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ANALYSIS OF MAIZE PROCESSING INTO POPCORN AS AN INCOME GENERATING ACTIVITY FOR LIVELIHOOD SUSTENANCE AMONG WOMEN IN NIGER STATE, NIGERIA

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ABSTRACT

The study analyzed maize processing into pop-corn as an income generating activities for livelihood sustenance among women in Niger State, Nigeria. Primary data were collected from sixty (60) pop-corn processors from the study area. Descriptive statistics, Gross Margin (GM) and multiple regression analyses were used to analyze the data collected. The result revealed that most of the processors are between the ages of 30-40 years, they were also married with household size of between 1-5 members. The study also showed that 71.67% of the pop-corn processors have Islamic/Arabic education. Majority of the processors used family labor for their processing activity, 100% of the pop-corn processors are not members of any association, likewise 100% of the pop-corn processors do not have contact with extension agent The study further revealed a GM of ₦41.33 for the pop-corn processors per kg of maize processed. The regression result shows that all the variables included in the model tested positive at 1% level of significance with an adjusted R^2 value of 0.889, which implies that the variables included in the model explain 88.9% variation in the livelihood status of the processors; that is they adequately explain the livelihood status of the pop-corn processors. The challenges faced by the popcorn processors include it causes drudgery and it is time consuming. It was recommended that female

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agricultural sector, as this will open up more employment opportunities and income generation to the ever increasing population. Processing is the act of converting a commodity from its raw state to a form more acceptable to the buyers or the next stage in the distribution chain. It changes the form of the product to make them ready for use (Olukosi *et al*, 2007). Though maize is one of the agricultural products that could be eaten with little processing. In the green state, maize can be parched, baked, roasted, boiled or steamed on the cob (Ofori and Kyei-Baffour, 2000). The processing of maize into different products actually helps to improve the shelf-life of maize and also reduced wastage.

Maize can be processed into various forms for both human and animal consumption, various ethnic groups in Nigeria process maize into different forms to suit their needs and requirements. Maize can be processed into animal feed, maize flour (for *tuwo*), wet-milled maize (for *pap*), and even into starch for use in pharmaceuticals and textile industries, apart from either roasting or boiling fresh maize for direct consumption. The popcorn maize variety can be processed into popcorn snacks. For individuals engaged in processing maize, it serves as a source of income to them which they use in sustaining their livelihood. According to Wikipedia (2013), income is the consumption and savings opportunity gained by an entity within a specified timeframe, which is generally expressed in monetary term. However, for households and individuals, income is the sum of all the wages, salaries, profits, interests payments, rents and other forms of earnings received in a given period of time.

Livelihood sustainability to the rural populace as well as the urban populace is a key factor to poverty eradication which is the number one item on the millennium development goals. According to Robert and Gordon (1991) in the 21st century livelihoods will be needed by perhaps two or three times the present human population. A livelihood comprises people, their capabilities and their means of living, including food, income and assets. Tangible assets are resources and stores, and intangible assets are claims and access. A livelihood is environmentally sustainable when it maintains or enhances the local and global assets on which livelihoods depend on and has net beneficial effects on other livelihoods. And a livelihood is socially sustainable when it can cope with and recover from stress and shocks, and provide for future generations (Robert and Gordon, 1991).

The role women play in agricultural and the rural society is fundamental to agricultural and rural development in Sub-Saharan Africa. The agricultural activities of women go beyond crop production to other aspect such as processing

Objectives of the study

The broad objective of the study is to analyze maize processing into popcorn as an income generating activities for livelihood sustenance among women in Niger State. However, the specific objectives are to;

1. describe the socio-economic characteristics of popcorn processors in the study area,
2. describe the steps involve in the processing of maize into popcorn ,
3. determine the profitability of popcorn processing,
4. determine the contribution of maize processing into popcorn to the livelihood sustenance of the processors; and,
5. Identify the challenges faced by the processors in the study area

Description of Study Area

The study area is Niger State; the State was carved out of the former North-Western state in 1976. The State lies between latitudes 8^0 20' N and 11^0 30' N and longitudes 3^0 30' E and 7^0 20' E. and share border with the Republic of Benin (West), Zamfara State (North), Kebbi (North-West), Kogi (South), Kwara (South-West), Kaduna (North-East) and FCT Abuja (South-East). The 2006 population census shows that the state has a population of 3,950,249 with an annual growth rate of 3.4%, and a projected population of 4,756,099 people by 2012.

