NEW PRODUCTS OF FUTURE POTENTIAL IN THE PHILIPPINES: CASSAVA FLOUR AND GRATES

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ABSTRACT

In most parts of the Philippines, root crops have evolved from being mainly a source of energy-rich human food to a key commercial crop with high-value and marketable products in the form of flour and grates. Economic analysis indicates that cassava flour could be competitive, both in price and quality, with wheat flour. Allowing a 25% profit margin attained from production to processing, cassava flour may be sold at 75% the cost of wheat flour. This resulted in a reduction of 5% in the cost of bread using a composite flour mix of 80% wheat and 20% cassava. It also produced a special type of aroma, texture and distinct taste, especially if using the Golden Yellow variety released by the Philippines Root Crops Research and Training Center (PRCRTC; now renamed PhilRootcrops).

Cassava grates, on the other hand, is the main component of high-value food products like cassava cake, "pitsi-pitsi" and cookies. Initial studies indicate its wide acceptability in urban markets, resulting in increasing demand. It obtained a return on investment (ROI) of 50%, compared to cassava flour, which had only 20%. Both products have their own processing system and equipment developed by PhilRootcrops, the Univ. of the Philippines in Los Baños (UPLB), and a private manufacture, the ALMEDA. These plants have served as pilot projects in previous studies.

The economic impact can only be felt if these village-type plants go into commercial production with sufficient and sustained volume. As the demands for flour and grates grow, there should be a number of these village-type plants in each cassava production area. Moreover, research and development on system improvement and evaluation should be continuously pursued with full integration of all efforts from crop production to product development.

INTRODUCTION

Root crops are the third most important crop in the Philippines, after rice and maize. They are traditional crops that are easy to grow and are adapted to a broad range of agro-ecological conditions. In fact, many of these root crops are planted in marginal areas where other crops cannot grow well. Root crops are an important source of food, feed and starch among the Filipinos. About half a million ha of agricultural land are planted to root crops each year (NRRDEN, 1999).

Among the root crops, cassava leads in terms of area and production. Cassava roots can be processed into various products, and can replace various associated raw materials whose supplies are imported or, if locally produced, are unstable. These include maize in the manufacture of animal feed, molasses for production of sweeteners or alcohol, and wheat flour in various bakery products. Presently, the use of cassava as a feed ingredient is more accepted by feed millers than ten years ago. However, cassava for food use is still at a semi-commercial or subsistence level. One major disadvantage of cassava is the high perishability of the fresh roots when not handled and stored properly. Cassava roots starts to exhibit vascular streaking about 48 hours after harvest, rendering them unfit for human consumption. To increase the potential of using cassava for food and to increase the value of the roots requires transforming the product into a dried form.

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This paper thus presents the potential of cassava flour and grates in processing as a viable industry.

OVERVIEW OF CASSAVA UTILIZATION

The average volume of cassava production in the past 10 years (1989-1999) was close to 2.0 million metric tons. Of this, 35% was used for the manufacture of starch, 50% for food and 5-15% for feed. The largest percentage is utilized for food, especially in Muslim Mindanao (southern part of the country), where the people utilize cassava as their staple food. Utilization of cassava as a feedstuff is a growing industry; hence, there is potential growth in this sector.

1. Industrial Uses

Commercial use of cassava began only in 1956 with the establishment of starch factories in Mindanao and Pangasinan, triggering a rapid increase in the production of the crop. Since then, the growth of cassava production has been related to the growth of the starch industry. The use patterns for food, processing and animal feed have changed from 68-21-11, respectively, in the sixties to the ratio of 60-34-6 in the seventies where starch is the major industrial use (Roa and Orias, 1997).

Today, there are ten major cassava starch factories in operation; however, cassava production for starch is facing problems of cost increases, prices instability and sustainability. In a related development, some companies have ventured into other uses of cassava, such as alcohol production for human consumption, and using it as a binder in the food and paper industries. Some of these are now being put in place in Negros Occidental and Northern Mindanao. The long-term viability of such projects and other considerations are being looked into to determine how technology, social and economic factors interplay and affect one another.

2. Food Uses

Cassava is traditionally eaten as a staple or a staple supplement when cereals are not adequately available. It is boiled, steamed or fried (e.g. *kabkab*), or processed into local delicacies of various procedures, forms and taste. In Mindanao alone, there are at least 30 different preparations of grated cassava (Loreto, 1999). Among the local delicacies, cassava pie, pudding and cake are gaining popularity in the urban areas. These products are traditionally prepared using fresh grated cassava. However, fresh cassava and its grated form have high perishability; hence, market reach is constrained. Thus, consumption of the roots is virtually confined to the rural areas.

POTENTIAL PRODUCTS

In areas far from starch mills and chip traders, income and employment opportunities from cassava are limited. To increase market reach and to make cassava products more available in the urban areas (where disposable income is presumably higher), requires transforming fresh cassava roots into more stable and acceptable products. The products that seem to have most potential are cassava flour and dried grates.

