



**PROFITABILITY ANALYSIS OF THE ADOPTION OF VALUE ADDITION TECHNOLOGIES BY WOMEN RICE PROCESSORS IN BENUE AND KOGI STATES, NIGERIA**

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**ABSTRACT**

This study examined the profitability of the adoption of value addition technologies by women rice processors in Benue and Kogi States, Nigeria. Multi stage sampling procedure was used to select 358 women rice processors for the study. Data were collected using structured questionnaire and analysed using descriptive statistics, chi-square, mean score from likert scale and gross margin. The result on Table 1 showed women rice processors capabilities on rice improved milling technology ( =2.23), cleaning and polishing rice value operation ( =2.42), rice destoning ( =2.34) , improved drying value addition technology( =2.14), sorting, grading and certification rice value operations ( =2.03), packaging( =2.26) and storage ( =2.25). On the other hand, processors in Kogi state showed their capabilities on rice improved milling ( =2.05), cleaning and polishing ( =2.09), destoning ( =2.02), packaging ( =2.06) and storage ( =2.06). and have access to labour, storage, processing equipment, preservative skills, Information on market for rice value added product and good sources of paddy with the mean score of 2.29, 2.03, 2.14, 2.10, 2.09 and 2.35 respectively. However, chi-square test on both states processors showed that improved milling, Improved drying, Packaging, Product branding & labeling and Storage were significant at 5%. The study found out that rice processing is profitable in the study areas with returns per naira invested in indigenous, modern and both methods of rice processing are ₦1.10, ₦1.24 and ₦1.17 respectively. Women rice processors in Benue and Kogi States are highly capable of adding value to their rice through most of the value addition technologies available except in few cases. The study therefore recommends that both public and private agencies should make productive resources for rice value addition accessible to women processors as this will accelerate the rate of adoption of modern improved technologies.

**Keywords:** Rice, Value, Addition, Technologies, Women, Processors

**INTRODUCTION**

In recent times, the concept of value addition in the agricultural sector of Nigeria's economy is given priority attention by both government and non-governmental organizations towards improving the income generation of the rural communities, especially among the women folk whose participation in the post-harvest management of crops cannot be over emphasized. Nigeria has a highly diversified agro-ecological condition which makes it possible for the production of a wide range of agricultural products. Despite Nigeria's potential competitive advantage of favorable agro-ecological and natural conditions in several agricultural commodities (including roots and tubers, cereals and legumes, tree crops and livestock), past and present agricultural policies and programmes have not been able to adequately and significantly address the constraints faced by small-scale farmers (Okoro and Ujah, 2009)..

Agricultural activities in Nigeria and most African nations are characterized by gender division of labour (Adejo, *et al*, 2015). Studies have shown that 79% of rural women take agriculture as their primary occupation and about 70-80% of them are involved in processing of agricultural commodities (Onuekwusi, *et al*, 2017). Despite their immense contributions to the agricultural sector, they are always relegated to the background. They have limited or no access to productive resources such as land, credit and extension services.

Value addition to agricultural products refers to stages such as cleaning, drying, grating, grinding, sorting, grading, packing, packaging, branding and marketing. According to Boland (2009),



value-added agriculture is the process of increasing the economic value and consumer appeal of an agricultural commodity. It is an alternative production and marketing strategy requiring the understanding of food safety issues taking cognizance of the consumer preferences (Ja'afar-Furo, *et al.*, 2011). Enhancing the value chain can improve the livelihood of smallholder farmers, ensure competitiveness in the global market, and ultimately contribute to economic growth.

