demand for cassava-based products by our people.

INTRODUCTION

During the past decade, 1991-2000, Vietnam's Cassava Program (VNCP) has achieved significant progress in four main aspects: 1) the network of cassava research and extension, set up in 1991, has expanded and has produced significant increases in production; 2) new cassava varieties, such as SM937-26, KM60, KM94, KM95, KM95-3 and KM98-1, are being grown in over 60,000 ha, resulting in a breakthrough in cassava production in Vietnam; and 3) pilot cassava farms of high productivity, high return and

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with soil fertility maintenance were studied and set up in various provinces, which has helped to increase the cassava growing area and provide raw materials for the processing industry; and 4) cassava processing factories with a total capacity of nearly 1 million tonnes of fresh roots per year have been established.

Three aspects in cassava research and development should be considered, evaluated and discussed: 1) cassava production in Vietnam: problems and prospects; 2) effectiveness of cassava research and extension in Vietnam; and 3) future needs in cassava research and development.

1. CASSAVA PRODUCTION OF VIETNAM: PROBLEMS AND PROSPECTS

At present, the annual production of cassava in Vietnam is about 2 million tonnes of fresh roots, ranking fifth in Asia, behind Thailand, Indonesia, India and China, and the thirteenth in the world (**Table 1**). However, yields remain very low. **Figure 1** shows that cassava was a minor food crop until 1975. Due to food scarcity after the reunification of the country the planted area and production increased markedly from 1975 to 1978, but then decreased gradually until the early 1990s, when production more or less stabilized due to the establishment of a cassava starch industry in south Vietnam and increasing demand for pig meat in north Vietnam. Yields remained rather stable between 7 and 9 t/ha.

Table 1. Cassava growing area, yield and production in the 13 major cassava producing countries in the world in 1998.

Region/country	Area (mil. ha)	Yield (t/ha)	Production (mil. tonnes)
Africa			
1. Nigeria	2.70	11.3	30.41
2. Congo, Dem R.	2.20	7.5	16.50
3. Ghana	0.63	11.4	7.17
4. Tanzania	0.69	8.9	6.19
5. Mozambique	1.02	5.6	5.64
6. Uganda	0.34	6.7	2.28
Asia			
7. Thailand	1.12	14.3	15.96
8. Indonesia	1.20	12.2	14.73
9. India	0.25	24.0	5.87
10. China	0.23	15.6	3.60
11. Vietnam	0.23	7.7	1.78
Latin America			
12. Brazil	1.58	12.4	19.81
13. Paraguay	0.24	13.9	3.30

Source: FAOSTAT, 1999.

