EFFICENCY OF CASSAVA PROCESSING TECHNIQUES AMONG RURAL WOMEN IN OWERRI, IMO STATE, NIGERIA

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ABSTRACT

The study identified, and analysed the different methods being used by the women in cassava processing, examine stages and time spent on each operation. The study was carried out in Owerri Agricultural zone of Imo State, Southeast, Nigeria. One hundred and fifty women cassava processors were chosen at random from 15 communities. Data were gathered through the use of interview schedule. Percentages and means were used in the data analysis. Three cassava processing methods were identified namely modern, traditional and a hybridized trado-modern methods. Six processed cassava products were identified and these were produced after about 15 operational processes depending on the product which include gari, akpu, akara-akpu, tapioca, starch and flour. The time spent on producing any of the products depend on the technique of processing adopted. An average of eleven and eighteen hours was spent on processing 100 kg of cassava tubers into gari product using trado-modern and traditional methods, respectively. Twenty eight hours was spent in processing cassava tuber into tapioca using traditional methods. It was discovered that using trado-modern and modern methods in cassava tuber processing were more efficient in terms of output, labour input and costs than traditional method. However, there existed no modern technology that can kick start and complete cassava tuber processing into any of the six products without relying on the traditional method. It is recommended that our engineers should construct low cost processing equipment that will reduce both the time on each operation and the tedious nature of cassava processing.

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INTRODUCTION

Cassava is a staple food source for people in southern Nigeria where it is consumed in processed forms mainly as *gari* and *akpu*. Cassava contains substances known as *cyanogenic glucosides*, which breaks down into hydrocyanic acid (HCN) after the plant in harvested. This acid makes cassava very poisonous for animal and human consumption (Cooke and Coursey, 1981). Processing of cassava is to remove this poison, reduce its toxicity, increase and its palatability and storage life. Rural based processing offers opportunities in terms of employment, adds value to products, reduces waste due to spoilage, improves acceptability, extends storage life and encourages development of technical and marketing skills of villagers (Ifediora, 1993). Chinsman and Fiagan (1987) reported that proper processing and preservation of harvested produce minimise post harvest losses and thus help to off-set shortage in food supply.

Cassava processing involves several operations and Kwatia (1986) identified three major classes of cassava processing technologies in Nigeria. These are technology based on drying and dried products with or without fermentation, and technology based on fermented cassava dough and minor processing technologies. These operations are mainly carried out by women. Karunwi and Ezumah (1988) observed that 84 percent of the processors are women and that *gari* is in many cases the major end product. Cassava roots processing has been done mostly by the traditional method which requires that the root be peeled with knife, washed, then followed by the application of different operations to arrive at the desired end product. For instance, in the production of *gari,* the peeled cassava tubers are grated after washing. Grating is manually done on a metal grater. The product which is marshy is poured into a sack prior to dewatering by putting large stones or wood on top and allowing it to stand for a few days, after which the semi dried mash in the sack is sieved to separate the fibres from the granulated pulp. The latter is fried in an open iron cast frying

pan to produce *gari.* These traditional methods have been criticized as grossly inadequate, inefficient, labourious, time consuming and can only be done on a very small scale (Odigbo 1979, Ikpi et al, 1986). Report from IITA (1988) showed that power grater can reduce the time needed to grate 140 kg of tubers from 6 hours to 20 minutes. Ikpi et al (1986) maintained that one processing hour on a machine saves women 21 hours' work each week and given the average amount of cassava processed by a household in a year in the Oyo State area surveyed with appropriate cassava processing equipment, each family could save an average of 441 hours of work. This study therefore is to investigate the efficiency of modern techniques of cassava processing among rural women in Owerri Agricultural Zone of Imo State. Specifically, the study is designed to:

i. identify and analyse the efficiency of the different methods being used by women cassava processing in the study area:
ii. examine the stages that product(s) undergo,
iii. examine the time spent on each operation and

