

## Effectiveness of Nigeria Policy on Substitution of Wheat for Cassava Flour in Bakery Products: Empirical Evidence from Enugu State, Nigeria.

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### ABSTRACT

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*The study assessed the effectiveness of Nigerian policy on cassava flour inclusion in bakery products.. It was conducted in Enugu State in 2010 and repeated in 2017. Data were collected using structured questionnaire from 60 households and 60 bakers in both years. They were analyzed using descriptive statistics. Results show that in 2010 only 3.3% of the bakers used cassava flour in baking, while 97.5% were using cassava flour in 2017. Some of the reasons for none use of cassava flour were ignorance, acceptability and quality of the products. Acceptability of cassava flour made products among consumers has grown from 1.7 in 2010 to as high as 46.7% in 2017, depending on the product. Some of the constraints faced by the bakers in the substitution of wheat for cassava flour include/technical know-how, low acceptability of cassava made products among consumers, high cost of non-cassava inputs, high cost and low supply of cassava flour and policy inconsistency. It is therefore suggested that there is a need to stabilize cassava and cassava flour production in the country to meet the demand for high quality cassava flour and provide a sustainable framework for the implementation of the policy to avoid the cases of policy inconsistencies as has been witnessed so far in the implementation of the policy.*

## 1.0 Introduction

Wheat flour has traditionally been used for bread making for generations. It is a very good cereal for making bread because of its particular qualities derived from the gluten proteins, which forms visco-elastic network with water (Defloor et al. 1993). However, over the years, due to the increasing wheat price and importation cost which has taken a toll on the resources of many nations around the world there has been a clamour for cheaper alternatives to wheat flour. For this reason, the Food and Agriculture Organization of the United Nations (FAO) established the composite flour program in 1964, having the broad objective of using local raw materials in the tropics for baking. Thus, over the years research have shown that

High Quality Cassava Flour (HQCF) can be a good substitute for wheat (IITA, 2012, Giami et al., 2004, Nangano et al., 2015), but the success of this in Nigeria is dependent on the economic factors of the country and the changes in the government policies in this regard. Over the years, there have been several policies regarding the use of cassava flour for bread making, but these policies have been continuously changed by successive governments for different reasons, making them ineffective.

Different levels of cassava flour can be used to replace wheat or rice, depending on the kind of product to be made. Cassava and wheat flour have similar properties and therefore can be substituted for each other at



different ratios for making different bakery products. The use of cassava flour was first introduced in Nigeria

in 2002, via the presidential initiative on cassava, and in 2004, 10% inclusion was made mandatory for baking by the Federal Government of Nigeria.

This policy on cassava inclusion stipulated strategies for all categories of bakers to include cassava flour in their products in the country. This was for the following reasons; stabilization of price, creation of new market, jobs and most importantly, reduction expenditure on wheat importation (Gbola, 2012; Layi, 2012).

Between 2007 and 2010 the percentage inclusion was reduced to 5% due to pressure from bakers and other interested economic and political stakeholders. In fact, bakers across the country reverted to the use of 100% wheat flour for baking, until 2012, when the Federal government announced the 40% cassava flour inclusion (Akinwumi, 2012). But, this policy has not been successful due to ignorance on the part of the bakers on the use of cassava flour and the inability of industries to meet the demand of bakers with respect to industry-grade cassava flour (Global Agricultural Information Network, 2012). This was coupled with the resistance from bakers due to their perceived negative effects of cassava flour on bakery products. Some of the alluded negative impacts of cassava flour on bread are; decrease in the volume of loaf, structure of the crumb, decrease in shelf life, and poor sensory qualities (Shittu et al., 2007; Houben et al., 2012; Osella et al., 2005). On the contrary, several other scholars have found out that up to 20% cassava flour substitution have no significant negative impact on bakery products although successive increase in the substitution may require using bread improvers for better quality. Some of the recommended bread improvers are emulsifying agents, enzymes, fats and oils, hydrocolloids, proteins and gums (Houben et al., 2012).

