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Assessment of Cassava Composite Flour Inclusion in Bread Production in Southwestern Nigeria

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Abstract

The study elicits information on the level of awareness, usage, and factors influencing cassava flour inclusion in bread production in Southwestern Nigeria. The study was carried out in Oyo, Lagos, and Osun states. Two towns were selected purposively from the selected states two sets of questionnaire were administered in the study area; the first set was administered on 25 bread bakers from each of the selected towns in the states, making 150 bread bakers. The second set was administered on 25 bread consumers from each of the selected towns in the states, making 150 bread consumers. Hence, a total of 300 respondents were considered in the study area. The study was analyzed using descriptive and inferential statistics by employing SPSS 20. The study revealed that about 46.7% of the bread consumers often ate bread in a day and most (66.7%) of them were aware of the cassava composite flour inclusion in bread production, but the majority (69.3%) of them could not identify the cassava bread. In addition, only 25.3% of the bread consumers had eaten the cassava bread before despite the fact that they often ate bread daily. Likewise, most (78.1%) of the bread bakers were aware of composite flour inclusion in bread production and they produced bread once in a day using Golden Penny (74.7%) flour. Due to the low level of awareness of majority of master bakers about composite flour inclusion in bread production from the selected channels, few (0.7%) bakers complied with the usage of composite flour inclusion in bread production. Most (76%) of the bread bakers used a brick oven. The study revealed that the high efficiency of the cost of modification (2.83), cost of raw materials (2.80) and cost of operation (2.46) were the factors inhibiting the bakers from using cassava flour in their bread production. The study further revealed the magnitude and direction of association among the availability of cassava flour and cassava bread production ($r=0.187$, $p<5\%$), product quality and cassava bread production ($r=0.388$ $p<10\%$). The study concluded that the awareness level of bread consumers in identifying cassava bread was low, and the level of compliance of bread bakers in cassava flour composite in bread production was also low due to the high cost attributed to it. The study recommends that government should create platforms that will increase the level of awareness and identification of cassava bread for bread consumers and to also subside the cost attributed to the factors inhibiting the use of cassava composite in bread production.

Keywords: Cassava composite flour; Bread production; Nigeria

Introduction

Nigeria is the largest producer of cassava among the top five producers in the world; Brazil, Thailand, Indonesia, and the Congo Democratic Republic [1,2]. Cassava is a woody perennial shrub that grows from 1 m to 5 m in height which is used to make food products such as gari, lafun, fufu, bread and cakes. It is also used as animal feed, fuel; ethanol and ingredient in a variety of products such as soups, syrups and furniture [3]. Cassava is cultivated almost exclusively in tropical and subtropical regions in Nigeria and its production contributes immensely to food security at the level of household in marginalized areas [4].

In Nigeria, bread has become the second most widely consumed food after rice. Bread is conventionally produced from wheat flour (*Triticum aestivum* Desf.) and also made, though to a lesser extent from the flour of other wheat species including *T. durum, T. dicocum,* and *T. spelta*. Bread has been described as unstable elastic solid foam containing a continuous phase of an elastic network of cross-linking gluten molecules and starch polymer, mostly amylose, and a discontinuous phase of entrapped, swollen and deformed starch granules. Bread is an important staple food both in the developed and developing the world. The rapid urbanization, increasing population and changing food habits have resulted in the preference for convenience foods such as bread, biscuits, and other baked products. Bread is normally made from wheat flour that is cultured with yeast, allowed to rise, and baked. Composite flour, such as cassava composite flour is also used in baking bread, but the processing is very technical compared to cassava flour used for staple food.

The processing of cassava flour for confectionaries (cassava-composite flour) is different from the cassava processing for staple food of Egbas in Ogun state such as *elubo lafun*. Cassava flour for producing confectionaries is harvested and be processed the same day and is not allowed to ferment at all while cassava processing for staple food of Egbas in Ogun state, "*elubo lafun*" is fermented for at least three days before further processing. Therefore, fermentation is the difference between cassava-composite flour and cassava processing for *elubo lafun*. The composite flour is the name given to wheat flour that has been diluted with other flours. Therefore, cassava-composite flour will result in "cassy bread".

Despite the fact that Nigeria is the largest producer of cassava in the world, Adewumi [4] reported that Nigeria accounts for zero percent value-added to cassava globally as compared to Thailand's 80%. Ndichu et al. [3] corroborated the former study and concluded that the nation contributed a negligible proportion of global trade in value-added cassava products due to the uncompetitive nature of its production and weak-processing systems. However, the rising cost of importing wheat

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flour has been a matter of great concern to the government of Nigeria, as such led to high cost of production of confectionaries made with wheat flour. This importation of wheat flour had

contributed to the depletion of foreign reserve, decrease in the purchasing power of Naira, increase in unemployment and poverty level of Nigerians. By virtue of the negative impact, the importation of wheat flour has on Nigeria's economy, there is a need to introduce substitute product for wheat flour in making indigenous confectionaries, hence, the introduction of High-Quality Cassava Flour (HQCF) is germane. It is not only cassava that can be used for this purpose but also plantain, yam, cocoyam, rice, potatoes and similar carbohydrates [5,6] but cassava was chosen in Nigeria because of its comparative advantage. Due to that, the Nigerian government had enacted a policy of cassava flour inclusion in confectionaries as a panacea for the mentioned phenomena (negative implication of wheat importation). Okeke [7] posited that "despite the awareness (workshops, seminars and courses) on the production and baking of cassava bread (cassy bread) and confectionaries organised by Federal Institute of Industrial Research Oshodi (FIIRO) for members of master bakers in Nigeria and other bakers, what is then hindering the production of the anticipated cassy bread?" Okeleke and Nwosu [8] studied the presidential initiative on cassava crop production and use as a substitute in bread production in Enugu state. Adepoju and Oyewole [9] studied the household's perception and willingness to pay for bread with cassava flour inclusion in Osogbo Metropolis, Osun State, Nigeria. Studies have considered factors that are influencing the behavioral decision of people on the consumption of cassy bread [7,9-11] and such factors are packaging, taste, size, price, color, flavor, market distance, and health benefits. There is a dearth of information on the level of awareness, the usage and the factors inhibiting the cassava flour inclusion (composite flour) in bread production in Southwestern Nigeria. Hence, this study will shed light on the level of awareness of cassava flour inclusion, the compliance and the factors influencing the usage of cassava flour in bread production in Southwestern Nigeria.

