

INDIGENOUS TECHNOLOGIES IN HOME PROCESSING OF ROOT CROPS: A SURVEY AND ECONOMIC ANALYSIS

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ABSTRACT

This study analyzed the income generating potential of indigenous technologies in processing sweet potato and cassava roots in the rural areas.

Twenty-three indigenous root crop processing products were studied and classified as fried, steamed, baked and dried. Of the 23 products monitored, nine have positive net returns namely *maruya*, *bitsu-bitso*, cassava doughnut, *pilipit*, *sinaging*, *pinisi*, *cacharon*, slice and *tinitim*. The use of inefficient indigenous tools and equipment, unstandardized product formulation and high labor input greatly contributed to the high production cost, hence the losses in the other products.

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INTRODUCTION

Studies show that small farmers grow sweet potato and cassava mainly for home use. Villanueva (1980)* pointed out that 50% of sweet potatoes produced is used as food, 39% dis-

posed and 11% as feeds. Similarly, 48% of the cassava produced is used as food, 37% disposed and 15% as feeds.

Development thrusts in agriculture include the improvement of the life quality of the rural poor where majority of the root crop processors (farmers and

*Villanueva, C.D. et al. 1980. Agro-economic studies of root crops in the Philippines. Terminal report. ViSCA. 200 pp.

non-farmers) belong. Yet, there has never been a research on root crop processing to show which processes of the identified indigenous technologies have high income potential. Research of this kind is useful to technology generators in developing area specific technology for root crops and to policy makers in formulating facilitative policies that enhance economic growth of the rural poor.

Specifically, the study aimed to identify the indigenous technologies in processing sweet potato and cassava, determine the income generating capability of indigenous food products, and identify areas for improving existing technologies to increase their productive potential. The broad focus of the study includes processing not only by farmers themselves but also by non-farmers as long as the processed products are sold or disposed to generate income for rural households.

METHODS

A market survey on the processed root crop products sold by rural households was undertaken to identify the indigenous processing technologies and the kinds of processed products. These products include those converted to final products such as cakes, crackers, sweets and local delicacies and those converted to intermediate products such as starch, flour and chips.

Fifty-nine towns in Leyte were used in the selection of sample markets and cooperators. To assure that all processed products were picked-up, the sample markets were systematically se-

lected by listing all the municipal markets in sequence. From Baybay, the base town, every third town was considered a sample market. From each sample market, a list of root crop based processed products and processing equipment used was prepared. The processors were also interviewed in relation to the technology used. To simplify the selection of cooperators, products processed similarly but using different technologies were considered different. Products named differently but processed similarly were considered similar.

For monitoring purposes, a list of processors was prepared according to the product processed. Nonetheless, a processor may be producing two or more products; hence, the actual number of sample processors could be less. The process of making the product until it was sold in the market was observed.

Cost and return analysis of the different indigenous root crop processing technologies was made during the monitoring process to determine the net returns accrued to the rural households. The cost and return was computed based on the usual volume produced by the processors but was expressed in pesos per kilogram of raw material for uniformity of units used.

RESULTS AND DISCUSSION

Processed Root Crop Products

Twenty-three indigenous root crop products processed at the household level around Leyte island were

considered. Twenty-two products were for human food and one for feed. Several food products with the same formulations and process descriptions have different names in various places. The root crop food products could be classified into fried, steamed/boiled and baked.

Fried Root Crop Food Products.

The raw materials of the fried root crop products were usually cassava and sweet potato roots. Ingredients used to enhance the flavor of the products were brown sugar, pounded rice, banana, milk, and coconut. The ingredients and methods of mixing during processing differed in each product. For products requiring very fine particles, the roots were grated using a home-made grater. The grated roots were then mixed with other ingredients and spread in thin layers on leaves or any material that would serve the purpose. The mixture was then formed into specific shapes and then fried. The total process varied from product to product. Generally, the methods of processing by frying could be classified into five main groups (Table 1).

Steamed/Boiled Root Crop Food Products. The seven products in this category could be classified into three main groups based on their processing methods (Table 2).

Baked Root Crop Food Product. Cassava *bibingka* is the only product in this category. With the use of hands, peeled cassava roots are washed, grated and pressed to remove the juice. Sifting follows and the sifted pulp is mixed with milk, beaten eggs, margarine,

brown sugar and salt. The mixture is poured into baking trays and baked until done. The baked product is then cut into slices ready for market. The crust is brownish and dry.

Dried Root Crop Product for Feed and/or Flour Manufacture. Cassava roots are peeled, washed, and cut into strips/chips with a shredder. The strips/chips are sundried until dry and brittle before packing for storage or immediate selling to middlemen. The chips have more or less uniform shapes and sizes. The product can be used for food or feed.

Equipment Used

Twelve indigenous processing devices were commonly used by the processors in their traditional root crop processing operations. They are as follows:

Cassava/Sweet Potato Peeler. The peeler is actually a common kitchen knife.

Cassava Shredder/Chipper. The shredder consists of a shredding blade which is made of a tin plate with holed corrugations, mounted and nailed on a wooden frame.