METHODOLOGY

The study area Owerri Agricultural zone of Imo State Southeastern Nigeria was purposely chosen because there is a preponderance of women cassava processors in the area. Imo State is within the humid zone of Southeastern Nigeria with a population of 2,485,499 persons and a population density of 499 km^2 (Federal Office of statistics, 1993). The zone is made up of nine local government areas. A random sample of five local government areas was made. Three rural communities were selected at random from each of the chosen local government areas giving a total of fifteen communities. With the aid of community leaders a list of women cassava processors was complied. From the list, a random sample of ten respondents were chosen from each community. This gave a total sample of one hundred

and fifty (150) respondents. The respondents were mainly those who have the capacity to process 100 kg of cassava tubers into any of the cassava products. Interview schedule, oral interviews and observations formed the source of primary data for the study. In recording the time spent on the operations where machines were used, attention was paid on the time spent on feeding the machine with the material to be processed and collecting the processed materials. For dewatering, time was recorded based on time it took to tire the white bag containing cassava pulp and adjusting it on the equipment. Descriptive statistics such as percentages and means were applied in the data analysis.

RESULTS AND DISCUSSIONS

Efficiency of the methods used in cassava processing

The study identified fifteen processing operations which the cassava tuber undergo before transforming into any of the six major cassava products. The cassava products identified were *gari, akpu,* starch, *akara-akpu*, *tapioca* and flour. The processes they undergo ranged from peeling to drying. The most time consuming and labour intensive operational process or stage in production was identified to be manually slicing parboiled cassava tubers using kitchen knife into noodles. It took the respondents an average of 15 hours to complete slicing a 100 kg bag of cassava tubers.

Table 1 shows the methods used (in percentages) and the average time (in hours) spent on various operational processes involved in processing 100 kg of cassava tubers into the different cassava products.

TRADITIONAL PROCESSING TECHNIQUES

The production of the six products identified from cassava tuber involved thirteen traditional processing operations as shown in table 1. All the processing operations are labour intensive since manual labour are utilized in implementing each function or operation. However, some

processing operations involved minimal use of mechanical method before the final product could be realized.

Gari Production Processing Stages;

Eighty one percent of the respondent were involved in processing cassava tubers into *gari.* The cassava tubers are peeled using a kitchen knife or matchet to remove the bark, then cut and washed. The washing is to remove dirt and adhering mucilage. Water, basin and sponge were used. This is then loaded into white bags and taken to the grating machines to produce the cassava pulp. The pulp are loaded into white bags prior to dewatering which takes upward of ten minutes to three days depending on the dewatering method adopted, quantity of pulp and the urgency to process the product. Dewatering and fermentation takes place simultaneously. The dewatered hardened caked pulp are broken down in between the palms to reduce them unto granules. They are sieved manually and then fried into *gari.* Eighty percent of the respondents used traditional method of fire, frying pan, wood and tripod stand or clay masonry and constant stirring of pulp with a stirrer to produce a dry crispy granular product called *gari.* The respondents (100%) indicated that *gari* could be stored up to six months. An average of 18 hours was spent by the respondents in *gari* processing using traditional methods. Cassava peeling, sieving and frying took eighty seven percentage of the time spent in *gari* processing using traditional method. These processes and stages in the production of *gari* are the most risky, tasky and labour demanding. The processes and stages in *gari* production showed that trado-modern method was applied since all the respondents used machine and traditional technologies in production.

Akpu Production Processing Stages:

The processors (66%) processed cassava tubers *into akpu* after passing through six stages. These include Peeling, washing,

soaking and fermentation, sieving, decanting and dewatering. To facilitate softening of cassava tubers during soaking and fermentation, potash, kerosene or salt are added into the water by the respondents. These additives also help to reduce the odour from the fermented tubers and maintain a whitish colour after processing for an average of eight days. The fermentation period range between 3-4 days. The softened tubers are then sieved with framed iron sifters or baskets. The sieving in water in a container allows for the separation of the fibrous parts from the fine part. The filtrate settles in the container while the fibrous parts are left in the sifter. The filtrate is allowed to settle and the water decanted. The semi-liquid filtrate in then stored in white bags for further dewatering and usage as *fufu* or for commercial purposes.

This study showed that *akpu* is produced using only traditional methods. The cassava tuber peeling took 40% of the time of the respondents. The total average time spent to produce *akpu* was 10.hours. The time recorded against soaking was based on the time required for the processor to measure water into the cassava tuber container. This study identified the following stages in *akpu* production. Cassava tuber peeling ==> washing ==> soaking/fermentation ==> removal from water ==> decant water ==> dewater/drain ==> *akpu*.