The study format follows thus; introduction, review of the literature, methodology, results and discussion, conclusion and recommendations, and further study.

Review of Literature

Food and Agricultural Organisation (FAO) [2] reported that Nigeria is the largest producer of cassava in the world with a current production output of about 54 million tonnes. Nigeria produces a third more than Brazil and almost double the production capacity of Thailand and Indonesia. But despite this, Nigeria is not an active participant in the international market when compared with these countries. About 90% of the annual production of cassava in Nigeria is however for human consumption while only 10% is utilized for industrial products.

Cassava ranks fourth among world's staple crops after wheat, rice and maize but third in sub-Saharan Africa after rice and maize. Cassava (Manihot esculenta Crantz) (also known as manioc or yucca) is one of the leading food and feed plants in the world with a global production of about 160 million tonnes per year. Cassava is mostly grown in four regions; West Africa, the Congo basin, tropical South America, and Southeast Asia. Cassava is a higher producer of carbohydrate per hectare than the main cereal crops and can be grown at a considerably lower cost. Cassava processed products can be grouped into primary and secondary products. Primary products are obtained directly from raw cassava roots (e.g. gari, fufu, starch, chips, pellets etc.) while secondary products are those that are obtained from further processing of primary products (e.g. Cassava confectionaries, starch etc).

Estimates for the percentage of cassava used for industrial utilization range from 5% to 16%; one of such industrial products is High-Quality Cassava Flour (HQCF) which was developed by the International Institute for Tropical Agriculture (IITA) and has gained popularity in the West African sub-region over the past few years, while the rest is used directly for human consumption. High-Quality Cassava Flour which is also a secondary product has been developed for the purpose of partial substitution of wheat flour for bread baking and confectionaries production.

Odurinde [12] defines steps of making cassava flour as thus. One, harvest matured cassava from the farm and load it to the processing shed immediately and if the quantity of cassava harvested cannot be carried in the same day for logistic reasons, the cassava stem will not be detached from its shrub until the vehicle to carry it is ready. That is to say, fermentation will not occur if the cassava is still attached to its shrub even if it has been uprooted. But care must be taken not to bruise the cassava when uprooting it. Two, peel the cassava and wash it in clean water. Three, grind the cassava with the grating machine. Four, press the grated cassava with screw jack or hydraulic jack. The pressing is very technical and very important. The moisture level of the cassava should be reduced to below 20%. The process from harvesting to pressing must be under 24 hours, if not; the product has turned to elubo (staple food) and may not be good for baking. After pressing below 20% moisture and fermentation are completely halted, the next stage is drying. Five, dry to a moisture level of below 14%; the drier the product the longer the storage life or the shelf life. The moisture level is the most important quality which will be examined at the point of sales and if properly processed as narrated above, the color of the product will be snow white. Drying could be by the sun if the quantity is not much or if the period is dry season and there is no possibility of sudden rainfall. The ideal method of drying is the industrial dryer. Some industrial dryers are capable of handling up to 10 tonnes per day. If the processing is during the rainy season the best alternative is the industrial dryer (Figure 1) [12].

Cassava flour can be used as a partial replacement for many bakery and pasta products. Since 1996, the Natural Resources Institute in collaboration with the Ghanaian Food Research Institute and the University of Ghana has conducted a series of tests with bakeries in Accra. The research demonstrates that high-quality cassava flour can be incorporated into common snack foods such as biscuits and cakes and that such substitution is acceptable among a wide range of consumers.

Okeleke and Nwosu [8] studied the presidential initiative on cassava crop production and use as a substitute for wheat flour in bread production in Enugu state. The study focused on whether the legislation on the use of cassava flour for bakery and confectionary businesses succeeded in the study location. The methodology used in this study was both primary data such as interview and questionnaire

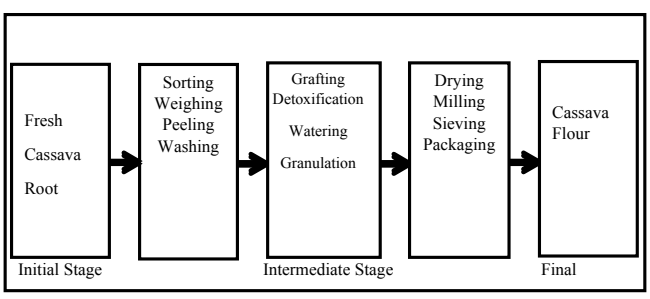

Figure 1: Flow chart for cassava flour production.

and secondary data such as records. The study was analyzed with descriptive (frequency and percentages) and inferential statistics (ANOVA). The study concluded that the presidential directive resulted to increase in production of cassava crop in Enugu State and also reported that the campaign on composite flour inclusion was adequate. The study showed that composite flour made bread were implicitly demanded by consumers as master bread bakers did not include either wheat or cassava flour on the labels of the cassy bread. Hence, the study recommends that ingredients of bread should be made explicit on its labels as this will further publicize the cassy bread and increase the level of customers' confidence. The study only focused on Enugu State in Southeastern Region and neglects other regions. Not only that, but it also failed to assess the level of awareness of cassava flour inclusion in cassy bread production. The study did not consider the type of cassava crop that is best suitable for cassy bread (in terms of shelf life).

Adepoju and Oyewole [9] studied the households' perception and willingness to pay for cassy bread in Osogbo metropolis, Osun State, Nigeria. The study used primary data (questionnaire) with the aid of multistage sampling for the study. One hundred and twenty-seven (127) respondents participated in the study out of 150. The study used both descriptive (frequency and percentage) and inferential statistics (logistics regression model) for the analysis.