The role of women in agricultural production in Nigeria can never be over emphasized. Various researches conducted on the contribution of women to agricultural development in the country revealed women contribution to the farm work is as high as between 60 and 90% of the total farm task performed. The contribution of the women ranges from such tasks as land clearing, land tilling, and planting, weeding, fertilizer/manure application to harvesting, food processing, threshing, winnowing, milling, transportation and marketing as well as the management of livestock (Damisa, *et al.*, 2007)

Ayoola, *et al.* (2012) revealed that women play vital roles in food production, processing and marketing in Nigeria; producing about 60-80 percent of total output, and contributing about 60-80 percent of agricultural labor force. They also contribute more than two-thirds of their produce towards household subsistence. Women are largely involved in the production, processing and trading of rice and other food crops such as sorghum, maize, cassava, cowpea, melon, pepper, vegetables and yam. Despite the contribution that women farmers make in the production and processing of rice grains in the country, there is general believe on gender inequality in the access to productive resources in the north central Nigeria. They have limited access to productive resource (Damisa, *et al.*, 2007). There is need to correct these challenges faced by rice women processors by investigating the level of rice value addition technologies they are engaged in, in terms of packaging, improved processing, sorting and grading, destoning, improved drying, cleaning and polishing.

The women ability and capability are most often not readily taken into consideration before the said technologies are designed for them while basic socio economic characteristic that could push the adoption of rice processing technologies have not been identified. The cost and return on a technology use may either motivate or discourage the use of a technology.

It is essential to establish this factor as it affects the women rice processors in the study area. Most of the research findings in many literatures have not really addressed the levels of capabilities of women in using improved technology explicitly rather emphases have been on adoption of rice processing technologies.

The main objective of this study is profitability analysis of the adoption of the value addition technologies by women rice processors in Benue and Kogi States, Nigeria while the specific objectives are to

- i. Describe the socio-economic characteristics of the respondents.
- ii. identify value addition technology capabilities of women rice processors.
- iii. examine the access of women processors to productive resources for rice value addition
- iv. comparatively analyze costs/returns of women processors using indigenous, modern and both methods of value addition technologies.

## **METHODOLOGY**

### **The Study Area**

The research was carried out in Benue and Kogi States of Nigeria. Kogi State was created on August 27<sup>th</sup> 1991 from Kwara and Benue States with the Capital at Lokoja. Geographically, it is located between latitude 6°30'N and 8°5'N and Longitude 5°51'E and 8°00'E sharing boundaries with Kwara, Ondo, Ekiti, Niger, Benue, Nassarawa, Anambra, Enugu, Edo States as well as the Federal Capital Territory. Annual rainfall stands between 1016mm and 1524mm. It has a maximum temperature of 33.2°C and average temperature of 22.8°C, with an average humidity of 70%. Kogi State is marked with two distinct seasons in a year; these are wet and dry seasons. The wet season spans between middle of March and October and the dry season is usually experienced between the months of October and March. Kogi State had a total population of about 5,103,626 people in 2024



(using the state projected growth rate of 3.0% by NBS) and a land area of about 30, 354, 74 square kilometres.

The confluence of river Niger and river Benue creates alluvial fertile soil which is very good for crop production. According to Kogi State Economic Empowerment Development Strategy (KOSEED) (2004), Kogi State has about 2 million hectares of cultivated land but only about 0.5 million hectares are under cultivation. About 73.5% of the cultivated land (1,470 ha) can be cultivated in the raining season while 26.5% (530,000ha) is suitable for dry season farming. The agricultural sector provides a very wide opportunity for investment complemented with the services of the Kogi State Agricultural Development Project (KSADP).

Kogi State registered rice farmers were estimated to be about 9, 708 of which 40% (3, 883 farmers approximately) of them were said to be women (KSADP and FG Anchor Borrowers, 2019). The people of Kogi State also rear animals like cattle, sheep, goats, swine, poultry and fish. Benue State is one of the North Central States in Nigeria. It is inhabited predominantly by the Tiv, Idoma and Iggede peoples, who speak Tiv Idoma, and Iggede languages respectively. Its capital is Makurdi. Benue is a rich agricultural region; popularly grown crops include; sweet potatoes, cassava, soya bean, guinea corn, flax yams, sesame, rice, and groundnuts, Palm Tree. The State lies in the Southern Guinea Savanna between latitudes 6°25'N and 8°8'N and longitudes 7°47'E and 10°E' (Onlinenigeria, 2003)

