Processing of Cassava for Improving Livelihood of Rural Communities*

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1. INTRODUCTION

Cassava (*Manihot esculenta* Crantz) root is an important dietary staple for possibly as many as 500 million people in the tropical countries of the world (Wenham 1995).The estimated world production of cassava is about 165.3 million tons from about 16.2 million ha (FAO, 1995). It is a native of tropical America from where it spread to other countries (Cock 1985). Cassava was introduced in this Subcontinent either by Portuguese during the 17 th century or brought from South America in 1840 (Srinavas and Anantharaman, 2000). Cassava is grown in about 95 countries of the world, and currently Nigeria, Brazil, the Democratic Republic of Congo, Thailand and Indonesia are the world's largest producers of cassava (Nair et al. 2000). Thailand is the largest exporter. In contrast, Africa doest not export much cassava because it is almost entirely consumed as food.

Increasing world population coupled with limited availability of energy in some countries has prompted a recent surge of interest in cassava, not only in its traditional forms as human foods and animal feed stuffs, but also for production of important industrial products such as normal and specialized starches, alcohol, glucose and other products. Cassava, mainly grown in diverse risk prone areas, plays a significant role in the livelihood of people living close to the subsistence level. As low cost energy producer, this crop has greater potential in meeting the food security of the small and marginal farmers. Farmers in Bangladesh are not aware of the importance of cassava and do not follow scientific production,

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processing, preservation and management techniques. In Bangladesh, cassava is a neglected crop and is largely grown in Madhupur, Garo Hill and Chittagong Hill Tract areas.

Cultivation and marketing of cassava are mostly carried out by the poor tribal people, specially the tribal women in these localities. Cassava is a seasonal root crop and is available from late September to January. In Bangladesh, the estimated annual production is about 30,000 metric tons (Shams-Ud-Din 2002). Cassava, unlike potato and sweet potato, is subjected to rapid post harvest deterioration. Consequently the growers are bound to sell the crop at a very low price quickly after harvest and are deprived of the profit. About 20-30% of the total production of cassava is spoiled and wasted due to lack of post harvest storage, processing and preservation facilities in the growing areas. Introduction of appropriate and effective processing and preservation facilities in these localities to minimize post harvest losses is thus warranted. The local people eat cassava as boiled whole tubers like sweet potatoes. No other processed cassava products are available in the localities. Apart from rapid post harvest spoilage, another problem associated with cassava is that the cassava roots contain toxic component known as cyanogen. Thus the roots should be subjected to some form of processing, usually involving treatment by heat or fermentation before consumption in order to remove the toxic substances.

Processing of cassava into various value added products such as cassava flour, starch, breads, biscuits, cakes, rolls, toasts, vermicelli, chips, French-fries, pickles, sauces and animal feeds through development of small-scale enterprises have potential to increase income and improve livelihood of cassava growers (Shams-Ud-Din 2000). Moreover, increased utilization of cassava through processing into various products would ensure proper price of cassava to the farmers with resultant increase in yield and total production. This in turn will help improve the socio-economic status of the poor cassava growers. Many technologies are available on the processing of cassava elsewhere in the world. However, these are not suitable for direct adoption in Bangladesh due to socio-economic and cultural limitation. Further, due to least commercial intervention, the cassava is still to be available as different food products for commercial use in Bangladesh.

The purpose of this paper is to identify the production practices and utilization pattern of cassava, and examine the ways and means of increasing income generating activities of the rural poor through small-scale processing of cassava in a selected area of Bangladesh.

2. METHODS OF THE STUDY

This study was conducted under one of the component projects of the Research and Extension in Farm Power Issues (REFPI) program of DFID-Bangladesh. The duration of the project was 17 months starting from January 2002 and continued up to May 2003. During 1st phase of the project i.e. from January 2002 to December 2002 "Samannita Unnayan Seba Sangothan (SUSS)", Madhupur, District Tangail acted as the collaborating NGO of the project and during the 2nd phase i.e. from January 2003 to May 2003 'Bekar O Bettahin Samaj Unnayan Sangstha' (BBUS), Jalchatra, Madhupur, District Tangail was involved with the project as the 2nd collaborating NGO. The collaborating NGOs were committed to run the project by utilizing developed technologies, trained personnel and equipment/machineries after the expiry of the project. A Participatory Rural Appraisal (PRA) to assess the 'Potential of cassava processing in Madhupur Upazila' was conducted in Jalchatra, Pirgacha, Jainagacha, Beduria and Sadupara villages under Madhupur Upazila of Tangail District in January 2002.