Eddy, Udofia, and Eyo [13] studied the sensory evaluation of wheat/cassava composite bread and the effect of label information on acceptance and preference. The study examined the performance of 10%, 20% and 30% cassava composite bread via evaluating the color, aroma/ flavor, texture, acceptability and buying preference. The study revealed the process of making cassava flour. The indigenous oven was used to bake the dough. The control (100% wheat flour bread) was baked in line with the specification of Akobudu [14] and sample bread (composite flour) were baked in accordance to the method specified by the National Root Crop Research Institute [1,6,15]. The two doughs were baked in line with the registered standard. The doughs were analyzed for moisture, dry matter, ash, proteins and fat contents with the aid of analytical methods recommended by AOAC [16] and James [17]. In the study, three sampled composite bread and the control (90% composite flour, 80% composite flour, 70% composite flour and 100% wheat flour) were served to ten semi-trained panelists that were made up of staff and students of Akwa Ibom State Polytechnic, the panelists were familiar with the sensory attributes; flavour, taste, texture, colour of the samples. Nine points hedonic scale was designed to measure the degree of preference of the samples. The samples were presented in identical containers, coded with 3-digit random numbers served simultaneously to ease the possibility of the panelists to re-evaluate a sample. Precautions were taken to prevent carry-over flavor during the tasting by ensuring that panelists rinsed their mouth with water after each stage of sensory evaluation. Analysis of Variance was used for this study at a 95% confidence level. Using SPSS version 17. The study showed that bread baked with 10% and 20% of the composite flour were not significantly different in all sensory attributes (Figure 2). Furthermore, the study shows that bread baked from 30% composite flour shows low mean scores to all the sensory attributes (Figure 3). [13].

The study shows the uniformity in the scores between all labeled and unlabeled samples meaning that nutrition information label on percentage composition of cassava flour did not significantly lower acceptability and preference for the samples. The study concluded that the quality of bread that can be produced from wheat-cassava flours mixtures depends on the level of substitution. The study advocated that 90% and 80% composite flour for bread production should be adopted as an alternative to 100% wheat bread.

Samples	Colour	Taste	Aroma	Texture	Preference	Acceptability
100R	8.50^{a}	8.50^{a}	8.40	8.60	8.40a	7.90^{a}
70L	7.70^{b}	7.40^{c}	7.00	5.40	7.90^{c}	7.90^{b}
80L	7.80^{a}	7.80^{b}	7.80	7.80	7.80^{c}	7.80^{b}
90L	7.10^{c}	8.30^{b}	8.30	8.00	8.10^{b}	8.30^{a}
70NL	6.60^{a}	7.80	7.80	5.70	7.80^{c}	7.80^{b}
80NL	8.20a	8.10	8.20	8.10	8.10^{b}	8.10^{b}
90NL	8.10^{a}	8.10	8.10	8.10	8.10^{b}	8.10b

Mean scores in columns with same letters are not significantly different ($p < 0.05$).
100R = 100% wheat flour bread, 70L = 70% composite flour bread (labeled), 80L = 80% composite flour bread (labeled), 90L = 90% composite flour bread (labeled), 70NL = 70% composite flour bread (unlabeled), 80NL = 80% composite flour bread (unlabeled), 90NL = 90% composite flour bread (unlabeled).

Figure 2: The mean score for hedonic sensory attributes of samples.

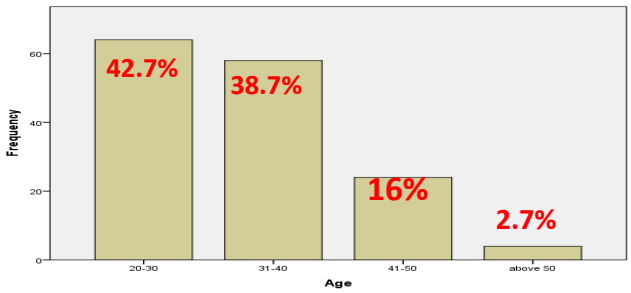

Figure 3: Distribution of respondents' age (consumers).

Factors Influencing the Usage of Composite Flour for Bread Production

Scholars stipulated factors inhibiting cassava flour inclusion in bread production in Nigeria. Okeleke and Nwosu [8] reported that citizens are skeptical of the quality of bread made from composite flour and consider it as inferior to bread made out of whole wheat flour, more also, the "wheat cabals are indeed a strong formidable force that are affecting the usage of composite flour inclusion in bread production." Michael [18] showed that lack of understanding of the millers on the likelihood of cassava flour inclusion with wheat flour for bread production and inadequate indigenous capacity to process industry grade cassava flour hindered the cassava flour inclusion in bread production in Nigeria.

Adepoju and Oyewole [9] corroborated other studies that packaging, taste, size, price, color, market distance, and health benefits and irregular supply of a product are the factors influencing the purchasing decision of cassy bread. Chabikuli [10] revealed that brand name, price, fibre content, and taste determine consumers' buying decision of cassy bread. In addition, Akankwa [11] observed that skin color and taste are the germane factors that statistically influence the buying decision of cassy bread. Meanwhile, Adepoju and Oyewole [9] reported that out of the mentioned factors, the taste was the most germane factor influencing consumer decision to buy cassy bread. About "96.8% of the respondents reported that they will be willing to pay a premium for bread with cassava flour inclusion (composite flour bread) if proper attention is given to the taste." Adepoju and Oyewole [9] reported that for 10% composite flour in bread making price had a negative effect on the purchasing pattern of the respondents. For 20% composite flour in bread making, price, the age of the household head and share of bread in total household food expenditure were the significant factors influencing households' willingness to pay for cassy bread. For 30% and 40% composite flour in bread making, the share of bread in monthly food expenditure and price were the factors influencing the

buying decision of the respondents at those values of composite flour respectively. Adepoju and Oyewole [9] revealed that majority of the respondents who had actually tasted cassy bread preferred it to bread made entirely from wheat flour. The study recommended that master bakers should adopt the use of composite flour for bread production and careful attention should be given to the taste, packaging, size, colour, and price of the bread as the mentioned variables affect the buying decision. Prathiraja and Ariyawardana [19] studied the impact of labeling on buying behavior and concluded that consumers are meticulous about labeling of product they intend to buy especially staple food; drugs etc so as to decipher the ingredients because of their health consciousness and most of them are willing to pay premium price for the nutritional information/ingredients on the label.

