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COMPARATIVE ANALYSIS OF CASSAVA AND SWEET POTATO IMPROVED PROCESSING TECHNIQUES IN NIGERIA: RURAL WOMEN EXPERIENCE

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ABSTRACT

One of the major products obtained form cassava and sweet potato is 'gari'. It is widely utilized and common. Economic recession in Nigeria has made 'gari' a more valuable food, especially for the poor in the urban areas.

The present and future prospect of cassava and sweet potato processing depends more upon the developments of improved processing technologies that can increase labour productivity and of improved products that can meet the changing need of the rural and urban dwellers to replace the age-long traditional processing techniques.

The aim of this study is to compare the cassava and sweet potato improved processing techniques for products generation. A total of 320 women were randomly selected and interviewed from the Agricultural Development Projects states in South western Nigeria with the use of interview schedule. Inferential statistics and descriptive statistical tools were used in analyzing the data.

The results showed that the same improve processing technologies used for cassava processing are used for sweet potato processing and the most widely used improved processing technologies include, abrasive peeler, sieve, motorized grater, screw jack or hydraulic press. Cassava and sweet potato products include "spari", "lafun", starch and 'fufu'.

A ,major conclusion in this paper is that sweet potato "spari" is slightly darker than the cassava and it is cyanide free unlike cassava "gari", which needs to be processed to remove the cyanide contents. Furthermore, there is no difference in the processing techniques of cassava and sweet potato.

INTRODUCTION

Women play important roles as producers of food, managers of natural resources, income earners, and caretaker of household food and nutrition security.

Despite improvements in building women's capabilities, gender gaps in entitlements of the resources that women can command through available legal means continue to persist.

In Nigeria, modern agricultural technology has contributed significantly to agricultural developments and has led to a wide gap between the developing and the developed countries. This gap is as a result of differences in the level of technological developments, transfer and adaptation process. Moreover, in many developing countries including Nigeria, lack of technological and scientific knowledge limits economic and agricultural progress. There is therefore, the need to keep pace with the rapid rate of demand for food to improve the gloomy food situation and its consequences in food production. Moreover, an efficient extension service is highly desirable.

Despite the recognized importance of women in agriculture, their effect or impact as regards agricultural production is not well felt as a result of inadequate technology (traditional).

Hence, for sustainable increase in women's agricultural productivity and rural development in the processing of cassava and sweet potato, there is the need to compare the use of the improved processing techniques for product generation. Moreover, the traditional contribution of women to agricultural production (cassava and sweet potato products) has been rendered inefficient due to the crude form of the processing technologies frequently in use, which results in low agricultural

productivity that is relatively inversely proportional to the enormous labour intensive input. Cassava is already widely grown, processed, and consumed, as "gari" but sweet potato is just being promoted.

There is therefore the need to compare the processing techniques of both crops to enhance agricultural productivity and economic growth.

This study will therefore, find out the comparison of processing techniques of cassava and sweet potatos and products generated wit the use of the improved processing techniques.

IMPORTANCE OF CASSAVA AND SWEET POTATO IN NIGERIA

Until very recently, cassava and sweet potato have been considered crops of less importance. Adaptability of sweet potato and cassava to a wide range of agro- ecological conditions is one of the qualities that make them important for enhancing food security in Nigeria. Cassava and sweet potato are also very important because they can be used as cash crops. This is because ready market is available for the products.

(a) Cassava and sweet potato products can also have diversified utilization. They can be processed into several local foods such as "Gari"; puff-puff, chin-chin, chips, broad, cake, pie, doughnuts, buns, porridge, to mention just a few. Cassava and sweet potato products have added value and attracted higher prices than the raw cassava and sweet potato tubers (Ministry of Agriculture Malysia, 1999). Though the importance of sweet potato is just gaining prominence in Nigeria, it has followed the pace of cassava with the introduction of new varieties from Uganda, Kenya and Malawi, the production has greatly been on the increase (Akoroda et al. 1992).

Though sweet potato is an important staple food crop in Nigeria the consumption patterns are still limited to boiled or roasted fresh root, and dried sweet potato chips. Effort to diversify utilization, has created alternative markets and extended the availability of the sweet potato; a variety of processed products have been developed.

