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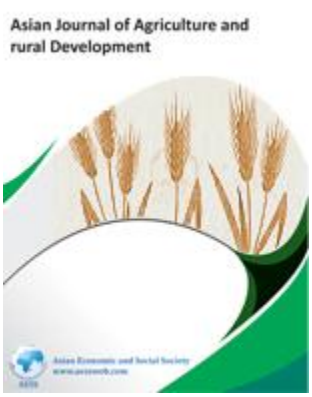

Consumer Preference for Processed Cowpea Products in Selected Communities of the Coastal Regions of Ghana

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Abstract

The nutritive value of cowpea as an essential source of protein to supplement carbohydrate diets has long been recognized. Its role as a subsidiary crop to be relied on during the "hungry season" and during times of food shortages, drought, inflation and the subsequent erosion of the consumer's purchasing power, particularly among the urban poor, makes it a crop of choice by housewives who look for nutritious but cheaper sources of food. This paper sought to investigate consumer preference for processed cowpea-based products, such as, boiled cowpea with cereals, fried cowpea paste, and cowpea fortified maize dough in selected communities of the coastal regions of Ghana. Using descriptive statistics, Kendall's Coefficient of Concordance, and Logit Model, it was found that there was high preference for processed cowpea-based products in all the communities studied; and that processing cowpea into various food types was relatively profitable. Key socio-economic factors and consumer characteristics that influence preference include gender, marital status, income, education, product taste, sustainability of products (satisfying) and product availability. The production of gas (flatulence) after consumption of the products was the most pressing factor that influences preference. Unavailability of the products was identified as the least pressing factor. The researchers recommend that the production and utilization of cowpea in the study area and in other parts of Ghana should be encouraged as it would help to both improve the nutritional status of consumers and also help generate income to producers and processors. There should also be further research into the disliking intrinsic characteristics of the products considered.

Keywords: Consumer Preference, Cowpea Products, Coastal Regions, Ghana

Introduction

Among the most difficult problems confronting the world communities since the history of humankind have been those of food shortages and diet deficits. It is estimated that, more than 800 million people in developing countries, including Ghana, are undernourished and the total gram of protein consumption per day is low in these countries as compared to the developed countries. For example, Ghana consumes 49.6 g/day, as compared to the USA (112.5g/day), (FAO, 1996). Protein energy malnutrition as assessed by physical growth and body measurement is still widespread throughout Ghana (NNS, 1986). Many consumers spend a greater proportion of their income on food, but they still remain malnourished, lacking in the required protein-calorie level needed for effective development and proper growth of the body.

Cowpeas have been identified as containing adequate levels of protein to help curb the problem of protein malnutrition. Because of their nutritive value, cowpeas have been identified as good vehicles for combating protein calorie malnutrition in Ghana (Sefa-Dedeh, 1993). It has been documented that over 80% of mothers in Ghana use cowpea to prepare infant foods and family diets (Mensa-Wilmot et al., 2001). Nevertheless, the preference for cowpeas is highly variable among consumers. Amegatse (1995) identified some of the mitigating factors against increased utilization of cowpea as: the hard-to-cook defect, high fuel consumption, prolonged cooking time, and characteristics of beany flavor and indigestion.

Cowpeas can be processed into many local low-cost, but highly nutritious ready-to-eat or partially made foods such as: fried cowpea paste (*Akla / Kosai*); boiled cowpea with gari (*Bobo / Yo'kɛ' Gari*); boiled cowpea

and rice (*Waakye*); steamed cowpea paste (*Alele* / *Tubani*), and cowpea fortified maize dough (CFMD). Such products if acceptable and affordable by a broader section of the population will be an important contribution to improving the lives and health of the people of Ghana and elsewhere.

The main objective of the study therefore was to investigate consumer preferences for cowpea-based products in selected communities of the coastal regions of Ghana. The specific objectives of the study were to: determine the size, distribution, and level of preference for cowpea/cowpea-based products; identify the factors that influence the preference for these products; analyze the effect of the factors that influence the preference for the products; and evaluate the financial benefit of processing cowpeas in the study area.

