11th FUTA AGRIC CONFERENCE

THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

SCHOOL OF AGRICULTURE AND AGRICULTURAL TECHNOLOGY

Theme

Agricultural Revolution for Sustainable Livelihoods

8th - 11th May, 2023

PROCEEDINGS

EDITED BY:
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LEVEL OF WOMEN INVOLVEMENT IN YAM PROCESSING (YAM FLOUR) IN IBARAPA NORTH AND LAGELU LOCAL GOVERNMENT AREAS OF OYO STATE, NIGERIA

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Abstract
The study analyzed the level of women involvement in yam processing in selected Local Government Areas of Oyo State. Multi-stage sampling technique was used to select one hundred and thirty-two yam processors for the study. Primary data were collected with the aid of structured questionnaire through the assistance of trained enumerators. The analytical techniques employed included descriptive statistics, Ordinary Least Square (OLS) and Logit regression analysis. It can be concluded that many of the processors processed mainly for sale as income generation/livelihood source while civil service, yam processing and farming topped the major occupation of the sampled women in the area at 39%, 38% and 21%, respectively. Further, majority (82%) of the processors used traditional methods of yam processing. The main sources of information to the processors were family and friends and, workshops and seminars. The level of involvement of the processors in yam processing activities was high except milling activity. Marital status and age of the processors, among others, were the main determinants of yam processing into yam flour in the area. Finally, the finding revealed that high cost of milling machine and unstable electricity were most severe constraints militating against yam processing in the area. Based on the findings of this research, it is therefore recommended that the price of milling machine should be subsidized by the government for easy access by yam processors, alternative sources of supply should be put in place by processors in the study area,

Keywords: Women, yam, processing, flour

Introduction
Yam, a starchy tuber produced underground by several *Dioscorea species*, is one of the most valuable crops in West Africa with the region producing 93% of global yam (Siyanbola, 2018). In Nigeria, yam production is valued at $13.7 billion, exceeding that of cassava, maize, sorghum, millet, and rice combined (IITA, 2017). Like many agricultural products, yam cannot be eaten in its raw form but needs to be processed into various forms before it can be consumed. Aside this, yam is perishable and as such cannot be stored for more than a few weeks after harvesting. According to Siyanbola (2018), farmers can lose about 10-15% of harvested yam in the first three months with losses approaching 50% after six months of storage. Hence, processing of yam tubers

into staple non-perishable and easily transportable forms therefore offers an alternative and better way of yam storage. Moreso, processing increases the shelf life of yam tubers, the palatability of the end products (*Amala* or pounded yam) and also reduces wastages, post-harvest losses and hence, less hunger and, food and nutritional insecurity. Furthermore, if processed and properly packaged with better marketing strategies and outlets, it can serve as source of foreign exchange earnings thereby boosting the revenue of the processors and government at all levels. Yam can be boiled and eaten with fried egg, fish sauce or vegetable soup. It can also be made into porridge, pounded and meshed into stick paste or dough in mortal and pestle or in pounding machines. Additionally, it can be fried, roasted, flaked or baked or, made into flour which can be used to produce *amala*, the favorite meal of the locals and elites alike in the State. Industrially, it can serve as poultry and livestock feed, adhesive for producers of cartons, packaging companies as well as leather and shoe producers (Oladipo *et al.,* 2020; Salawu *et al.,* 2014).

Despite the social exclusion, discrimination and barriers to accessing necessary productive resources and services, technology, market intelligence, and financial assets than their male counterparts, women remain an important economic provider and caretaker of their households contributing immensely to economic growth and development of the country (Adeniyi *et al*., 2023; FAO, 2017). And though, Nigeria has one of the lowest recorded female labour force participation rates in the world (Ufondu *et al.* (2021), literature is replete with active involvement of women in processing activities of different agricultural products (such as yam) in addition to farming operations and other livelihood sources within the country (Siyanbola, 2018; Salawu *et al.,* 2014). They have the potentials of increasing food production and availability if empowered and their capacity built up for increased efficiency in their processing operations, as many of them still rely on traditional processing techniques. It is against this backdrops that the study investigated level of women involvement in yam processing in the study area for possible provision of interventions on innovations that could boost their efficiency and income levels thereby improving their living standard and nutritional security in the area. The specific objectives for this study included to: identify the various reasons why women engage in yam processing, the major occupation of the processors and methods used in yam processing; identify the various sources of yam processing information available to the processors; determine the level of involvement of women in yam processing; analyze the determinants of level of involvement of women in yam processing and, examine the constraints militating against yam processing in the area