The wet season spans between middle of March and October and the dry season is usually experienced between the months of October and March. Benue State has a land area of about 30,800 Km<sup>2</sup>. The area is inhabited by the Tiv (the largest ethnic group in the state), the Idoma, and a number of smaller groups, all are mainly agricultural people. It has a population of about 6,550,607 people in 2024 (using the state projected growth rate of 3.0% by NBS). Mining is important in several scattered areas: south of the Benue River there are lead deposits near Akwana and limestone deposits near Yandev; north of the river there are saline springs in the Benue valley and major deposits of tin, niobium, and marble.

Benue state population of registered rice farmers is said to be 10,346 farmers of which about 55% (5,690 farmers approximately) of them were said to be women (Benue Agricultural and Rural Development Authority-BNARDA and Anchor Borrowers, 2019).

#### **Target Population and Sampling Techniques**

The population for this study comprises all the registered women rice processors with Agricultural Development Projects in Benue (5,690 women rice farmers), and Kogi States (3,883 women rice farmers) of Nigeria. A sample size of 360 women processors were selected using a multi – stage sampling techniques. The first stage was purposive selection of three (3) Agricultural zones from each state of the study area (Benue and Kogi) based on the concentration of rice women processors in these agricultural zones. These sums up to six (6) Agricultural zones. The second stage involved purposive selection of two (2) blocks from each zone to give a total of twelve (12) blocks. In the third stage, two (2) cells were selected randomly from each block of the agricultural zones in the study areas giving a total of twenty-four (24) cells. The fourth stage, fifteen (15) registered women rice processors were selected randomly from each of the selected cell to give a total sample size of three hundred and sixty (360) respondents for the study

#### **Data Collection**

Data were collected through the use of interview schedule and a well structured questionnaire. The enumerators to elicit the information were trained on data collection and ethical conduct involved in data collection. The questionnaire was used to collect information on the following areas:

- A. Socio-economic characteristics of the respondents
- B. Value addition technology capabilities of women rice processors
- C. Access of women processors to improved value addition technologies.
- D. Costs and returns on rice grain value addition

#### **Method of Data Analysis**

Data for this study was analyzed using both descriptive such as frequency count percentages, mean, mode and mean score from Likert type of scale and inferential statistics such as, Chi – square



analysis and Cost and return analysis. Descriptive analysis was used to achieve objective i, ii and iii, Chi – Square statistics was further used to test hypothesis for the significant difference in the technology capabilities of women in value addition in the two (2) selected states of objective ii and cost and return analysis was used to achieve objective iv

Access of women rice processors to improved value addition technologies was measured on 3-point Likert type rating scale: not accessible (1point), accessible (2points) and highly accessible (3points). The mean can be calculated as follows:

$$= \frac{\sum fx}{N}$$
 Where:  $\bar{x}$  = Mean response,  $\sum$  = Summation,  $f$  = number of respondents choosing a particular scale point,  $x$  = value of each scale  $N$  = total number of respondents. Any mean score greater than 2 is high while the mean score less than 2 is low

Chi – Square statistics to test value addition technology capabilities of women rice grains processors. The calculation of Chi-Square statistics is given as follows:

$$\chi^2 = \sum \frac{(f_o - f_e)^2}{f_e}$$

Where  $\chi^2$  = Chi-square value

$f_o$  = the observed frequency of the value addition technology capability by rice processors

$f_e$  = the expected frequency of the value addition technology capability by rice processors

As depicted in the formula, the Chi-Square statistic is based on the difference between what is actually observed in the data and what would be expected if there was truly no relationship between the variables.

