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THE EFFECT OF TECHNOLOGICAL INNOVATION AMONG RURAL WOMEN IN NIGERIA: A CASE STUDY OF "GARI" PROCESSING IN SELECTED VILLAGES OF BENDEL STATE, NIGERIA

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ABSTRACT

The paper identifies the technological improvements/innovations which can support the socio-economic well-being of rural women in Nigeria. It is a participatory observation study with some rural women in selected villages in Bendel State, Nigeria involved in gari processing.

The study shows that there are positive and adverse effects of gari processing. The introduction of the gari processing machine has eliminated some of the drudgery associated with the traditional method of processing and the processing is now done in a shorter time. It has however transferred part of the processing work which traditionally belongs to the women, to the men and has therefore deprived them of a source of income.

Introduction

In previous times the rural concept of food production was the ability of farm families to produce enough food with which to feed their families, and a little surplus to sell. In generic terms this was known as subsistence living. In sociological terms rural dwellers were known to farm in order to pay for ceremonial and rent funds. The ceremonial fund includes food given to one's extended family, especially one's in-laws. The rent fund is the produce sold to the cities in order to obtain cash for the purchase of durable food and to pay taxes. But more importantly it is the food sold to cities in order that ruralites may belong to the larger filial community or the society.

Today, food production in Nigerian rural areas is geared primarily to capture food sales in urban towns. It has become involved in many technological innovations. It is tied up with the infrastructure of the country, the communication and transportation systems and available

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markets in, near, or outside the rural areas. In some rural communities, food production has shifted to only the processing of farm produce; in others it is the planting, harvesting and storage of farm produce which is sold in times of scarcity.

This paper will identify the technological and institutional innovations which could support and improve the socio-economic well-being of rural women in general or a particular target group. Specifically, this paper will discuss the results of a participation observation study with some rural women at work in some rural villages of Bendel State, Nigeria.

In order to write this paper, interviews were conducted with women processing food crops with a visit to their areas of operation. The interviews (structured and unstructured) featured three rural women's occupation categories namely: sole farming, processing of farm produce, and trading in farm produce whether processed or unprocessed. The predominant occupation in villages visited was the processing and sale of cassava (*Manihot utilirima*) 'gari' production. (Gari is known as farina in some countries).

The structured interview was used where it was possible and this was only with about twenty-four women. Interviews were also conducted with the administrative staff of two industrial institutions-one that makes equipment for processing farm produce and a factory that processes gari. The unstructured interviews were held in villages and sales depot where a large group of women made individual questioning impossible.

The survey was carried out in one week. About two hundred people, mainly women, were interviewed or observed at work.

A brief description of 'gari' and 'gari' processing

'Gari' is a fermented, dehydrated food product made from cassava. It is a primary staple food in West Africa and an important food item in parts of East and Cnetral Africa. In South America a similar product, 'Fahrena de Mandioca', is widely eaten especially in Brazil.

The making of 'gari' consists of six major steps from harvesting to sale. The traiditonal method of carrying out these steps is almoet totally manual. In consequence, it is tedious and labor-intensive.

The steps consist of uprooting cassava tubers from the farm, transporting them to the village, peeling, grating, fermenting and dewatering, and toasting.

Processing 'Gari' in Selected Villages of Bendel State

Cassava processing into 'gari' was observed in three villages in Bendel State: Owa, near Agbor, Ussele Uku, and Onitsha Ugbo. In these villages

the ploughing, planting and weeding of cassava farms were done by men. A few women who cultivate cassava farms were in the minority, although some have farms close to their abode. Produce from such farms was kept for family consumption.

The practice observed and reported by the women is that they buy the cassava tubers unharvested. They uproot the tubers themselves. They peel them on the farms or in the villages. The specie of casava which grows in that region of the country is easily skinned. However, a large quantity of tubers is required to produce a sizeable amount of 'gari' Therefore, skinning becomes monotonous and tedious. The vegetation of the area allows the growing of cassava all year round, but more cassava is harvested during the rainy season.

After peeling, the tubers are washed and grated. Traditionally the women used home-made graters[1], but today these graters have been improved. They are now fixed to a wooden cylindrical drum, and driven by a small diesel engine. The grating operation has been reduced from several hours to a few minutes.