Sweet Potato Slicer/Chipper. The device is actually a carpenter's smooth plane for wood or lumber operated by sliding the sweet potato root forward against the bottom surface of the smooth plane to produce thin, flat slices.

Cassava Grater. The grater consists of a tin-plate blade with nail-punctured protrusions which is mounted and nailed on a wooden frame.

Table 1. Indigenous fried root crop food products.

Process	Local Name of Product	Features
Chipping/Shredding - Frying	<i>Camote chips</i>	Crispy, thin, flat and irregular in shape, yellowish brown, oily and made from sweet potato roots.
	<i>Baduya</i>	Crispy, thick, flat and round, brownish and made from sweet potato roots.
	<i>Maruya</i>	Crispy, thick, flat and round, brownish and made from sweet potato roots.
	<i>Bitsu-bitso</i>	Crispy, thick, flat and round, brownish and made from cassava roots.
Grating - Frying	<i>Cassava doughnut</i>	Soft-dry, ring-shape and brownish.
	<i>Pilipit</i>	Soft-dry, short-round bar and made from cassava roots.
	<i>Sinaging</i>	Soft and/or crispy, short-round and made from cassava roots.
Grating - Pressing - Frying	<i>Butse-butse</i>	Soft-dry, ball-like and made from cassava roots.
	<i>Pinutong shakoy</i>	Soft-dry, helix bar and made from cassava roots.
Grating - Steaming - Drying - Frying	<i>Kabkab</i>	Crispy, thin, flat and wide, brownish and made from cassava roots.
Frying (Cassava flour as intermediate product)	<i>Pinisi</i>	Soft-dry, short-helix bar and brownish.
	<i>Puto-sulot</i>	Soft-dry, short-rectangular bar and brown.
	<i>Shakoy</i>	Soft-dry, short-helix bar and brown.
	<i>Cacharon</i>	Crunchy, square or rectangular and pale yellow.

Table 2. Steamed/boiled root crop products.

Process	Local Name of Product	Features
Steaming/Boiling	Slice	Soft-moist and sticky, short rectangular bar and made from cassava roots.
	Java roll	Soft-moist and sticky, round and made from cassava roots.
	<i>Camote candy</i>	Soft-dry, short rectangular bar and made from sweet potato roots.
Grating - Pressing - Steaming	<i>Cassava puto</i>	Soft-moist and sticky, rounded and yellow.
	<i>Tinitim</i>	Soft-moist and sticky, rectangular, yellow and made from cassava roots.
	Java cake	Soft-moist and sticky, rectangular, yellow and made from cassava roots.
Grating - Drying - Boiling	<i>Ira-id</i>	Soft-moist and sticky, short, rounded bar, wrapped with banana leaves and made from cassava roots.

Cassava Juice Extractor. The device consists of a long bench, two-arm length lumber and rocks as weights. One end of the lumber is tied with a

rope to the other end of the bench. Extraction is done by wrapping the grated cassava roots with a nylon sack and placing the sack in between the tied

ends of the bench and the lumber. The rocks are loaded at the other end of the lever arm lumber as weights to press and extract the juice.

Coarse Cassava Flour Sifter. The sifter consists of a native winnowing basket used for winnowing rice and a framed plastic screen. The pressed grated cassava roots are placed on the plastic screen and rubbed by hand against the screen surface to disintegrate them through the screen into the winnowing basket.

Cassava Puto Steamer. The steamer consists of a common clay pot and halved coconut shell which serves as molder and holder of the *puto*.

Kabkab Steamer. The steamer is composed of a big carajay with a slatted structure that fits 5 cm below its brim and a few cm above the water level. It is operated by placing the freshly flattened *kabkab* on the slatted structure and steaming it until cooked.

Boiled Sweet Potato/Coconut Grates Grinder. The grinder is a manually operated commercial corn mill.

Camote Candy Cooking Stove. The stove is a common open fire stove.

Camote Candy Flattening-Compacting Device. The device is made of 2.5 cm diameter plastic pipe and is operated by rubbing and pressing the pipe over the *camote* candy spread inside the compacting or molding box.

Boiled Cassava Pounder. The pounder is the common mortar and pestle for pounding rice. Boiled cassava is pounded to produce a fine pasty product.

The most common drawbacks of the identified processing devices are the risk and tediousness in the processing operations. These drawbacks contribute to low one-man output capacities of the devices and low or negative profitability of the products due to high labor cost.

Cost and Return Analysis

Most of the indigenous root crop products were usually sold in primary schools and villages. Since most of the processors were housewives operating on part-time basis, their finished products were usually limited and easily sold in the locality.

Income analysis of the different products monitored employed the following measures: total receipt, total cost, net income, return to household labor and percent net gain on total receipts.

Table 3 shows the summary of measures and variables used in the income analysis of all root crop food products. Of the 23 root crop products monitored, only nine have positive net returns above variable costs. These include *maruya*, *bitsu-bitso*, cassava doughnut, *pilipit*, *sinaging*, *pinisi*, *cacharon*, slice and *tinitim*.