Methodology

Study Area

Six communities, namely; Akatsi (Volta region–V/R), Nima and Madina (Greater Accra region-GAR), Winneba (Central region–C/R), and Abuadze and Takoradi (Western region–W/R) of Ghana were the study area. The choice of these locations was based primarily on the fact that, the Bean/Cowpea Collaborative Research Support Project (CRSP), of which the study was part, undertook some preliminary studies at the locations and additional social-economic information was needed for further studies in those localities. The communities are densely populated and many inhabitants are migrants who are engaged in commercial activities. Majority of the people have their daily meals outside the home (food-away-from-home). The importance of cowpea, with its high nutritive value, has therefore, made it possible for cowpea-based food processors/sellers to occupy a sizeable portion of the food market in the study area.

Type and Source of Data

Both primary and secondary data were used for the study. Two types of questionnaires (for consumers and cowpea processors) were used to obtain data for the study. A total of 166 consumers and 135 cowpea processors were interviewed. The purposive and simple random sampling techniques were used to select the respondents.

Analytical Methods

Descriptive statistics such as frequency tables and percentages were used to analyze the size, distribution, and level of preferences for cowpea and cowpea-based products in the communities of the study area. Kendall's Coefficient of Concordance (**W**) analysis was used to rank the items identified as constraints/problems against the preference for the cowpea-based products into the most pressing to the least pressing (Mattson, 1986). The degree of agreement of the rankings by the consumers was then measured. **W** ranges from 0 to 1. In deriving **W**, let T, represents the sum of ranks for each constraint/problem being ranked (socio-economic factors and product characteristics). The variance of the sum of ranks is given by:

$$Var_T = \frac{\sum T^2 - \left(\sum T\right)^2 / n}{n} \quad (1)$$

The maximum variance of T is given by:

$$m^2\left(n^2 - 1\right)/12 \quad (2)$$

Where *m* is the number of consumers and *n* is the number of constraints/problems. The formula for (**W**) is then given by:

$$W = \frac{(\sum T^2 - \left(\sum T\right)^2 / n)/n}{m^2\left(n^2 - 1\right)/12} \quad (3)$$

This simplifies to the computational formula for **W** as:

$$W = \frac{12\left[\sum T^2 - \left(\sum T\right)^2 / n\right]}{nm^2\left(n^2 - 1\right)} \quad (4)$$

In this study, **n** includes elements like product taste, product scent, gas production (flatulence), product price, unavailability of the products, mode of presentation, and ignorance about nutritive value of products.

Hypothesis: $\mathbf{H_0}$**:** there is no agreement between the rankings of the influencing factors, and $\mathbf{H_1}$**:** there is agreement between the rankings of the influencing factors. **W** was tested for significance in terms of the *F* distribution, given by: ((m - 1)*Wc) / (1 – Wc), with (n-1) - (2/m) degrees of freedom for the numerator and (m-1)*((n-1)-(2/m)) degrees of freedom for the denominator (Edwards 1964). The Logit model, based on the cumulative logistic probability function was used to analyze the effect of factors that influence the consumer's preference for the cowpea products (Pindyck and Rubinfeld, 1991). The dependent variable is dichotomous or binary choice, having two options of preference and non-preference for processed cowpea products. The Logit model was specified as follows:

$$Pi = F(Zi) = F(\alpha + \beta Xi) = 1/1 + e^{-Zi} = 1/1 + e^{-(\alpha + \beta Xi)} \quad (5)$$

where, *e* is the base of natural logarithms, which is approximately equal to 2.718. *Pi* is the probability that the consumer will make a certain choice, given *Xi*, the products characteristics and socio-economic characteristics of the consumer.

Estimation of the Logit model

Both sides of equation (5) are multiplied by $1+e^{-Zi}$ to get:

$$\left(1+e^{-Zi}\right) Pi = 1 \qquad (6)$$

Equation (6) is divided by *Pi*, and then 1 subtracted from it to get:

$$e^{-Zi} = \frac{1}{Pi} - = 1 - Pi / Pi \qquad (7)$$

By definition, however, $e^{-Zi} = 1/e^{Zi}$ so that:

$$e^{Zi} = \frac{Pi}{1-Pi} \qquad (8)$$

By taking the natural logarithm of both sides we get:

$$Zi = \log\frac{Pi}{1-Pi} \quad \text{Or} \quad \log\frac{Pi}{1-Pi} = Zi = \alpha + \beta Xi$$

(from equation (5) (9)