Vietnam

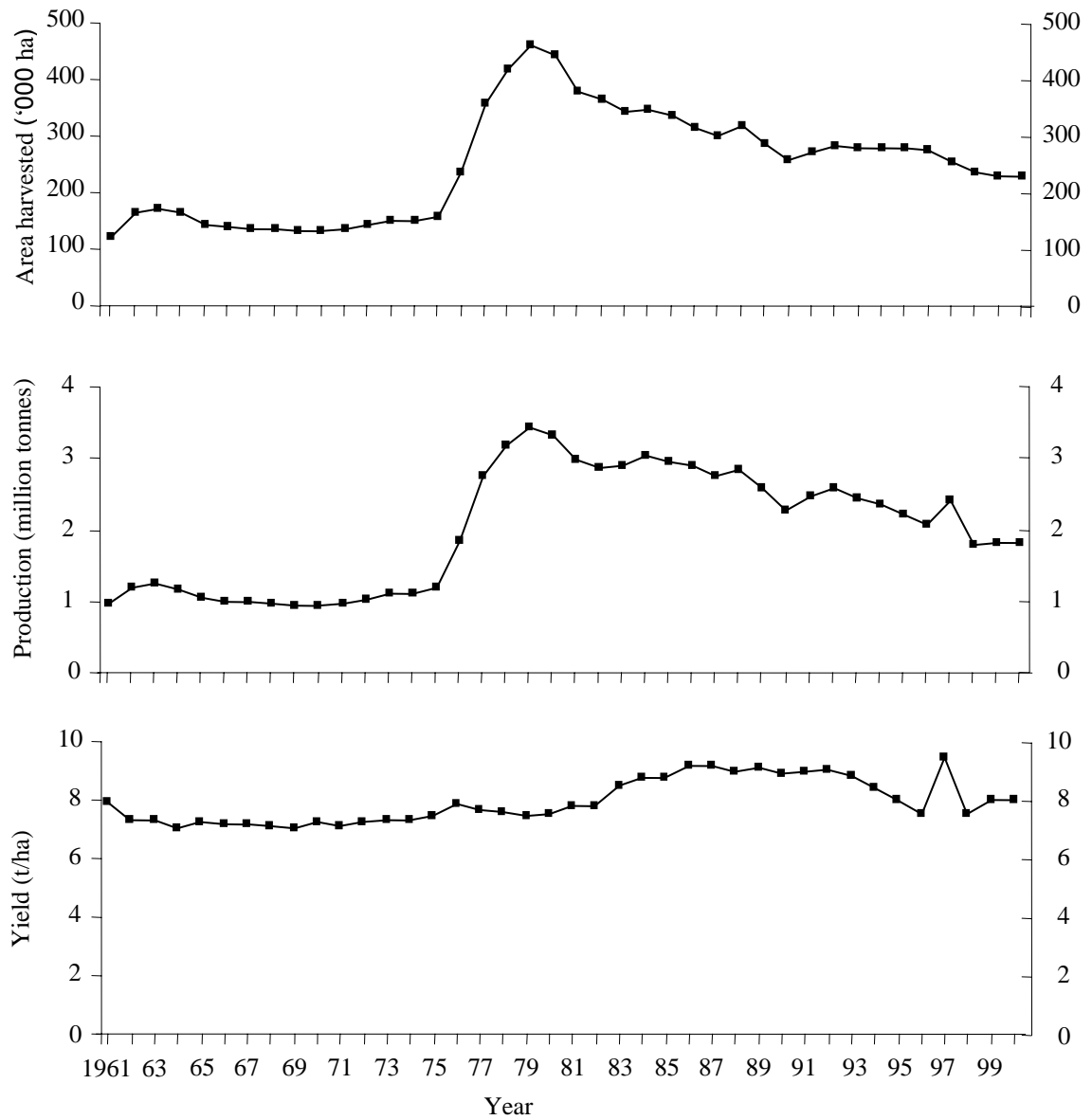


Figure 1. Cassava harvested area, production and yield in Vietnam from 1961 to 2000.
 Source: FAOSTAT, 2001.

In Vietnam cassava has a high potential for both export and local consumption. In terms of cassava exports Vietnam ranks fourth in the world, behind Thailand, Indonesia and China. The total amount of cassava exported from Vietnam was 30,000 tonnes a year during the period of 1992-1994, this increased to 150,000 tonnes in 1997 and reached over 200,000 tonnes in 1998. The cassava processing industry in Vietnam is still modest and cassava exports are limited. However, cassava production, processing and exports have a high potential due to its their ability to attract foreign investment into the production of cassava starch and monosodium glutamate (MSG) since the early 1990s. Vietnam has a good potential for cassava starch processing and export as compared with other countries in Asia (**Table 2**).

Table 2. World trade of cassava products (dried chips, pellets and starch) in millions of tonnes.

Market region	Average of 1983-1985	Average of 1992-1994	Average of 1995-1996	1998	1999	2000 prelim
Export	7.0	9.8	5.9	4.4	5.8	5.7
1. Thailand	6.4	8.3	4.6	4.0	5.3	5.2
2. Indonesia	0.4	1.1	0.6	0.2	0.3	0.3
3. China and Taiwan	0.1	0.3	0.4	-	-	-
4. Vietnam	-	-	0.1	0.2	0.2	0.2
5. Other countries	-	0.1	0.3	-	-	-
Import	6.6	9.7	5.9	4.4	5.8	5.7
1. EU	5.5	6.5	3.5	2.9	4.3	4.0
2. China and Taiwan	0.3	0.9	0.7	0.5	0.7	0.5
3. Japan	0.3	0.5	0.4	0.3	0.3	0.3
4. South Korea	0.2	0.7	0.3	0.4	0.1	0.1
5. Other countries	0.3	1.1	1.0	0.3	0.4	0.8

Source: Henry and Gottret, 1996; Henry and Hershey, 1998; Hoang Kim et al., 2000; FAO, 2000.

In South Vietnam cassava has rapidly changed its role from a food crop to a major source of raw material for starch processing and the animal feed industry. Cassava starch is an export product of high value. Cassava has been a crop giving a good cash flow with a steady market, and has become a main source of income of farm households in many areas. Cassava is a highly competitive commodity crop because it adapts well to a wide range of climates and soils, it is easy to grow, tolerant to low soil fertility and requires only low inputs (**Table 3**).