Adepoju and Oyewole [9] reported that Nigerian lawmakers argued that-compelling master bakers to include cassava flour in bread production would amount to forcing Nigerians to be eating products that might be harmful to their health; the country has a measurable diabetic population and that diabetic patient are warned to desist from consuming foods with high (carbohydrates) glycemic index. Furthermore, Chukwu [20] reported that FIIRO studied glycemic index of cassava and shows that it has a glycemic index of 52-53 which is still within the stipulated/recommended range of 0-55 glycemic index for diabetic patients. Hence, the claim of Nigerian lawmakers that cassava was injurious to patients and should not be taken was refuted. Likewise, National Agency for Food and Drug, Administration and Control (NAFDAC), substantiated the inclusion of cassava flour in bread production by considering the nutrients and health implications of cassava and concluded that the inclusion of cassava flour in bread production was healthy [20].

Oviahon, Yusuf, Akinlade, and Balogun [21] studied the determinants of bread consumers' willingness to pay for safety labels. The study was carried out in Oredo Local Government Area, Edo State, Nigeria. The study used a survey method for data collection. The result of the study using regression showed that educational level, new price, marital status, the source of information and what respondents looked out for in bread were the variables that significantly influenced the willingness to pay for cassy bread in the study area. Likewise, Lupin, Rodriguez, and Lucaze [22] studied the contingent valuation of consumers' willingness to pay for organic food in Argentina; the study used the survey method for data collection and concluded that the lack of reliable regulatory system and lack of good storage capacity to manage quality produce were the reasons for the low consumption of organic products in Argentina.

Research Methodology

Study area

The study area was Southwestern (SW) Nigeria which comprised Ondo, Ekiti, Oyo, Lagos, Ogun, and the Osun States. The SW is bounded in the East by Edo and Delta states, in the North by Kwara and Kogi states, in the West by the Republic of Benin and in the South by the Gulf of Guinea. The study area had a population of 28,767,752 in 2013 [23]. SW has a tropical climate which is characterized by wet and dry seasons. The wet season is connected with the Southwest monsoon wind from the Atlantic Ocean while the dry season is related to the northeast wind from the Sahara Desert. The annual rainfall ranged between 150 and 3000 mm while the temperature ranged between 21°C to 34°C. The vegetation in Southwestern Nigeria is made up of freshwater swamp and mangrove forest at the belt [23] Figure 4.

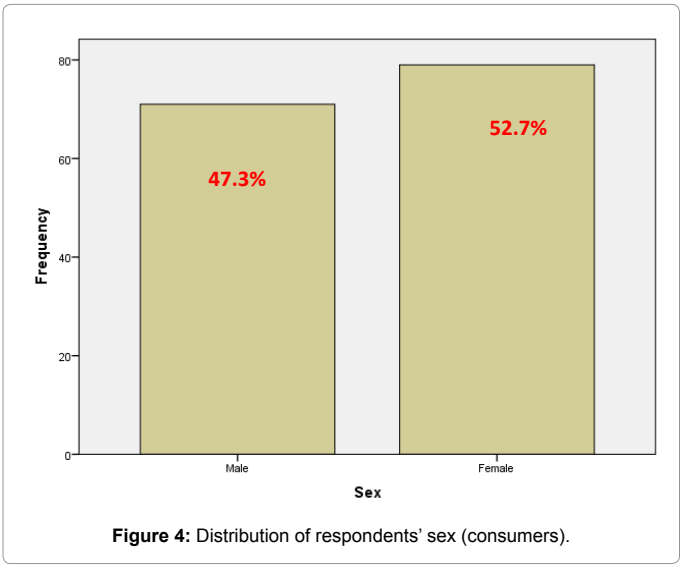

Figure 4: Distribution of respondents' sex (consumers).

Sources of data and sampling procedure

The study was carried out in three states in Southwestern (SW) Nigeria and these are Oyo, Lagos, and Osun states. Two towns were purposively selected from the selected states; Ibadan and Oyo town in Oyo state, Ile-Ife, and Osogbo in Osun state and Akoka and Gbagada in Lagos state. Two sets of questionnaire were administered in the study area; the first set of the questionnaire was administered on 25 bread bakers from each of the selected towns in the states, making 150 bread bakers. The second set was administered on 25 bread consumers from each of the selected towns in the states, making 150 bread consumers. Hence, 300 respondents were considered in the study area. The first set of questionnaire elicited information on the awareness of cassava flour inclusion in bread production, the level of compliance, the percentage of substitution of cassava composite flour incorporated and factors influencing the utilization of cassava as an input to bread production. The second set of questionnaire elicited information on the bread consumers' perception and awareness of cassava flour inclusion in bread production.

Method of data analysis

A descriptive statistic such as frequency, percentages, and graph were used in analyzing the data. An inferential statistical technique, correlation, was used in testing the magnitudes and direction of relationship for the studied variables.