Cacharon has the highest percentage (54%) gain on total receipts followed by slice (37%), *pilipit* (23%), *bitsu-bitso* (12%) and *maruya* (11%). The other products with positive net returns have only about 10% or less gain on total receipts.

Several factors contributed to the registered losses and low profitability

Table 3. Summary of costs and returns of the different kinds of processed indigenous root crop products, 1986.

Product	Total Receipt (P)	Total Cost (P)	Net Income ³ (P)	Return to Household Labor (P)	Percent Gain on Total Receipt (P)
<i>Camote chips</i> ¹	6.96	9.24	-2.28	-3.33	-
<i>Baduya</i> ¹	7.50	7.65	-0.15	-0.67	-
<i>Maruya</i> ²	32.15	28.57	3.58	1.97	11.14
<i>Bitsu-bitso</i> ¹	2.65	2.33	0.32	0.09	12.08
<i>Cassava doughnut</i> ¹	7.14	6.39	0.75	0.09	10.50
<i>Pilipit</i> ¹	7.50	5.70	1.80	1.08	22.67
<i>Sinaging</i> ¹	8.57	7.72	0.85	0.12	9.91
<i>Butse-butse</i> ¹	4.46	6.43	-1.97	-2.56	-
<i>Pinutong shakoy</i> ¹	1.50	2.60	-1.10	-1.32	-
<i>Kabkab</i> ²	16.05	20.21	-4.16	-5.71	-
<i>Pinisi</i> ²	62.50	57.14	5.36	1.02	8.58
<i>Puto-sulot</i> ²	62.50	65.71	-3.21	-8.94	-
<i>Shakoy</i> ²	38.85	43.33	-4.48	8.87	-
<i>Cacharon</i> ²	83.20	37.95	45.25	39.94	54.39
<i>Slice</i> ¹	4.85	3.04	1.81	1.49	37.00
<i>Java roll</i> ¹	2.50	5.48	-2.98	3.31	-
<i>Camote candy</i> ¹	7.60	9.70	-2.10	-2.31	-
<i>Cassava puto</i> ¹	1.76	3.15	-1.39	-1.63	-
<i>Tinitim</i>	7.50	6.75	0.75	0.00	10.00
<i>Java cake</i> ¹	1.39	2.69	-1.30	-1.54	-
<i>Ira-id</i> ²	14.25	18.91	-4.62	-3.07	-
<i>Cassava bibingka</i> ¹	5.45	7.28	-1.83	-7.64	-
<i>Dried cassava chips</i> ¹	0.60	1.28	-0.68	-0.82	-

¹Based on one kilogram of fresh roots as raw materials.

²Based on one kilogram of cassava flour used in processing.

³Net income above all variable cost including the value of household labor computed based on the hiring rate in the area.

of the root crop based food products. Firstly, the processors use unnecessary ingredients (e.g. extravagant use of sugar on naturally sweet products). Secondly, the price per unit of the processed product is very low based on volume. Products usually sold at

P0.25/piece could easily be sold for P0.50 to P1.00 which was still cheaper than commercial baked products (P1.00 to P1.50/piece). Thirdly, the processes are labor intensive, hence the high labor cost. This large labor requirement was attributed to improper

and inefficient equipment (e.g. a processor in Northern Leyte uses a carpenter's plane in chipping root crops). Others use an individual steamer instead of a batch type one which can considerably cut processing time of *puto* and *kabkab*. Some of the indigenous equipment are also crude and strenuous to operate, i.e. it requires a stronger person than the wife or daughter to operate, hence doubling labor cost. This was exemplified in the use of cassava juice extractor and in the stirring of camote candy.

Major Problems In Home Processing of Root Crops

The major problems of root crop processing by household entrepreneurs in Leyte are enumerated below:

Unstandardized Product Formulations. Amounts of ingredients are merely estimated based on experience of food processors and this bring about great variations in product qualities.

Due to lack of knowledge about the physico-chemical properties of the raw materials, addition of some ingredients to the formulations may cause adverse effects on the products' qualities. For instance, adding sugar to sweet potato slices before frying causes browning of the product.

Poor Sanitation. In household operation, mixing of ingredients is commonly done by hands. Equipment and cooking utensils are seldom cleaned. Processing areas are usually un-screened and therefore, are highly accessible to flies and other insects. Disposal of wastes is poorly done.

Poor and/or Imbalanced Nutritional Value. Most of the identified food products are considered energy food with high carbohydrates and fat contents. Addition of sugar or coconut milk further stresses the imbalanced nutritional quality of the products.

Poor Packaging Materials. The products are generally packed in thin plastic bags with improper sealing. Such packaging practice results in short shelf-life which ranges from 2-7 days. The use of thin packaging materials particularly for fried and crispy products results in the early onset of rancidity and rapid loss of crispiness.

Inefficient Food Processing. Food processing at the household level is generally laborious and inefficient in terms of manpower resources. All operations in the processes are usually done either manually or by using inefficient and unsanitary traditional tools.