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Socioeconomic Factors Influencing Consumption of Bio-fortified Cassava/Sorghum-based Complementary Foods in Ogun State, Nigeria

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Abstract

The study assessed the socioeconomic factors associated with consumption of bio-fortified cassava and sorghum-based complementary foods for children under 5 years in Ogun State. A multistage and purposive sampling procedure was used to select 227 rural nursing mothers for the study. Primary data were obtained using structured interview guide. The data were analysed using descriptive and inferential statistics. The mean age of mothers and children were 30 ± 8.60 years and 14 ± 4.35 months, respectively. About 86.6% were not aware of the existence of bio-fortified cassava flour. There were significant associations ($p < 0.05$) between nursing mothers' family types ($\chi^2 = 8.97$), ethnicity ($\chi^2 = 12.14$), educational status ($\chi^2 = 13.39$), years of formal education ($r = 0.176$), average weekly income ($r = 0.99$), total size of cultivated farmland ($r = 0.003$) and food consumption frequency. The type of occupation, ethnicity, level of awareness and frequency of extension contacts were found as significant (at 5%) determinants of decision to consume bio-fortified cassava and sorghum-based complementary food. Most of the respondents were willing to consume bio-fortified cassava/sorghum flour, if available. Hence, bio-fortified cassava/sorghum-based complementary foods are desirable in alleviating child malnutrition in Ogun State.

Keywords: Bio-fortified cassava, Rural women, Food consumption, Child nutrition

Introduction

Complementary foods are given to children with the prime purpose of meeting their increased demand for nutrients. There are great concerns about the nutritional adequacy of common traditional complementary foods given to children in developing countries, such as Nigeria (Oyarekua, 2009; Amagloh *et al.*, 2012; Onoja *et al.*, 2014). Inadequate complementary feeding has been reported to negatively impact on the cognitive, psychomotor and affective domains of children, as well as attainment of full potential in life (Amagloh *et al.*, 2012). Most malnutrition cases among under-five have been linked to inadequate complementary feeding (Semahegn *et al.*, 2014). Most families in developing countries are unable to supply their children nutritionally-adequate complementary foods due to poverty and ignorance about how to properly utilise available food commodities for this purpose.

Traditional risk factors such as poor nutrition, parental disadvantage and illness, poverty and social inequality contribute to child malnutrition (Ubesie and Ibeziakar,

2012). Other important factors which affect complementary feeding are education and age of mother, type of family, profession of father and mother, and lack of knowledge regarding ideal feeding practices (Chapagain, 2013; Holambe and Tharkar, 2014; Semahegn *et al.*, 2014). In addition, mother's motivation in feeding their children, barriers to feeding, the foods mothers offered their children are other important factors in complementary feeding practices (Egyir *et al.*, 2016).

Cassava (*Manihot esculenta* Crantz) is a major food crop in Nigeria. Vitamin A-biofortified cassava is a timely intervention to alleviate the endemic problem of vitamin A deficiency in the Country. Cassava has about 1-3% protein, thus underscoring the need to supplement it with other suitable crops (Oluranti *et al.*, 2015). Sorghum (*Sorghum bicolour* [L] Moench), the fifth most important cereal crop in the world next to wheat, rice, maize, and barley in terms of production, is desirable for attaining food security by sub-Saharan countries (Tizazu *et al.*, 2011). Sorghum is, however, relatively low (9%) in protein (Onoja *et al.*, 2014). Soybean (*Glycine* max) is a commonly grown legume among Nigerian farmers. Pigeonpea is an underutilised drought-resistant legume and a cheap source of protein. The protein content of soybean and pigeonpea are 40% and 17-30%, respectively (Odeny, 2007; Onoja *et al.*, 2014), thus making them appropriate crop for enriching either cassava or sorghum-based complementary foods. The general objective of the study was to assess the socioeconomic factors influencing consumption of bio-fortified cassava/ sorghum-based complementary foods among children under five in Ogun state.