Methodology

Study Area

Oyo State is an inland State in south-western Nigeria, with its capital at Ibadan. It is bounded in the north by Kwara State, in the east by Osun State, in the south by Ogun State and in the west partly by Ogun State and partly by the Republic of Benin. The State covers approximately an area 28,454 square kilometers. The landscape consists of old hard rocks and dome shaped hills, which rise gently from about 500 meters in the southern part and reaching a height of about 1,219 meter above

sea level in the northern part. Some major rivers such as Ogun, Oba, Oyan, Otin, Ofiki, Sasa, Oni, Erinle and Osun River originate in this highland (McKenna, 2016).

The climate of the State is equatorial, notably with dry and wet seasons with humidity. The dry season lasts from November to March while the wet season starts from April and ends in October. Average daily temperature ranges between 25°C (77.0 °F) and 35°C (95.0 °F) almost throughout the year (McKenna, 2016). The economy of Oyo is based on agriculture and handicraft. Agricultural products include yams, corn (maize), cassava, beans, millet, plantains, tobacco, cacao, palm products, cotton, kola nuts, indigo and fruits. The State is also noted for its cottage industries, consisting of cotton spinning, weaving, dyeing, leather working (sheep and goat skins), wood carving and mat making.

Lagelu LGA has its headquarter in Iyana Offa. It has an area of 338km^2 and a population of 147,957 at the 2006 census. Lagelu is subdivided into 14 towns/villages out of which Opeodu, Kajola and Ogo were selected to this study. Ibarapa North LGA with its headquarter at Ayete have notable towns in the LGA such as Tapa and Igangan. Each of the towns has quite a number of villages out of which Igbo-Ora, Eruwa and Iganga were selected for the study. The LGA is located in the Northern west of Oyo State Nigeria, about 134km from Ibadan the State capital. It has an area of 1,218km^2 and a population of 101,092 at the 2006 census. Majority of the inhabitants of the LGA are professional farmers, few of which are civil servants.

Sampling techniques and sample size: Traditional women processors, most of which were illiterate and semi-illiterate were the main focus in this study. Many of them engage in yam processing because *amala,* the final product from yam processing, is a favorite food among the locals and elites alike in the State. During festive periods and ceremonies, *amala* and *ewedu* soup is a key component of food items served.

Multi-stage sampling technique, as described by Forsythe *et al.* (2021), was used for the selection of the sample for the study. The first stage involved a simple randomized selection of three villages from each of the selected LGAs in the State. List of registered women processors from the Agricultural Development Project Office, Oyo State served as population/sample frame for the study. The second stage involved a proportionate sampling of 66% of registered yam processors in the area making a total of one hundred and thirty-two women yam processors as the sample size for the study (Table 1).

Table 1: Selection of sample size for the study

LGA		Villages	Sample frame	Sample size (66% of sample frame)
Lagelu	Iyana ofa	Opeodu	40	26
		Kajola	30	20
		Ogo	29	19
Ibarapa North	Ayete	Igbo-ora	20	13
		Eruwa	45	30
		Iganga	37	24

Total	6	201	132

Source: Agricultural Development Project (ADP), Oyo State (2021)

Method of Data Collection: Cross sectional data were used for the study and were obtained from the processors with the aid of structured interview schedule which contained closed and open-ended questions. The interview schedules were administered with the assistance of trained enumerators who were familiar with the terrain of the area. Information on various reasons and methods of yam processing, level of involvement in yam processing and factors affecting the level of women involvement in yam processing in the area were obtained and subjected to statistical analysis using SPSS and STATA software packages.

Analytical techniques: To achieve the objectives of the study, descriptive statistics such as frequency distribution, percentages and Likert rating scale were used to identify the various reasons for their engagement in yam processing, the yam processing methods and sources of information on yam processing venture in the area. Participation index and a 4-point Likert-type rating scale were used for the analysis of the level of involvement of the respondents in yam processing in the area. The various processing activities included peeling (PE), slicing (SL), washing (WA), parboiling (PA), drying (DR), pounding (PO), grinding (GR), packaging (PA). Four point Likert-type of scale was then used to score each activity viz; always involved = 4, occasionally involved = 3, rarely involved = 2 and never involved =1. The participation index score was calculated by adding up all the scores of a respondent's activities and dividing it by the number of all the activities to derive the mean score. Any mean score greater than or equal to the cut-off mean score, that is, ≥ 2.5 was considered as high involvement and *vice versa* for low involvement.

