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Mechanization of Cassava Processing in Iwo Local Government Area of Osun State, Nigeria

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Abstract: A study was conducted to assess the different cassava processing machinery available, the most acceptable machine, effect of machines cost on the acceptability of mechanisation, cost of maintenance and services of the machines in Iwo Local Government Area, Osun State, Nigeria. The survey was undertaken using structured questionnaires administered through a participatory learning technique. The local government was divided into four zones and four processing centres were chosen from each zone to give a total of 16 processing centres. A total of 160 machines were recorded. Grating machines, 75 (46.9%), pressing machine, 59 (36.9%), sifting machines, 3 (1.8%), milling machines, 33 (14.4%) in all the processing centres. Peeling, washing, slicing, chipping, drying and frying operations were predominantly done manually. Sources of power of the machines are: diesel (84.7%), petrol (9.4%), electricity (5.9%). The diesel engine was widely utilised due to the ruggedness of the processing operations. High cost of most of the machines, cost of maintenance and services were constraint to acquisition of the already available machines in the market. Maintenance and service culture of most of the processors were poor and this affected the durability of the machines. This study revealed that certain cassava processing operations were met for a particular sex. Grating, dewatery, milling operations were predominantly for men while peeling, washing, drying and frying operations were common among women.

Key words: Mechanization · Cassava Processing · Nigeria

INTRODUCTION

Nigeria has been world leading producer of cassava with an estimated annual production of 2.6 million tons from an estimated area of 1.7 million hectares of land [1-2]. The major problem of cassava is that it is extremely perishable and the harvested tuber must be processed to curb post harvest losses [3]. According to Food and Agriculture Organization (FAO) [4], the estimated industrial cassava use was approximately 16 percent of cassava root production and was utilised as an industrial raw material in 2001 in Nigeria. Ten percent was used as chips in animal feed, 5 percent was processed into syrup concentrate for soft drinks and less than 1 percent was processed into high quality cassava flour used in biscuits and confectionery, dextrin pre-gelled starch for adhesives, starch and hydrolysates for pharmaceuticals and seasonings. This estimate left 84 percent or 28.9 million tonnes of production for feed consumption, a portion of this was lost in post harvest and wastes. Currently, 70% of total production is processed into garri, lafun and akpu [5].

The need to mechanised cassava processing is enormous. Traditional cassava processing has a number of undesirable attributes and this has drawn the attention of national agricultural research to devote utmost interest and resources to engineering research in operations, to minimise the drudgery, enhance commercial quality of the products and labour intensities that are involved in traditional manual operations [6]. The highest share female labour in cassava processing called for an urgent need to appropriate gender sensitive machines and equipment for cassava processing [7,8]. In garri production, peeling and frying constitute a substantial percentage of the total cost of production. Peeling in cassava processing has been major bottleneck in the mechanisation of cassava due to the varying shapes and sizes of cassava tubers.

Mechanisation of cassava production and processing will enhance human capacity in the rural areas,

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leading to intensification and increase productivity as a result of harvesting, handling and appropriate machinery [9]. More importantly, it reduces drudgery, making the food processing an attractive enterprise. It therefore, has the potential for national economic growth, food self-sufficiency, industrial growth and employment leading to poverty reduction.

MATERIALS AND METHODS

Survey of mechanisation of cassava processing in Iwo Local Government Area of Osun State was divided four zones namely Olupona (Zone 1), Telema (Zone 2), Adara (Zone 3) and Iwo (Zone 4). This study was conducted by means of a structured questionnaire, administered through a participatory learning technique. Each of these zones were further divided into four locations. Thus, a total of 16 processing centres were visited. Some of the parameters investigated through the questionnaire were:

- Most prominent machines adopted by the processors.
- Gender relationships in the cassava processing operations.
- Effect of machine cost on acceptability of mechanisation.
- Relationship between the machine manufacturer and cassava processor.

Data was collated and subjected to quantitative statistical analyses using SPSS computer software. These included frequency counts, percentages and cross tabulation.

RESULTS AND DISCUSSION

A total of 16 processing centres were visited in Iwo Local Government Area of Osun State in Nigeria. Most of the processors have more than one machine. A total of 160 machines were observed in the course of this study. A cursory glance at Table 1 reveals that grater (46.9%) was widely accepted, while mechanical dewatering press (36.9%) and milling machine (14.4%) were embraced by the processors.