Dewatering and fermentation of the pulp used to be done by tying the pulp tightly between the planks with or without weight on it. The process lasted from three to eight days. In most of Bendel State today, fermentation has been omitted in 'gari' processing. To dewater, the pulp (slightly greased with palm oil)[2] is placed in bags, and covered with a plank. A hydraulic hand jack is placed over the plank and the jack is operated to extract water.

Native cane and rush sieves are used in shifting the pressed mash, to depurate before toasting or 'garifying.'[3] All these processes are carried out traditionally by women in one day.

'Gari' processing in Oyo State

In Oyo State the stages of 'gari' making are similar, but for the peeling, dewatering and fermentation. In this State, peeling is done in the villages as more time is required to peel the hard skin of the cassava specie grown in the area. Peeling becomes an operation involving many workers. Fermen

[1] A flat metal punched over its surface with a nail, attached to a wooden platform on one end.

[2] The addition of palm oil lubricates pulp and facilitates toasting as well as giving gari some Vitamin A, and an acceptable color to the indigenes.

[3] The word 'garifying' was coined by P. O. Ngoddy and W. Wurdemann, University of Ife, Ile-Ife, in their article 'Techno-Economic Features of an Intermediate Technology for 'Gari' Processing'. It describes the roasting or toasting of cassava pulp which involves a heat treatment that partially gelatinizes and dehydrates the produce, to a moisture content of 10 per cent or less (wet basis).

tation and dewatering takes from five to eifiht days, because:

(i) hydraulic jacks are not available for dehydration, and

(ii) sour 'gari' is preferred by the people[4]. The longer the fermentation takes, the more sour is the 'gari'.

A difference observed in areas just visited and another area of Bendel and Oyo States is in their improvised toasting pots for 'gari'. The Ika, Ussele Uku Bendel State women use round cast iron pots for garifying. The advantages of this is that cast iron is capable of retaining heat for some time. The women work individually. In the Edo speaking areas of Bendel State, frying pots are long and rectangular in shape and are made from steel drums. Its length enables two operators sitting on opposite sides to toast mash together. In Oyo State, earthenware oblong pots sometimes half buried in the ground are used for garifying. Earthenware pots allow and even distribution of heat when toasting 'gari'.

Table 1 shows the processes of making 'gari' in four villages of Fashola Area, Oyo State. It also shows the average total time spent on the stages as observed over the period of two weeks. The average bag of 'gari' weighs 103 kg. Helpers are used in transporting, peeling, preparation for pressing and toasting the pulp. Time here does not include days for fermenting the cassava tubers.

TABLE 1 TOTAL NUMBER OF HOURS SPENT TO PROCESS ONE BAG OF GARI TRADITIONALLY IN OYO STATE

	Kokogi (hr.)	Igbonla (hr.)	Akolo (hr.)	Okosse (hr.)	Average (hr.)	Percentage of total
Transport	3.0	2.75	6.0	5.5	4.3	4.64
Peeling	60.0	54.5	71.0	55.0	60.11	64.70
Washing	2.0	2.0	3.5	1.5	2,25	2.42
Grating	7.75	7.5	7.0	7.6	7.46	1.59
Preparation for pressing	2.6	2.5	3.75	2.16	2.76	2.98
Toasting	22.5	22.5	20.0	23.0	22.0	23.68
Total	97.92	85.75	105.25	88.78	92.92	100.0

Source: Williams, C. E. (1978).

Interviews with village women in the traditional "gari" industry

All of the women interviewed in these villages said that they process 'gari' for commercial purpose (i.e. process and sell). They buy cassava plants at the point of harvest from male farmers, dig the tubers and carry them by head to the villages in Ussele Uku and by bicycles in Owa Village.

[4] The preference for sour 'gari' might have arisen from a lack of a quick dewartering tool.

Grating and dewatering are done by small engines. No woman owned any grating or dewatering machines. Gari is processed and sold in nearby markets every four days. The mode of transportation to markets is by head loads where the market is nearby or by taxis where it is far.

The quantity of 'gari' processed depends on the season, and the availability of children during the holidays. When the children are available 40–80 kilos of 'gari' could be processed between two market days. The art of processing 'gari' is developed at an early stage. It is not learnt in adulthood, hence the meaningful contribution to production when children are on holiday. Otherwise, a hard working woman can only process between 20 to 40 kilos in the same time.