Sampling procedure and sample size

Maize is widely grown in all parts of Niger state, the processing of maize into various products is based on the tradition and need of the people. The population for the study comprised mainly of pop-corn (*guguru)* processors.

Niger state is divided into three (3) agricultural zones (zone A, B and C) based on the Agricultural Development Programme (ADP) zonal classification of Local Government Areas

(LGAs) in the state.A multi-stage sampling procedure was employed to select the respondents. The first stage was a purposive selection of Bida LGA (zone A) for pop-corn processors (due to their dominance in the area) The second stage was also a purposive selection of Emi Mayaki Legbo, Emi Ciroma and EfuAlhaji Nagya areas from Bida LGA The third stage involved the random selection of processors, but since the processors were not registered getting a total population from which to get a representative sample was difficult. Therefore a sort of snowball randomization was used were processors linked one to other processors, until I found a sample large enough for the study. sixty (60) respondents were randomly selected from Bida LGA for pop-corn processor based on the proportion of the population of processors in each area.

Analytical Techniques

The analytical techniques are the statistical tools (descriptive and inferential) that are used to achieve the stated objectives of the study.

Descriptive statistics

Objectives 1, 2 and 5 were achieved using descriptive statistics such as frequencies, percentages, tables and chart. Descriptive statistic is employed to organize and summarize observation so that they are easy to comprehend.

Gross Margin Analysis

Gross Margin Analysis was used to achieve objective 3. The Gross Margin (GM) is very useful in a situation where fixed capital is negligible.According to Olukosi and Erhabour (2005), GM is the difference between Gross Income (GI) and Total Variable Cost (TVC). It is expressed as:

GM = GI – TVC ----------eqn1

Where:

GM = Gross Margin (in Naira per kg of maize processed)

GI = Gross Income (in Naira per kg of maize processed)

TVC = Total Variable Cost (in Naira per kg of maize processed)

Multiple regression analysis

Objective 4 of this study was achieved using regression analyses.

The regression equation according to Gujarati (2004) is given as

$Y = \beta + \beta_1 x_{i1} + \beta_2 x_{i2} + \beta_3 x_{i3} + u$ ----------eqn2

Where;

Y = Livelihood Status (LS) of the processors (dependent variable)

β_1- β_3= regression coefficient

X_1 = Income Poverty (IP)

X_2 = Infrastructure Poverty (IFP)

X_3 = Human Resource Poverty (HRP)

β= Constant term

U = Error term

The livelihood Status (LS) of maize processors were estimated by estimating the IP, IFP and HRP

The relationship between Livelihood Status (LS), Income poverty (IP), Infrastructure poverty (IFP) and Human Resource poverty (HRP) as used by Xiaoyun,*et al* (2001) and Ilu,*et al* (2006) is defined as:

$LS = [K_1 (T_1 . K_{11}) + K_2 (T_2 . K_{21} + T_3 . K_{22} + T_4 . K_{23} + T_5 . K_{24} + T_6 . K_{25} + T_7 . K_{26}) + K_3 (T_8 . K_{31} + T_9 . K_{32}).]$ ----------eqn3

The sum of the weight of IP, IFP and HRP will be equal to 1.0 (assuming equal weight among the indices)

Thus:

K_1= Weight of income poverty = 0.33

K_2= Weight of infrastructure poverty = 0.33

K_3= Weight of human resource poverty = 0.33

Total weight = **1.00**

K_{11} = Weight of income generated from maize processing represented by average daily income per Day in relation to the poverty line (1.25 dollar per day per head)= 1.00. Since income is the only component of the income poverty.