The formula for the Participation Index (PI) in yam processing was presented in equation 1.

$$PI = \frac{PE + SL + WA + PA + DR + PO + GR + PG}{8} \quad \ldots\ldots\ldots\ldots\ldots\ldots (\mathbf{1})$$

Logit regression model was used to analyze the determinants of the level of women involvement in yam processing in the area. In this study, all the respondents with participation index greater or equal to the cut-off mean were categorized as 1 and those below the mean were regarded as zero. The implicit form of logit regression model is as stated thus:

$$In(Y) = \frac{1}{1 + \exp^{Inzi}} X$$

$$In(Z) = \beta_0 + \sum_{i=1}^{n} \beta_i X$$

Where:

Y= dichotomous response variable (High level of involvement in yam processing=1, and otherwise=0) and Z= independent variables

The explicit form of the model is:

$$Y = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i3} + \beta_4 X_{i4} + \beta_5 X_{i5} + \beta_6 X_{i6} + \beta_7 X_{i7} + \beta_8 X_{i8} + \beta_9 X_{i9} + U_i$$

Where, Y = Level of involvement (Y = 1 for high involvement and 0 otherwise); X_1 = Age; (Years); X_2 = Household size (No.); X_3 = Marital Status (dummy: married 1; 0 otherwise); X_4 = Education level (Years); X_5 = Years of experience (Years); X_6 = Extension contact (No.); X_7 = Household income (₦); X_8= Membership of cooperative society (1 = Yes; 0 otherwise); X_9 = Access to credit (₦)

Results and Discussion

Reasons for engagement in yam processing

Yam processors in the study area had three basic reasons for their engagement in the yam processing venture. As shown in Fig. 1, more than half (57%) of the processors processed mainly for commercial purpose/livelihood source. Further, 23% of the processors engaged in processing at subsistence level to meet the family consumption/food needs while 20% of processors engaged in processing basically to serve the dual purpose of meeting basic family consumption/food needs (subsistence) as well as commercial purpose as income generation source. The implication of the finding was that, being rational beings, the processors dabbled into the venture because of the high patronage of processed yam (*elubo)* as a preferred food delicacy when prepared with *ewedu* at household level, during festive periods and other special occasions. Increased market for a product in most cases translates to increased income for the women. Increase income also boost women's self-esteem and improve their household living conditions. This finding is in agreement with that of Ojo *et al.* (2013) who reported that majority of yam farmers in the area produced for sales and consumption.

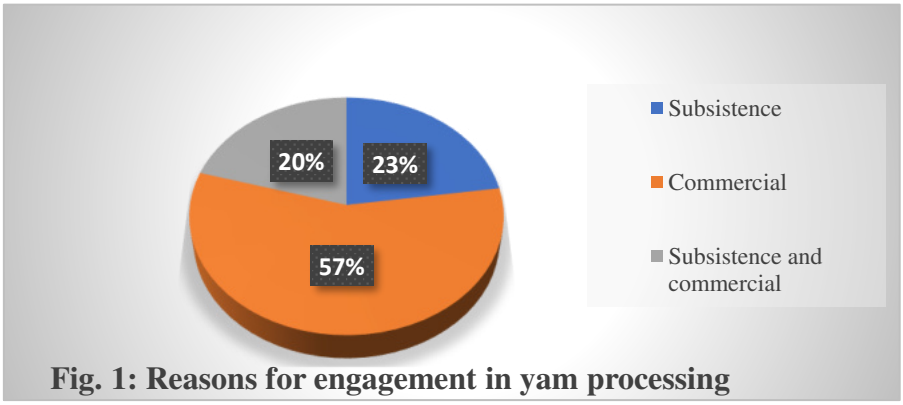

Fig. 1: Reasons for engagement in yam processing

As shown in Fig. 2, civil service, yam processing and yam production topped the major occupations of the sampled women in the area at 39%, 38% and 21%, respectively. The least occupation by the women was artisanship at 2%. The findings revealed that civil servants in the area also engaged in yam processing as alternative source of livelihood probably due to rising inflation which has weakened the purchasing power of Naira as well as rising food and non-food prices which had made salary of public employees lost its value. Moreover, while some of them chose yam

processing as their primary occupation probably because it is less cumbersome and risky than farming, few of the farmers still embraced yam production as their primary occupation alongside their role as caregivers at the home front. This could translates to reduced variable costs of processing as the yam tubers needed could be produced directly from their farms for further processing into flour (*Elubo*). This showed women's resilience in the face of economic realities in the country.