**Decision Rule:** The Null Hypothesis is rejected when  $\chi^2_{\text{Computed}} \geq \chi^2_{\text{Tabulated}}$  under the degree of **freedom df = (R-1) (C-1)**

Cost and return analysis for value addition on rice

From the equation  $TC = TFC + TVC$  ..... (1)

Where, TC = Total cost, TFC = Total fixed cost, TVC = Total variable cost

GI = Gross income =  $Q \times P$  ..... (2)

Where, Q = quantity of rice, P = unit price of rice

NI = Net income =  $GI - TC$  ..... (3)

Where, GI = Gross income, TC = Total cost

To determine profitability of rice, ratio was calculated as follows:

$GR = TC/GI$  ..... (4)

Where, GR = Gross ratio, TC = Total cost, GI = Gross income

## RESULTS AND DISCUSSION

### Socio-economic Characteristics of the Respondents in Benue and Kogi States

#### Age

The age distribution of women rice processor as shown in Table 1 indicates that Majority (75%) of the farmers in Benue State were between 31 and 50 years with the mean age of about  $40 \pm 8.62$  years' standard deviation while (75.30%) of the respondents in Kogi State were between 31 and 50 years with the mean age of about  $42 \pm 9.25$  years' standard deviation. This implies that women rice processors in Benue and Kogi States were in their active and productive ages which could help them to participate highly in rice value addition technologies. This result agrees with Adam et al. (2018) who said that most of the participants in rice processing value chain are within the ages of 31-40 years.

#### Marital Status

The distribution of respondents' marital status shows that majority of them (72.80%) were married, a few were single (22.22%), divorced (2.80%) and widowed (2.22%) in Benue State, likewise in Kogi State majority (73.10%) were married, while a few were single (11.20%), divorced (9.00%) and widowed (6.20%) as it is indicated in the Table. This implies that majority of the women rice processors in the study area are married. Marital status has being found to influence social





organization and economic activities such as agriculture and resource management within a household (Nyunza and Mwakaje, 2012).

#### **Educational Qualification**

As indicated in Table 1, majority of the respondents (93.30%) in Benue State had formal education of which 8.90%, 40.00% and 44.40% of them attained primary, secondary and higher education respectively. Also in Kogi State majority of the respondents (86.50%) had formal education of which 21.90%, 33.10% and 35.50% of them attained primary, secondary and higher education respectively. Education is important for training and skill enhancement planning and implementation for rice processors by extension service providers since it is easier to train processors who are literate. Education is a factor in the adoption of modern practices. It is generally considered an important variable that could enhance adoption of new technology. This study is in agreement with the finding of Akarue and Ofoegbu (2012) who stated that most rice farmers can read and write.

#### **Household Size**

With respect to household size, 94.45% of the respondents in Benue State had between 1 and 10 persons with the mean household size of  $5 \pm 2.73$  persons' standard deviation. While majority (73.66%) of the respondents in Kogi State had between 1 and 10 persons with the mean household size of  $7 \pm 7.56$  persons' standard deviation. This implies that respondents in the study areas had large household size. This is of great importance in farm production as rural households rely more on family members than hired workers for labour on their farms.

#### **Years of farming Experience**

The distribution of respondents in terms of years spent in rice processing, it was found that 68.89% of the Benue State respondents had rice processing experience of between 1 and 10 years, while 22.22% of them had the experience of 11 and 20 years. In Kogi State, it was found that 59.55% of the respondents had rice processing experience of between 1 and 10 years, while 28.08% of them had the experience of 11 and 20 years. The higher the year's experience of the rice processor, the more informed and skilled, they become. As experience plays a very important role in the performance of any enterprise. This suggests that the production of rice by processors in the study area would be high. The result is in consonance with Olaolu et al. (2013) who stated that Long period of experience is an important advantage in farm productivity since it encourages faster adoption of farm innovations.

#### **Extension Contact**

Majority of the respondents (99.99%) in Benue State had contacts of between 0 - 5 with extension agents in a year with the mean number of contact to be about  $0 \pm 0.57$  years' standard deviation. In a similar way, majority of the respondents (96.63%) in Kogi State had contacts of between 0 - 5 with extension agents in a year with the mean number of contact to be about  $2 \pm 1.99$  years' standard deviation. This shows that the number of contacts is very low compared to *a priori* expectation of about '40 and above' number of contacts with 80 farmers required of an ADP's Training and Visit extension system in Nigeria (Agbarevo and Obinne, 2010).