2.1 Establishment of Cassava Processing Centres

Two cassava processing units were established each at the field sites of the collaborating NGOs located at Jalchatra and Dokhola of Madhupur Upazila. The units were equipped with brick-made baking oven (*Tondur*), locally fabricated cabinet drier, various bakery accessories and other low-cost food processing equipment. Each *tondur* had the production capacity of about 150-200 kg of bakery products per day. The purpose of the centres was to provide necessary training to the cassava farmers on cassava processing and manufacture of various value added cassava products through procuring raw cassava directly from the farmers. The concerned NGOs took the responsibility for marketing the processed cassava products.

2.2 Research on Product Development

Different formulations and processes for production of various value added cassava products were developed in the laboratory of the Department of Food Technology & Rural Industries of the Bangladesh Agricultural University, Mymensingh (BAU). The most important cassava-products developed were: dried chips, flour, breads, biscuits, cakes, rolls, crackers, vermicelli, fried chips, French-fries, candies, pickles, sauces, starch, sago and others. The composition analysis of the raw cassava and sensory evaluation of the products developed were also performed.

2.3 Skill Improvement Training

During the 1st phase of the project a training course on cassava processing was conducted in two batches for six days each at the field site of the SUSS in Jalchatra, Madhupur. Each batch consisted of 15 trainees of which 10 were female and 5 were male. During the 2nd phase of the project another training course was organized in two batches for 3 days each at the field site of the collaborating BBUS located in Dokhola of Madhupur Upazila. Each batch of the training progamme consisted of 15 trainees of which 10 were female and 5 were male. Necessary arrangements were made for regular field visits in the processing site and for technical supports in the field as per requirement. Seminar/workshop to share the experiences of the visits to cassava processing centres were also arranged.

3. PRODUCTION PRACTICES AND ECONOMIC IMPORTANCE OF CASSAVA PROCESSING

3.1 Production Practices of Cassava

3.1.1 Climate, Soil and Planting Season

Cassava grows better in warm and humid climate with well distributed rainfall. It can tolerate drought and grows on all types of soil; but saline, alkaline and ill-drained soils are not suitable. Cassava grows best on light sandy loams or on loamy sands which are moist, fertile and deep; but it also does well on soil ranging in texture from the sands to clays and on soils of relatively low fertility (Srinavas and Anantharamn 2000). In Bangladesh, it grows best on red clay soil of Madhupur region. Cassava can be planted at any time of the year, if grown as irrigated crop, but in Bangladesh it is usually planted in December-January.

3.1.2 Methods of Planting

Cassava can be planted using mound, ridge and flat method. However in Madhupur region the flat method is usually practiced. Cassava is propagated exclusively from cuttings. Cuttings are obtained from the stems of plants at least ten months old and 2-3 cm diameter. After harvesting, these stems are stored in a dry place until the next planting. Cuttings about 15-20 cm long are taken from the lowest 75-150 cm of the stem after the first 20 cm have been discarded. Cuttings from the upper part of the stem grows faster, but their final yield is less. The cuttings are planted in prepared land by hand vertically to 5 cm depth giving 75 X 75 cm spacing. Mechanical planters are also used elsewhere (Grace, 1977). The number of plants per hectare varies between 10,000 and 15,000. Fertilizers @

50:25:50 kg/ha urea, super phosphate and muriate of potash are usually applied in split doses. But for high yielding varieties the fertilizers may be as follows: NPK @ 100:100: 100 kg/ha with farm yard manure 12.5 t per ha (CTCRI, 2000). Water is essential until the plant is well established. In moist soil, sprouting takes place within the first week after planting.

3.1.3 Harvesting

The crop is harvested after 9-10 months of planting. With proper application of fertilizers the yield of cassava varies from 20 to 40 t/ha depending on the varieties. In Madhupur region the yield of cassava tubers range from 10-12 t/ha. Cassava crop is harvested by lifting the tubers from the soil. The soil around cassava stem is dug by a spade and the plant is then uprooted. The crop can also be harvested mechanically. The harvesting tools such as first order lever and second order lever type are used in many cassava producing countries (Balagopalan, 2000). The number of tuberous roots and their dimensions vary greatly among the different varieties. The roots may reach a size of 30-120 cm long and 4-15 cm in diameter, and a weight of 1-8 kg or more.