Results and Discussion

Socio-demographic characteristics of the respondents (bread consumers and bakers)

Figures 5-13 reveals the socio-demographic characteristics of the respondents; bread consumers and bread bakers respectively. Figure 5 shows that the majority (42.7% and 38.7%) of the respondent bread consumers were in the age range of 20-30 years and 31-40 years respectively. They further reveal that only 16% and 2.7% of the respondent bread consumers were in the age range of 41-50 years and above 50 years respectively. Likewise, Figure 6 reveals the respondent consumers' sex; males being 47.3% and females 52.7%. Figure 7 shows that about 54% of the bread consumers were married while only 46% of them were single. Furthermore, Figure 8 shows that majority

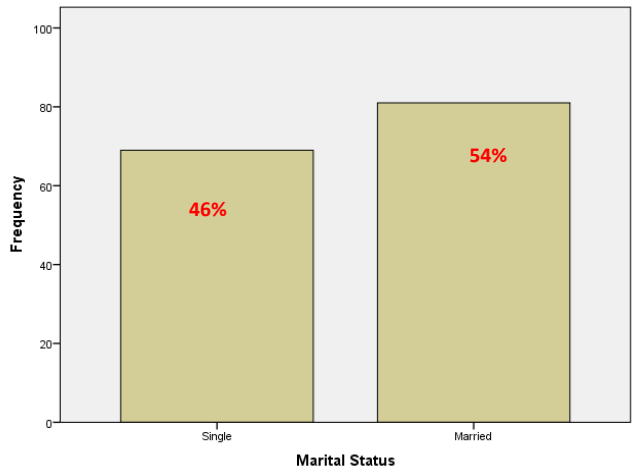

Figure 5: Distribution of respondents' Marital Status (bread consumers).

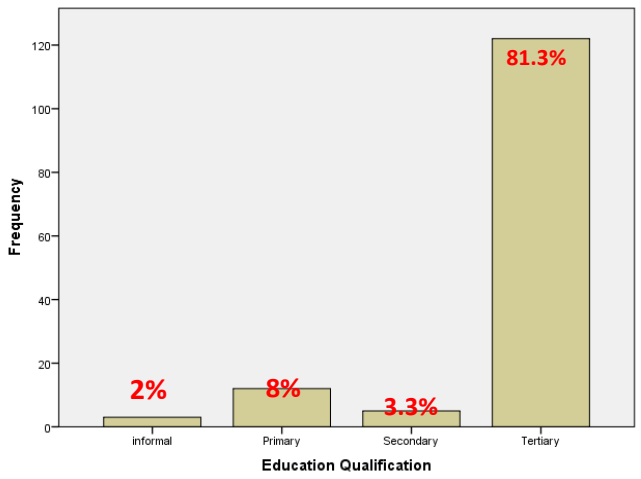

Figure 6: Distribution of respondents' highest educational qualification (consumers).

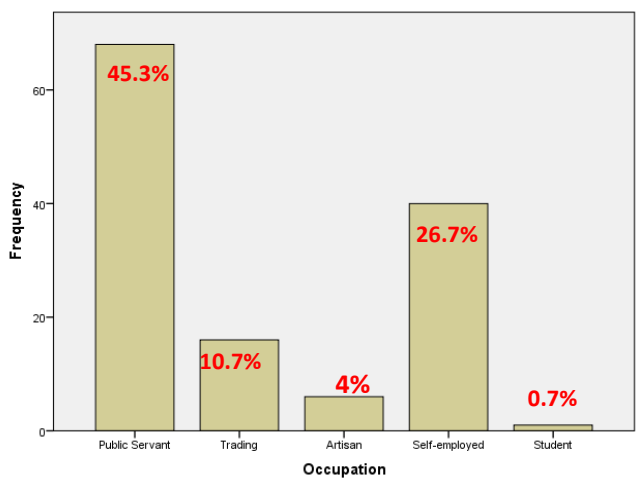

Figure 7: Distribution of respondents' occupation (consumers).

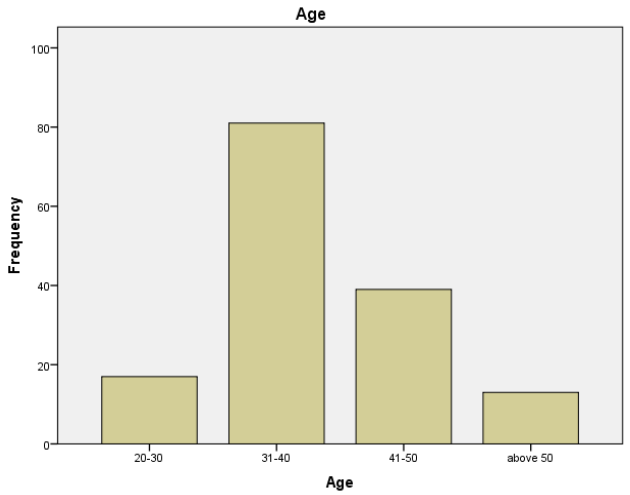

Figure 8: Distribution of respondents' age (bread bakers).

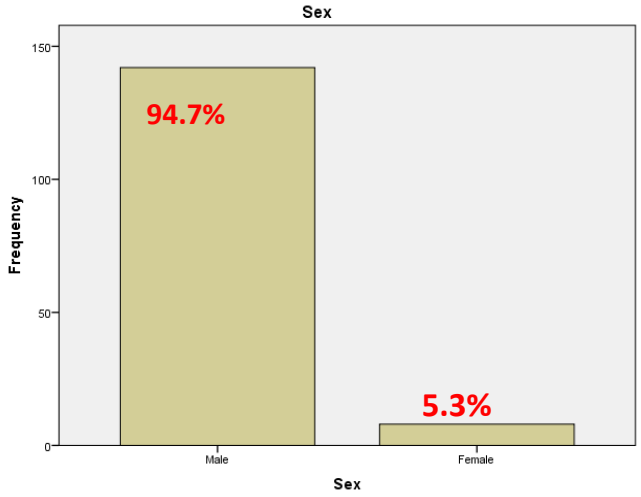

Figure 9: Distribution of respondents' sex (bread bakers).

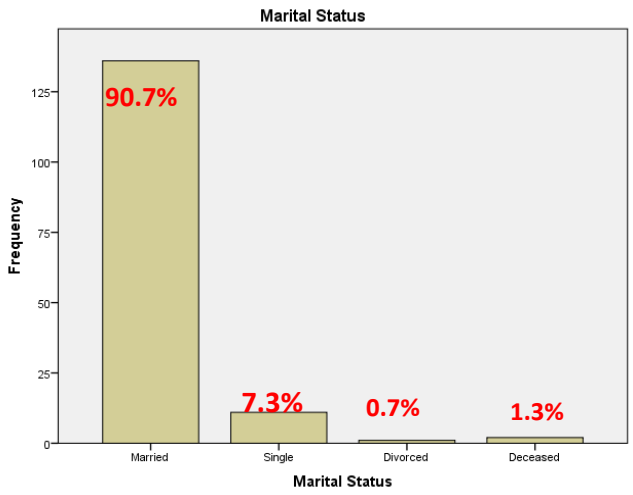

Figure 10: Distribution of respondents' marital status (bread bakers).

