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EFFECTS OF ADOPTION OF MODERN PROCESSING TECHNOLOGIES IN CASSAVA PROCESSING ON FARMERS SOCIO ECONOMIC CHARACTERISTICS IN THE AGRICULTURAL ZONES OF OSUN STATE

[1]Olufemi, D. I. [2]Ogunwale, A. B. [3]Adio, M. O. and [4]Adebisi, S. A.

[1,2]Department of Agricultural Extension and Rural Development, Ladoke Akintola University of Technology, PMB 4000, Ogbomoso, Nigeria

[3]Department of Agricultural Economics and Farm Management, Federal University of Oye Ekiti, PMB 373, Ekiti State, Nigeria

[4]Department of Agricultural Extension and Rural Development, Federal University of Agriculture, PMB 2240, Abeokuta, Nigeria

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Abstract

The high cost of modern equipment has led to low level of cassava processing: which has negatively affected food production. This study therefore examined effects of adoption of modern processing technologies in cassava processing on farmers socio economic characteristics in the agricultural zones of Osun State. Multistage sampling technique was used to select one hundred and eighty nine (189) cassava processors in the study area. Data were collected using a well-structured interview schedule. Descriptive statistical tools and Pearson Product Moment Correlation analysis (PPMC) were used. The mean age of the respondents was revealed to be 53.4 years. The mean output of processed cassava products before adoption of modern processing technology was 50.9 tonnes. The mean output of processed cassava products after adoption of modern processing technology was 59.2 tonnes. Pearson's Product Moment Correlation analysis revealed that there is a positive and significant relationship between selected socio economic characteristics of the cassava processors such as age (r=0.191*, p=0.010); household size (r=0.178*, p=0.017); years spent in school (r=0.677**, p=0.000) and years of experience in cassava processing (r=0.475**, p=0.000) on the output of processed cassava tubers. It was concluded that the output of processed cassava products after adoption of modern processing technology was higher than the output of processed cassava products before adoption of modern processing technology. It was recommended that more cassava

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processors should adopt improved and modern processing technology.

Keywords: Cassava, educated processors, output, processor and years of experience

1. INTRODUCTION

Nigeria remains the highest producer of cassava in the world with about 60 million metric tonnes (FAOSTAT, 2022). Also, global cassava production in terms of total area harvested has increased substantially in recent years. Nigeria led the world in this aspect with total harvested area of 7.7 million ha in 2020 (FAOSTAT, 2022).This then presupposed that traditional use or utilization of cassava is changing from primarily human consumption to processing into industrial products as well as for exportation. Cassava is usually consumed in processed forms. Cassava processing by traditional methods is labour intensive but the increasing application of improved processing technology has reduced processing time and labour and encouraged increased production. Industrial utilization of cassava products is increasing but still accounts for less than 5% of the total production (Shittu *et al.,* 2016).

Processing is important for the marketing of cassava, and reduces the bulk, extends shelf life thereby reducing transportation cost. Fresh cassava roots have low value per unit weight; whereas processing adds value to it and therefore increases the market value. In addition, fresh roots of some cassava cultivars contain cyanogen which are reduced or eliminated through processing (Oluchi, 2021). In response to growing shortage of labour in Nigeria, researchers have developed a wide array of simple mechanical processing technologies that reduce drudgery, labour requirements and facilitate the commercial processing of cassava.

A number of studies have been carried out on the adoption of improved technologies singly and independently; (Abdoulaye *et al.,* 2014). The agricultural productivity improvement increases farmers' real wages and secures food supply at reasonable prices (Otchia, 2014). Agricultural growth via technological transformation leads to an expanded food supply which presupposes relationship between production and processing operations in agriculture. Inadequate adoption of contemporary innovation and technology has constrained cassava productive efficiency to less than 60% in most countries in sub-Saharan Africa including Nigeria (Ajibefun, 2015). The call to address this seemingly difficult challenge has again come to the fore as the demand for cassava products is increasingly gaining momentum among various consumers.