Starch Production Processing Stages

After the peeling, washing and machine grating, the pulp produced is sieved using framed fine cloth sieve. Sieving is done in basin containing water. Care is usually taken by the respondents not to totally destarch the pulp as they are further processed into *gari*. The aqueous starch suspension in the basin is allowed to settle and the top water decanted at intervals. Starch results after decanting of water. Some respondents allow the starch to dry in the container or spread out in a container for the sunlight to facilitate its drying. Fifty percent of the respondents produced starch during the survey. With the exception of the use of machine grating, the starch production process was traditional.

Cassava tuber peeling and sieving used 66% of the time the respondents spent on starch production. The respondents used an average of Nine hours in producing starch with cassava tubers. There was the application of trado-modern technique in starch production. This study identified that starch production involved the following stages: Cassava tuber peeling ==>washing ==> grating ==> watering and sieving ==> decanting ==> stocking filtrate in bag ==> spreading and sun drying ==> starch.

Tapioca Production Processing Stages

Forty percent of the respondents processed cassava tubers into tapioca during the survey. The peeled and washed cassava tuber, are cut into bits then parboiled for 30-45 minutes and sliced into noodles using knife or framed iron perforated grater. The sliced noodles are either washed before soaking or soaked directly in water for upwards of ten hours thereafter washed. The essence of the soaking and washing is to remove the slippery mucilage like substances that make the noodles sticky. It preserves better when sun dried and could last upwards of an average of six months thereafter without spoilage.

The most tasking stage in tapioca processing was reported to be during slicing. This consumed an average of 15 hours. This was about 54% of the average of 27.79 hours spent in producing tapioca. In tapioca production, all the processes and steps were traditional. This means that no alternative technique was applied to reduce the time and labour spent in producing the product.

***Akara-Akpu* Production Processing Stages:**

Only about thirteen percent of the respondents were *akara-akpu* processors. They involved both traditional and modern techniques in the eight stages in the production of *akara-akpu;* these include cassava tuber peelings, washing, grating, dewatering, pounding/grinding, addition of condiments, shaping and frying.

The semidried pulp is pounded using mortar and pestle. About 60% and 85% of those who produced *akara-akpu* dewatered and pounded the pulp using traditional techniques respectively. The pounding is to make the pulp finer. This pulp is then mixed with condiments (pepper, salt, onions, maggi, crayfish) to taste and then shaped into small ball ready for frying in hot palm oil. Under the fried condition, the respondents indicated that it could store for nine days without spoiling. About Seventy one percent of an average of 17 hours spent in *akara-akpu* production were spent in peeling, frying and grinding by the respondents. These operations were manually implemented with their attendant drudgery, stress and cost on the human person.

Cassava Flour Production Processing Stages.

Only Seven percent of the respondents indicated having processed cassava tuber into flour. The product under went the following stages: Cassava tuber peeling, washing and cutting, soakings, sun-drying, pounding/grinding and then sieving. The soaking in water lasts for about 24 hours after which sun-drying follows. The dried cassava is then ground with mortar and' pestle. This lasts for an average of 3.85hours. The pounded cassava is sieved using framed fine cloth sifter to remove coarse particles thus the fine powdery particles are the cassava flour. Cassava flour can be stored for two months and more than two months during the wet and dry seasons, respectively. The processing of 100kg cassava tuber into cassava flour took the respondents an average of 16 hours which is 66% of a day.

MODERN METHOD OF CASSAVA PROCESSING

In the study area, there was no evidence of a complete use of modern techniques in cassava processing into its various products, with the exception of *akpu* and *tapioca* production that all the respondents

used only a combination of modern and traditional (trado-modern) methods in the production of *gari, akara-akpu*, cassava flour and starch.

Four cassava processing equipment were identified in the study area. These include Grating, dewatering, frying and grinding machines and were owned by individual processors and entrepreneurs as shown in tables 1 and 2.

In *gari* processing, the use of modern and traditional techniques reduced the time of processing operation from an average of 17.52 hours to an average of 11.hours. This is equivalent to 37% reduction in time of operation in *gari* production.