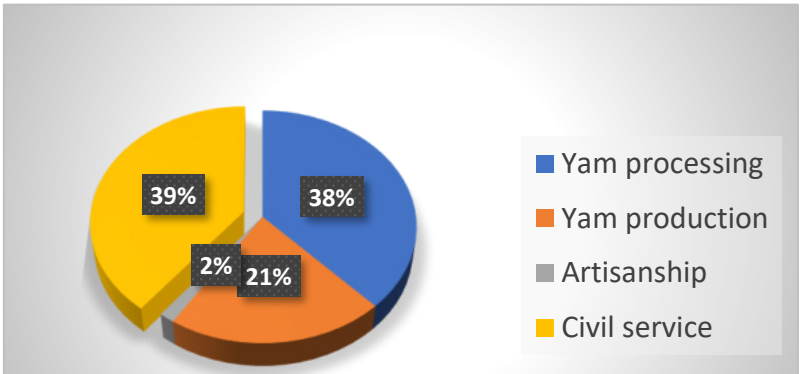

Fig. 2: Major occupation of the processors

Processing methods adopted by yam processors in the study area

The type of processing method adopted by the processors would have appreciable influence on the efficiency level of the farmers. Fig.3 revealed that 82% of the processors used traditional methods of processing while 18% used modern methods. This implied that traditional methods of processing were predominant among yam processors in the study area. This can be adduced to the fact that visits of extension agents were grossly inadequate or non-existent in the area.

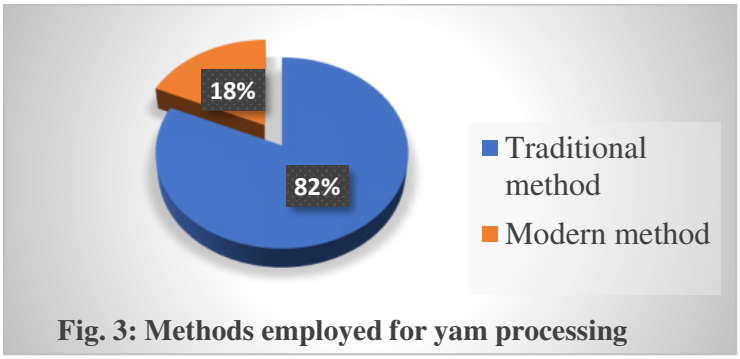

Fig. 3: Methods employed for yam processing

Sources of information available for the yam processors

Agricultural processing involves agricultural output transformation, sorting, packaging and grading in a way that appeal to the consumers. Access to right information on how to improve the yam processing techniques and proper utilization of such information by the women will create more demand, increase productivity and income of the women. Further, price information helps the

women yam processors to know the prevailing prices and price trends in the market and helps them to plan on how they can maximize profit efficiently. The result of the 3-point likert rating scale revealed that the main sources of information to the processors were from family and friends (WM = 2.80) and workshops and seminars (WM = 2.58) which ranked 1st and 2nd, respectively. Access to information from radio ranked 3rd at weighted mean score of 2.00 while information form extension agents and cooperative society were the least which ranked 6th and 7th, respectively. The finding revealed that extension agents and cooperative society where useful information on improved processing methods should be domiciled were inadequately accessible to the processors. The extension agents' role in reaching out to the processors in the design of the most appropriate strategies and dissemination of useful and timely information needed to improve the productivity of these women processors was not accomplished probably because of the limited decision-making power of women. No wonder, many of them engaged the use of traditional methods for yam processing in the area. Similar finding was reported by FAO (2003) that in spite of their role in food production, women in sub-Saharan Africa receive little from the agricultural extension services due to traditional prejudiced attitude towards women, lack of time on the part of women to attend meetings due to their productive and reproductive roles and their limited decision-making powers. According to United Nations (2015) women hold only a minority of decision-making positions in public and private institutions in most societies around the world. Several studies have alluded to the need to develop suitable extension services that target women farmers (Satyavathi *et al*., 2010). The result is also consistent with the findings of Jari and Fraser (2009) who found that availability of market price information resulted in an increase in commercialization in the study area.