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The high cost of modern equipment has led to low level of cassava processing. This has negatively effect on food production level and hindered national development. The exorbitant cost of mechanization has resulted in reduced patronage in the purchase of cassava processing equipment. For instance, the average cost of a locally fabricated 5-hp self-action grater is about ₦98, 000 and a locally fabricated peeler costs about ₦2, 864,097.00 (Integrated Cassava Project, 2017). The high cost of purchasing this equipment has been adduced to the absence of a subsidy scheme on cassava processing equipment. High cost of modern technologies hinders cassava processing and food production in Nigeria. The high cost of Modern technologies is an impediment that hampers cassava processing and food production with a negative effect on the socioeconomic transformation, and national development in Nigeria.

The specific objectives are to:

i. Describe the socio-economic characteristics of cassava processors as mediating variables for the effect of adoption of modern technologies in the study area
ii. Examine the Output before Adoption of Modern Technologies for Cassava Processing
iii. Examine the output after adoption of modern technologies for cassava processing

Hypothesis of the study:

H_{01}: There is no significant relationship between output of processed cassava tubers after usage of modern cassava processing technologies and selected socioeconomic characteristics of cassava processors.

2. RESEARCH METHODOLOGY

The study was carried out in all the three Agricultural Zones of Osun State. Osun state is found in the Southwest geopolitical zone of Nigeria, situated between latitude 7°05'N and longitude 4°35'E and is bordered by Kwara, Ekiti, Ondo, Ogun and Oyo. Osogbo is the state's capital while other prominent towns include Ede, Iwo, Ejigbo, Ilesa and Esa-oke.

Osun State Agricultural Development Programme (ADP) classified the State into three agricultural zones based on the variations in vegetation cover. These are: Iwo-Ikire, Osogbo-Ikirun and Ife-Ijesa zones as shown in Figure 1. Osun State has a total of 30 LGAs which include Atakumosa East, Atakumosa West, Ife Central, Ife East, Ife North, Ife South, Ilesa-East, Ilesa-West, Obokun and Oriade consistute the ten (10) blocks in the Ife-Ijesa agricultural zone. Ede South, Ede North, Egbedore, Ejigbo, Ola-oluwa, Iwo, Ayedire, Isokan, Ayedaade and Irewole constitute ten (10)

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blocks in the Iwo- Ikire agricultural zones. Boluwaduro, Ila, Ifedayo, Ifelodun, Orolu, Olorunda, Osogbo, Boripe, Odo-otin, Irepodun constitutes the ten (10) blocks in Osogbo-Ikirun agricultural zones.

The predominant population of Osun State is Yoruba. The vegetation of the state comprises rainforest zone, derived savannah and savannah. The average rainfall ranges from 1125mm in the derived savannah to 1475mm per year in the rain forest belt. The mean annual temperature ranges from 27^0C in June to 39^0C in December (Agboola *et al.,* 2021). Osun state is an Agricultural and commercial state known for crops such as cassava, cocoa and rice.

Prominent markets such as the Ayegbaju international market, Oja Oba market Osogbo, Oranran market, Aje international market, Oluode market Osogbo, Alamisi market Ikirun, Oja Obi market Ila-Orangun, Sabo market Ile-Ife, Ilesha market, Owena market, Timi market, Orile owu market, Ikire market and the Atakumosa Market in Ilesa attract thousands of buyers and sellers of diverse commodities and contributes to the economy of the state.