The hypotheses of this study were stated in null form as follows: Ho_1**:** There is no significant association between respondents' socio-economic characteristics of respondents and food consumption characteristics; and $Ho_{3:}$ Adoption of yellow flesh cassava complementary food is not significantly related to respondents' socioeconomic characteristics.

Methodology

A multistage sampling procedure was used for selecting respondents for this study. Out of the 20 Local Government Areas (LGA) in Ogun State, two were purposively selected, namely Abeokuta North LGA and Ewekoro LGA. This was based on the concentration of cassava farmers in the area. The second stage involved the simple random selection of Ilewo-Orile and Ibara-Orile communities from Abeokuta North while Kere, Wasimi and Papalanto were selected from Ewekoro LGA. Simple random sampling technique was used to select 63 rural nursing mothers from Kere, 28 from Wasimi, 47 from Ilewo-Orile, 43 from Ibara-Orile and 46 rural nursing mothers from Papalanto. Thus, a total number of 227 rural nursing mothers were interviewed for this study.

A validated structured interview guide by the professionals in the field of Agricultural Extension, Agricultural Administration and Food Science and Technology was used to elicit information from the respondents. Also, a reliability test was conducted using 30 rural nursing mothers that were not included in the study sample. A Cronbach-alpha test of internal consistency was conducted with reliability coefficients of 0.88. Attitude of respondents to food consumption characteristics was measured on the scale

of SA, A, D, and SD. The frequency of food consumption was ascertained using a rating scale of thrice a day (3), twice a day (2) and once a day (1) on a total of 52 food items. Food consumption characteristics were measured using a Likert scale of strongly agree (5), agree (4), undecided (3), disagree (2) and strongly disagree (1) on a total of 9 items. Production and consumption of target crops were determined using an adoption scale of not aware (0), aware (1), interest (2), evaluation (3), Trial (4) and adoption (5). Frequency of consumption of cassava products was measured using a 3-point rating scale of regularly (3), occasionally (2) and never (1) with a total of 10 items. Data were analysed using frequency counts, percentages, means, Pearson Product Moment Correlation (PPMC), Chi-square test, Analysis of Variance (ANOVA) and Logit model to determine the respondents' decision to adopt bio-fortified cassava. The use of logit model for this analysis is consistent with the literature on adoption (Afolami *et al.*, 2015; Alston *et al*., 1995) which describes the process of decision to consume as taking on a logistic nature. Hence, the logistic model selected for this study follows Pindyck and Rubinfeld (1998).

Results and Discussion

Socio-economic characteristics of the respondents

The socioeconomic characteristics of the respondents presented in Table 1 show that 52.9% of the respondents were between 21 and 30 years of age while 31.3% of them were between 31 and 40 years of age. The mean age of the respondents was found to be 30±8.60 years. This implies that the respondents in the study area were still young and should have the potential to adopt technology disseminated to them since Ogunwale (1998) reported a positive and significant correlation between age and adoption of innovation. Also, the result revealed that majority (74.0%) of the rural mothers were nursing babies who were less than 23 months old and the mean age of the babies were 14±4.35 months. This is an indication that the majority of the respondents were nursing mothers having 1 or more children in the study area.

Furthermore, findings revealed that most (63.0%) of the respondents have 3 or less children, while 33.0% of the respondents had between 4–6 children. The mean number of children (children size) was 3. The result also shows that both sexes of children were dominant in the study area, that majority of these children were less than 5 years. Meanwhile, majority (94.3%) of the respondents were married while few (4.4%) were single mothers and 1.3% were separated (Table 1).