However, Hall (1995) stated that the most promising option for developing alternative uses and higher value markets for sweet potato in developing countries including Nigeria is to used various form of processed sweet potato to substitute wheat in yeast broad and existing snack items.

RURAL WOMEN IN FOOD PROCESSING

Food processing results in the prevention of food deterioration, reduction of wastage, conservation of food crops and livestock products into forms that are acceptable to different socio-economic classes, depending on their dietary habits and maintenance and improvement of food nutritional quality through elimination of toxic substances present in the raw materials and facilitation of packaging and distribution. According to Longe (1985), 33.5 percent of food crops are lost during and after harvest. Processing (no matter how crude) results in reducing post-harvest losses.

Despite the numerous roles of women in food processing, the conservation of crude and traditional methods of performing these roles sets women at the fringe of developments. Improved processing technologies needed by the women should therefore reduce the drudgery of work, productivity and income and earning capacity.

Many of the traditional processing systems have been improved and some mechanized (Odebode, 1997). The introduction of these improved crops (including cassava and sweet potato) has met with various degrees of success and will benefit women economically and socially.

CASSAVA AND SWEET POTATO PROCESSING EQUIPMENT

Cassava and sweet potato processing stages involve peeling, grating, pressing, sieving, dewatering, roasting and packing though the traditional ways of processing cassava and sweet potato are developed to fit into local social conditions. Equipment involved are usually very simple, low in cost and locally available (Odebode, 1997).

A wide rang of processing techniques, equipment and products have been developed varying from country to country and within individual countries. Improved processing equipment involve processing methods, such as peeling, washing, grating and rasping, pounding, pressing and de-watering, sieving, roasting, drying, milling, grinding, chipping and slicing. However, the majority of the labour required for the processing of all root crops (including cassava and sweet potato) is provided by women (FAO, 1984).