Table 3. Production costs and economic returns from growing cassava, cv. KM 94, on grey podzolic soils of An Vien village in Dong Nai province in 1998/99.

Items	Average farmers ¹⁾	Good farmers ²⁾
Costs ('000 VND/ha)	3169 (100.0%)	4397 (100.0%)
1. Labor	1156 (36.5%)	1802 (40.9%)
2. Planting material ³⁾	400 (12.6%)	450 (10.2%)
3. Fertilizers	1045 (33.0%)	1640 (37.3%)
4. Hired tractor	342 (10.8%)	380 (8.6%)
5. Land tax	116 (3.6%)	125 (2.8%)
6. Interest	23 (0.7%)	-
7. Others	87 (2.7%)	-
Output		
1. Yield of fresh roots (t/ha)	16.2	27.8
2. Farm gate price ('000 VND/tonne)	315	297
3. Gross income ('000 VND/ha)	5130	8257
Net income ('000 VND/ha)	1934	3860
Benefit/cost ratio	0.61	0.88

¹⁾Mean of 80 farm households in An Vien

²⁾Mean of 9 good farmers in An Vien

³⁾Farmers supply their own planting material; cost estimated at 400,000 VND/ha

In North Vietnam cassava is a significant source of food and animal feed for small-scale farm households. Cassava is suitable for farmers in remote areas and for rural development programs in mountainous areas. In the food security policy of the Vietnamese government cassava is an important staple food in mountainous areas.

Four main constraints in cassava production in Vietnam are: 1) unstable prices and lack of markets; 2) low cassava yields in remote areas due to a limited adoption of new varieties and appropriate technologies; 3) low soil fertility in most cassava growing areas; and 4) limited diversification of products in processing. These are existing problems confronting the development of cassava production in Vietnam. The present situation of cassava production, processing and marketing in Vietnam was recently analyzed and reviewed in detail by Hoang Kim *et al.*, 2000.

Vietnam has a high potential in cassava production and processing, due to: 1) increasing demand for cassava in the food, starch, animal feed and pharmaceutical industries and export; 2) currently, cassava yields are very low (8.3 t/ha), but they can be doubled by using high yielding varieties with high starch content, and by applying appropriate cultivation techniques; 3) Vietnamese farmers are laborious and willing to adopt new technologies; this will lead to a higher economic efficiency in cassava

production; and 4) cassava growing areas can be extended into newly reclaimed soils, such as acid sulfate soils, hilly bare lands and sandy soils in the Central Coastal Region.

2. EFFECTIVENESS OF CASSAVA RESEARCH AND EXTENSION IN VIETNAM

Results of research on varietal improvement, cultivation techniques, processing, utilization, marketing and other economic aspects were presented in annual Vietnam Cassava Workshops. A review of cassava research in Vietnam has also recently been compiled by Hoang Kim *et al.* (2000). Cassava research in Vietnam has made significant progress since VNCP initiated its cooperation with the International Center for Tropical Agriculture (CIAT) and started taking part in the Asian Cassava Research Network in 1988. Major achievements in cassava production were obtained when the Vietnam Cassava Research and Extension Network (VCREN) was established and began its active collaboration with cassava processing factories, especially Vedan Vietnam Enterprise Ltd.

The effectiveness of cassava research and extension in Vietnam has been highly regarded after the release and dissemination of new varieties, such as KM94, KM60, SM937-26, KM98-1, KM95-3, KM95 and SM1447-7, and the adoption of improved cultivation techniques brought about a breakthrough in more sustainable cassava production, especially in the Southeastern Region. In recent years, cassava yields in Tay Ninh, Binh Phuoc, Dong Nai and Ba Ria-Vung Tau provinces have increased by 50-80%, due to the use of new varieties and the application of appropriate technologies (**Table 4**).

Table 4. Cassava area, yield and production in some provinces in the Southeastern Region.

	Area ('000 ha)			Yield (t/ha)			Production ('000 t)		
	1990	1994	1998	1990	1994	1998	1990	1994	1998
Tay Ninh ¹⁾	3.3	15.4	18.6	10.79	14.22	19.39	36.2	219.8	360.7
Binh Phuoc ²⁾	(4.7)	(6.8)	9.8	(9.52)	(9.95)	21.07	(44.4)	(67.5)	208.2
Dong Nai	14.5	12.1	12.7	13.25	12.11	15.04	192.6	146.5	191.5
Ba Ria-Vung Tau	0.1	7.2		6.4	12.29		0.5	88.5	

¹⁾Cassava in Tay Ninh in 1998 for industrial use 13,965 ha, for food 4,653 ha.