Besides the 'gari' processing occupation, all of the women have no other means of livelihood. Goats, hens, etc. are reared for domestic consumption. Light farming consisting of growing melons, okro, peppers, and tomatoes is done by the women to supplement feeding the family. Occasionally the surplus stock is sold in the markets. Buyers at these markets are from nearby and distant towns who themselves are traders. Villagers sell wholesale to them, but may sell at retail to fellow villagers.

Fruit trees like native and avocado pears, mangoes, oranges, etc. belong to the men. They sell these fruits to distant traders. The men also own and operate the grating and dewatering machines used by the 'gari' processors.

There were two such machines in Owa village near Agbor, and three in Ussele Uku. All males owning grating and dewatering machines belong to a union. This union fixes prices for operations and organizes a schedule of work for its members. Machine owners strictly adhere to the roster, thereby avoiding a clash in operation and gains made. The ordering of rosters are guided by the number of machines available in the village and the interval of the market days.

Besides 'esusu'[5] groups, no woman belonged to an organized cooperative. The women at Ussele Uku were not happy about their lack of uniformity in 'gari' selling prices. The poverty of 'gari' sellers/processors was attributed to their divided stand. The 'esusu' group is organized by older women in the villages. Money is borrowed for various purposes. Principal among these is the payment of school fees. Free primary education covers only tuition. Books, desks, chairs, etc. are provided by the parents of the pupils in the schools. To expand their trading business, build or renovate a house and meet ceremonial expenses are other reasons for borrowing money from the 'esusu' group. The length of time for repayment is not stipulated, but an interest of 5K per every N1.00 borrowed is charged (Table 2).

[5] 'Esusu' is a thrift and loan group, formed by members of a trade, or some age group in villages and towns.

TABLE 2 EXPENDITURE OF 'ESUSU' CONTRIBUTION BY WOMEN*

Item	Frequencies	Percentage of total
To buy personal clothes	23	24.5
For farming	11	11.7
Spent on festivals and ceremonies	8	8.5
To feed family	7	7.4
To trade	4	4.2
To pay school fees	2	2.1
To take care of children	1	1.1

* The studies done in this area were of 94 women who processed 'gari' for commercial purposes. Out of this number 38 women or 41 percent did not contribute to the 'esusu' scheme.

Sources: 1) Favi, F. (1977) Women's Role in Economic Development: A Case Study of Villages in Ovo State. Unpublished M. Sc. Thesis, Department of Agricultural Extension, University of Ibadan, p. 75.

2) Williams, C. E. (1978) Research papers on Women's activities in organised clubs in five villages and hamlets around Fashola.

The women believe that their occupation is very difficult and tedious and they, without exception said that their daughters will never be similarly engaged. Asked what improvement they would like in their work, the response was "buy our 'gari' at a higher price". Suggestions of forming a cooperative, owning their own grating and processing machines and selling through a cooperative did not appeal to them.

Health and sanitation in the villages were of a very good standard. The children and their parents were not under or mal-nourished. Contrary to what one would expect, they even looked prosperous. There may be other fundamental reasons (e.g. sociological) why these women are adverse to suggestions for change being made to them, but that was not within the scope of this study.

The 'Gari' Machinery Factories

Six kilometers from Ussele Uku there was a factory owned by a private indigenous company. It was established to fabricate or manufacture wood for metal furniture and equipment to meet the needs of the Nigerian rural population. One of its major achievements is the design, development and manufacture of complete 'gari' making machinery, major components of which have been patented in Nigeria.

The lack of raw materials was a setback in the factory. The major product being produced is 'gari' machines. A steam driven palm oil press is the only other machine being manufactured. The 'gari' machine has five component parts. These are (a) the cassava grater, (b) dough shifter,

(c) mechanical press, (d) garifier, and (e) movable stove units with blowers. The machine does not have a flow line, i.e. machines are fed individually and manually for the processing of 'gari'.

The villagers who were asked whether they knew of the existence of the factory answered yes, but said it was not meant for them. The reason for this attitude was not far-fetched as the machine costs N30,000. The major consumers of the company's product are the government, specifically the National Root Crop Research Institutes and a few entrepreneurs.