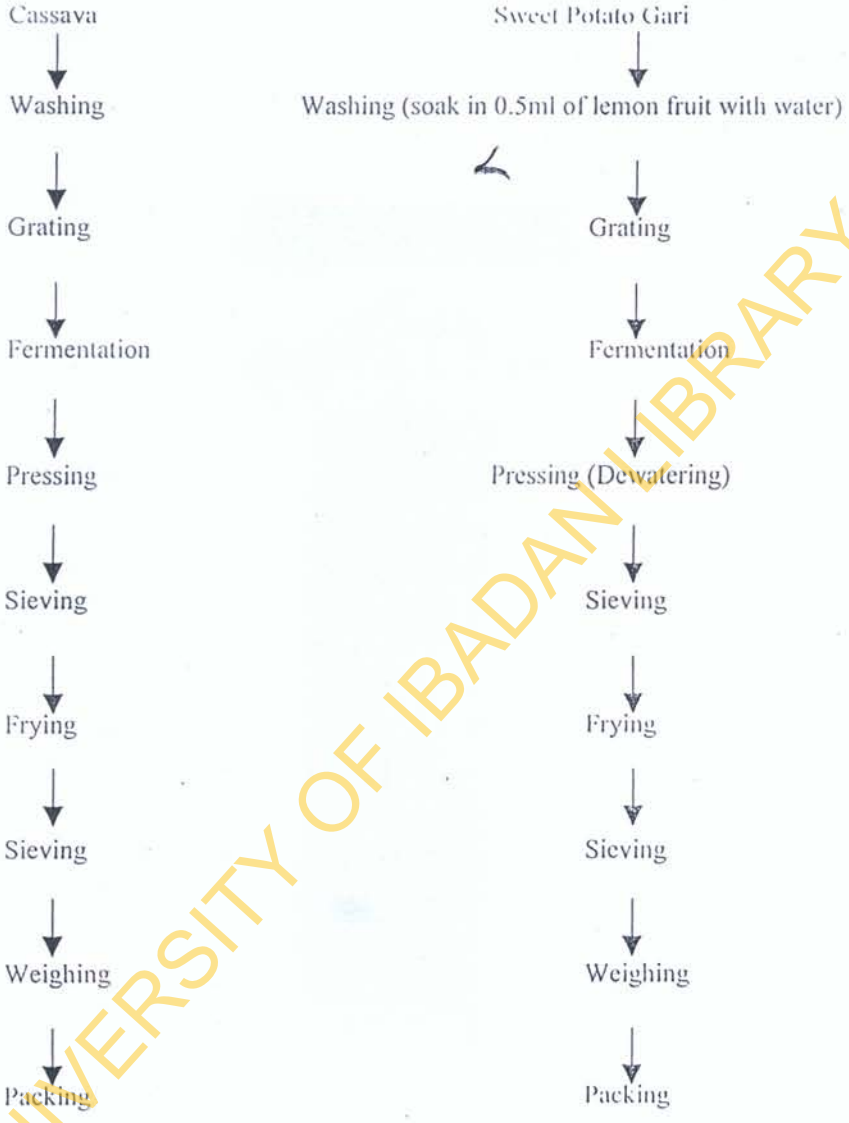

Fig. 1: Flow chart comparing the various stages in Cassava and sweet potato processing into "Spari" (fermented granules)

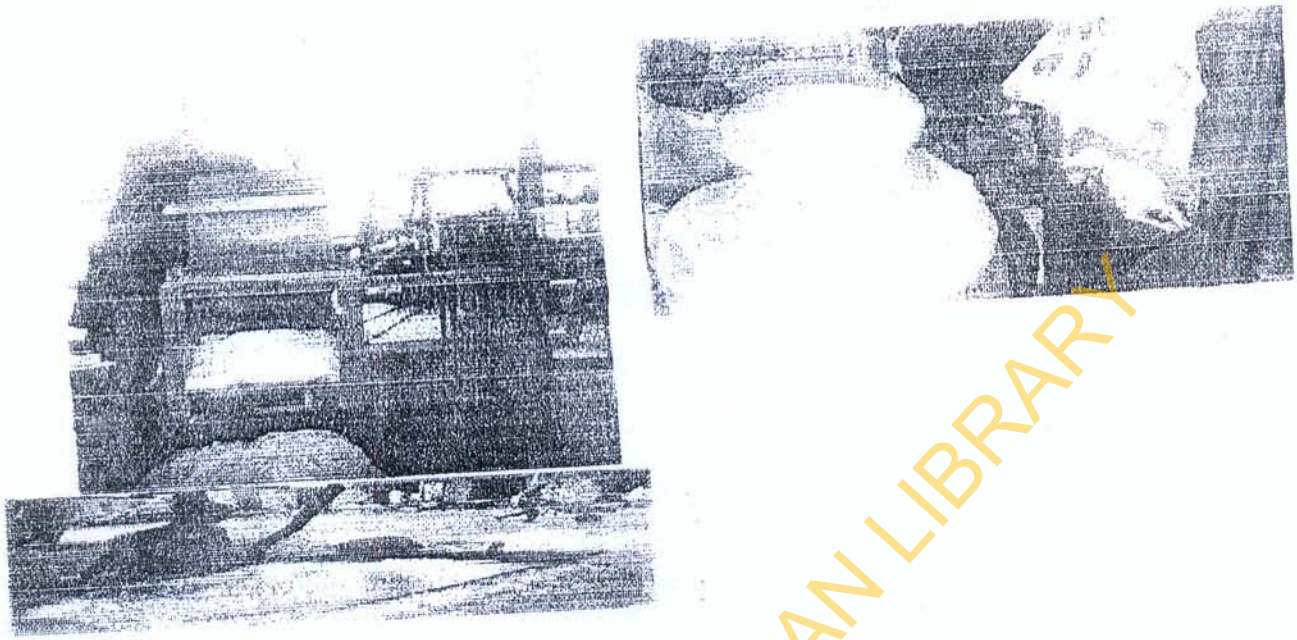

Fig. 2: Processing stages of cassava and sweet potato "spari"-Grating, Pressing & Frying