The dependent variable in the regression equation is the logarithm of the odds that, a particular choice would be made. Since P_i is the probability of consumer preference for processed cowpea-based products, (1-P_i) is the probability of non-preference for processed cowpea-based products. P_i / (1-P_i) is the odds ratio in favor of preference for processed cowpea-based products. Socio-economic characteristics of the consumer (sex, age, household head, household size, income, educational level, marital status, and occupation) and product characteristics (scent, taste, nutritive and economic value, sanitary and health related issues) served as the explanatory variables. From equation (9), the Logit model for this study is given by:

$$Log\ (P_i/I\text{-}P_i) = \beta_0 + \beta_1 SEX_i + \beta_2 AGE_i + \beta_3 HHHD_i + \beta_4 HHSZ_i + \beta_5 INCOM_i + \beta_6 EDUC_i + \beta_7 MST_i + \beta_8 OCCU_i + \beta_9 Pp_i + \beta_{10} NUTR_i + \beta_{11} SUST_i + \beta_{12} TASTE_i + \beta_{13} SCENT_i + \beta_{14} CHPDT_i + \beta_{15} GAS_i + U_i \qquad (10)$$

Subscript $_i$ is the ith observation, P_i is the probability that the *ith* consumer has a preference for the product given X_i. SEX_i is Gender of the *ith* Consumer (male = 1, female = 0); AGE_i is Age in years; $HHHD_i$ is Household Head (head = 1, otherwise = 0); $HHSZ_i$ is Household Size; $INCOM_i$ is Income level in Ghanaian Cedis/month; $EDUC_i$ is Educational Level (Dummy: Primary = 1, otherwise = 0; J.S.S. = 1, otherwise = 0, etc.); MST_i is Marital Status (Dummy: Married = 1, otherwise = 0; Single = 1, otherwise = 0; etc.); $OCCU_i$ is Occupation (Dummy: Self employed/businessperson = 1, otherwise = 0; etc); Pp_i is Price of Products in Ghanaian Cedis; $NUTR_i$ is Nutritive Value of Product (Nutritious (protein content) = 1, otherwise = 0); $SUST_i$ is Sustainability of Product (sustainable =1, otherwise =0); $TASTE_i$ is Product Taste (tasty/delicious = 1, otherwise = 0); $SCENT_i$ is Product Scent (like scent = 1, otherwise = 0); $CHPDT_i$ is Affordability of Product (cheap = 1, otherwise = 0); GAS_i is Gas content/flatulence (gaseous = 1, otherwise = 0); β_i = the vector of estimated coefficients; and U_i = the error term.

The a-prior expectations were:

$\beta_1 > 0$, $\beta_2 < 0$ $\beta_3 < 0$, $\beta_4 < 0$, $\beta_5 < 0$, $\beta_6 < 0$, $\beta_7 > 0$, $\beta_8 > 0$, $\beta_9 < 0$, $\beta_{10} > 0$, $\beta_{11} > 0$, $\beta_{12} > 0$, $\beta_{13} > 0$, $\beta_{14} > 0$, $\beta_{15} < 0$.

The Z statistics was used to measure the level of significance for each of the estimated coefficients. The goodness of fit statistics given is the Mc-Fadden R-squared. The likelihood-ratio (LR) test was computed to determine the joint significance of the independent variables in the model. The LR test statistics followed a standard chi-square (X^2) distribution with the degrees of freedom equal to the number of independent variables used in the model. The higher the percentage of the prediction, the greater is the predictive power of the model. The discussion results were based on the log-odds ratio.

The profitability of processing cowpea into various products was evaluated using profit margin analysis. The analysis, a financial ratio, was aimed at measuring how efficient the cowpea processors use their assets in their operations (Ross et al. 2001). This is given by the net income divided by sales as follows:

$$Profit\ Margin = Net\ Income / Sales \qquad (11)$$

The net income from processing cowpea was computed by finding the difference between the total revenue generated and the total cost of operation per *olonka* (bowl of cowpea of approximately 3kg) per day. Mathematically, the net return was computed as follows:

$$NR = TR - TC \qquad (12)$$

$TR = P_i Q_i$ and $TC = \sum_{1=0}^{n} P_{Xi} X_i$, where *TR* = total revenue generated from sales per day, *Pi* = the price of product, *Qi* = quantity of product produced and sold in a day, *TC* = total cost of operation in a day, *Pxi* = price of inputs, and *Xi* = *i*th input.