Peeling, washing, slicing, drying and frying operations were predominantly undertaken manually. One of the graters observed have the frame made of wooden materials. Prime mover of the machines were diesel (84.7%), petrol (9.4%) and electricity (5.9%)

Table 1: Summary of Cassava Processing Machinery Observed during the Study

Machine Type	Respondents	% Response
Peeling	-	-
Washing	-	-
Grating	75	46.9
Presser	59	36.9
Chipping	-	-
Sifting	3	1.8
Frying	-	-
Drying	-	-
Milling	23	14.4

Table 2: Source of power

Source of power	No. of Machines Observed	% of Machines Observed
Electricity	57	5.7
Diesel	75	84.7
Petrol	8	9.4

Table 3: Mechanical and economical characteristics of grating machine

		No. of respondents	% of respondents
Source of power	Electricity	5	8.5
	Diesel	2	88.1
	petrol	53	3.4
Mode of operation	Manual	0	-
	Mechanical	75	100.0
Availability of spare parts	Readily	67	89.3
	available scarce	8	10.7
Maintenance culture	Periodical	19	25.3
	Erratic	56	74.7
Cost of machine	High	54	72.0
	Moderate	17	22.7
	low	4	5.3
Sex of operator	Male	43	91.5
	Female	4	8.5

(Table 2). The diesel engine was widely utilised despite the fact that electricity was the cheapest. This could be adduced to absence of electricity. Where there is electricity, its erratic supply outweights the economical advantage derived from its use. Sometimes, non-availability of fuel from filling station forced processors to purchased adulterated fuel from black markets, which consequently have adverse effects on their functional life span. All the observed machines were locally produced except the engine driven the machines.

The grating machines had been fully adopted in all the processing centres visited (Table 3). Diesel engine was favoured for grating operation due to its ruggedness. The common problem shooter of this machine had been

Table 4: Mechanical and economical characteristics of dewatering machines

		No of respondents	% of response
Source of power	Man power	-	-
	Electricity	-	-
	Diesel	-	-
	Petrol	-	-
Mode of operation	Manual	0	0.0
	Mechanical	59	100.0
Availability of spare parts	Readily	47	79.7
	available scarce	12	20.3
Different category of	Hydraulic press	33	55.9
dewatering machines	Screw press	20	33.9
	Parallel board press	6	10.2
Capacity	70 – 200 kg/day		
Maintenance culture	Periodical	5	8.5
	Erratic	54	91.5
Acquire formal training	Yes	2	
	No	57	3.4
Cost of machine	High	15	25.6
	Moderate	40	67.8
	low	4	6.8

Table 5: Mechanical and economical characteristic of sifting machine

		No. of observed	% Response
Source of power	Electricity	-	-
	Diesel	3	100.0
	Petrol	-	100.0
Mode of operation	Manual	-	-
	Mechanical	3	100.0
Availability of spare parts	Readily	3	100.0
	available scarce	-	-
Capacity	150-200 kg/hour		
Maintenance culture	Periodical	-	-
	Erratic	3	100.0
Acquire formal training	Yes	-	-
	No	3	100.0
Cost of machine	High	2	66.0
	Moderate	1	33.3
	low	-	-

commented by the processors were tearing and wearing of the grater mesh, vibration, regular replacement of bearing, driven belt and rust of the mesh. Safety of the operator was not bored in mind in the design and construction of the machines. Sometimes, accident did occur. Maintenance and service of the machines were not taken seriously. Spare parts were readily available, with a lot of adulterated ones. Men were the major machine operators (91.5%) while women (8.5%) were minor machines operators.

The mechanisation of dewatering operation had been successful as shown in Table 4 and the machines were very popular with garri processors both in the urban and rural areas. Three different types of dewatering press were observed: hydraulic press (55.9%), power screw press (33.9%) and parallel board press (10.2%). Most of the cassava processors favoured the use of hydraulic press; reasons given were: ease of operation, efficiency is high, least efforts to supply the required power. Its shortcomings a re loss of oil through plunger casing, while power screw and parallel board presses, worn of the thread constitute major problem. This unit operation was mainly operated by men.