#### **Annual income**

The income distribution of the respondents as shown in Table 1 indicated that most (64.44%) of the women rice processors in Benue State earned between ₦101, 000- ₦300,000 per annum. While most (58.42%) of the women rice processors in Kogi State earned between ₦101, 000- ₦400, 000 per annum. This study agrees with the finding of Abah et al. (2015) whose study showed that majority (65.48%) of respondents made 200,000 Naira or less in sales income/annum and that most of the farmers are small holder farmers with small market share of the paddy rice market



**Table 1: Socio-economic Characteristics of Respondents in Benue and Kogi States (n= 180)**

Variable	Benue		Kogi State		
	Freq	(%)	Mean	Freq	Mean
<b>Age (years)</b>					
20 – 30	29	16.11		12	6.70
31 – 40	82	45.56		73	41.00
41 – 50	53	29.44	40	61	34.30
51- 60	12	6.67		26	14.70
61 -70	4	2.22		6	3.40
<b>Total</b>	<b>180</b>	<b>100</b>		<b>178</b>	<b>100</b>
<b>Marital Status</b>					
Single	40	22.22		20	11.20
Married	131	72.80		131	73.10
Divorced	5	2.80		16	9.00
Widowed	4	2.22		11	6.20
<b>Total</b>	<b>180</b>	<b>100</b>		<b>178</b>	<b>100</b>
<b>Level of Education</b>					
No formal education	12	6.70		24	13.50
Primary education	16	8.90		39	21.90
Secondary education	72	40.00		59	33.10
OND/NCE,HND/Degree	80	44.40		56	31.50
<b>Total</b>	<b>180</b>	<b>100</b>		<b>178</b>	<b>100</b>
<b>Household size</b>					
≤ 5	125	69.45		63	35.40
6 – 10	45	25.00	5	77	43.26
11 and above	10	5.50		7	2.26
<b>Total</b>	<b>180</b>	<b>100</b>		<b>178</b>	<b>100</b>
<b>Years spent in rice processing</b>					
≤ 10	124	68.89		106	59.55
11 – 20	40	22.22		50	28.08
21 – 30	6	3.33	11	22	12.36
> 30	10	5.50			
<b>Total</b>	<b>180</b>	<b>100</b>		<b>178</b>	<b>100</b>
<b>Annual income (₦)</b>					
≤ 100,000	39	21.67		34	9.10
101,000 – 200,000	60	33.33		41	23.03
201,000 – 300,000	56	31.11	307,083.33	35	19.66
301,000 – 400,000	13	7.22		28	15.73
401,000 – 500,000	5	2.70		10	5.62
> 500,000	7	3.89		30	16.85
<b>Total</b>	<b>180</b>	<b>100</b>		<b>178</b>	<b>100</b>
<b>Extension contacts/Annum</b>					
0 contact	164	91.10	0	68	
1- 5	16	8.89		104	
> 5		58.43			
<b>Total</b>	<b>180</b>	<b>100</b>		<b>178</b>	<b>100</b>

**Source:** Field Survey, 2019

### **Value Addition Technology Capabilities of Women Rice Processors**

The distribution of respondents according to their value addition technology capabilities on rice in Benue state on Table 2 shows that majority of women rice processors indicated their



capabilities in rice value addition technologies as capable; rice improved milling machine (which is a modern technology) with the mean score of 2.23, This capability of women on improved rice milling machine in the study area is not unconnected with the fact that there are improved milling machines spread all over the rice producing areas in Nigeria. cleaning/polishing rice value operation with the mean score of 2.42, rice destoning mean score of 2.34, improved drying value addition technology mean score of 2.14, sorting, grading rice value operations mean score of 2.03, packaging in customized bag mean score of 2.26, storage operations in rice processing mean score of 2.55.