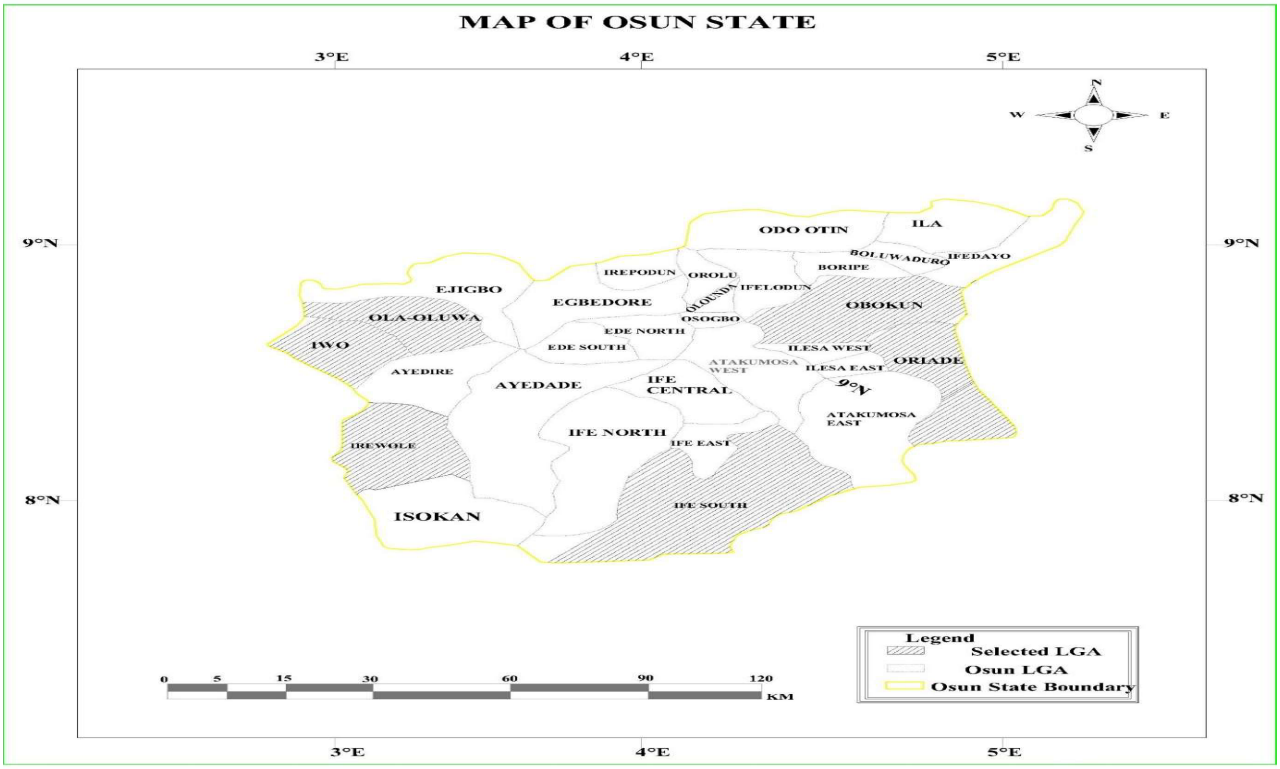

Figure 1: Map of Osun State Showing the Study area.

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The population of the study comprised of all cassava processors in all the Agricultural zones of Osun state. These processors, with their diverse characteristics, experiences, and adoption patterns, form the basis for understanding the effect of modern technologies for cassava processing.

A multistage sampling technique comprising of three (3) stages was employed in selecting the respondents for this study. Osun State has three (3) Agricultural Development Projects Zones and thirty (30) blocks. These are Osogbo-Ikirun agricultural zone which has ten (10) blocks, Iwo-0Ikire which has (10) blocks and Ife-Ijesha which is also made up of (10) blocks (Agboola *et al.,* 2021).

The study was carried out in all the agricultural zones of Osun state. There are ten (10) blocks (Local Government Areas) in each agricultural zones of Osun state. Four (4) blocks with larger number of cassava processors were purposively selected in each agricultural zones of Osun state. Therefore, Orolu, Irepodun, Ifedayo and Odo-Otin were selected for Osogbo-Ikirun agricultural zone of Osun state; Ife-South, Ife-East, Ife-North and Obokun were selected for Ife-Ijesa agricultural zone of Osun state; Iwo, Ayedaade, Ayedire and Olaoluwa were selected for Iwo-Ikire agricultural zone of Osun state for this study.