²⁾Data for Binh Phuoc in 1990 and 1994 are for the whole of Song Be province.

Source: Vietnam Statistical Publishing House, 1990, 1994 and 1998.

On acid sulfate soils and fallow lands of Tri Ton and Tinh Bien districts in An Giang province, a cropping system of cassava (8 months) rotated with Mua rice (4 months) has been very successful. In this area, even though the water supply is limited in the dry season, cassava gives a yield of 16-20 t/ha of fresh roots and provides farmers with an income of 2.4-5.6 million VND/ha. Agri-product Import-Export Company of An Giang (AFIEX) provides loans of low interest to farmers and buys cassava roots for starch

processing. Cassava production and processing have increased farmers' income and generated more employment, especially in the dry season.

In North Vietnam farmers grow new cassava varieties on small areas of land (360-5000 m²) and use the roots to raise pigs. Farmers practicing this system get 50-600 kg more live weight of pig, which are equal to 45-545 USD/household/year. The dissemination of new varieties is not as fast as in the South or in other countries, but the technology transfer process benefits many people, increasing farmers' income and generating more employment (Kawano, 1999).

The use of farmer participatory research (FPR) in the development and transfer of technologies for cassava production in mountainous and hilly areas of the North has been quite successful in the first phase (1994-1998) of the Nippon Foundation Project. In the second phase (1999-2003), this program is expanding to the Central Coastal and Southeastern Regions. On sloping lands, the intercropping of cassava with grain legumes such as peanut and black bean, and the planting of contour hedgerows of *Tephrosia candida* or vetiver grass are the best practices for soil conservation.

Long-term experiments on the application of NPK fertilizers for cassava on different soils show that on fertile soils the effect of P was still not significant after three years of continuous application; meanwhile, on grey soils of low fertility, N, P and K application gave positive effects already in the first year. Recommended N: P₂O₅: K₂O ratios for cassava for various soils are in the range of 4:2:4 and 3:2:4. The appropriate plant density is between 10-14 thousand plants/ha. Peanut, mungbean and maize can be intercropped with cassava on high-fertility soils, while on low-fertility soils peanut gives better results.

The utilization of cassava leaves and roots for feeding livestock is also being investigated. The development of cassava markets and marketing strategies are also being surveyed and studied. The application of biotechnology in lysine and starch processing has been initiated.

Even with a limited budget, VCREN has a good organizational structure and has frequently exchanged information on cassava production, processing and marketing, especially in the annual workshops. Therefore, research results, mainly new varieties and cultivation techniques, are now widely disseminated and applied in cassava production.

3. FUTURE NEEDS IN CASSAVA RESEARCH AND DEVELOPMENT

3.1 Determination of an appropriate strategy for cassava research and development

Agricultural development is still the focus of many Asian countries and Vietnam is no exception, even though there has been a trend towards urbanization and industrialization. In Vietnam, cassava is a major source of income for farmers in areas of low fertility soils and adverse climatic conditions. It is also a source of raw materials for starch processing and for the animal feed industry with a high commercial value.

Therefore, in the plan for the development of agriculture to the year 2010, the Ministry of Agriculture and Rural Development of Vietnam has emphasized the production of rice, maize and cassava.

3.2 Selection and dissemination of high yielding varieties with a high starch content

Emphasis will be on the making of crosses, the importing of hybrid seed and varieties from different sources, and on the application of biotechnology in the selection and dissemination of high yielding cassava varieties with a high starch content. Attention is also paid to the breeding and selection of multi-purpose varieties, which have a short growth duration, a prolonged harvesting period, and which are suitable for human consumption.

3.3 Transfer of appropriate cultivation techniques to farmers in different areas

In order to increase yield and to attain a sustainable cassava production system, more attention will be paid to fertilizer application on low fertility soils and to soil conservation measures on sloping lands.

3.4 Cooperation with processing factories in establishing areas with a stable source of raw materials

It is necessary to plan and stimulate the growing of cassava in certain areas, which will provide a stable supply of raw materials for processing factories, and to establish pilot farms where cassava gives high yields and where soil fertility is maintained, and to improve cultivation techniques with farmers' and factories' participation.

3.5 Research on the development of cassava processing technologies

Post-harvest technologies, diversification of processed products (instant food, fast food, animal feed, pharmaceuticals, textiles and paper) and the utilization of cassava for small-scale livestock production in remote areas, need to be studied and transferred into real production.

3.6 Structural improvement and development of the cassava extension network

3.7 Development of local and export markets of cassava

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