1. Cassava Flour

Wheat grain is still the primary raw material for flour milling in the country. Like in other tropical countries, it is highly import-dependent with most wheat coming from the United States, Canada and Australia. The Philippines is the fourth biggest importer of wheat, next to Japan, Egypt and China. Since flour is produced from an imported raw material, locally produced alternatives are sought. Research by the Philippine Root Crop Research and Training Center, in collaboration with the Department of Agricultural Chemistry and Food Science, indicates that many bakery and other food products can be substituted with cassava flour without affecting their quality (**Table 1**).

Table 1. Acceptable level of substitution of cassava flour in selected food products.

Food Product	% Substitution	References
Paborita	50	Palomar *et al*., 1981 & Lauzon *et al*., 1987
Cheese crackers	50	Palomar *et al*., 1981 & Lauzon *et al*., 1987
Coconut cookies	50	Palomar *et al*., 1981
Doughnuts	50	Palomar *et al*., 1981
Gollorias	50	Palomar *et al*., 1981
Polvoron	100	Palomar *et al*., 1981
Pandesal	20	Palomar *et al*., 1981
Fried cheese sticks	50	Truong *et al*., 1983
Cinnamon rolls	50	Monserate *et al*., 1983
Muffins	50	Truong *et al*., 1983 & Lauzon *et al*., 1985
Cassava shrimp sticks	50	Lauzon *et al*., 1985
Chiffon cake	100	Lauzon *et al*., 1985
Butter cake	100	Lauzon *et al*., 1985
Cacharon	100	Lauzon *et al*., 1985
Hot rolls	20	Palomar *et al*., 1981
Loaf bread	10	Palomar *et al*., 1981

The flour used in these products had been dried to a moisture content of 10-12%, and milled to a particle size that will pass through the 180 µm mesh.

2. Dried Grates

On the other hand, the market for cassava cakes, pies and pudding is slowly developing. As mentioned earlier, the high perishability of fresh cassava roots and grates remains a challenge among post-harvest scientists. One possible solution is the use of dried grates. Dried grates are those products that underwent rasping and drying, and finally passed through a 140 µm mesh. Studies by Palomar *et al*. (1981) and Lauzon *et al*. (1985) show that cassava cakes, pies and pudding produced using dried cassava grates are comparable with those produced from fresh grates in taste, appearance and acceptability among consumers. Dried grates as a product form has certain advantages, such as: a) being as stable as flour; b) amenable to use in preparations of various local delicacies; and more importantly, c) have good market demand. Market testing shows a promising market

potential for grates in convenient delicacy packs, not only for domestic distribution but also for Filipinos living abroad who long for this special product.

FLOUR AND GRATES PROCESSING

Processing of cassava into flour and grates is very simple. The fresh roots undergo primary processing such as sorting, washing and peeling prior to chipping or grating. Drying of the chips or grates is accomplished either through sun-drying or the use of mechanical dryers. Milling followed by sieving of the dried chips or grates is done to attain the final consistency of the product (**Figure 1**).

There are a few critical points in the process: a) cleanliness of the chipping/grating and drying activities; b) dryness of the chips/grates; and c) appropriate storage of the chips/grates. Moreover, the use of high quality roots is very important because it dictates the overall quality of the product.

Economic Analysis

Fine flour recovery from fresh roots is approximately 25-30%, depending on the maturity of the roots, variety and machine efficiency. Under the present price and cost structure for cassava and wheat, it is economically feasible to produce cassava flour at a competitive price. Allowing a profit margin for raw materials in processing, cassava flour may be produced at 75% the cost of wheat flour. Hence, cassava flour can be sold at 18.00 pesos/kg, while wheat flour costs 25.00 pesos/kg. The resulting cost of bread made from a wheat-cassava composite flour mix of 80: 20 will be lower.

For cassava grates, net returns are relatively higher because they can be sold at a price 25% higher than that of cassava flour due to their special use. This results in an improvement of ROI (returns on investment) of up to 50%, compared to a maximum of only 25% for cassava flour.

Pilot Production of Flour and Grates

One of the projects assisted by PhilRootcrops belonged to the Mabagon Rootcrop Cooperative Association (MARCA) in Hindang, Leyte. It is a cooperative comprising mostly female members and managed by a male member. Most of the members are also producers of cassava, generally on a semi-commercial or subsistence level. The variety commonly planted in their farms is Golden Yellow with a yield range of 5-18 t/ha with no fertilizer input (Tan *et al*., 1996).

Housewives of cassava growers who are also members of the cooperative carried-out processing of cassava chips. Quality dried cassava chips were made by washing the roots, peeling them into thin cylindrical strips, and sun-drying on mats. The process is a traditional practice of women in the area. The quality of dried chips passed the quality specifications for flour.

The project then introduced a chipping and milling machine for flour processing. When the production of flour stabilized, the idea of utilizing cassava flour was introduced to bakeries and other food processors. Later, the project expanded into the production of dried grates due to the demand from food processors in Manila.