In starch production, the time was reduced by 50% using trado-modern method. Also in *akara-akpu* production the timing of operation reduced from 17 hours to 13 hours using a combination of traditional and modern methods of production. In the case of flour production, there was a reduction of 13% in time of operation. The time gained using trado-modern method of production could be applied to other more profitable ventures than being wasted. Also a complete use of modern techniques in all the processes would release more time to the cassava processors for investment into other economic ventures that could enhance family living condition.

Table 2 shows the ownership and spread of modern cassava equipment in the study area.

Table 2: Ownership and spread of modern cassava processing equipment in the study area.

NAME COMMUNITY	TYPE OF OWNERSHIP	GRATING Machine	DEWATERING Machine	FRYING Machine	GRINDING Machine
Ahiazu	Individual	3	2	2	4
Ikeduru	Individual	2	2	1	6
Mbaitoli	Individual	2	1	1	4
Owerri	Individual	5	3	3	10
Ohaji Egbema	Individual	4	2	1	6
TOTAL		**16**	**10**	**8**	**30**
MEAN		**3.2**	**2.0**	**1.6**	**6**

(a) **Grating Machine:** The washed cassava tubers are crushed into pulp using the grating machines mounted on wheels or concrete slabs, with the assistance of manual labour to feed the machine with cassava tubers. Table 2 indicated that an average of three grating machines were identified in the study area being used in cassava processing.

(b) **Dewatering Machine:** An average of two dewatering equipment was identified in each of the study area. This equipment involves the use of Iron instrument constructed with or without compartments where bags containing the wet pulp are put for press drying. They are press-dried with the aid of hydraulic press or the screw press. Eighty percent of the *gari* processors used this equipment while 40% of *akara-akpu* processor used it.

(c) **Frying Machine:** The mechanical method of frying was mainly used for *gari* processing. Only about 20% of the respondents who processed *gari* used the machine. An average of two of such machines were identified in operation in each of the areas studied.

(d) **Grinding Machine:** These machines are more in number in the area studied. An average of six of such equipment were found in use in the surveyed area. About 70% of the cassava processor respondents used the machine in grinding cassava into flour.

This study has shown that *akpu*, starch, *tapioca*, *akara-akpu* and cassava flour could be processed using only traditional methods since they required minimal mechanical effort. However, *gari*, starch, *akara-akpu* and cassava flour could be processed using trado-modern method. The use of a trado-modern method in cassava processing is attributable to non-availability of such machines that could kick start and compete the processing of any particular product or the inefficiency of the available machines or their non-existence in the study area. The importance of Mechanization of cassava processing operations can not be over emphasized since it will lead to reduction in time spent and cost of women labour in processing. Moreover, it will attract such benefits as ensuring that the production operations are completed in the shortest possible time, with time and money saved and or put into other economic use and family welfare.

Most of the respondents reported however that:

(1) over matured cassava produce fibrous and woody tubers and this negatively impact on the quality of such processed products.

(2) traditional method of cassava processing is labour-intensive, time consuming and tedious, while the mechanical method

though expensive for some operations saves time and less tedious.

(3) mechanical methods sometimes affects the taste of the processed products when used for grinding and frying.

(4) shape of tuber affects the efficiency in the peeling process of the tuber in the peeling process of the cassava using manual efforts.

CONCLUSION AND POLICY RECOMMENDATIONS

Cassava processing into six major products (*gari, akpu,* starch, *tapioca, akara-akpu* and flour) involved the use of both traditional and mechanical methods of production in the study area. Mechanical methods were used mainly for such operations as grating, dewatering and frying *gari* as well as grinding cassava tuber for flour, while the traditional method was applied in all operations. Higher output and efficiency was recorded among the operators who adopted mechanised (modern) methods. This was attributed to quickness in its use and reduction in the man hours spent on the operations. Generally, the time spent in each operation vary from product to product depending on the method (traditional or modern) of processing adopted.

Governments, non-governmental organisations and private individuals particularly our engineers need to design and fabricate low-cost processing equipment and other items that will reduce both the time spent on each operation and the labour requirements for each. It is hoped that greater attention and support for women cassava processors would improve productivity as well as raise their standard of living.

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