Methodology

Purposive and Simple Random sampling were used to select 160 cassava and sweet potato processors who are women in agriculture beneficiaries and 160 women who are not women in agriculture beneficiaries from agric developments project Nigeria in Cassava and sweet potato growing zones 4 states of southern Nigeria that are in cassava and sweet potato growing were randomly selected from three geo-political zones of Nigeria. Each states as agricultural developments project in each states capital. The women, in, agriculture program beneficiaries were used for the study. Both qualitative and quantitative methods of data analysis were used in analyzing the primary data. The secondary data were in the form of official documentation and the local and state government levels and literature with research report specific to the relevant issues of the study. The qualitative methods used include focused group discussion and in-depth interview with states agricultural developments program officials and other relevant organizations working in the locality and women community leaders in the area. A total of 160 cassava and sweet potato processors and 160 women processors not using improved processing techniques were involved.

Table 1.0: State in Southern Nigeria by Geo-political zone and states sampled for interviews

Zones	State in the Zone	States selected
South-West	Lagos, Ekiti, Ondo, Edo, Ogun Oyo, Osun	Osun, Ondo
Souht-South	Delta, Bayelsa, Rivers, Akwa Ibom, Cross River	Delta, Cross river
South-East	Imo, Anambra, Enugu, Abia Enonyi	Anambra

The primary data for the study was collected with the interview schedule and in combination with qualitative method of data analysis. The qualitative methods used include Focus Group Discussion and IN-depth Interview (IDI) with the State Agricultural Developments Programmes officials and other relevant organization working in the locality and other local leaders in the study area.

A total of 160 cassava and sweet potato processors and 160 women processors not using improved processing techniques were involved in the study.

RESULTS AND DISCUSSION

Use of Crops by Cassava and Sweet Potato Processors

Most (90%) of the women processors interviewed process cassava and sweet potatoes into various forms such as "gari", "fufu", "lafun", starch, flour, cassava and sweet potato snacks.

Results also showed that they preferred processing these commodities before sale so as to realize more profit. Though they opined that sweet potato "gari" and "lafun are yet to attract appreciable profit due to dark colour of sweet potato "spari" and "lafun". Processing was found to be a popular activity among the women interviewed. Processing is regarded as an extension of farming which helps in providing food for the family. Thus empowering the low-income processors. Though not much sale is recorded for sweet potato "spari" and flour.

REASONS FOR PROCESSING SWEET POTATO AND CASSAVA

Most (68%) of respondents process cassava because the products give a lot of income used in supplementing the family income. Others stated that the inherited the processing activity from their mothers. Though some do not like processing sweet potato "gari" and "lafun" because of the slightly dark colour of the products though cassava "gari" are produced in high quantity. Cyanide seems to be one of the major limitations of cassava utilization and the potential of sweet potato as alternative is very high (Oduro, et al, 2000). The non-participating express the fact that they were satisfied with cassava processing techniques because sweet potato roots are sticky to touch and may not to find ready market for it due to the dark colour.

SOURCES OF CROPS FOR PROCESSING

Most of the women interviewed reported getting their corps from their husband's farm, while some (25) got their crops from the family while others (21) reported purchasing their crops from the markets for sweet potato and cassava processors while the non-participating women processors indicated that the major source of crops for processing is from the family's own production (54%) while others are purchased from the market. This indicates that women help to improve the value of their crops from family farm by processing them. Better returns are obtained if these crops are sufficient and surplus to sell.

STAGES IN CASSAVA AND SWEET POTATO PROCESSING

Processing activities listed by all the cassava and sweet potato processors using the improved processing technologies are similar. Tubers are peeled, washed, grated, pressed and roasted. Half of a teaspoon lemon is added to water to soak sweet potato for about 30-25 minutes to aid fermentation before grating, pressing and roasting. Commonly processed cassava and sweet potato products enumerated by the participants and non-participant include gari, fufu, starch and "lafun". These processing stages and products were later confirmed through the focus group discussion and the interview and discussion with the women - in —Agriculture Staff in the Agriculture Development programme. Traditional and improved sweet potato processing equipment in the study are presented below:

TABLE 2: TRADITIONAL AND IMPROVED CASSAVA AND SWEET POTATO PROCESSING EQUIPMENT IN THE STUDY AREA

PROCESSING STAGES	TRADITIONAL TECHNOLOGY	IMPROVED TECHNOLOGY
A. GARI		
1. Peeling	Knife made of bamboo, flint or metal	Mechanical peeler, Motorized peeler, hand peeler, hand rasper
2. Washing	Local Calabash bowl	Aluminum tank
3. Grating	Rough stone, prickly truck of palm sheet/tin iron pierced with nail on the side	Mechanical Grater motorized grater, hammer mill, disk grater, hand grater
4. Fermentation	Heavy stone on heavy weighed cloth or nylon bag	Batch fermentation in aluminum tank, locally made hydraulic or mechanical
5. Dewatering/Pressing	Heavy Stone on bag/container	Hydraulic jack press, screw press, parallel board press, upgraded traditional press for few minutes
6. Sieving	Woven baskets, suspended cloth pieces holding mash	Improved pulverizers e.g. drum sieve, rotating sieve
7. frying/Revasting	Cash iron pan over wood fire	Upgraded roaster, solar dryer, kiln type dryer
8. Sifting	Woven basket	Improved pulverizer and sifter
B. LAFUN		
1. Peeling	Knife made of bamboo, flint or metal	Mechanical peepler, motorized peeler, and hand rasper
2. Soaking	Local calabash	Aluminum tank
3. Pulverizing	Woven basket	Improved pulverizer
4. Dewatering	Heavy stone on heavy weighed cloth on nylon bag	Hydraulic press, Mechanical
5. Drying	Cash iron pan over wood fire	Drum drier and solar drier
C. STARCH		
1. Peeling	Knife made of bamboo	Mechanical peeler; cassava fiter, motorized peeler
2. Washing	Calabash bowl	Aluminum tank
3. Grating	Sheet or tin iron pierced with nail on one side	Power grater, motorized grater, Disc grater
4. Dewatering	Heavy stone on heavy weighed cloth on nylon bag	Hydraulic press, screw press
5. Drying	Cash iron pan over wood fire	Engraved fryer, solar dryer
6. Packing	Local jute bag	Sealed bag
D. FUFU		
1. Peeling	Local knife	Hand peeler (mechanized)
2. Washing	Local calabash bowls	Aluminum tank
3. Grating	Rough stone	Motorized grater
4. Dewatering	Heavy stone on heavy	Rotatory grater, mechanical press hydraulic press
5. Packaging	Local jute bag Hydraulic	Hydraulic

Source: Adapted from Odebode (1997)

AWARENESS OF IMPROVED TECHNOLOGY BY SAMPLED WOMEN

Women processors were asked whether they were aware of improved cassava/sweet processing technologies. This is presented on table 3.0. The proportion of participating women processors who were aware of the newly introduced improved cassava sweet potato processing is high compared to the proportion of non-participants.

This will affect the use of improved practices introduced. The difference in awareness is a clear indication of the effect of the extension contact (WIA contact).

Table 3.0: Distribution of Sampled Women based on Awareness of Improved and Sweet Potato Processing practices

AWARENESS	PARTICIPATIONS		NON-PARTICIPANTS	
	Frequency	Percentage	Frequency	Percentage
Improved Practice have not heard)	2	1.0	152	95.0
Improved Practice were not been using)	36	23	8	5.0
Improved Practice (heard and still using)	122	76.0	-	-
Total	160	100.00	160	100.0

There is no significant relationship between contact with extension agents and use of improved technology. The results show a significant relationship between extension contact of rural women and the use of improved technology (X^2 =12.20, P=0.25). Women processors who are more exposed to formal extension information, have a higher propensity towards the use of those with less experience. Contact with extension agents improves awareness of women to technological innovation,. These findings are consistent with Akinola (1983), Clark and Akin Bode (1968).

Table 4.0: Chi-square test of Relationship Between Extension contact and use of Improved Practices

Table 4.0: Use of Improved Technology

Extension Contact	Low		High		Total
	Observed frequency	Expected frequency	Observed frequency	Expected frequency	
Participants	142	(75)	18	85	160
Non-Participants	8	(75)	152	85	160
Total	150	150	170	170	320

Chi-Square=12.20 Degree of freedom = 1 $p \leq 0.05$

Test of Difference between cassava/Sweet Potato processors and the use of Improved Technologies

A t-test statistics was used to test the hypothesis. It was revealed that the t-value (6.22) is greater than the tabulated (T = 1.65, p = 0.05). hence, there is a significant difference between cassava/sweet potato women processors and the use of improved processing technologies.