The result also revealed that women rice farmers in the study area have low capability in the area of rice branding and labeling with the mean score of 1.92. This indicates that the women rice processors mean scores on product branding operation was below the mean 2 hence, the women rice processors value addition technology capability on this operation is low. Currently, product branding is an area where rice processors in the study area especially those operating on a small scale capacity are lagging behind. Product branding is one of the marketing functions that influence customers' decision to purchase an item. Hence, it is an integral aspect of product advertisement.

This result implies that rice processors in Benue state were highly capable in improved milling, cleaning/polishing, destoning, improved drying, sorting, grading and certification, packaging and storage rice value addition operations, while product branding and labeling was rated low. Drying is done by spreading the paddy across the pavement, preferable on a protective mat, and occasionally stirring it so the sun will dry it evenly. this is in consonance with the result of research carried out by Oyediran (2016), which showed that rice were dried manually(traditional method) (100%) by the rice processors. and that Small-scale rice processors used tarpaulins, bare ground or on a concrete floor.

**Table 2:** Distribution of Women Rice Processors base on Value Addition Technology Capabilities in Benue State (n= 180)

Rice value addition Technologies	Not capable (1)	capable (2)	Highly capable (3)	Sum of Responses	Mean Score
Improved milling machine	3	133	44	401	2.23**
Cleaning/polishing machine	2	100	78	436	2.42**
Destoning machine	2	115	63	421	2.34**
Improved drying (5-10% moisture content)	11	132	37	386	2.14**
Sorting and grading	18	138	24	366	2.03**
Packaging in Customized bags	14	105	61	407	2.26**
Product branding & labeling	58	78	44	346	1.92*
Storage (metal silos)	12	56	112	460	2.55**

**Source:** Field Survey, 2019

**Note:** Multiple responses. Any mean greater than 2 = capable and any mean less than 2 = not capable.

The distribution of respondents according to their value addition technology capabilities on rice in Kogi state as contained in Table 3 shows that women rice processors in Kogi state are capable in rice improved milling technology with the mean score of 2.05, cleaning/polishing rice value operation with the mean score of 2.09, rice destoning with the mean score of 2.02, packaging with the mean score of 2.06, storage operations in rice processing with the mean score of 2.50.

The result also revealed that women rice farmers in the study area have low capability in the area of improved drying value addition technology with the mean score of 1.87, sorting, grading and certification rice value operations with the mean score of 1.45 The respondents here have no standardized sorting, grading and certification methods. However, grading is done by considering the magnitude of broken rice found in the polished rice. Also, rice product branding and labeling operation with the mean score of 1.47. This indicates that the women rice processors mean scores on these operations were below the mean 2 hence, the women rice processors value addition technology capability on this operation is low. In this area, branding is done by labeling with chalk, charcoal and



ink of various colours used to inscribe identification sign or number on the sack containing rice. However, a better branding and labeling is done by larger milling factory like that of Confluence Rice Mill.

This result implies that women rice processors in Kogi State were highly capable in improved milling, cleaning/polishing, destoning, packaging and storage rice value addition operations, while improved drying, sorting, grading and certification, product branding and labeling was rated low. Winnowing can also be done through standing adjacent to the direction of wind pouring the grains into an open headed container beneath the operator. This agrees with that of Rathna (2016), who revealed that cleaning is done by winnowing and gravity separation by hand. Rice that contain stones are of low quality to consumers, hence, to command good market for rice, it has to be totally free of stones. Even though machine for destoning rice are available, stones in rice can be handpicked to make it clean and safe for consumption. This result is in tandem with that Adam *et al.* (2018) who reported that women were mostly involve in cleaning (winnowing and destoning) rice and making fit for consumption.