Furthermore, several criticisms have resulted against the substitution of wheat flour for cassava flour policy. For instance, the National Assembly had kicked against the policy fearing that the use of cassava flour for bread making might be injurious to people's health especially diabetics, since there are a large number of diabetic patients in the country. On the contrary, this argument has been deposed by the farmers who argued that after all Nigerians eat a large amount of foods made from cassava such as garri, tapioca and fufu; which have not been associated with diabetes. This

controversy led to a research by the Federal Institute of Industrial Research (FIRO) to measure the glycemic index of cassava made bread. The result indicated that the glycemic index of cassava was within the tolerable range of 52-53 for diabetic

patients (FIRO, 2016). Thus laying to rest the adverse claims against the use of cassava flour for baking. Furthermore, the National Agency for Food and Drug, Administration and Control (NAFDAC), has affirmed that the use of cassava flour for baking is healthy based on the nutrients composition of cassava (Chukwu, 2012).

On the other hand, the production of HQCF in Nigeria has been bedevilled with several technical challenges. This is due to the nature of cassava production process, marketing and consumption in Nigeria. To start with, cassava is a perishable commodity; its decay starts from the second day after harvesting, thus making it lose value for industrial use (Bokanga, 2007; Hahn, 2007). Also, due to the manual process of producing cassava flour, lower quality flours are produced. The slow nature of manual processing encourages fermentation, thus making it produce lower quality products in baking (Ohimain, 2014). In other words, to produce HQCF for baking, the process must be completed rapidly to prevent fermentation. In this regard, the use of Screw presses reduces the moisture content of grated cassava rapidly thereby decreasing the rate of fermentation. (Kolawole et al., 2012b; Kolawole et al., 2012a). Despite the availability of equipment for cassava processing (Sanni et al., 2006), peeling is still mostly done manually and is associated with high wastages of the cassava. Manual peeling also predisposes the cassava to human contact which increases the chances of microbial activities in the process (Ohimain et al., 2013).

The foregoing therefore suggests that there is a need for an inquiry into the effectiveness of the cassava flour inclusion in bakery products policy in Nigeria. This is with a view to understanding what has worked and what has not, also, looking at the challenges encountered by the bakers in the use of cassava flour in the country.

Though several related studies have been conducted in different parts of the country, none has successfully addressed the issues raised in this paper. An assessment of the economics of cassava processing in Kwara State, Nigeria was conducted by Muhammad-Lawal & Oyedmi (2013). Echebiri and Edaba (2008) also looked at the production and utilization of cassava in Nigeria: prospects for food security and infant nutrition. A Review of the prospects and challenges of composite



flour for bread production in Nigeria was also done by Ohimain (2014). Another review on refined cassava flour in bread making was carried out by Aristizábal, García, & Ospina (2017). Adeniji (2013) also did a review of cassava and wheat flour composite in bread making: prospects for industrial application. Mgbakor, Uzendu and Onicha (2014), conducted a study on the economic analysis of bread production with high quality cassava flour in Ndokwa West Local Government Area of Delta state, Nigeria. That was basically a profitability analysis. Another study by Adepoju and Oyewole (2013) looked at the households' perception and willingness to pay for bread with cassava flour inclusion in Osogbo Metropolis, Osun State, Nigeria. Oluwale et al. (2018), in South-western Nigeria, assessed cassava composite flour inclusion in bread production. This study looked at the distribution of bread consumers and bread bakers who were aware of cassava flour inclusion in bread and how it affected their bread consumption (in the case of consumers) and bread production (in the case of bakers). It also looked at the association between the awareness of cassava flour inclusion in bread production and adoption of cassava composite flour in bread production and the factors influencing the utilization of cassava as an input for bread production. None of these studies looked at the effectiveness of this policy. It is this gap that this work fills. The study was conducted in 2010 and repeated in 2017 in the same area. This was done to assess the progress that has been recorded in the implementation and adoption of the cassava flour initiative in the country since over the years.

## 2.0 Research Methods

**2.1 Study Area** The study was carried out in Enugu State, south-east Nigeria. Enugu state has its capital as Enugu. The state is made up of 17 local government areas (LGAs) and the principal cities in the state are Enugu, Nsukka, Oji and Udi, (Federal Republic of Nigeria Official Gazette, 2007).

Enugu State is located on latitude 6° 30' N and longitude 7° 30' E (Federal Republic of Nigeria Official Gazette, 2007). The state shares borders with Abia and Imo state to the south, Ebonyi state to the east, Benue state to the North East, Kogi state to the North west and Anambra state to the west. It came into being on 27th August, 1991. It has a total area of 7,161 Km<sup>2</sup> (Federal Republic of Nigeria Official Gazette, 2007). According to the 2006 census, the state has a total population of 3,257,298 people.