Table 2: Sources of information available for the yam processors

Variables	Regularly (3)	Occasionally (2)	Never (1)	WS	WMS	Rank	Remark
Family & Neighbours	105 (79.5)	27 (20.5)	0(0)	369	2.80	1st	MSI
Workshops and seminar	77 (58.3)	55 (41.7)	0(0)	341	2.58	2nd	MSI
Radio	0(0)	132 (100)	0(0)	264	2.00	3rd	MNSI
Television	0(0)	105 (79.5)	27 (20.5)	237	1.80	4th	MNSI
Print media	0(0)	77 (58.3)	55 (41.7)	210	1.59	5th	MNSI
Extension agents	0(0)	55 (41.7)	77 (58.3)	187	1.42	6th	MNSI
Cooperative societies	0(0)	53 (40.2)	79 (59.8)	185	1.40	7th	MNSI

Source: Field Survey, 2021

*Figures in parenthesis represent percentages MSI – Main source of information; MNSI- Minor source of information

Level of women involvement in yam processing in the study area

Yam processing involved different array of activities such as peeling, slicing, washing and parboiling among others. In order to determine the level of involvement of women in each of these activities, Likert rating scale was used (Table 3). The finding revealed that women were highly

involved in all the activities (except milling) with WM of 3.80 for peeling, slicing and washing while parboiling, drying, pounding and packaging had WM of 2.80, 2.64, 3.58 and 2.82, respectively. The low involvement in milling follows the *a priori* expectation because many of them did not have milling machine and such had to take the chips to millers for milling in exchange for money.

Processing activities	AI (4)	OI (3)	RI (2)	NI (1)	WS	WM	Remarks
Peeling	105 (79.5)	27 (20.5)	0(0)	0(0)	501	3.80	High Involvement
Slicing	105 (79.5)	27 (20.5)	0(0)	0(0)	501	3.80	High Involvement
Washing	105 (79.5)	27 (20.5)	0(0)	0(0)	501	3.80	High Involvement
Parboiling	0(0)	105 (79.5)	27 (20.5)	0(0)	369	2.80	High Involvement
Drying	55 (41.7)	0(0)	52 (39.4)	25 (18.9)	349	2.64	High Involvement
Pounding	77 (58.3)	55 (41.7)	0(0)	0(0)	473	3.58	High Involvement
Milling	28 (21.2)	27 (20.5)	0(0)	77 (58.3)	270	2.05	Low Involvement
Packaging	28 (21.2)	52 (39.4)	52 (39.4)	0(0)	372	2.82	High Involvement

Table 3: *Level of women involvement in yam processing*
Sources: Field Survey, 2021
Note: AI-Always involved; OI-Occasionally involved; RI-Rarely involved; NI-Never involved; WS-Weighted score; WMS-Weighted mean score

Determinants of level of women involvement in yam processing in the study area

Analysis of the logit regression model in Table 4 showed the factors affecting the level of women involvement in yam processing in the study area. The Prob > chi-square value was 0.000 which showed that the whole model was statistically significant at $P < 0.01$. Since this is a logistic regression, the interpretation of the result is better presented using the odd ratio. Odd-ratio is used to measure the strength of association between the independent and explanatory variables for categorical regression. A greater than one odd ratio shows a positive relationship while a less than one ratio depicts a negative relationship. Also, an odd ratio of one indicates an indifference in the relationship. All the variables, except income with odd ratio of 1.00, had odd ratios greater than one which implied positive relationships between each of the variables and level of involvement in yam processing in the area. Marital status and membership of cooperative societies were dummy variables and had odd ratios values of 2.75 and 1.88, respectively. This implied that being married and engaged in cooperative membership made the processors 3 and 2 times greater in the odds of being highly involved in yam processing. However, the odd ratios of age and household size were less than one (that is, 0.84 and 0.45, respectively) which revealed negative relationships between food security and the two predictors. This implied that a one-unit increase in age and household size made the odds of being food secured decreased by 16% and 55%, respectively. The findings corroborate the report of Nwachukwu *et al.,* (2020) who found that age, education level, farm

income, cooperative membership, household size and extension contact influenced the participation of the respondents in cassava processing in Abia State, Nigeria

Table 4: Factors affecting the level of women involvement in yam processing in the study area