The project was successful, both in terms of acceptance by bakeries and profitability. This continued until the co-op leader resigned from the cooperative due to political and family reasons, leading to a vacuum in the leadership of the cooperative. No

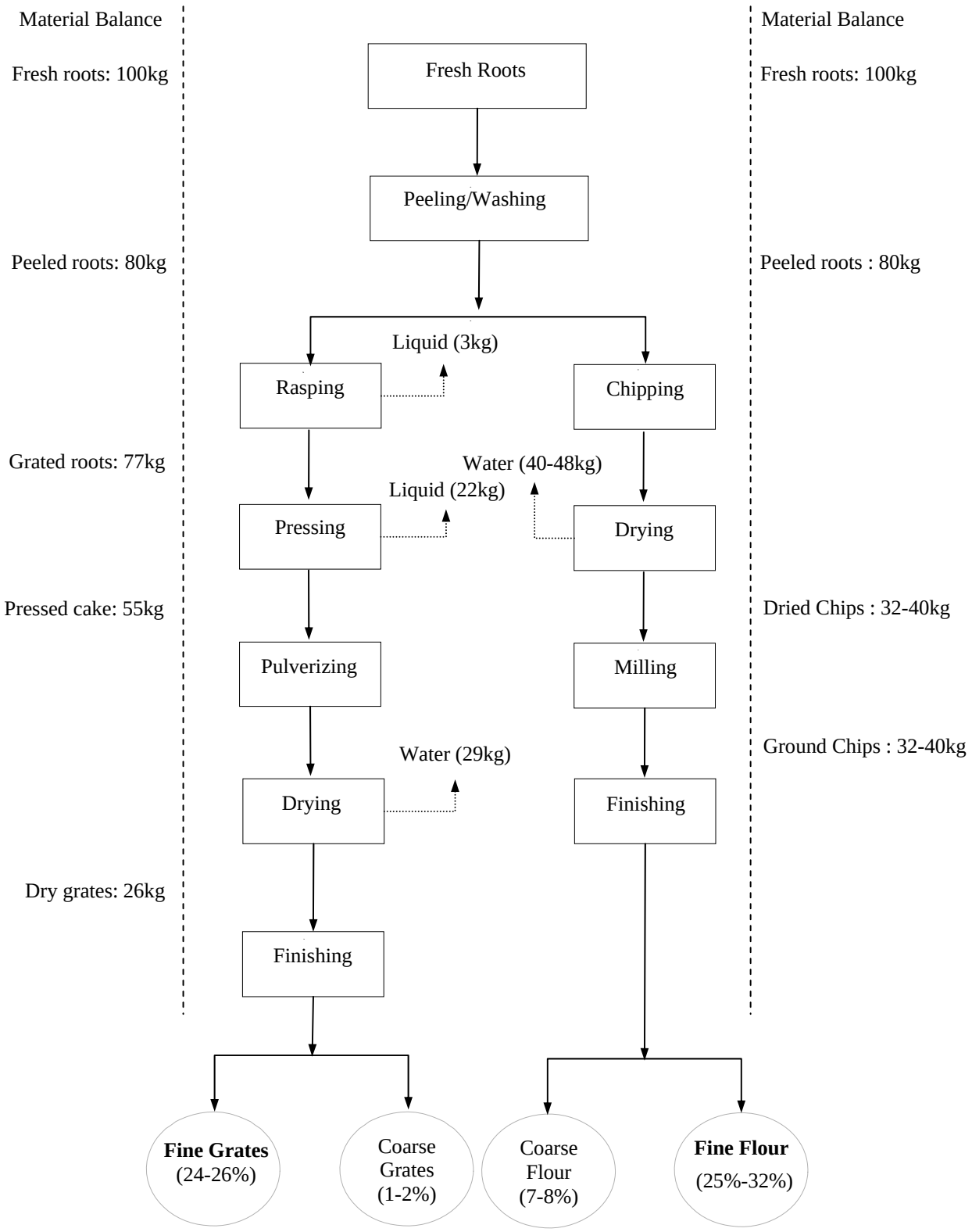

Figure 1. Cassava flour and grates processing flow and estimated recovery (in percent) from fresh roots.

one among the members was willing to take on the responsibility. Consequently, the supply of cassava flour to bakeries became irregular, forcing bakery owners to switch back to 100% wheat flour. Similarly, the market for dried grates switched to other suppliers due to the unstable supply from the cooperative.

CONCLUSIONS AND RECOMMENDATIONS

Cassava flour has yet to evolve into a commercial product, and be produced on a commercial scale. It must succeed at a smaller entrepreneurial scale, but with a larger collective production capacity from a number of established mini-plants. Cassava flour may find a market niche, not as bread flour alone but as specialty flour, similar to sweetpotato flour, which is marketed as gluten-free flour for those suffering from celiac disease. The processing of dried grates, on the other hand, should be passed on to processors that can strongly market the product, both domestically and abroad. It is in this new direction that we see brighter prospects for cassava flour and dried grates in the near future – they are competitive in both price and quality.

From the extension activities done by PhilRootcrops, there seems to be a need to really examine the framework for commercializing products such as flour and grates. Finally, the question remains: "Should processing (value addition) and sales be done by cassava growers, or should growers benefit solely from the increased demand of roots?"

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