Enugu has well drained soil and good climate, sitting at about 223 meter (732 feet) above sea level. The mean temperature is between 20.30°C to 36.20°C with rainfall between 0.0098cu in to 2.18cu in (Federal Republic of Nigeria Official Gazette, 2007).

Economically, the state is predominantly rural and agrarian. The major crops are yam, cassava, cocoa, palm produce, rice, maize, cashew, cocoyam, as well as a variety of fruits and legumes. (Federal Republic of Nigeria Official Gazette, 2007).

Trading is also a dominant occupation and manufacturing and processing activities, mostly in Enugu, Oji and Nsukka areas also exist (Federal Republic of Nigeria Official Gazette, 2007). Among these are numerous bakeries and confectionaries scattered around the state and producing different kinds of bakery products, among which are bread, chin-chin, cake, doughnut meat pies and egg roll.

### 2.2 Sampling procedure

The study was conducted in 2010 and repeated in 2017. In each case two stage sampling techniques were adopted in the selection of respondents. In the first stage, two out of the six agricultural zones in Enugu state (Enugu metropolis and Nsukka) were purposively selected based on the population of bakery enterprises in the study area. A list of bakeries was used in each selected area. In each of the areas, 30 bakeries were randomly selected, giving a sampling size of 60 respondents for the bakers. The study also adopted multistage sampling technique in the selection of households for their level of acceptability of bakery product with cassava flour inclusion. In the first stage, two local government areas, Enugu and Nsukka were selected as a result of the predominance of bakery enterprises. In the second, stage 30 households were selected from each of the two local government areas. From each household the household head or a knowledgeable representative was interviewed. This gave a sample size of 60 households and a total of 120 respondents for the study.

### 2.3 Data Collection

Data for this study were obtained from primary sources. The primary data were collected through the administration of a semi-structured questionnaire by the researcher. The researcher collected data relating to the personal information of the respondents, their socio-economic characteristics, quality of bread produced from cassava flour, consumer reaction and response, cost of production of cassava bread, the different bakery products that can be made using

cassava flour, the percentage of cassava flour added to the different bakery products, consumers' acceptability of bakery product with cassava flour inclusion.

### 2.4 Data Analysis

In order to realize the purpose of this study, a number of statistical tools were employed in analyzing the data obtained for the study. Descriptive statistics such as frequencies, mean tables, percentages and a four point likert scale. The decision for the mean was based on the bench mark of 2.5 which was gotten from  $1+2+3+4 = 10$ . The product of this 10 ( $10/4$ ) of 2.5 became the benchmark mean.

## 3.0 Results and Discussion

### 3.1 Comparative analysis of percentage of bakers using cassava flour

Figures 1 and 2 shows the percentage number of bakers using cassava flour in 2010 and 2017, respectively.

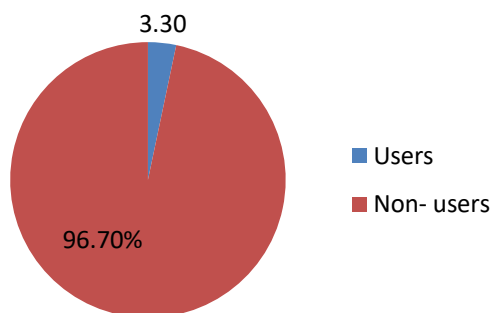


Figure 1: Proportion of bakers using cassava flour in 2010

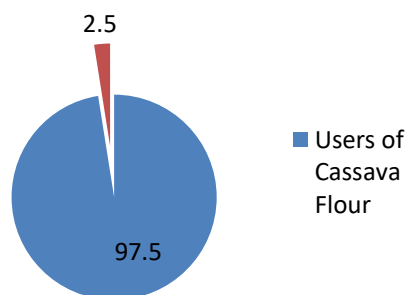
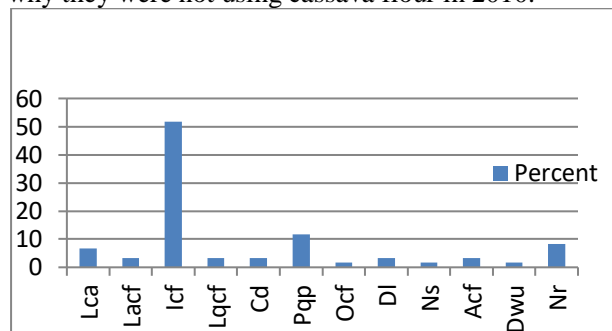


Figure 2: Proportion of bakers using cassava flour in, 2017

In 2010, it was found that only 3.3% of respondents in the study area used cassava flour in baking, while 96.7% did not. Whereas, in 2017, 97.5% of respondents were found to use cassava flour in baking while 2.5% were not, indicating a significant increase in the use of cassava flour in the area.