The second stage involved a random selection of two (2) cells (villages) each from the selected blocks what will sum up to a total of twenty four (24) cells that will be selected. The last stage involve the systematic random selection of 30% of identified cassava processors in each selected cells (at the interval of 3). This implies that a total of one hundred and eighty nine (189) cassava processors will constitute the sample size for this study as presented in Table 1.

Table 1: Summary of Sampling Procedure and Sample size

All zones in Osun state	40% of Selected blocks in each zone	Random selection of cells in each block	Number of registered cassava processors	30% of registered cassava processors (respondents)
Osogbo-Ikirun	Orolu	Ifon	29	9
		Onigaari	36	11
	Irepodun	Ilobu	23	7
		Erin osun	12	4
	Ifedayo	Aiyetoro	16	5
		Temidire	13	4
	Odo-otin	Igbaye	13	4
		Ijabe		

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			9	3
Sub-total	**4**	**8**	**151**	**47**
Ife-Ijesa	Ife south	Mefowarade	26	8
		Abiri ogudu	32	10
	Ife east	Ilode	19	6
		Yekemi	16	5
	Ife North	Famia	29	9
		Oyere	27	8
	Obokun	Ikinyinwa	13	4
		Ilase	19	6
Sub-total	**4**	**8**	**181**	**56**
Iwo-Ikire	Iwo	Molete	40	12
		Oke Adan	43	13
	Ayedaade	Araromi Owu	47	14
		Ode omu	33	10
	Ayedire	Ile ogbo	34	10
		Kuta	31	9
	Olaoluwa	Ogbaagba	36	11
		Asamu	23	7
Sub-total	4	8	**287**	**86**
Grand total	**12**	**24**	**619**	**189**

Source: Osun State Ministry of Agriculture and Food Security, 2024.

Descriptive Statistical Tools that were used include frequency counts, percentages and means. These were used to describe socio-economic characteristics of cassava processors as mediating variables for the effect of adoption of modern technologies, output before adoption of modern technologies for cassava processing and output after adoption of modern technologies for cassava processing. Also, Pearson Product Moment Correlation analysis (PPMC) was used to test for the null hypothesis.

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3. RESULT AND DISCUSSION

Socio Economic Characteristics of the Respondents

In Table 2, the socio economic characteristics of the respondents were presented. Almost 70.0% of the respondents indicated that they are male while 30.7% indicated they are female. This result implies that both male and female adopt modern cassava processing technologies, an indication that modern cassava processing technologies are relatively appealing to the cassava processor irrespective of their sex, hence the reason of adoption of the processing technology by the cassava processors. Meanwhile, the dominance of male in the adoption of the modern processing technologies might be connected with the huge financial commitment involved where male are favourably placed to have access to huge financial commitment in the enterprise due to their position in the rural society. This result does not conform to the findings of Fatuase *et al.,* (2019) where majority of the respondents were female. Meanwhile, this study conforms with the findings of Uchemba *et al.,* (2021) where majority of small-scale cassava farmers in the study area are male which is in agreement with the earlier findings of Ajieh (2014) on the adoption of improved cassava production and processing technologies in Oshimili Delta State, Nigeria in whose study revealed 65% of the farmers as male.

Almost half (49.7%) of the respondents indicated they are between 51-60 years of age; 35.4% indicated they are between 41-50 years while 12.2% and only 2.6% of the respondents indicated they are above 60 years of age and not more than 40 years of age respectively. The mean age of the respondents was revealed to be 53.4 years. This result implies that cassava processors in the study area are matured, responsible, and energetic and still in their economic productive years. This is an indication that, the cassava processors will eagerly adopt and embrace technologies introduced to them to improve their productivity. The implication of the respondents being in their economic productive years is that they will readily adopt technology that will aid their production in order to increase their income and be economically active in the competitive market. This means that most of the cassava processors are at their productive age which enables them to actively participate in adoption of modern cassava processing technologies. As stated in the study of Uchemba *et al.,* (2021), the analysis of factors influencing adoption of good agricultural practices (GAP) among cassava farmers under Nigeria Agricultural Transformation Agenda who are in their economic productive years.