3.1.4 Cost of Cultivation and Return from Cassava

Information collected from farmers included cost of cultivation of cassava, for which the details are presented in Table 1. Total cost of Tk. 16,050 per hectare was incurred for cultivating cassava in Madhupur region. Labour component accounted for 77.26% (Tk. 12,400) of the total cost of cultivation, while material cost accounted for 22.74% (Tk. 3,650). About Tk. 1,337.50 was incurred for production of one ton of cassava tubers. Gross returns (@ Tk. 4,000 per ton), considering only tubers at an average yield of 12 tons per hectare, was Tk. 48,000. Thus farmers' net benefit was Tk. 31,950 from one hectare of cassava cultivation. The Benefit-Cost Ratio of cassava production was 2.99 (Table 1).

Table 1: Cost of cultivation and return from cassava (Tk. per hectare)

Activity/Item	Input	Quantity	Unit cost (Tk.)	Total cost (Tk.)
1 .Land preparation	Country plough	3 times	500	1,500
2. Planting materials	Stem cuttings	10,000	0.25	2,500
3. Plantation of stem cuttings	Labour	60 No.	50	3,000
4. Weeding	Labour	50	50	2,500
5. Fertilizers	Urea	50 kg	7	350
	TSP	25	12	300
	MP	50	10	500
	Labour	4	50	200
Sub-total:	-	-	-	1,350
6. Harvesting	Labour	80	50	4,000
7. Carrying	Van fares	12 tons	100	1,200
Gross cost of cultivation(A):	-	-	-	**16,050**
Total yield of cassava: **12 tons**				
Gross returns, @ Tk.4,000 per ton (B):	**Tk. 48,000**			
Net returns:	**Tk. 31,950**			
Benefit-Cost Ratio (B/A):	**2.99**			

3.2 Economic Importance of Cassava Processing

Cassava provides a major source of calories for poor families, because of its high starch content. With minimum maintenance, the farmers can dig up the starchy root of the cassava and eat it 6 months to 3 years after planting. Thus, people can cultivate cassava during times of war or natural disaster when no other food is available. In Africa, people also eat the leaves of the cassava as a green vegetable, which provides a cheap and rich source of protein and vitamins A and B (Bruinsma et al. 1985). Cassava is also cultivated for animal fodder. In many cassava growing countries, the crop is used as partial substitution for wheat flour, thus providing income to resource-poor farmers and saving foreign exchange for national governments.

Fresh cassava roots cannot be normally stored without spoilage for more than a few days after harvest. To overcome this difficulty in the marketing and utilization of cassava and to avoid heavy post harvest losses (20-30%), the roots need to be processed into shelf-stable products. Cassava is very cheap as compared to cereals

and pulses, other root and tuber crops such potato, sweet potato, yams, aroids and others.

Cassava tubers being rich in starch, is an important subsidiary food. It forms a raw material for starch and sago industry, and is a component of animal, fish and poultry feeds. Cassava starch has more purity than potato or maize starch, the tubers being practically free from non-starchy constituents such as protein and lipids and the extraction is easier and direct. Thailand and India are the major exporters of cassava starch in the international market where it is used as filler materials in paints, medicine and health drinks. Moreover, the starch and the products derived from it are used extensively in the food, brewing, pharmaceutical, paper, textile and adhesive industries. Recently it has found place in the manufacture of biodegradable plastic. It is processed into food products like flour, breads, biscuits, cakes, toasts, crackers, chips, sago, vermicelli, pappads, candies, pickles, sauces etc. Technology has been developed for economic production of alcohol from cassava tubers. Dried cassava chips are frequently used for the preparation of flour which is consumed in the same manner as rice. It also forms a major component in many animal feeds. Native and modified starches are important raw materials for many industrial uses such as in food processing, textile and adhesive manufacturing and in oil drilling industry. Starch is also raw materials for producing many derived sugar products, such as glucose, fructose, malto-dextrins and manitols, each of which has specific properties and uses in food, chemical or pharmaceutical industries (Balagoplan et al. 2000; Srinavas and Anantharaman, 2000). In industry it serves as a raw material for manufacturing starch, dextrin, glucose and ethyl alcohol.