Further on socioeconomic profile of the respondents, findings revealed that most (71.8%) of the respondents belong to monogamous type of family while 28.2% of the respondents belong to polygamous type of family. Most (77.5%) of the respondents were Christians while 23.8% and 0.4% were Muslims and Traditionalists respectively. This contradicts Jibowo (1992) who reported that traditional religion is the most prevalent among rural inhabitants of the various states in Nigeria. The finding corroborates Adamu *et. al.* (2008) who reported that over 80% of rural women farmers in Southwest Nigeria were Christians. Majority (85.0%) of the respondents earned ₦5,000 or less on weekly basis while 10.6% earned between

Table 1: Distribution based on the personal characteristics of the respondents (n = 227)

Variables	Frequency	Percentage	Mean (S.D)
Age of Mothers (Years)			
≤20	22	9.7	
21-30	120	52.9	30 years (±8.60)
31-40	71	31.3	
41-50	13	5.7	
51 & above	1	0.4	
Age of Baby (Months)			
0-23	168	74.0	
24-35	23	10.1	14Months (±4.35)
36 & above	36	15.9	
No of Children			
≤3	143	63.0	
4-6	75	33.0	3children
7 & above	9	4.0	
Children under 5year (Male)			
≤3	193	96.5	
4-6	3	3.0	1child
7	1	0.5	
Children under 5years (Female)			
≤3	182	91.0	
4-6	1	0.5	1child
Marital Status			
Married	214	94.3	
Single Mother	10	4.4	
Separated	3	1.3	
Family types			
Polygamous	64	28.2	
Monogamous	163	71.8	
Religion			
Christianity	176	77.5	
Islam	50	22.0	
Average Income/day			
≤5,000	193	85.0	
N5,100-10,000	24	10.6	
N10,100-15,000	2	0.9	?5,060 (±475)
N15,100-20,000	2	0.9	
N21,000 & above	6	2.6	

S.D = Standard deviation; Source: Field work, 2014

₦5,000 and ₦10,000 on weekly basis from their occupations. Hence, they were mostly low income earners and this could affect the consumption of bio-fortified cassava/sorghum based complementary foods.

Attitude of Respondents to Food consumption Activities

On the note of attitudinal disposition of the respondents, Table 2 reveals that about 99.6% of the respondents agreed that taking balance diet promotes good health. This shows that the respondents in the study area were well knowledgeable on the importance of adequate diet for the promotion of good health. Most (99.2%) of respondents believed that no amount spent on food was economically wasted. This reveals that a very high premium is placed on food consumption by the respondents. This result reveals that the respondents possessed the right disposition to food.

Adoption of Production and Consumption of target crops

The results on Table 3 show that majority (86.6%) of the respondents were not aware of production of yellow-flesh cassava. Out of the respondents that were aware of the production of yellow flesh cassava flour, 3.5% of the respondents had developed interest in its production, 0.9% were on evaluation stage, while 0.4% of the respondents had developed trials and adopted it. Most (90.8%) of the respondents were aware of the use of sorghum in feeding babies. However, 30.0% of the respondents who were aware of the use of sorghum in feeding babies had developed interest in its use as baby food, 25.6% were on the evaluation stage while 26.4% had adopted it to feed their babies. About 50% of the

Table 2: Attitude of Respondents to Food consumption Activities (n = 227)

Statements	SA	A	U	D	X	SD
Adequate diet is eating of varieties of meals from different food groups to meet nutritional needs						
Taking adequate diet promotes good health	175 (77.1)	51 (22.5)	-	1 (0.4)	-	4.72
I believe no amount spent on food is economically wasted	140 (61.8)	85 (37.4)	-	1 (0.4)	1 (0.4)	4.54
I believe food eaten reflects the state of health of individuals	130 (57.3)	96 (42.3)	-	1 (0.4)	-	4.51
Good food taken reduces sickness	132 (58.2)	91 (40.1)	1 (0.4)	3 (1.3)	-	4.50
We believe no food is culturally/religiously prohibited	88 (34.8)	82 (36.1)	11 (4.8)	41 (18.5)	5 (2.2)	3.81
Spending much on food are counted waste by some members of the family	71 (31.3)	60 (26.4)	13 (5.7)	78 (34.4)	5 (2.2)	3.36
Households in this community make adequate diets their priority	85 (37.3)	88 (38.8)	9 (4.0)	41 (18.1)	4 (1.8)	3.78
Adequate diets are too expensive to attain	67 (29.6)	87 (38.3)	10 (4.4)	50 (22.0)	13 (5.7)	3.80
Preparation of adequate diet is too stressful for the food manager	67 (29.6)	87 (38.3)	10 (4.4)	50 (22.0)	13 (5.7)	3.50