The sum of the weight of the indices that make up the infrastructure poverty will be equal to 1.00. Thus, assuming equal weight each index has a weight of 0.17.

K_{21}= Weight of infrastructure poverty represented by type of accommodation of the Processor = 0.17

K_{22} = Weight of infrastructure poverty represented by affordability to healthcare services by the Processor = 0.17

K_{23} = Weight of infrastructure poverty represented by type of means of transportation owned by the processor = 0.17

K_{32} = Weight of infrastructure poverty represented by number of household facilities owned by the processor = 0.17

K_{33} = Weight of infrastructure poverty represented by access to portable water within 1km distance or 1 hour by processor = 0.17

K_{34} = Weight of infrastructure poverty represented by access to electricity by processor = 0.17

The sum of weights of the indices that make up the human resource poverty will also be equal to 1.00. Thus, assuming equal weight, each index has a weight of 0.50

K_{31} = Weight of human resource poverty represented by capacity to sponsor children's education = 0.50

K_{32} = Weight of human resource poverty represented by capacity to feed own household members = 0.50

T_1 = Income poverty status measured as an average daily income in relation to poverty line (1.25 dollar per day = ₦ 195). The average daily income per head was divided by the naira value of the poverty line, to categorize processors into those living below, on and above the poverty line. Thus,

0 = Below poverty line

1 = On the poverty line

2 = Two times above the poverty line

3 = Three times above the poverty line

4 = Four times above the poverty line

5 = Five times above the poverty line

6 = Six times above the poverty line

T_2 = Type of accommodation used by the processor scored as

1= Mud house with thatched roof

2= Mud house with zinc roof

3 = Concrete house with zinc roof

4 = Concrete house with aluminum roof

T_3 = Affordability of processors to healthcare services, scored as

1 = Affordable

0 = Not affordable

T_4 = Means of transportation owned by the processor, scored as

0 = None

1 = Bicycle

2 = Motor cycle

3 = Car

T_5 = Number of household facilities owned by the processors (e.g television, radio, refrigerator, handset etc)

T_6 = Accessibility of processor to portable water within 1km distance or 1 hour, scored as

1 = Pipe bone water

2 = Well water at home

3 = Community borehole

4 = Community well

T_7 = Accessibility of processors to electricity (PHCN), scored as

1 = Accessible

2 = Not accessible

T_8 = Number of children sponsored to school at (primary, secondary and tertiary levels)

T_9 = Number of times the processor is able to feed his family per day, scored as

1 = Once

2 = Twice

3 = Thrice

The three main functional forms (linear, semi-log and double log) were tried to see the contribution of the income poverty (IP), infrastructure poverty (IFP) and the human resource poverty (HRP) on the livelihood status of the processors. The best fit model was chosen based on the coefficient of multiple determination (R^2) value, significant of F-value and T-value and the significant level of the dependent variables as well as their coefficients and their signs.

RESULTS AND DISCUSSION

Table 1: Distribution of popcorn processors according to age, years of experience and household size

Characteristics	Frequency	Percentage	Minimum	Maximum	Mean
Age (year)					
<30	2	3.33	27	56	39
30-40	35	58.33			
41-50	16	26.67			
>50	7	11.67			
years of experience					
<5	8	13.33	3	30	14
5-10	14	23.33			
11-15	13	21.67			
>15	25	41.67			
Household Size					
1-5	26	43.33	1	11	4
6-10	16	26.67			
11-15	18	30.00			
Total	**60**	**100**			

Source: Field survey, 2012

The mean age of the popcorn processors as revealed by table 1 is 39 years, majority of the processors (58.33%) fall in the active age of 30-40 years, this means that the processors are still strong and agile to carry out the activity. A high percentage of the popcorn processors (41.67%) have been in the business for more than fifteen years, this implies that the business is not new to them. The size of their household shows that 43.33% of the processors have household size of between 1-5 and 30% have 11-15 members in their household, with the mean household size of four (4) people. This means that the popcorn processors actually have enough hands to assist them with the activity.