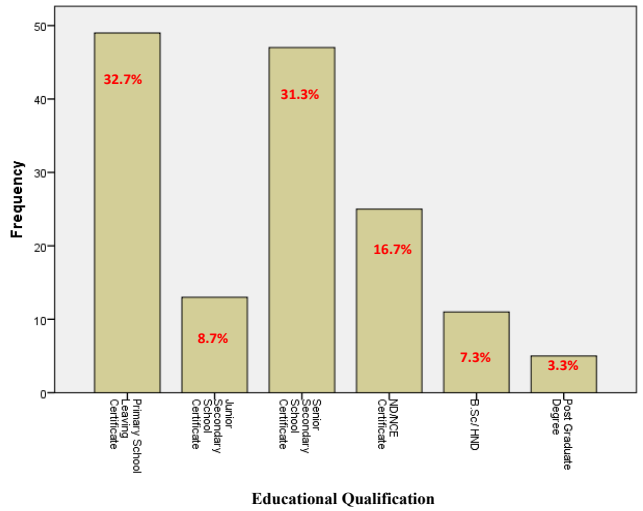

Figure 11: Distribution of respondents' highest educational qualification (bread bakers).

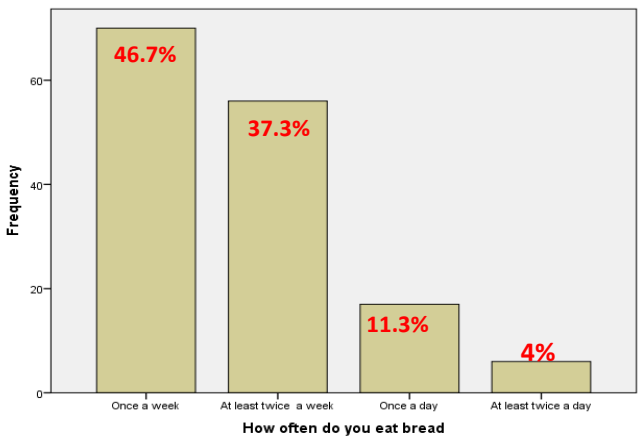

Figure 12: Distribution of respondents' eating of bread (bread consumers).

Figure 13: Respondents' awareness of cassava flour inclusion in bread production (bread consumers).

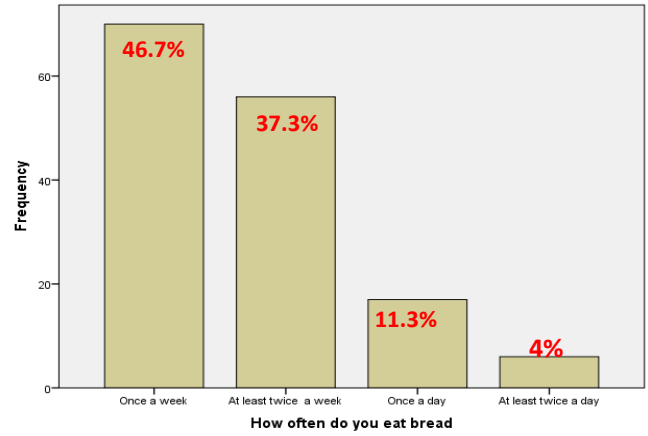

Figure 14: Respondents' identifying cassava bread (bread consumers).

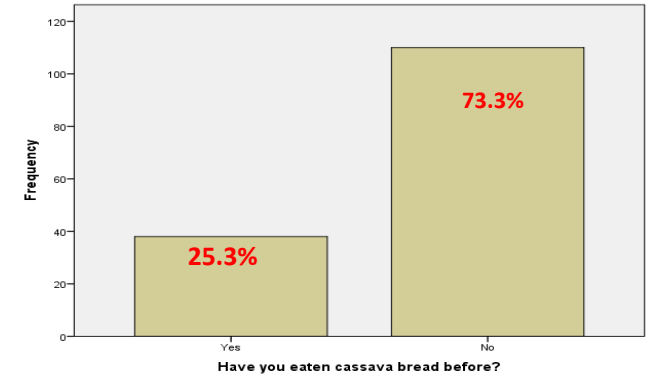

Figure 15: Eating of cassava bread before (bread consumers).

(81.3%) of the bread consumers' highest educational qualifications were tertiary, only 3.3%, 8% and 2% of them had a secondary school certificate, primary school certificate and no educational qualification (informal) respectively. Figure 9 reveals the occupation of the bread consumers. About 45.3% and 26.7% of them were public servants and self-employed respectively. Also, 10.7%, 4.0% and 0.7% of them were traders, artisans, and students respectively.

Figure 10 shows the age distribution of the respondent bread bakers. The majority (54%) of the bread bakers were in the age range of 31-40 years, about 26% were in the age range of 41-50 years while only 11.3% and 8.7% of the bread bakers were in the age range of 20-30 years and above 50 years respectively. Not only that, Figure 11 reveals that majority (94.7%) of the bread bakers were males, while only 5.3% of them were females. Figure 12 reveals that about 90.7% of the respondents were married while 7.3%, 0.7% and 1.3% of the respondents were single, divorced and widowed respectively. In addition, Figure 13 shows that about 32.7% and 31.3% of them had a primary school certificate and senior secondary school certificate respectively. Only 8.7%, 16.7%, 7.3% and 3.3% of the respondents had a junior secondary school certificate, ND/NCE certificate, B.Sc./HND, and Postgraduate degrees respectively.