SA= strongly agree; A= agree; U= undecided; D= disagree. Values in parentheses are percentages
Source: Field survey 2014

Table 3: Adoption of Production and consumption of target Crops (n = 227)

Innovations	Not Aware	Awareness	Interest	Evaluation	Trial	Adoption
Production of yellow-fleshed cassava flour	197 (86.6)	25 (11.0)	8 (3.5)	2 (0.9)	1(0.4)	1 (0.4)
Use of sorghum in feeding	34 (15.0)	172 (75.8)	68 (30.0)	58 (25.6)	60 (26.4)	60 (26.4)
Use of pigeon pea flour	106 (46.7)	88 (38.8)	22 (9.7)	22 (9.7)	22 (9.7)	32 (14.1)

Values in parentheses are percentages; Source: Field work, 2014

respondents were not aware of the use of pigeon pea in feeding children while 14.1% had adopted the use of pigeon pea flour in feeding their children. Table 3 therefore reveals that there is need to create awareness about yellow flesh cassava and pigeon pea as food crops for complementary feeding.

Test of association between socio-economic characteristics and their food consumption characteristics

This result of the hypothesis "there is no significant association between socio-economic characteristics of respondents and their food consumption characteristics" was tested using Chi-square test (χ^2) analysis and the result presented in Table 4. The socio-economic characteristics considered were marital status, family types, religion, occupation, ethnicity and education status. The Chi-square test analysis shows that there were significant association ($P > 0.05$) between respondents family type ($\chi^2 = 8.970$), ethnicity ($\chi^2 = 12.141$) and educational status ($\chi^2 = 13.399$). Table 6 also shows that there were no significant association between marital status ($\chi^2 = 2.824$), religion ($\chi^2 = 0.969$), occupation ($\chi^2 = 3.373$) and their food consumption characteristics. Respondents from polygamous setting are likely to consume more food than their counterpart from monogamous family setting. Ethnic group also determine the types of food consumed. Therefore, the family type, ethnicity and educational status of the respondents (Nursing mothers) determine their food consumption characteristics.

Test of association between socio-economic characteristics and food consumption frequency

The hypothesis "there is no significant association between socio-economic characteristics of respondents and their food consumption frequency" was tested using PPMC and the result was presented in Table 5. The variables considered were age of mother, household size, numbers of children under 5 years, years of formal education, average weekly income and total size of cultivated farmland. The correlation analysis shows that there were significant ($P > 0.05$) association between years of formal education ($r = 0.176$), average weekly income ($r = 0.099$), total size of land cultivated ($r = 0.063$) and food consumption frequency.

The fact that only years of formal education, average weekly income and total land size cultivated were significant shows that the educational level of the respondents (nursing mother) will help them ascertain which food is good for their nursing babies.