Although nutritionists consider cassava an ‘inferior’ crop because of its low protein content (Table 2), it is advantageous to the producers and consumers for the following reasons (Bruinsma et al. 1985): (a) It is the most remunerative crop plant in the hot climates, yielding perhaps more starch per hectare than any other cultivated crop with a minimum labour (b) It has a high biological efficiency in the production of edible matter. In cereals a large part of the energy from photosynthesis is needed for building stalks to support the grains, whereas in roots and tuber crops such as cassava, there is no such requirement. Only 36-50% of the total plant mass of cereals is edible while 63-85% of root and tuber crops can be consumed by humans; and (c) Cassava is principally an energy provider and in many production areas it is considered a typical reserve food crop.

Cassava has a number of attributes that have made it an attractive crop for small farmers with limited resources in marginal areas. The attributes are: (a) It is one of the most efficient carbohydrate-producing crops; (b)It is tolerant of low soil fertility and drought; (c) It has the ability to recover from the damage caused by

most pests and diseases; (d) The roots can be left in the ground for long periods as food reserve and, thus, provide an insurance against famine; (e) The crop is well adapted to traditional mixed cropping agricultural systems and subsistence cultivation in which farmers seek to minimize the risk of total crop failure; and (f) Cassava is one of the most efficient producers of starch, which constitutes about 85% of the storage root tissue dry-matter content.

Table 2: Composition (per 100 gm edible portion) of some cassava products in comparison to other staple foods*

Components	Fresh tubers cassava	Cassava flour	Rice (Milled)	Potato
Water (g)	60	12	12	80
Energy (kJ)	658	1470	1522	322
Protein (g)	0.7	1.5	7.0	2.0
Fat (g)	0.4	0.01	0.5	0.1
Total Carbohydrate (g)	37	84	80	17
Fibre (g)	1.0	1.5	0.2	0.4
Starch (g)	28 – 32	-	-	-
Sugar(g)	3 – 5	-	-	-
Ash (g)	0.4 – 0.6	-	-	-
Thiamin (Vit.B_1) (mg)	0.07	0.04	0.06	0.1
Riboflavin (Vit.B_2) (mg)	0.03	0.04	0.03	0.03
Nicotinamide (mg)	0.7	0.8	1.0	1.5
Vitamin C (mg)	30	-	-	15
Calcium (mg)	8	55	5	10
Iron (mg)	1.0	2.0	1.0	0.7
Vitamin A (I.U.)	-	-	-	-

*Source: Leung et al. (1972)

The cassava roots are rich in carbohydrates (mainly starch) but they are low in protein, fat and mineral contents. However, the cassava roots, in comparison to rice and potato, contain higher amounts of Vitamin C, riboflavin (Vitamin B_2), iron, calcium and fibre (Table 2). As cassava is inferior in protein content to both rice and potato, animal or plant protein products are often used to balance the diet in cassava-consuming countries. Cassava tuber is known to contain antinutrient factor, cyanide (Padmaja, 1995; Cooke and Coursey, 1981; Cutting, 1978). Fortunately, the various processing steps involving treatment by heat or fermentation before consumption remove most of this toxic substance from the cassava roots.

4. PROMOTION OF CASSAVA PROCESSING ACTIVITIES

4.1 Participatory Rural Appraisal (PRA) Survey

A Participatory Rural Appraisal (PRA) to assess the potential of cassava processing in Madhupur Upazila was conducted in Jalchatra, Pirgacha, Jainagacha, Beduria and Sadupara villages under Madhupur Upazila of Tangail District in January 2002. A total of 9 PRA tools were used to collect information on existing cropping systems, time line of cassava production, productivity and fertilizer use, pattern of different crops etc. Wealth ranking was assessed by the participants considering the size of land holdings. Farmers of all five villages were categorized into three categories like rich, medium and poor. The Venn diagram of five villages showed that farmers used to get different information from the Missionaries. While the Caritas and World Vision provided education and health care services to the villagers, and the Directorate of Agricultural Extension provided services relating to crop production through the Block Supervisors. A total of 200 participants, 40 from each village participated in the PRA. The major findings of the PRA in relation to potential of cassava processing were as follows:

- The cultivation of cassava, for family consumption, started since 1948 by the tribal people of the locality with *jhum* cultivation;
- The local people used to eat cassava only by boiling the roots like sweet potato;
- Since 1971-72, farmers started to grow cassava commercially and used to supply cassava on contract basis to Messrs Rahman Chemicals Ltd., Dhaka for manufacture of starch from cassavas. However, this company subsequently stopped buying cassava from the farmers for unknown reasons. Consequently growers stated losing interest to grow cassava in large scale and the crop was gradually being replaced by pineapples, ginger, aroid, banana and sugarcane.
- Four varieties of cassava were available in the region and these were *Philippine, Nagra, Red* and *White* varieties. The highest yield was achieved with the *Philippine* variety of cassava followed by *Nagra, White* and *Red.* In terms of taste, the most popular variety was *Nagra* followed by *Philippine, White* and *Red variety.*
- The average highest yield of cassava was found to be about 12 ton per ha while the lowest average yield was about 8 tons per ha.

- The costs and returns of cassava , aroids, ginger and pineapples were calculated and it was found that the highest Benefit-Cost Ratio was obtained with ginger (3.22), followed by cassava (2.99), aroids (1.14) and pineapples (1.12).
- The farmers, mostly the tribal people, grow cassava for their family consumption in Madhupur region and a good number of farmers sell fresh cassava in the local markets in excess of their requirements for family consumption;
- Most farmers are interested to grow cassava on commercial basis if the facilities for marketing, storage and processing are available in the localities;
- Cassava appears to be the most economical and lowest risk subsistence crop for small farmers. However, the most striking problem associated with the utilization of the cassava is that the crop spoils very rapidly after harvest (within 2-3 days) and this calls for quick processing;
- Local people showed interest to increase their income generating activities through production and marketing of various value added cassava products on small scale basis;
- Literate and illiterate male and female youths showed interest for being trained on cassava processing.

4.2 Processing of Cassava Products

The various cassava-based food products (Table 3) were developed during the period of research on products development as well as during training programme of both phases of the project. Production of all these value added products involved simple equipment, recipes and procedures. In order to prepare various bakery products, the cassava flour was first produced using simple technology and forty percent of cassava flour was mixed with sixty percent of wheat flour in formulations of different bakery products such as breads, cakes, biscuits, soft rolls, toasts etc. The bakery products were manufactured with the help of brick-made baking ovens (*Tondur*) constructed one at Jalchatra and another at Dokhola in Madhupur Upazila. Most of the products were highly appreciated by the trainees and local people. The collaborating NGOs, SUSS and BBUS made all arrangements for selling the cassava products through their sales-agents In

addition to various bakery products other products like fried chips, French-fries, pickles, sauces, starch, sago etch were also processed from cassava.

Table 3: The products developed from cassava

Sl No.	Name of the Products	Sl No.	Name of the Products
1.	Dried Cassava Cubes	12.	Cassava French-fries
2.	Dried Cassava Slices	13.	Cassava Vermicelli
3.	Cassava Flour	14.	Cassava *Chanachur*
4.	Cassava Breads	15.	Cassava Candies
5.	Cassava Cakes	16.	Cassava Pickles in Oil
6.	Cassava Sweet Biscuits	17.	Cassava Sweet Pickle
7.	Cassava Cracker/Salted Biscuits	18.	Cassava Chutney
8.	Cassava Toasts	19.	Cassava Sauce
9.	Cassava Soft Rolls (Buns)	20.	Cassava Starch
10.	Dried Cassava Chips	21.	Cassava Sago
11.	Fried Cassava Chips	22.	Animal Feeds from Cassava

4.3 Procurement of Cassava and Value of Cassava Products: Some Evidence

During the 1st phase of the DFID supported project, the collaborating NGO SUSS procured 2,000 kg. fresh cassava from the farmers during the periods from May to June and from October to December 2002 respectively. These cassava roots were processed to produce 710 kg. of cassava flour by the NGO. Forty percent of cassava flour was mixed with sixty percent of wheat flour for production of various bakery products such as breads, cakes, biscuits, soft rolls, toasts etc. Thus 710 kg. of cassava flour was used with 1,065 kg. wheat flour to make a total of 1,775 kg. cassava-wheat flour mixture, and the production of various bakery products from this cassava -wheat flour mixture was about 4,000 kg. Total production of various bakery products (with or without cassava flour) was about 22,000 kg during the period from June to December 2002 for which the total value was about Tk. 880,000 (Table 4.)