**Table 3:** Distribution of Women Rice Processors base on Value Addition Technology Capabilities in Kogi State (n = 178)

Rice value addition Technologies	Not capable (1)	Capable (2)	Highly capable (3)	Sum of Responses	Mean Score
Improved milling machine	18	132	28	366	2.05**
Cleaning/polishing machine	18	129	33	373	2.09**
Destoning machine	17	140	21	360	2.02**
Improved drying (5-10% moisture content)	50	101	27	333	1.87*
Sorting and grading	108	59	11	259	1.45*
Packaging in Customized bags	44	79	55	367	2.06**
Product branding & labeling	113	47	18	261	1.47*
Storage (metal silos)	15	58	105	446	2.50**

**Source:** Field Survey, 2019

Note: Multiple responses. Any mean greater than 2 = capable and any mean less than 2 = not capable.

**Table 4:** Chi-Square Test on Value Addition Technology Capabilities of Women Rice Grains Processors in Benue and Kogi State

Rice value addition operations	$\chi^2$ calculated	$\chi^2$ tabulated
Improved milling	3.63**	5.99
Cleaning/polishing	7.02	5.99
Destoning	7.42	5.99
Improved drying	3.67**	5.99
Sorting, grading & certification	6.04	5.99
Packaging	3.43**	5.99
Product branding & labeling	5.30**	5.99
Storage	0.66**	5.99

**Source:** Field Survey, 2019

Table 4 shows the result of Chi- Square analysis on value addition technology capabilities of women rice grains processors in Benue and Kogi States. It was revealed that Cleaning/polishing, destoning, Sorting, grading & certification were not significantly different while Improved milling, Improved drying, Packaging, Product branding & labeling and Storage were significant at 5%. Decision rule: The Null Hypothesis is rejected when  $\chi^2_{\text{Computed}} \geq \chi^2_{\text{Tabulated}}$  under the degree of freedom  $df = (R-1) (C-1)$ . The reason for the non-significant difference such as cleaning/polishing, destoning,





Sorting, grading and certification is not farfetched because it is a known fact that women in both Benue and Kogi States had little or no access to modern milling technologies especially as most of them were not able to destone rice properly or overtly; too, sorting, grading and certification as reported earlier where at a less advanced and standardized levels among women rice processors in both States, and even the whole country where rice were produced and processed. While the significant variables might be connected to the fact that Benue State had more modern milling factories than Kogi State. For instance, Kogi had few Small-scale rice milling industries with Confluence rice as the Large Scale industries while Benue State had more small-scale industries and larger milling industries compared to Kogi. Hence it is obvious that women in Benue State were more capable in these processing value addition technologies like improved milling, improved drying, packaging, product branding and labeling, and storage than those from Kogi State. This implies that women rice processors in Benue State now patronize the large scale processing rice industries. This goes to say that the establishment of large scale processing industries has a positive radiating effect on the small scale

#### **Women Rice Processors' Access to Productive Resources for Value Addition**

The distribution of respondents according to their access to productive resources for rice value addition in Table 5 indicates that women rice processors in Benue and Kogi State had access to productive resources for rice value addition in terms; labour with a mean score of 2.29, storage facilities with the mean score of 2.03, processing equipment with the mean score of 2.14, market information on rice value added product with the mean score of 2.09 and access to good source of paddy with the mean score of 2.35.

The result of the study further revealed that credit facilities with the mean score of 1.55, access to land for rice value addition with the mean score of 1.91, processing and storage skills with the mean score of 1.83, extension services/innovative ideas with the mean score of 1.34 and packaging of their products with the mean score of 1.80. It can be said that women rice processors has less access to these productive resources for rice value addition technologies since the mean score is below 2. This is due to that fact that women farmers lack access to participate in research and extension training and most of the rice processing operations are carried out and guided mostly by men. This implies that majority of the women rice processors in the study area have little or no access to extension services, indicating that women are being side lined and denied access to innovative ideas on rice value addition. Women access to extension services is deterred as these extension services are male dominated and corruption is pervasive making it difficult for women to practice agriculture and other activities. Women lack access to skills and knowledge of agro-technology. Gender disparities in agro-technological knowledge and skills limit women participation and earning power, both at the production stage of the value chain, and in processing and marketing, women often consult male parties to act as advisor in deciding such market factors as pricing and management (USAID and WFP, 2017).