Table 4: Test of association between socio-economic characteristics and food consumption characteristics

Variables	Chi-square	Df	P-value	Decision
Marital Status	2.824	2	0.244	NS
Family Types	8.970	1	0.003	S
Religion	0.969	1	0.325	NS
Occupation	3.373	5	0.643	NS
Ethnicity	12.141	4	0.016	S
Educational status	13.399	6	0.037	S

P-value is significant at the 0.05 level; NS = Not significant; S = Significant; all variables are measured at Nominal and ordinal level. Source: Field survey, 2014

Table 5: Correlation test of significance between socio-economics and frequency of food consumption

Variables	r	p-value	Decision
Age of mother	0.021	0.79	NS
Household size	0.135	0.092	NS
No of children under 5 years	0.109	0.203	NS
Years of Residence	0.12	0.889	NS
Years of formal education	0.176*	0.049	S
Average weekly income	0.99*	0.014	S
Total size of cultivated farmland	0.003*	0.05	S

* is significant at 0.05 level; NS = Not significant; S = Significant; r = correlational value
Source: Field survey, 2014

A large farm size enables the nursing mothers to cultivate enough crops while insufficient income could also affect the quality of food consumed and hence has implication on their health.

Socio-economic Determinants of Decision to Consume Bio-fortified Cassava/ sorghum based Complementary Foods

The factors that influenced the adoption of YFC were examined using the binary logistic regression model. The likelihood estimates of the logit model indicated that the Chi-square statistic of 213.89 was highly significant ($p<0.01$) suggesting that the model has a strong explanatory power. The pseudo coefficient of multiple determinations (R^2) shows that 70% of the variation in respondents' decision to adopt bio-fortified complementary foods in the study area was collectively explained by the independent variables (Table 6). The main occupation of the respondents had a

Table 6: Logit regression showing the effects of respondents socio-economic characteristics on bio-fortified cassava/sorghum based complementary foods

Variable	Coefficient.	Standard Error	P>|z|	Marginal effect
Age of mother	0.0461	0.0493	0.350	0.009
Years of education of mother	-0.7757	0.6930	0.263	-0.1704
Main occupation	-0.2735*	0.1631	0.093	-0.0578
Household size	-0.5340	0.6178	0.387	-0.1153
Ethnicity	1.5822**	0.7954	0.047	0.2758
Year of residence	-0.0279	0.03801	0.463	-0.0059
Farm size	-0.0058	0.0668	0.931	-0.0012
Level of awareness of yellow fleshed cassava	1.5677*	0.8264	0.058	0.3689
Level of income	-0.4143	0.7904	0.600	-0.0881
Frequency of extension contact	6.1272***	08128	0.000	0.9099
Constant	-3.3345	1.6953	0.049	
Number	227			
LR $Chi^2(10)$	213.89			
Prob>Chi2	0.0000			
Log-Likelihood	-45.497			
Pseudo R-Square	0.7015			

***= (P<0.01) Significant at 1 percent, **= (p<0.05) Significant at 5 percent, *= (p<0.1) Significant at 10 percent

Source: Field work, 2014

negative significant coefficient ($p < 0.1$) on decision to consume bio-fortified cassava/sorghum based foods in the study area. This suggests that respondents who are farmers are less likely to consume than the non-farmers.

The results of the marginal effect showed that ethnicity of the respondents (those that are the Yoruba) has a likelihood of increasing consumption of bio-fortified cassava/sorghum based complementary foods by 2.75 percent times than others who are not. Similarly, the level of awareness of the respondents on bio-fortified cassava/sorghum based foods complementary foods increases the consumption level by 3.7 percent while extension contact increases the livelihood of the respondents to consume by 9.1 percent.

Conclusion and Recommendations

Based on the results of the study, it is concluded that food consumption frequency and characteristics are determined by respondents' years of formal education, weekly income and size of farm cultivated. Food availability is positively associated with food consumption frequency. Along the same line, adoption of yellow flesh cassava is associated with respondent's ethnicity and average weekly income. Most of the respondents in the study area are willing to consume yellow flesh cassava/sorghum flour provided they are readily available at their disposal. The type of occupation, the ethnicity, level of awareness of yellow flesh cassava and frequency of extension contacts were the major determinants of consumption of yellow flesh cassava in the study area. The study therefore recommends that the educational status of mothers be boosted as a way of ensuring adequate empowerment of rural women for improved food consumption. More awareness on yellow flesh cassava is recommended in order to improve not only the level of adoption but also the decision to consume the product. The study also recommends that extension agents and health workers should make bio-fortified cassava available to rural nursing mothers in order to eradicate the occurrence of malnutrition in Ogun State.