Awareness of cassava composite flour inclusion in bread production

Awareness of cassava composite flour inclusion in bread production for bread consumers is presented in Figures 14 and 15. Likewise,

		How often do you produce bread?				Total
		Once daily	twice daily	once a week	twice a week	
Have you heard of cassava flour inclusion in bread production?	Yes	114 (78.1%)	31 (21.2%)	1 (0.7%)	-	146 (100.0%)
	No	1 (25.0%)	1 (25.0%)	-	2 (50.0%)	4 (100.0%)
Total		115 (76.7%)	32 (21.3%)	1 (0.7%)	2 (1.3%)	150 (100.0%)

Table 1: Association of awareness of cassava flour inclusion in bread production and how often they produced bread.

	Frequency	Percent
Dangote	16	10.7
Golden Penny	112	74.7
Honeywell	22	14.7
Total	150	100.0

Table 2: Type of wheat flour used in bread production.

		Public Enlightenment (Bakers Association)				Total
		Very High	High	Average	Low	
Have you heard of cassava flour inclusion in bread production?	Yes	53 (36.3%)	65 (44.5%)	23 (15.8%)	5 (3.4%)	146 (100.0%)
	No	-	-	-	-	-
Total		53 (36.7%)	65 (44.2%)	23 (15.6%)	5 (3.4%)	146 (100.0%)

Table 3: Association of awareness of cassava flour inclusion in bread production and public enlightens (bakers association).

		Media(Radio, T.V, Handbill, News Paper					Total
		Very High	High	Average	Low	Very Low	
Have you heard of cassava flour inclusion in bread production?	Yes	5 (3.7%)	19 (14.2%)	35 (26.1%)	59 (44.0%)	16 (11.9%)	134 (100.0%)
	No	-	-	-	-	-	-
Total		5 (3.7%)	19 (14.8%)	35 (25.9%)	59 (43.7%)	16 (11.9%)	134 (100.0%)

Table 4: Association of awareness of cassava flour inclusion in bread production and media (Radio, T.V, Handbill, News Paper) of awareness.

		Seminar / Workshop					Total
		Very High	High	Average	Low	Very Low	
Have you heard of cassava flour inclusion in bread production?	Yes	4 (14.8%)	1 (3.7%)	2 (7.4%)	3 (11.1%)	17 (63.0%)	27 (100.0%)
No		-	-	-	-	-	-
Total		4 (14.8%)	1 (3.7%)	2 (7.4%)	3 (11.1%)	17 (63.0%)	27 (100.0%)

Table 5: Association of awareness of cassava flour inclusion in bread production and medium of awareness (seminar/workshop).

		Have you undertaken any kind of sensitization/training by government on cassava flour?		Total
		Yes	No	
Have you heard of cassava flour inclusion in bread production?	Yes	3 (2.1%)	141 (97.9%)	144 (100.0%)
	No	-	-	-
Total		3 (2.0%)	141 (98.0%)	144 (100.0%)

Table 6: Association of awareness of cassava flour inclusion in bread production and any kind of sensitization/training undertaken by government on cassava flour.

		Have you adopted cassava composite flour in your bread production		Total
		Yes	No	
Have you heard of cassava flour inclusion in bread production?	Yes	1 (0.7%)	145 (99.3%)	146 (100.0%)
	No	-	-	-
Total		1 (0.7%)	145 (99.3%)	146 (100.0%)

Table 7: Association of awareness of cassava flour inclusion in bread production and adoption of cassava composite flour in bread production.

		Level of wheat flour inclusion (%) (100%)	Total
What kind of oven do you use for production?	Brick Oven	114 (76%)	114 (76%)
	Electric Oven	33 (22.0%)	33 (22.0%)
	Gas Oven	1 (0.7%)	1 (0.7%)
	MCADAMS	1 (0.7%)	1 (0.7%)
Total		**149 (99.3%)**	**149 (99.3%)**

Table 8: Association of the kind of oven used for bread production and percentage level of wheat flour inclusion in the bread production.

Tables 1-6 reveals the awareness of composite flour inclusion in bread production and the usage of it by the bread bakers.

Consumers' perspective

Figure 13 presents the bread-eating habit of the respondent bread consumers. About 46.7 and 37.3% of the respondents ate bread once a week and at least twice a week respectively. About 11.3% and 4% of them ate bread once a day and at least twice a day respectively. Figure 14 reveals that about 66.7% of the bread consumers were aware of cassava flour inclusion in bread production while 33.3% of them were not aware of cassava flour inclusion in bread production in the study area. In addition, Figure 14 reveals that only 30.7% of the respondents could identify cassava bread in the study area while the majority (69.3%) could not. Likewise, Figure 15 reveals that only 25.3% had eaten cassava bread out of 30.7% that could identify the cassy bread. About 73.3% of bread consumers reported that they had not eaten the cassy bread before.

Bakers' perspective

Tables 1-6 presents the bakers' perspective on the level of awareness of composite flour inclusion in bread production. Table 1 reveals the association between the awareness of cassava flour inclusion in bread production and how often the bakers produced bread. The majority (78.1%) of the bakers that reported that they were aware of cassava flour inclusion in bread production and stated that they produced bread once in a day. About 21.2% of them reported that they produced bread twice in a day while only 0.7% of them reported that they produced bread once a week. In addition, out of the bakers that reported that they were not aware of cassava bread inclusion in bread production, 25% of them reported that they produced bread once in a day; another 25% produced bread twice daily while about 50% of them reported that they do produce bread twice in a week. Furthermore, Majority (74.7%) of the bread bakers used Golden Penny flour for bread production while 14.7% and 10.7% of them used Honeywell and Dangote flour respectively for bread production in the study area (Table 2).

Table 3 reveals the association between the awareness and the level of public enlightenment (Bakers' Association) about the cassava flour inclusion in bread production. The majority (36.3% and 44.5%) of the bakers reported that the level of the awareness of cassava flour inclusion through public enlightenment was very high and high respectively. Also, the majority (26.1% and 44%) the bakers further responded that the level of awareness of cassava flour inclusion in bread production through media (as shown in Table 4) was average and low respectively. Likewise, in Table 5, the majority (63%) of the bakers reported that the level of awareness of cassava flour inclusion in bread production through seminar/workshops were very low. This study buttresses the view of Okeke [7] about the awareness medium of cassava composite flour in Nigeria Table 6.