Distribution of popcorn processors according to educational level and marital status

Educational level tells the level which one has attend in acquiring knowledge, and the marital status has to do with the stand of an individual in the marriage institution

Table 2: Distribution of popcorn processors according to educational level and marital status

Characteristics	Frequency	Percentage
Level of education		

No formal education	11	18.33
Islamic/Arabic	43	71.67
Primary	3	5.00
Jenior secondary sch.	1	1.67
Senior secondary sch.	2	3.33
Tertiary	-	-
Marital status		
Married	46	76.67
Widow	12	20.00
Divorced	2	3.33
Membership in Association		
Members	-	-
Non members	60	100.00
Contact with Extension Agent		
Contact	-	-
No contact	60	100.00

Source: Field survey, 2012

The result of table 9 revealed that majority of the popcorn processors (71.67%) have Islamic or Arabic education, with a few (5%) having primary education. This means that they have low level of western education. Most of the processors are married (76.67%), this means that they could have children that will help them in their processing activity.

Popcorn processing

The popcorn processors use traditional method of processing, they also have two methods which are the same except that some use sand to fry and some use salt. The step by step process for pop-corn production involves cleaning, conditioning, heating sand or salt then frying. The first step involves cleaning the dried maize grain (yellow variety) by hand picking to remove stones and any other foreign material, then the maize grain is conditioned by sprinkling water to soften it. The next step is to heat the sand or the salt that will be use to fry (pop) the maize, the sand or the salt is heat so as to be able to pop the maize grain. The maize grain is then put into the pot bit by bit to fry it, the maize grain is then turn with a broom as it pops until it all pops out, then it is sieved to remove sand. The final step is conditioning with sugar, which involves boiling water and sugar together and pour it in the popped popcorn, then turn it to make sure that the sugar goes round the pop-corn. Below is a channel that shows the steps involved in popcorn processing.

Process	Explanatory Notes
Raw material	Dried maize (yellow variety)
Clean	Clean by hand picking of stones and dirt
Condition	Sprinkle water to soften the maize
Heat sand or salt	Sand or salt should be allowed to heat in a frying pot
Fry	Frying by putting small quantity of maize in the pot
Turn	Turning the maize with broom until it all pops
Condition with sugar	Boil water and sugar together and use it to condition the pop-cornStir very
Allow to cool	

Figure 1: Steps in pop-corn processing

Table 3: Costs and Returns of Popcorn Processors

Item	Cost (₦/kg)	Percentage of total cost	Returns (₦/kg)
Gross Revenue			500
Variable Cost			
Average cost of maize	214.93	46.86	
Average cost of sugar	141.56	30.86	
Average cost salt	1.57	0.34	
Average cost of firewood	60.58	13.21	
Average cost of poly bag	20.03	4.37	
Average commission	20.00	4.36	
Total Variable Cost	458.67		
Gross Margin	41.33		

Source: Field Survey, 2012. 60 Respondents

The costs and returns of popcorn processing as shown by table 14, showed that the returns per naira per kg of maize processed is ₦500, with₦458.67 as the total variable cost and a gross margin of ₦41.33, which implies that the business is a profitable one. Maize which is the major raw material for popcorn constitute 46.86% of the total variable cost.

Relationship between Maize processing and livelihood sustenance of the processors

The result of the regression analysis for the maize flour processors is shown in table 9. The livelihood status (dependent variable) was regressed against the independent variables which are income poverty (IP), infrastructure poverty (IFP) and human resource poverty (HRP) indices to see the contributions of each of the index on the livelihood status of the processors.