The result reveals that 63.5% of the respondents were married, 14.3% and 11.6% were widowed and separated respectively while 5.3% indicated they are single and divorced. This result implies

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that majority of the respondents have experienced marriage institutions which might have positioned them to be more financially committed, this is expected to influence their rate of adoption of technology that might increase their income and improve the welfare of their household members. The result is in line with the findings of Fatuase *et al.,* (2019) where majority of the cassava processors are married, their marital status is expected to encourage the adoption of the modern cassava processing technologies as family is seen as a learning institution where family source information from.

The result further reveals that 32.3% of the indicated they spent not more the 6 years in school; 27.0% and 25.4% indicated they spent between 7-12 years and above 12 years in school respectively while 15.3% indicated they had no formal education. The mean years spent in school by the cassava processors was revealed to be 9.9 years. This result implies that majority of the respondents had formal education though with majority having low level of education. Irrespective of the level of their education, their experience in formal school is expected to influence their rate of adoption of technologies for cassava processing as their exposure to education is expected to serve as leverage for them over their colleagues in the cassava processing industry. This result is in line with the findings of Uchemba *et al.,* (2021) who revealed a mean years of 9.17 spent in school by the cassava processors used for their study, an implication that majority of the respondents have at least attempted secondary school education. This result also conforms to the findings of Awoyemi *et al.,* (2020) on assessment of cassava processing technologies usage among rural women in Kwara State, Nigeria whose findings revealed that 93.3% of the respondents had good educational background.

Above half (52.4%) of the respondents indicated they have between 4-6 members in their household while 38.6% and 8.9% indicated they have above 6 and not more than 3 members in their household. The mean household size of the respondents in the study area was revealed to be 6 members. This result implies that cassava processors in the study area have a fair large household size. The number of household size is expected to influence their rate of adoption and usage of the technologies as producing optimally will aid better welfare for their respective household due to increase in income realized. The result is similar to the findings of Fatuase *et al.,* (2019) who revealed the mean household size of cassava to be above 6, an implication for the adoption of the cassava modern processing technologies.

Above half (51.3%) of the respondents indicated they are Christians while 48.7% indicated they are Muslims. This result is implies that no religion is bias to cassava processing as an agricultural

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activity. This result is an indication that cassava processing is a majorly accepted economic activity in the study area.

The result further reveals that respondents in the study area engage in various livelihood activities, as it was indicated by 39.2% and 34.9% that they engage in farming and are artisans respectively while 25.9% indicated they are into the trading business as secondary occupation. This result implies that cassava processing is an economic activity that creates opportunity for the respondents to engage in other economic activity. This is expected to be a major influence for the people to engage in cassava processing as it allows their participation in other economic activity.

The result reveals that 28.0% of the respondents indicated they have accumulated 30 years and above experience in processing of cassava; 27.0% indicated between 21-30 years and not more than 10 years as experience accumulated in cassava processing respectively. Also, 17.9% of the respondents indicated they have accumulated between 11-20 years of experience in cassava processing. The mean years of experience accumulated in cassava processing by the respondents was revealed to be 21.7 years. This result implies that cassava processors in the study area are well experienced in cassava processing and this is expected to influence their rate of adoption of technologies introduced into cassava processing. Their experience in cassava processing will enable them to make decisions that are profitable to the processing business due to their experience from the past. Technological improvement is what is desired by every agricultural business owner so as to improve on their productivity. The result conforms to the findings of Ehinmowo and Fatuase (2016), who revealed in their study that cassava processors that adopt modern processing technologies were highly experienced.