The table below reveals the income realized by processors of cassava and sweet potato. This varies as a result of cost production, rates of demand, place of sale and quality of gari sold. There is a wide gap between income realized in cassava 'gari' and sweet potato gari. This may be as a result of the fact that consumers are not yet familiar with the potential of sweet potato gari improving income of the household.

Table 5: Distribution of respondents based on income realized per month

	CASSAVA GARI		SWEET POTATO GARI	
Range of income/month	Frequency	Percentage	Frequency	Percentage
Below ₦500	05	3.0	100	63.0
₦500-₦1000	10	6.0	40	25.0
₦1001-₦2000	20	13.0	17	10.0
₦2001-₦3000	45	28.0	3	2.0
Above ₦3000	80	50.0	-	-
Total	160	100.0	160	100.0

Moreover, the dark colour of sweet potato "gari" may also be a hindrance to its sale. Consumers may be discouraged from its purchase. Hence, more work needs to be done in examining the yield and inhibit browning.

FOCUS GROUP DISCUSSION

The results of the focus through the discussion and the in depth interview are stated below. The focus group organized is made of sweet potato and cassava processors. Two focus groups were interviewed. These groups involve the processors of Cassava and Sweet potato using improved processing technologies and the second involves cassava and sweet potato processors not using the improved processing technologies.

The women interviewed pointed out that the promotion of the use of improved cassava and sweet potato flour technologies stated many years ago (Bokanga, 1989) when training according these women was a form of discussions, demonstration and practical sessions. For participants to produce cassava flour and sweet potato flour and make various products in awareness creation seminar jointly organized by IITA, Oyo State Ministries of Agriculture, Commerce, and Industry and Women's Commission. This was followed by the training of trainer's programme organized by the state government. Though the case of sweet potato flour came up during this period too, but it was not as pronounced as cassava flour for bakeries.

The women during the focus group stressed the fact that flour through dewatering and grating is suitable for bakery products and bread. Moreover, the women stressed that the potential of cassava flour to partially or wholly replace wheat flour in most bakery products cannot be over emphasized as it will enhance opportunities and provide employment for rural and urban dwellers. Other uses of sweet potato according to rural women processors interviewed during the focus group include the under listed points:

- Sweet potato has a high yield potential.
- It is acceptable due to its sweetness.
- It is not as expensive as cassava.
- It has a high nutrient yield per hectare per day.
- It is drought tolerant and can withstand typhoon condition.
- The leaves can be used in livestock industry as feed.
- It enhances food security

Other uses of sweet potato mentioned during the focus group session is that sweet potato is used in making snacks, such as puff-puff, buns, cake, doughnuts, chin-chin, and bread.

CONCLUSION

A major conclusion of the paper is that cassava/sweet potato women processors of the ADP have a greater knowledge of, and easier access to new technologies than those not participating. This means that participation in the Agricultural Development Programme (ADP) (through WIA) is related to the use of processing technologies. This confirms a favourable impact of contact with extension agents.

Moreover, women cassava processors use the same processing technologies to process sweet potato. The only difference according to them is that lemon is used to soak sweet potato for 30-35 minutes to aid fermentation before grating. Efforts should therefore be made to increase sweet potato and cassava products through the used of improved processing techniques to enhance economic progress in Nigeria. This can be done by

(b) increasing investment in agricultural research and extension in Nigeria;
(c) empowerment of male and female in the area of access to land and increasing the land area to increase adoption of cassava and sweet potato processors and producers and this can be done by promoting extension visit and strengthening of research/extension farmer linkages;
(d) educational empowerment of women and most especially through the education of women and entrepreneurs on the products that can be made from cassava and sweet potato;
(e) enactment of government policy that will promote agriculture and the production of cassava and sweet potatoes by the farmers;

Though sweet potato campaign with social mobilization techniques to spread the gospel about sweet potato in Nigeria especially to women and the farmers in general;

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