Regression result for pop-corn processors

The result of regression analysis measuring the relationship between LS, IP, IFP and HRP of pop-corn processors is shown in table 10.

Table 4: Results of Regression analysis for pop-corn processors

Variables	Coefficient	T-values
Constant	2.797	56.761***
Income Poverty (IP)	0.386	15.119***
Infrastructure Poverty (IFP)	0.629	5.591***
Human Resource Poverty (HRP)	1.049	12.247***
$R^2 = 0.895$		
Adjusted $R^2 = 0.889$		
F- value = 159.714***		

Source: Field Survey, 2012 ***significant at 1%

The result of regression analysis for pop-corn processors revealed that the best fit model among three functional forms (lineal, semi-log and double log) tried was the semi-log model where the independent variables were logged. The result reveals that all the variables including the constant tested positive at 1% level of significant. This implies that all the variables (income, infrastructure and human resource poverty have significantly contributed to the livelihood status of the pop-corn processors, with the human resource livelihood having the highest contribution of 1.049 and the income poverty with the least contribution of 0.386. this means that the infrastructure and the human resource poverty contributed to the livelihood status of the pop-corn processors more than the income poverty, that is to say the infrastructural facilities available to them and the ability to carter for their household through schooling and feeding have a higher contribution to the livelihood status of the pop-corn processors. This further means that the income derived from the processing activity is not the leading contributing factor in determining the livelihood status of the pop-corn processors.

The adjusted R^2 value of 0.889 implies that the variables included in the model explain 88.9% variation in the livelihood status of the processors; that is they adequately explain the livelihood status of the pop-corn processors.

Table 5:Challenges faced by popcorn processors

Challenges	Frequency	Percentage
Little quantity can be processed at a time	48	80.00
It causes drudgery	58	96.67
It is time consuming	60	100.00
Inadequacy of well-directed marketing systems	12	20.00
Quantity processed may not meet the requirement of the growing population	40	66.67
Quality may not suit the taste of the consumers	55	91.67
Changes in consumers preferences	60	100
Total	**333***	

Source: Field Survey 2012. * multiple response

The challenges faced by popcorn processors as revealed by table , showed that majority of the respondents admit that little quantity can be processed at a time, it causes drudgery, it is time consuming, quality may not suit the taste of the consumers and changes in consumers preference with 80%, 96.67%, 100%, 91.67% and 100% respectively, are the major challenges they are faced with.

Summary

The study analyze maize processing pop-corn as an income generating activities of women in Niger state, Nigeria. It describes the socio-economic characteristics of the processors, and the steps involve in the processing, the cost and return of the processors. It also analyze the contribution of the processing activity to the livelihood sustenance of the processors as well as the challenges faced by the processors. Primary data were randomly collected from 60 pop-corn processors in the study area using a well structured questionnaire. Data were analyzed using descriptive statistics, cost and return analysis and multiple regression analysis

The study revealed that majority of the processors are in their active years of between 30-40 years and they are also married. The study also find out that the processors have low level of literacy with 71.7% of pop-corn processors have Islamic /Arabic education. And that all the respondent of the pop-corn processors do not belong to any association and the household size of the processors were majorly between 1-5 members Also 100% of pop-corn do not have contact with extension agents. The study also revealed that the processing of maize into into popcorn is a profitable venture as it has a gross margin of ₦41.33 per kg of maize processed.

The result of the study also revealed that processing activity in the study area have some effect on the livelihood sustenance of the processors. The result of the regression analysis shows that the best fit models were semi-log which further revealed that all the variables included in the model (income poverty, infrastructure and human resource poverty) all tested positive at 1% level of significant, with the human resource poverty having higher contribution of (1.040) to the livelihood status of pop-corn processors. The adjusted R^2 value of regression all shows high level of contribution of the variables in explaining the livelihood status of the processors.

The challenges faced by the processors includes it causes drudgery (96.67%), it is time consuming (100%), changes in consumers preference (100%) and little quantity can be processed at a time (80.00%).

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