### 3.2 Reasons why most bakers do not use cassava flour in their bakery products

Figure 3 shows the reasons posited by the bakers for why they were not using cassava flour in 2010.



Where;

- Lca = low consumers' acceptability
- Lacf = lack of access to cassava flour
- Icf = ignorance/no idea about cassava flour
- Lqcf = low quality of cassava flour
- Cd = causes damages
- Pqp = poor quality of the products/outcome of the products after baking
- Ocf = odour of the cassava flour
- Di = I don't like it
- Ns = not seen
- Acf = availability of cassava flour
- Dwu = I don't want to use it
- Nr = no response

Figure 3 Reasons why bakers were not using cassava flour in 2010

Results show that the reasons for none use of cassava flour ranged from low consumers' acceptability, lack of access to cassava flour, ignorance/ no idea about cassava flour, low quality of cassava flour, the damages to the end product, poor quality of the products/outcome of the products after baking, odour of the cassava flour etc. It was found that a major reason was ignorance about the existence of cassava flour which accounted for more than 50% of the shortcomings.

### 3.3 Bakery Products made from Cassava Flour:

Table 1 shows the distribution of the products made from cassava flour in 2010 and 2017.

**Table 1: distribution of Bakery Products made from Cassava Flour:**

Products	2010	2017
	Percentage	Percentage
Bread	1.7	27.93
Chin-chin	1.7	30
Cake	-	30
Meat Pie	-	22.5
Doughnut	-	27.5
None use	96.7	-

Results show that in 2010, 1.7% of Breads and 1.7% of Chin-chins produced by bakers, in the study area, were made from Cassava flour. Whereas, in 2017, 27.93% of Bread, 30% of Chin-chins, 30% of Cakes, 22.5% of Meat pies and 27.5% of Doughnuts were made from Cassava flour. There has been an obvious and great increase over the years on the number of products made from cassava flour. This can be attributed to an increasing adoption of the cassava flour inclusion policy by bakers over the years or to the increasing acceptability of cassava flour products by the Nigerian consumers.

### 3.4 Consumer acceptability of Cassava flour Products

Tables 2 and 3 show the different levels of acceptability of cassava flour made products in 2010 and 2017, respectively. While the assessment was done holistically for all products among consumers in 2010, it was disaggregated into the different products and separately for both consumers and bakers in 2017.

**Table 2: Percentage level of acceptability of Cassava flour Products in 2010**

Level of acceptability	Frequency	Percentage
Highly acceptable	1	1.7
Acceptable	0	0
Low acceptable	1	1.7
Not acceptable	2	3.3
Indifferent	58	96.7
<b>Total</b>	<b>60</b>	<b>100.0</b>

Field Survey 2010

**Table 3: Percentage level of acceptability of Cassava flour Products in 2017**

Level of acceptability	Bakers	Households
	Percentage	Percentage
<b>Bread</b>		
Very high acceptance	12.5	20.0
High acceptance	42.5	28.3
Low acceptance	30.0	31.7
No acceptance	15.0	20.0
<b>Doughnut</b>		
Very high acceptance	22.5	1.7
High acceptance	32.5	40.0
Low acceptance	30.0	43.3
No acceptance	15.0	15.0
<b>Chin-chin</b>		
Very high acceptance	2.5	-
High acceptance	52.5	26.7
Low acceptance	35.5	46.7
No acceptance	10.0	26.7
<b>Cake</b>		
Very high acceptance	22.5	11.7
High acceptance	30.0	31.7
Low acceptance	37.5	38.3
No acceptance	10.0	18.3
<b>Meat pie</b>		
Very high acceptance	5.0	23.3
High acceptance	55.0	40.0
Low acceptance	37.5	31.7
No acceptance	2.5	5.0

Field Survey 2017

The results show that in 2010, 3.3% of consumers of baked products expressed no acceptability for products baked with cassava flour while few consumers (1.7%) expressed low acceptability and an equal proportion

1.7%) expressed high acceptability. In 2017, the consumer acceptability of various products baked with cassava flour was collected individually. The result showed that it was only in the case of chin-chin that there was as high as 26.7% of no acceptability, the percentage was low in other products and as low as 5% in the case of meat pie. In all the products there is observed and increasing acceptability of cassava flour made products from low to very high, an indication of good acceptance among the Nigerian consumers, which was different from the case in 2010.