One of these 'gari' machines was bought and installed in a village in the same local government area as Ussele Uku. A visit was made to this village in order to observe the 'gari' machine in action and to assess roughly its qualities.

The setting of the 'gari' machine was in a factory. Four of the component parts of the machine were installed and were in use. The peeler was not bought. The factory was of a moderate size. It employed 48 workers and 11 of them were women. During cassava season, 1,000 kilograms of gari are processed daily. The factory was reported to be in production throughout the year, because it has vast acres of alternating cassava plots attached to it.

The women in this employment peel the cassava tubers, wash them ready for grating, and mix the pulp with palm-oil before dewatering. The general cleanliness of the factory is the responsibility of the women.

The gari produced in this factory is very hygienic and of a high quality. It is packed in portions of 20 kilograms, and it is only sold in the markets of Lagos, Ondo, etc. where prices are high. Unlike 'gari' made traditionally, machine toasted 'gari' is very dry, and it keeps its taste, smell and flavor over a period of six months, without the addition of preservatives. Ordering of the product is done by radio transmission, and lorries are used for transporting the product to its destination. The money transactions dealing with the sale of the product are not known to the workers, not even the supervisor of the works. During all of the interviews, labor incomes and working hours were not disclosed. It was suspected that the investigator would calculate their earnings in an indirect way. To most villagers in Nigeria, financial matters are treated as strictly a personal affair.

The Technology Contributed to 'Gari' Processing

The technological contribution to 'gari' processing as seen from this brief study are mainly two: the intermediate scale and the industrial scale technologies. The intermediate technology deals with the introduction of cassava tuber graters and hydraulic dewatering pressers. These were found to be very efficient. They are few, and expensive to use. They are

owned and operated by men.

The industrial technology deals with the introduction of a gari plant where nearly all the processing of the gari was done by machines. The factory has a large turnover. The peeler was not present but women were employed to skin cassava tubers.

Other technological contributions are the availability of good motorable roads, bicycles, cars and lorries for the evacuation of the 'gari' product, and generators to drive the plant in the factories where electricity is not available.

Effects of Technologies on Women's 'Gari' Processing

There are positive and adverse effects of these technologies on 'gari' processing. Examination of the small scale technology shows that one of the hardest steps of 'gari' processing, grating by hand for several hours, has been eliminated. Grating cassava now occupies a small fraction of 'gari' processing. No longer is there the fear of constantly bruising the fingers with graters. Dewatering (which is not an energy exerting step) has been reduced from five to eight days to merely half an hour. With the reduction of these steps in processing, it has become possible for a processor to make the 'gari' which will be sufficient for sale on a market day in one day.

The greatest asset of the industrialized gari machine is the 'garifyer'. The machine toasts as well as dries. The cylindrical toasting machine is fitted with proders through out its length. These make stirring easy during the operation to avoid burning. The garifyer eliminates the contact of operators with steam during garification. The movable steel solid fuel stoves on wheels ensure a continuous regulated heat supply during processing.

An improved infrastructure and transportation makes evacuation to makets easy. Women have seized this advantage to become both processors and traders, thus eliminating cheap sales at the farm gate. These facilities have attracted urban dwellers to rural areas on market days. Such interactions bring about dynamic changes in the life style of the ruralites.

Adverse effects were also observed in the work of the women through the introduction of improved technologies. Hitherto, the grating of cassava tubers and the dewatering of the pulp which were the work of the women have automatically become the work of the men with the introduction of mechanical graters and presses. When a man is not available to operate the machines, young boys are delegated this responsibility. Women have never been known to operate them. This has deprived the women of a source of income.

The locally manufactured 'gari' plant is labor intensive. Male energy

is required for lifting, filling and processing. Female labor in the plant is minimal and not indispensable. However, males are impatient beings and they hate monotony. But for these two well known factors, women would have been completely eliminated in this factory.

Peeling by machine is an ineffective method and it is done by grating the skin off. Where the machine succesfully grates the brown skin, the thick white unedible part of the cassava remains. An efficient large scale grater for gari plants has yet to be invented.

Two imported gari plants—the Newell Dunford machine, and a Brazilian 'Fahrena de Mandioca' machine, have a peeling deficiency. Women are engaged in the skinning of cassava tubers in places where these industrial machines are found in Nigeria. Women are employed to do this aspect of the work in a male dominated plant because male labor and skill at skinning are very costly.