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References

Adamu, C.O., Awotunde, J.M. and Sodiya, C.I. (2008): Women farmers perception of constraints to increased crop production in Oyo State. ASSET Series C 3(1): 53-61.

Afolami, C.A., Obayelu, A.E. and Vaughan, I.O. (2015): Welfare impact of adoption of Improved cassava varieties by rural households in South Western Nigeria. Agricultural and Food Economics 3(1):1-17.

Alston, J., Norton, G. and Pardey, P. (1995): Science under scarcity: Principles and practice for agricultural research evaluation and priority setting. Cornell University Press, Ithaca, NY, 624p.

Amagloh, F.K., Weber, J.L., Brough, L., Hardacre, A., Mutukumira, A.N. and Coad, J. (2012):

Complementary food blends and malnutrition among infants in Ghana: A review and a proposed solution. Scientific Research and Essays 7(9): 972-988.

Babbie, E. (2009). The basics of social research. 5th Edition. Wadsworth Cengage Learning, Australia, 576 p.

Chapagain, R.H. (2013): Factors affecting complementary practices of Nepali mothers for 6 months to 24 months children. Journal of Nepal Health Research Council 11(24): 205-207.

Egyir, B.K., Ramsay, S.A., Bilderback, B. and Safali, S. (2016): Complementary feeding practices of mothers and their perceived impacts on young children: Findings from KEEA district of Ghana. Maternal Child Health Journal 20(9): 1886-1890.

Holambe, V.M. and Thakur, N.A. (2014): Factors affecting late introduction of complementary food: A Kaplan Meir analysis. National Journal of Community Medicine 5(1): 140-143.

Odeny, D.A. (2007): The potential of pigeonpea (*Cajanus cajan* (L.) Millsp.) in Africa. Natural Resources Forum 31: 297–305.

Oluranti, O.M., Badejo, A.A. and Fagbemi, T.N. (2015): Processing effects on the total carotenoid content and acceptability of food products from cultivars of biofortified cassava (*Manihot esculenta* Crantz). Applied Tropical Agriculture 20 (2):104-109.

Onoja, U.S., Akubor, P.I., Gernar, D.I., Chinmma, C.E. (2014): Evaluation of complementary food formulated from local staples and fortified with calcium, iron and zinc. Journal of Nutrition and Food Sciences 4: 326. doi: 10.4172/2155-9600.1000326.

Oyarekua, M.A. 2009: Co-fermentation of cassava/cowpea/carrot to produce infant complementary food of improved nutritive quality. Asian Journal of Clinical Nutrition 1(3): 120 - 130.

Ogunwale, A.B. (1998): Socioeconomic factors associated with the adoption of alley farming Technology in Osun State. Ph.D. Thesis. Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria.

Pindyck, R.S. and Rubinfeld, D.L. (1998): Econometric models and economic forecasts. 4th Edition. McGraw-Hill, Singapore. 630p.

Semahegn, A., Tesfaye, G. and Bogale, A. (2014): Complementary feeding practice of mothers and associated factors in Hiwot Fana specialised hospital, Eastern Ethiopia. Pan African Medical Journal 18:143.doi: 10.11604/panj.2014.18.143.3496.

Tizazu, S., Urga, K., Belay, A., Abuye, C. and Retta, N. 2011: Effect of germination on mineral bioavailability of sorghum-based complementary foods. African Journal for Food, Nutrition and Development 11(5): 5083-5095.

Ubesie, A.C. and Ibeziakar, N.S. (2012): High burden of protein-energy malnutrition in Nigeria:beyond the health care setting. Annals of Medical Sciences Research 2(1): 66-69.