A lot had been achieved on the mechanisation of sifting operation but machines were not prominent with the cassava processors (Table 5). FAO [10] adduced low acceptability of sifting machines to the fact that this operation is not very difficult and tedious compare to other cassava processing operations. Majority of the processors commented on its high cost of operation and the machines were too expensive. This unit operation was undertaken mainly by women (89%). Only three sifting machines were observed in all the processing centres. The machines were powered by diesel engine of capacity ranging from 3-5 horse power. Poor maintenance practice was observed. The machines spare parts were readily available. They were mainly operated by men.

Horse Power and it was driven by belt. The efficiency of the machine was being affected by sieve condition, that is clogging and rusting of the sieve holes and moisture content present in the dewatered mash. The only problem associated with the machines were the regular replacement of sieve and belt. Milling operation was fully mechanised and the prime mover was diesel engine (69.6%) (Table 6). There were two major types of milling machines observed, Hammer Mill (96.9%) and Plate Mill (30.4%). Most of the machine operators were untrained. This unit operation was done mechanically. Spare parts were readily available. The maintenance culture was poor. The processors complained on high cost of machines (78.3%).

Table 7 reveals that certain cassava processing operations are predominantly for certain sex. Grating (91.5%), dewatering (93.0%) and milling (91.3%) operations are predominantly undertaken by men. While peeling, washing (74.8%), frying (93.0%), drying (82.6%) and sifting are performed mainly by women. Women operated petrol engines while men operate diesel engines. Thus sex of machine operators depends on the prime mover. Women were mostly engaged in cassava

Table 6: Mechanical and economical characteristics of milling machines

		No. of observed	% Response
Source of power	Electricity	4	17.0
	Diesel	16	69.6
	Petrol	3	13.0
Mode of operation	Manual	-	-
	Mechanical	23	100.0
Availability of spare parts	Readily	21	91.3
	available scarce	2	8.7
Different category of	Plate mill	13	56.5
milling machines	Hammer mill	10	43.5
Maintenance culture	Periodical	17	73.9
	Erratic	6	26.1
Acquire formal training	Yes	8	34.8
	No	15	65.2
Cost of machine	High	18	78.3
	Moderate	3	13.0
	low	2	8.0

Table 7: Sex of the Cassava Processors in the Study Areas

	No. of Respondents	
Processing Operators	% Male Operators	% Female Operators
Peeling	6.0	94.0
Grating	91.5	8.5
Washing	15.2	74.8
Pressing	93.0	7.0
Sifting	32.0	68.0
Frying	7.0	93.0
Drying	17.4	82.6
Milling	91.3	8.7

processing operations that were predominantly manual. On spot assessment revealed that women were more careful in operating machines than men. The majority of the abandoned machines were powered by diesel engines. There was positive significant difference in maintenance culture of machines operated by women compared to men. If appropriate gender sensitive technology is developed in cassava processing, there will be an upsurge in women involvement in the industry.

Prominent number of processors reported that cost of machines, high operation cost of some of the cassava processing machines stood as a major bottleneck to the growth of mechanisation of cassava processing in Nigeria. Erratic supply of electricity and lack of water were seen as major setback to the industry and this consequently increase cost of production.

CONCLUSION

The study carried out revealed that most of the processors possess more than one machines. Grating, pressing and milling operation have been successfully mechanised. The most acceptable cassava processing machine and engine were grating machine and diesel engine respectively. Most of the machines were damaged for non-specification of capacity of matchable engine to drive them. The majority of the processors mentioned that high cost of all the processing machines have hinders their acquisition of the machines.

Processing of cassava either for industrial or domestic uses involves different operations of which peeling constituted a major bottleneck. Involvement of women were noticeable in the following cassava processing operations such as peeling, sifting, frying and drying while men predominantly undertake grating, pressing and milling operations which had been mechanised. Some of the processors complained of non-assistance from government in all the processing centres.

RECOMMENDATION

The high cost of most of these machines constituted an hindrance to the acquisition of the readily available machines in our local markets. Since capital investment of the processors were low, they are therefore encouraged to form corporate bodies so as to buy communally those machines lacking. Provision of basic infrastructure amenities such as electricity, water, accessible roads and filling stations will not only go a long way to improve the standard of living of rural processors to adopt machines using electricity and diesel.

Government and agricultural machinery companies should give the requisite assistance towards the commercialisation of viable cassava processing machinery emanating from research institutions, which if mass produced will be available to the processors at subsidized rate.

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