Almost 70.0% of the respondents indicated they belong to cassava processing association while 31.7% indicated they do not associate with cassava processing association. This result implies that cassava processors in the study area are likely to have ease of access to technological information on cassava processing and ease of access to machines and inputs needed for the modern way of processing cassava.

Moreso, 67.7% of the respondents indicated that they have their personal farms where they cultivate arable crops while 32.3% indicated they do not possess farm. This result implies that majority of cassava processors in the study area are farmers while they still earn from arable crop cultivation. This result is an indication that cassava processors engage in other livelihood activity and this might make them to be more financially buoyant to purchase technological inputs introduced to them for modern cassava processing.

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The result reveals that 46.6% of the respondents indicated that cassava processed were gotten from their personal farm while 37.6% and 15.9% indicated the cassava were purchased and also from both (personal and purchased) sources. This result is an indication that cassava processors in the study area are not likely to be in shortage supply of cassava to process since they got it from different sources. It is also an indication that cassava farmers in the study area have ready-made market for their cassava tubers. The cultivation of cassava in the study area is expected to boost the lucrative business of cassava processing in the study area.

Majority (80.4%) of the respondents indicated that they are involved in both (primary and secondary) processing activities while 10.1% and 4.2% indicated they get involved in only primary and secondary processing activities respectively. The primary processing activities includes peeling and washing while the secondary processing activities includes drying and milling. The laborious engagement of the processing activities might have an influence on the type of activity each respondents get engaged in.

50.8% of the respondents engage in cassava processing individually while 49.2% indicated they process in group. This result is an indication that cassava processing can be practiced as a lone man business or engage in partnership. The mode of processing engaged in might be influenced by various factors such as gender, capital and other important inputs needed for processing activities.

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Table 2:Distribution of respondents according to Socioeconomic Characteristics n=189

Socioeconomic characteristics	Frequency	Percentage	Mean
Sex			
Male	131	69.3	
Female	58	30.7	
Age (years)			
≤40	5	2.6	
41-50	67	35.4	53.4
51-60	94	49.7	
Above 60	23	12.2	
Marital status			
Single	10	5.3	
Married	120	63.5	
Separated	22	11.6	
Divorced	10	5.3	
Widowed	27	14.3	
Years spent in school			
No formal education	29	15.3	
≤ 6	61	32.3	9.9
7-12	51	27.0	
Above 12	48	25.4	
Household size			
≤3	17	8.9	
4-6	99	52.4	
Above 6	73	38.6	
Religion			
Christianity	97	51.3	
Islam	92	48.7	
Secondary occupation			
Farming	74	39.2	
Trading	49	25.9	
Artisan	66	34.9	
Years of experience in cassava processing			

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≤10	51	27.0	21.7
11-20	34	17.9	
21-30	51	27.0	
Above 30	53	28.0	
Belongingness to association			
Yes	129	68.3	
No	60	31.7	
Owing personal cassava farm			
Yes	128	67.7	
No	61	32.3	
Source of cassava for processing			
Personal farm	88	46.6	
Purchased from market	71	37.6	
Both	30	15.9	
Type of cassava processing activities			
Primary processing (e.g. peeling, washing)	19	10.1	
Secondary processing (e.g. drying, milling)	8	4.2	
Both	152	80.4	
Mode of processing			
Individually	96	50.8	
Group	93	49.2	

Source: Field Survey, 2024

Output before Adoption of Modern Technologies for Cassava Processing

Table 3 reveals that 43.9% of the respondents produced above 40 tonnes of processed cassava while 18.5% and 18.0% indicated they have an output between 11-20 and 21-30 tonnes respectively. Also, 13.8% and 5.8% of the respondents indicated they processed an output of not more than 10 tonnes and between 31-40 tonnes of processed cassava. The mean output of processed cassavas was revealed to be 50.9 tonnes. This result implies that cassava processors in the study area produced majorly for commercial purpose irrespective of the type of tools or ways used for the processing.