### 3.5 Percentage of Cassava Flour Added to Baked products

Table 4 shows the percentage distribution of quantity of cassava flour incorporated in different products.

**Table 4: Mean Percentage of Cassava Flour Added to Baked Products:**

Bakery Product	2010 (%)	2017 (%)
Bread	6	27.93
Chin-chin	10	19.10
Cake	-	26.08
Meat Pie	-	21.13
Doughnut	-	27.58

In 2010, the mean percentage of cassava flour added to bread by bakers, in the study area, was about 6% for bread and 10% for chin-chins. However, in 2017, the mean percentage of cassava flour added to bread increased to 27.93%, and 19.10% in chin-chins. While a mean of 26.08%, 21.13% and 27.58% cassava flour was being added to Cakes, Meat Pies and Doughnuts, respectively.

### 3.6 Number of Years spent by the bakers using Cassava Flour

Table 5 shows the distribution of the years spent by the bakers in the use of cassava flour.

**Table 5: Number of Years spent using Cassava Flour:**

No. of Years	2010	2017
Less than 1 year	0	2.5
1-5	3.3	27.5
6-10	0	21.5
11-15	0	10.0
16 years and above	0	5.0
None use	96.7	0

The result indicates that while the use of cassava flour was still very new among the bakers, many of the bakers have used it for about a decade and more in

2017.

### 3.7 Constraints faced by the bakers in their use of cassava flour for baking

Table 6 shows the different constraints faced by the bakers in their use of cassava flour.

**Table 6: Constraints to the Use of Cassava Flour**

Supposed constraint of bakery operators	Mean	Std. Deviation	Decision
Low level of household awareness of bakery products with cassava flour inclusion	2.43	0.93	Minor
Low level of specialization/technical know how	2.60	0.96	Major
Low acceptability of cassava made products	2.70	0.94	Major
Distant market and poor market network	2.28	0.85	Minor
Inadequate access to finance	2.30	0.79	Minor
Poor transportation and storage facilities	2.40	0.98	Minor
High cost of non-cassava inputs	2.83	0.87	Major
High cost of cassava flour	2.50	0.88	Major
Competitiveness among other bakery industries who are not using cassava flour	2.13	0.88	Minor
Inconsistency of government policies	2.10	0.87	Minor
Poor availability/seasonality of cassava flour	2.08	0.97	Minor
Supply of high quality cassava flour	1.167		Minor
High cost of labour and transportation	0.33		Minor
Inadequate Skilled Labour	0.083		Minor
Market size	0.2		Minor

Results show that the major constraints to the use of cassava flour by bakery operators include; low level of specialization/technical know-how, low acceptability of cassava made products among consumers, high cost of non-cassava inputs and high cost of cassava flour.

The result also shows that the supply of high quality cassava flour is not a serious constraint, thus implying that there is adequate supply of cassava flour or availability in Enugu state. High cost of labour and



transport was also a minor constraint, thus implying that cost of labour and transportation in acquiring cassava flour was not on an issue in Enugu State.

Apparently, there has been an increase in the percentage number of bakers who use cassava flour for baking' from as low as 3.3 in 2010 to 97.3 in 2017. There has obviously been a high rate of success in the adoption of the cassava flour policy in the area, thus, indicating its effectiveness. This is even as they use cassava flour for different products, apart from bread, and the acceptability of the products by the consumers. There is no doubt that the success of the policy is hinged on the ability of the substitution to reduce the cost of baking as has been noted by FAO (2002), that cassava flour can reduce a food manufacturer's bill for flour by as much as 48 to 50%, depending on the degree of substitution.

This result of increasing acceptability of cassava flour made products also very encouraging. This is because if the products are not accepted by the consumers, then the bakers would have had difficulty adopting the policy. The result is in resonance with the findings of Giami et al., (2004) and Akobundu (2006), who found that the use of up to 20% cassava flour, were reported by consumers, to have no negative effects on bread made from cassava flour and that bread baked from wheat flour with 10% and 20% cassava flour were rated even higher and preferred by the consumers due to various positive sensory qualities.