Discussion

From the foregoing observations one can conclude that any type of technology (whether intermediate or fully mechanical) is more advantageous to men than to women. 'Gari' processing has always been the occupation of women. In the traditional setting it remains so, but the mechanical innovation of grating and pressing have become the work of men. Is it the argument that women cannot operate machines?

The making of 'gari' in the factory visited would have completely excluded women's labor were it not for the tasks men find unpleasant and boring. The finished product of this factory is not made available to women for marketing because of the predominance of male labor and expensive machinery used in production, factors which make mechanically produced 'gari' high priced.

It has become a general rule that whenever a technological change leads to improved income-earning opportunities, men tend to avail themselves of these, even if the work was formerly the preserve of women.

Suggestions for Improvement

Women's contribution to th national economy of a country is never taken into consideration when introducing technological innovations that effect their occupations. Technological innovations to help women should not be labor-intensive. Pressing, cranking, cracking and lifting of mechanically operated tools should be simple and within the capacity of a woman's strength. The technological aspect of the innovation should be easy to operate by women. Maintenance and small repairs should be of a nature

that women can handle.

An important factor which always hinders the adoption of technological innovational equipment by women is their excessive cost. For instance, the 'gari' making machine by the Fabrico Engineering Company costs N30,000.00. The Newell Dunford 'gari' processing plant costs N100,000.00 in 1972. The Brazilian 'Fahrena de Mandioca' machine costs N300,000.00 to buy. The diesel engine which drives the traditionally made 'gari' grater assembled in a box costs N1,200. By the time the costs of other parts are added the machine becomes N3,000. The cassava pulp jack is also expensive.

The question now arises. Can village women whose output is only 40 kilos of processed 'gari' a week afford the high costs of diesel driven graters and pulp pressers? When smaller tools are beyond their level of income, how can equipment which costs far more than a couple of thousand naira be purchased by them? It is therefore suggested that mechanical tools intended for rural women's work should be within their financial means.

Women's attitudes towards their work do not encourage development workers. Their mentality as regards their inferiority to men and their inability to compete with them needs to be changed. However, it appears that their cultural training militates against their initiative to challenge men. The women in this case study were very secretive. The observer had reasons to believe that they are wealthier than they portrayed, but they underestimated themselves. Both the adults and children looked healthy, reasonably well-dressed and their village were clean.

They were very emphatic in the belief that their children would never inherit their occupation. If this is so, it means that there will be less and less people to carry on rural trade in the future. If and when this happens, farm products will be insufficient for the country's needs. Precious hard currency will have to be exchanged for the importation of 'gari,' thus heightening our problems in the international trade balance.

Before the situation worsens, a re-education of women will be necessary. There are many aspects of learning needed by them. Through a slow process of learning women should be made to feel equal to males or at least not inferior to them, bearing in mind the respect that is due to husbands. This psychological oppression by men is the cause of women's submissiveness to fatalism.

Women should be trained to see their hidden contribution (without remuneration) as a major factor responsible for the stability of the economy of their families. Measured in monetary terms women would be found to contribute more to the coffers of the family and nation at large than their male counterparts.

The women in the area of study were not united in many ways, nor were they willing to venture into unity. These women should be taught to organize themselves into groups for purposes of receiving welfare infor-

mation, benefits of other organisations, grants and aids from the government, forming pressure groups in order to get an audience among male elders, forming registered cooperative groups for the benefit of receiving technical training, loans and credit to further their occupation or their organizational ambitions.

Already, with their 'esusu' contribution they are able to get individual loans at 4% interest. When the 'esusu' group becomes a regional trade group it will be possible to coordinate paid activities. When this happens the impact of rural women's participation and contribution to the national economy will be recognized and acknowledged. Recognition and acknowledgement of this nature leads to the meaningful inclusion of women's programs in the budgets of development projects.

Conclusion

The government should employ more rural development agents to educate women. Home Economics extension agents who are conversant with both the home care and particularly gainful pursuits of women are urgently needed in rural areas. The government should give women incentives when they form cooperatives. Such incentives should include placing improved technological tools in their villages for their use at minimal fees. This would break the monopoly of male domination in occupations which are meant to belong to females.

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