**Table 5:** Mean Distribution of Women Rice Processors on their Access to Productive Resources for Rice Value Addition (n= 358)

Productive resources	Not accessible (1)	Accessible (2)	Highly accessible(3)	Sum of Responses	Mean
Labour	21(5.87)	207(57.82)	129(36.03)	822	2.29**
Credit facilities	171(47.77)	176(49.16)	11(3.07)	556	1.55*
Land acquisition	113(31.56)	164(45.81)	81(22.63)	684	1.91*
Storage facilities	41(11.45)	267(74.58)	50(13.96)	725	2.03**
Processing equipment	50(13.97)	207(57.82)	101(28.21)	767	2.14**
Processing and storage skills	76(21.23)	269(75.14)	13(3.63)	653	1.83*
Preservative skills	83(23.18)	155(43.29)	120(33.52)	753	2.10**
Technical information on rice value addition	231(64.53)	122(34.09)	5(5.59)	490	1.37*
Extension service/innovative ideas on rice value addition	255(71.23)	84(23.46)	19(5.31)	480	1.34*
Information on market for rice value added products	80(22.34)	164(45.81)	114(31.84)	750	2.09**
Packaging equipment	112(31.29)	205(57.26)	41(11.45)	645	1.80*
Good sources of paddy	28(7.82)	178(49.22)	152(42.46)	840	2.35**

**Source:** Field Survey, 2019

Figures in Parenthesis represent (%) Note: Multiple responses. Any mean above 2 = highly accessible and any mean below 2 = low accessibility

### **Costs and Returns Analysis of Women Rice Processor Using Indigenous, Modern and both Method of Value Addition Technologies in Benue and Kogi State**

Result on table 6 shows that 3.35% of the respondents adopt indigenous method of rice processing, 56% adopt the modern method of rice processing while majority (81.00%) of women rice processors in the study area adopt both the indigenous and modern method of rice value addition. women rice processors in the study area mostly carry out some processing operations (like soaking of paddy, parboiling, drying) traditionally before undergoing the modern method of processing.

**Table 6:** Distribution of Respondents according to the Method of Rice Value Addition Adopted

Method of processing	Frequency	Percentage
Indigenous	12	3.35
Modern	56	15.64
Both indigenous & modern	290	81.00
Total	358	100.0

**Source:** Field Survey, 2019

### **CONCLUSION AND RECOMMENDATION**

Women rice processors in Benue and Kogi States are highly capable of adding value to their rice through most of the value addition technologies available except in few cases. A test on value addition technology capabilities of women rice grains processors in Benue and Kogi States shows that Improved milling, Improved drying, Packaging, Product branding & labeling and Storage were significant at 5%. Women rice processors in the study area have access to productive resources for rice value addition as in labour, storage, processing equipment, preservative skills, Information on market for rice value added products which will enable them to perform pretty well and make profit.

Based on the outcome of this study, the following recommendations were made:



- i. Since rice processing is profitable in the study area, the study recommends that the women rice processors should form unions and/or reorganize the ailing unions to enable them have high negotiation power on the prices of their produce/products.
- ii. Inadequate training of women farmers is one of the drawback factors against their technological capabilities. Hence, provision of up to date training by public extension and other programmes interventions from non-public organizations for rice processors will boost their capabilities and adoption of the rice processing technologies.
- iii. As it was comparatively found in this study, the return per naira invested using the various method of rice processing and value addition shows that the modern method appreciable have a better returns. Hence, effort should be geared towards making a paradigm shift from indigenous method to modern one since most women processors are using both indigenous and modern
- iv. Access of women rice processors to mechanized or modern processing technologies in affordable and adaptable conditions have been a major problem in the rice processing sector, and particularly among women farmers. Therefore, priority attention should be given to policies directed toward making available subsidized modern technologies adoptable and adaptable to their local conditions.

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