On the other hand low acceptability of cassava flour products among some consumers could be attributed to the image problem of cassava being regarded as an inferior good. Thus, products made from cassava are also regarded by some consumers as inferior commodities. Also it has been reported that some individuals have raised concerns over the presence of cyanogenic glucosides which could lead to toxicity (Day et al; 1996). Thus, there is a need for better education and proper sensitization in this regard.

The result of the percentage quantity of cassava flour used in the making of different products are somewhat within similar range with the result of Abass, Onabalu and Bokanga (1998), who found that depending on product and baker, the percentage level of wheat flour substitution for cassava flour was between 12.5-100% for chin-chin, fish pies and buns, a maximum of 20% for bread and between 5-25% for biscuits with a maximum of 60% in biscuit, depending on the type. There is therefore great potential for continued substitution of wheat for cassava flour in the country, given the varied levels already being used and accepted by consumers in the country.

### 3.8 Policy Direction

It is clear from the results that one of the challenges faced by the bakers is the low level of acceptability of cassava flour made bread by some individuals. This arises due to the increasing level of wheat substitution for cassava flour, which impact negatively on the quality of the bread. This is because the quality of bakery products produced with the mixture of wheat and other flours is reduced and even further increase of substitution of wheat for other flours continuously decrease the quality of the dough produced (Ohimain, 2014). Therefore, to increase the substitution of wheat with cassava flour will mean that bread making improvers will have to be used (Houben et al., 2012). Amongst these improvers Falade and Akingbala (2008) and Taiwo (2006) reported up to 10% emulsion of glyceryl monostearate and calcium stearyl lactylate, respectively. However, the problem is that these emulsifiers are currently imported. Therefore Nigeria cannot afford to reduce wheat importation and import bread improvers, as foreign exchange will obviously be impacted upon due to the continuous importation of bread improvers; this will negate the objective that was aimed at achieving by the reduction of wheat importation (Ohimain, 2014). This is because most of these improvers can be produced in Nigeria with palm oil, legumes and eggs that are abundant in the country (Ohimain, 2014).

Also, as has earlier been noted, another issue is the problem of inconsistencies in the Nigeria policies regarding the issue of cassava flour inclusion; this is as is evident among successive governments in the last 20 years. There is therefore a need to provide adequate framework based on research for the implementation of the policy in the country.

Furthermore, Ohimain (2010, 2013) and Philips et al., (2004) have reported that several competing uses for cassava has been identified over the past two decades following the cassava flour policy, such as in the textile, beverage, pharmaceutical and biofuel companies. In addition, the demand of Nigerian cassava chips by China has introduced a complexity in the strive to meet up with the local demand for HQCF, thus introducing doubt if this goal could easily be met in the short run. Besides, it has also been identified that the cassava flour value chain is very weak and unreliable in Nigeria leading to unnecessary scarcities-glut scenario at different times and in different parts of the country (Ohimain, 2014). Such situation cannot make for effective policy implementation in the country.

To address these challenges scholars have therefore



posited that there is an urgent need to increase the yield, as well as the area of cultivated cassava in the country (Akinwumi, 2012), since most of the cassava growers in the country produce at sub-optimal levels. In this regard, Adewale (Undated) posits that Nigeria needs to rethink the process of cassava production by applying a value chain approach if we are to achieve the aim of using cassava as a substitute raw material in bakery products and as an export commodity. Also the incentives provided by the cassava flour initiative has been identified as not being enough to spur investment in the sector, thus there is a need to provide additional incentives in this regard (Ohimain, 2010, 2013a, 2013b). These can be in the forms of subsidies and grants. This is because even in the other wheat producing and developed countries wheat is still highly subsidized, making the commodity cheaper in these countries. This situation could encourage the smuggling of wheat into the country ( Ohimain, 2014; David, 2011). These and other issues are some of the concerns that need to be properly addressed for efficient cassava flour production in Nigeria that meets both economic and environmental standards and global best practices.

#### 4.0 Conclusion

The results of the study have shown that there has been very remarkable increase in the level of substitution of wheat for cassava flour in the country. On the side of the consumers, there has also been a progressive increase in the level of acceptability of cassava flour made products over the years. These show that the policy has been very effective in achieving its mandate.

However significant progress can be made by increasing the availability of cassava flour through both expansion of cassava production and incentives to producers. Also there is need for continued consumer education to sustain the acceptability of the consumers and to encourage those that do not accept cassava made product to do so. It is also important to maintain the policy initiative with a sustainable institutional framework to avoid the problems of policy inconsistencies as has been the case in Nigeria.

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