Table 4: Procurement of cassava, production of cassava flour and sales proceeds of the bakery products*

Collaborst	Reporting period	Quantity of raw cassava procured (kg)	Producti on fo cassava flour (kg)	Production of cassava flour based bakery products (kg)	Value proceeds cassava flour based bakery products (kg)	Productio of wheat flour based bakery products (kg)	Total psroduc tion of bakery bakery products (kg)	Total value (Tk.)
SUSS: Samannita Unnayan Seba Sangothan	May 2002 to December 2002	2,000	710	4,000	160,000	18,000	22,000	880,000
BBUS: Bekar O Bettahin Samaj Unnayan Sangstha	February 2003 to March 2003	150	50	280	11,200	500	780	31,200
TOTAL:	-	2,150	760	4,280	171,200	18,500	22,780	911,200

* The major bakery products include: Breads, cakes, sweet biscuits, salted/cracker biscuits, soft rolls (Buns), toasts, vermicelli, *murali* etc.

** Formulations contained 40% cassava flour and 60% wheat flour

During the 2nd phase, the other NGO BBUS procured 150 kg. fresh cassava from the farmers during the periods from February to March 2003. These cassava roots were processed to produce 50 kg. of cassava flour by the NGO. Forty percent of cassava flour was mixed with sixty percent of wheat flour for production various bakery products such as breads, cakes, biscuits, soft rolls, toasts etc. Thus 50 kg. of cassava flour was used with 75 kg. wheat flour to make a total of 125 kg. cassava-wheat flour mixture and the production of various bakery products from this cassava - wheat flour mixture was about 280 kg. Total production of various bakery products (with or without cassava flour) during the period from February to March 2003 was about 780 Kg, valued at about Tk. 31,200. The management of the NGOs SUSS and BBUS made all arrangements for selling the cassava products through their sales-agents. Total production of various bakery products during phase I and II of the project was 22,780 kg with sales proceeds of Tk. 911,200.00 (Table 4.).

5. MANPOWR DEVELOPMENT AND LIVELIHOOD IMPROVEMENT

The following achievements were made centering round the cassava production and processing activities:

a. Sixty rural unemployed poor were trained in cassava processing – availability of trained manpower in cassava processing thus increased particularly in the production of cassava-based bakery products.

b. Income generation activities increased among the poor. A good number trained farmers showed interest for production of cassava-based value added products at small scale level. Different cassava-based food products specially bakery products were being manufactured and made available in the local market.

c. Utilization of cassava increased. The cassava farmers were benefited as they were getting better price. The collaborating NGOs procured 2,150 kg cassava from the farmers, produced 760 kg cassava flour and finally manufactured 4,280 kg cassava-flour based various bakery products worth Tk. 171,200.

d. Employment opportunity increased for local people. The collaborating NGO employed 16 staff including 5 cassava processing technicians, 7 sales-agents, 2 production supervisors, 1 Cashier-cum-accountant and 1 peon-cum-guard.

e. It has been demonstrated that there is a good prospect of home-based small-scale processing of cassava for production of value added cassava products in the Mahupur Upazila. Selection and demonstration of low cost cassava processing equipments for value added products have definitely encouraged farmers to set up small scale or household based cassava processing units to improve their livelihoods by adopting various cassava processing activities.

6. CONCLUSIONS

It has been evident through this investigation that cassava processing can make substantial value addition and thereby can contribute to development of livelihoods of the people of less developed areas, inhabited particularly by the tribal communities. Thus the production and processing activities can be geared to address livelihood development of selected target communities for whom cassava production and consumption has been an age-old practice.

The strategy for expansion of cassava production and processing should be based on linking the small scale producers with small scale processing activities. Decentralized small scale processing is an important strategy to resolve the problem of minimizing transport cost and post harvest deterioration of the bulky and low-cost crop like cassava.

The new entrepreneurs should be encouraged through provision of low-cost credit to develop/procure essential cassava processing equipment, especially the cassava chipping machine, peeling knives and pelleting machine. Besides, improved cassava processing technologies should be disseminated to farmers and small-scale food processors, and the products should be promoted among the target consumers by organizing food fairs and advertising through mass media.

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