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Table 3:Distribution of respondents according to output processed before adoption of modern technologies on cassava processing

Output before adoption (tonnes)	Frequency	Percentage	Mean
≤10	26	13.8	50.9
11-20	35	18.5	
21-30	34	18.0	
31-40	11	5.8	
Above 40	83	43.9	

Source: Field Survey, 2024

Output after Adoption of Modern Technologies for Cassava Processing

Table 4 further reveals that 43.9% of the respondents produced above 40 tonnes of processed cassava while 19.6% and 13.7% indicated they have an output between 21-30 and not more than 10 tonnes respectively. Also, 12.7% and 10.1% of the respondents indicated they processed an output between 11-20 and 31-40 tonnes of processed cassava. The mean output of processed cassava was revealed to be 59.2 tonnes. This result implies that cassava processors in the study area produced majorly for commercial purpose irrespective of the type of tools or ways used for the processing. This result is an indication that the advent of technological ways of processing cassava has improved the output of the cassava processors, which has aid their progress and make them more economically viable. Their rate of adoption is expected to be high due to the obvious rate in their production rate which was aided by the introduction of modern processing facilities.

Table 4: Distribution of respondents according to output processed after adoption of modern technologies on cassava processing

Output after adoption (tonnes)	Frequency	Percentage	Mean
≤10	26	13.8	59.2
11-20	24	12.7	
21-30	37	19.6	
31-40	19	10.1	
Above 40	83	43.9	

Source: Field Survey, 2024

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Testing of the hypothesis

Table 5: Pearson's Product Moment Correlation (PPMC) showing relationship between selected socioeconomic characteristics of cassava processors and output of processed cassava tubers after usage of modern cassava processing technologies

In Table 5, Pearson's Product Moment Correlation analysis revealed that there is a positive and significant relationship between selected socio economic characteristics of the cassava processors such as age (r=0.191*, p=0.010); household size (r=0.178*, p=0.017); years spent in school (r=0.677**, p=0.000) and years of experience in cassava processing (r=0.475**, p=0.000) on the output of processed cassava tubers in Osun State, Nigeria.

This result implies that as the age of the cassava processors increases the more experienced and courageous they are to use modern cassava processing technologies brought to them. Matured cassava processors are liable to take more risks in agricultural enterprise due to their zeal to succeed. Also, the larger the household size of the cassava processors, the more the likelihood to utilize the modern cassava processing technologies as many household members might be exposed to trainings on the use of the modern cassava processing technologies and replicate the training in their household to ensure compliance with the technical know-how of the technologies.

Years spent in school and years of experience in cassava processing with the use of modern cassava processing technologies significant relationship on the output of processed cassava tubers might be attributed to the level of knowledge garnered in their attendance of formal school and experience accumulated on the enterprise, hence the more experienced they are, the more the likelihood to use modern cassava processing technologies in the study area.

Therefore the null hypothesis which states there is no significant relationship between selected socio economic characteristics of the cassava processors and output of processed cassava tubers in Osun State is hereby rejected.

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Table 5: Pearson Product Moment Correlation analysis showing the relationship between selected socio economic characteristics of the respondents and output of processed cassava tubers with the use of modern cassava processing technologies in the study area

Socio-economic characteristics	Correlation coefficient	p- value	Remark
Age	0.191*	0.010	Significant
Household size	0.178*	0.017	Significant
Years spent in school	0.677**	0.000	Significant
Years of experience in the use of modern cassava processing technologies	0.475**	0.000	Significant

Source: Computed Data, 2024

***correlation is significant at 0.05 level {2-tailed}**

***correlation is significant at 0.01 level {2-tailed}**

Conclusion and Recommendation

It was concluded that the output of processed cassava products after adoption of modern processing technology was higher than the output of processed cassava products before adoption of modern processing technology. Also, the more experienced and educated processors had better output than the less experienced and educated ones. It was recommended that more cassava processors should adopt improved and modern processing technology. Moreover, the less educated ones should enroll in schools in order to improve their education and processing output.

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