Variables	Coefficient	Standard error	z-value	Odd Ratio
Age	-0.051	0.028	-1.83	1.05
Household size	-0.142	0.099	-1.43	1.15
Marital status	1.010	0.500	2.02	2.75
Education	-0.156	0.157	-0.99	1.17
Years of experience	-0.070	0.058	-1.20	1.07
Extension contacts	0.178	0.813	0.22	1.20
Income	-4.80e-07	8.12e-08	-0.06	1.00
Membership of Cooperative society	-0.629	1.084	-0.58	1.88
Access to credit	-8.49	1.06e-06	-0.80	4865.87

Source: Field Survey, 2021

Note: The asterisks (***, **) donate statistical significance at 10% and at 5% level of probability respectively

Constraints faced by the Yam Processors in the Study Area

Table 4 showed the constraints faced by the yam processors in the study area. The findings revealed that high cost of processing machine (3.0), unstable electricity supply (2.79) (which implied the) and high cost of transportation (2.60) ranked 1st, 2nd and 3rd respectively. These constraints arose due to high inflation and dwindling power of Naira, use of alternative power supply (Generator) with high milling charge by the millers and, poor road network to interior areas where yam is produced which increased transportation cost significantly. This result is consistent with the findings of Mutai *et al.* (2013) who argued that good road network reduced the cost of transportation for farmers and hence made it easy and cheaper for the farmer to access local town market. Lack of readily available market ranked least among the constraints Other identified constraints included, unstable price of inputs, inadequate improved varieties of yam, inadequate processing machine, unstable price of yam output and high rate of deterioration among others.

The finding corroborates the report of Salawu *et al.,* (2014) who found that climate change, inadequate credit facilities and poor road network among others were the major factors that hindered the processing activities in the area The result however differs from the findings of Siyanbola (2018) who reported that lack of capital to purchase yam tube

rs and purchase of stainless drums and lack of shelter at the processing site were some of the problems encountered by the processors in the area.

Table 5: Constraints faced by the yam processors in the study area

Source: Field Survey, 2021 **Note:** WS=Weighted Sum; WM=Weighted Mean

Constraints	Very severe (3)	Severe (2)	Not severe (1)	WS	WM	Rank
High cost of milling machine	132(100)	0(0)	0(0)	396	3.00	1st
Unstable electricity	105(79.5)	27(20.5)	0(0)	369	2.79	2nd
High cost of transportation	80(60.6)	52(39.4)	0(0)	344	2.60	3rd
Unstable price of inputs	0(0)	107(81.9)	25(18.1)	289	2.19	4th
Inadequate improved varieties	25(18.9)	79(59.8)	28(21.2)	267	2.02	5th
Inadequate processing machine	0(0)	132(100)	0(0)	264	2.00	6th
Unstable price of yam output	0(0)	132(100)	0(0)	264	2.00	6th
High rate of deterioration	25(18.9)	82(62.1)	25(18.9)	264	2.00	6th
Inadequate labour supply	0(0)	25(18.9)	107(81.1)	157	1.89	7th
Drudgery	0(0)	107(81.9)	25(18.9)	293	1.81	8th
Inadequate capital for business expansion	77(75.3)	27(20.5)	28(21.2)	215	1.63	9th
Incomplete turn of credit sales	27(20.5)	28(21.2)	77(58.3)	214	1.62	10th
Low volume of production	27(20.5)	28(21.2)	77(58.3)	214	1.62	10th
Seasonal supply of yam	0(0)	53(40.2)	79(59.8)	185	1.40	11th
Lack of readily available market	0(0)	27(20.5)	105(79.5)	159	1.20	12th

Conclusion

It can be concluded that many of the processors processed mainly for sale as income generation/livelihood source while civil service, yam processing and farming topped the major occupation of the sampled women in the area at 39%, 38% and 21%, respectively. Further, majority (82%) of the processors used traditional methods of yam processing. The main source of information to the processors was family and friends. The level of involvement of the processors in yam processing activities was high except milling activity. Finally, the finding revealed that high cost of processing machine and unstable electricity supply were most severe constraints militating against yam processing in the area. Yam processing in the study area could be a source of sustainable livelihood if the following recommendations are promptly and painstakingly addressed:

i. Government at all levels should ensure stable supply of electricity in the area
ii. The price of milling machine should be subsidized by the government for easy access affordability by yam processors
iii. Extension agents and cooperative societies should ensure useful and timely supply of relevant information needed by processors from time to time
iv. Good and accessible road infrastructure should be constructed while bad roads should be rehabilitated to ease movement of processors to the remote areas where purchase of yam is carried out.

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TECHNOLOGY FOR SELF RELIANCE

ISBN 817525766-0

9 788175 257665