Level of compliance with cassy bread initiative among bread bakers, especially, the percentage of substitution and how often the usage of the composite

Table 7 shows the association between the awareness of cassava flour inclusion in bread production and adoption of cassava composite flour in bread production. Few (0.7%) of the respondent bakers had

		Level of Cassava Flour inclusion (%)		Total
		0	5	
What kind of oven do you use for production?	Brick Oven	114 (99.1%)	1 (0.9%)	115 (100.0%)
	Electric Oven	33 (100.0%)	-	33 (100.0%)
	Gas Oven	1 (100.0%)	-	1 (100.0%)
	MCADAMS	1 (100.0%)	-	1 (100.0%)
Total		149	1	150
		99.3%	0.7%	100.0%

Table 9: Association of the kind of oven use for bread production and percentage level of cassava flour inclusion in the bread production.

Factors	Mean
Extent of modification	1.27
Cost of modification	2.83
Availability of cassava flour	1.61
Cost of raw material	2.80
Cost of Operation	2.46
It requires high skilled/Trained labour/Personnel	2.16
Product quality	1.57
Acceptability of finished product	1.57
Production	1.40
1=very low, 2=low, 3=high and 4=very high	

Table 10: Factors influencing the utilization of cassava as an input for bread production.

	EM	CM	ACF	CRM	CO	HSTL	PQ	AFP	P
EM	1.000								
CM	0.031	1.000							
ACF	0.098	0.187*	1.000						
CRM	0.018	0.032	0.181*	1.000					
CO	0.003	0.251**	-0.180*	0.092	1.000				
HSTL	0.048	0.220**	-0.165*	0.055	0.396**	1.000			
PQ	0.162	-0.026	0.022	0.052	-0.067	-0.106	1.000		
AFP	-0.085	-0.090	-0.030	-0.028	0.165*	0.308**	-0.037	1.000	
CBP	0.065	0.068	0.187*	0.151	-0.133	-0.053	0.388**	-0.164	1.000

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).
EM=Extent of modification
CM=Cost of modification
ACF=Availability of cassava flour
CRM=Cost of raw material
CO=Cost of Operation
HSTL=It requires high skilled/ Trained labour/Personnel
PQ=Product Quality
AFP=Acceptability of finished product
CBP=Cassy Bread Production

Table 11: Factors influencing the utilization of cassava as an input for bread production.

adopted the cassava composite flour in their bread production while the majority (99.3%) had not despite their level of awareness of the cassava composite flour. Furthermore, Table 8 shows the association between the kind of oven used for bread production and percentage level of wheat flour inclusion in bread production. The table shows that out of 99.3% of the bakers that used 100% of wheat flour in their bread production, about 76% of them used a brick oven, 22% of them used an electric oven, 0.7% of them used gas oven while 0.7% of them also used MCADAMS. Table 9 reveals the association between the kind of oven used for bread production and percentage level of cassava composite flour inclusion in the bread production. The table reveals that only 0.7% of the respondents (bread bakers) used 5% level of composite flour in their bread production and such bakers used a brick oven for bread production.

Factors influencing the utilization of cassava as an input for bread production

Tables 10 and 11 reveals the factors influencing the utilization of cassava flour inclusion for bread production in the study area. The mean values of the factors influencing cassava flour inclusion in bread production are shown. The extent of modification (1.27) and production (1.40) had a very low effect on the usage of cassava flour inclusion in bread production. Also, availability of cassava flour (1.61), product quality (1.57), the acceptability of finished product (1.57), and requirement of highly skilled/trained labor/personnel (2.16) had low effect on the cassava flour inclusion in bread production. Furthermore, cost of modification (2.83), cost of raw materials and cost of operation (2.46) had a high effect on the cassava flour inclusion in bread production in the study area.

Table 11 shows the magnitude and direction (correlation) of association among factor variables and between the factor variables and response variable (adoption of cassava flour inclusion in bread production). Also, the issue of multicollinearity was put into consideration in the analysis of factors influencing the utilization of cassava flour inclusion in bread production. The table reveals that there was a positive association between cost of modification and availability of cassava flour ($r=0.187$, $p<5\%$), cost of modification and cost of operation ($r=0.251$, $p<1\%$), cost of modification and requirement of highly skilled labour/personnel ($r=0.220$, $p<1\%$), availability of cassava flour and cost of raw materials ($r=0.181$, $p<5\%$), availability of cassava flour and production ($r=0.187$, $p<5\%$), cost of raw materials and requirement of highly skilled labour/personnel ($r=0.396$, $p<1\%$), cost of raw materials and acceptability of finished product ($r=0.165$, $p<5\%$), requirement of highly skilled labour/personnel and availability of finished product ($r=0.308$, $p<1\%$), and product quality and production ($r=0.388$, $p<1\%$). Hence, there was a negative association between availability of cassava flour and cost of operation ($r=-0.180$, $p<5\%$), availability of cassava flour and requirement of high skilled labor/personnel ($r=-0.165$, $p<5\%$). These results corroborated other scholars on the factors inhibiting the cassava flour inclusion in bread production [9-11].

Conclusion and Recommendations

The study concluded that the awareness level of bread consumers in identifying cassy bread was low, and the level of compliance of bread bakers in cassava flour composite in bread production was also low due to the cost attributed to it. The study recommends that government should create suitable platforms that will increase the level of awareness and identification of cassy bread for bread consumers and to formulate relevant policies that would address the factors inhibiting the use of cassava composite in bread production.

Further Studies

1. Studies should consider the specie(s) of cassava with good shelve life for cassy bread in Nigeria
2. Studies should be extended to cover the entire nation on the level of awareness and factors influencing the adoption and usage of cassava flour substitute for bread production.

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