All other things being equal, a relatively high profit margin is desirable. This would imply a low expense. Lowering sales price will not usually increase unit volume, but will normally cause profit margins to shrink. Total profit (or more importantly, operating cash flow), may go up or down, so the fact that margins are smaller isn't necessary bad, because, prices may be so low that there may be a loss on everything sold but this is recovered in volume. A positive margin, however, is an indication of profit whereas a negative margin indicates a loss.

Results and Discussion

Results of the study showed that, of the 166 consumers interviewed, approximately 49%, prefer already processed cowpea (ready-to-eat or partial products) and 51% prefer unprocessed cowpea (make-at home products), (Table 1). The preference for cowpea in the various communities showed that majority of consumers in Akatsi (V/R), and Abuadze and Takoradi (W/R) prefer unprocessed cowpea to processed cowpea, but in Nima and Madina (GAR) and Winneba (C/R) the preference is processed cowpea to unprocessed cowpea (Table 2). About the preference for the various cowpea-based products, the results of the study showed that there is a high consumer preference for *Akla/Kosai*, *Bobo/Yo ke Gari*, and *Waakye* compared to *CFMD*, *Alele/Tubani* (Table 3). The frequency of consumption of the various cowpea-based products was found to be twice per week (Table 4).

Table 1: Preference for Cowpea: Processed and Unprocessed (All Communities)

	Processed Cowpea	Unprocessed Cowpea	Total
Frequency	82	84	166
Valid %	49.40	50.60	100

Source: Field Survey, 2004

Table 2: Preference for Cowpea: Processed and Unprocessed (Separate Communities)

	Akatsi (VR)			Nima / Madina (GAR)			Winneba (CR)			Abuadze / Takoradi (WR)		
	Pro	Unpr	**Total**	Pro	Unpr	**Total**	Pro	Unpr	**Total**	Pro	Unpr	**Total**
Freq.	16	23	**39**	23	19	**42**	24	16	**40**	19	26	**45**
V. %	41	59	**100**	55	45	**100**	60	40	**100**	42	58	**100**

Note: Pro. = Processed, Unpr. = Unprocessed, V = Valid.
Source: Field Survey, 2004

Table 3: Preference for Cowpea-Based Products

Product	Frequency	Valid %
CFMD	29	17.47
Akla / Kosai	137	82.53
Bobo / Yo'kɛ' Gari	161	96.99
Waakye	161	96.99
Alele/Tubani	56	33.73

Source: Field Survey, 2004

Table 4: Number of Times of Consumption of Cowpea Products per Week

	ONE	TWO	THREE	FOUR	FIVE	SIX	SEVEN	Total
Freq	30	39	35	23	16	3	14	**160**
Valid %	18.75	24.38	21.88	14.38	10.0	1.88	8.75	**100**

Source: Field Survey, 2004

Table 5 presents the results of the rankings and the degrees of agreement of the rankings, *W*, of the factors that influence the consumer's preference for cowpea and cowpea products. In Akatsi (V/R), the most pressing factor was found to be the presence of foreign matter (such as stones) in the products, and the least pressing factor was testa color of the beans. At Nima and Madina (GAR), the most pressing factor was the presence of foreign matter (such as stones) in the products, and the least pressing factor was ignorance about the nutritive value of the products. At Winneba (C/R), the production of gas (flatulence) was the most pressing factor, and ignorance about the nutritive value of the products was the least pressing factor. At Abuadze and Takoradi (W/R), the most pressing factor was the production of gas (flatulence) and the least pressing factor was unavailability of the products. In aggregate (thus, for all the communities), the production of gas (flatulence) was the most pressing factor, and unavailability of the products was the least pressing factor. The tests of significance in terms of *F distribution* of the degree of agreement or concordance (*W*) between the rankings of

the influencing factors showed fairly low (<50%) degrees of agreement between the rankings for the separate communities and also for the aggregate.

Table 5: Identifying and Ranking of Factors that Influence Preference for Products

Influencing Factors (Problem/Constraint)	RANKING (Separate Communities)				Influencing Factors (Problem/Constraint)	RANKING (All Communities)
	Akatsi (V/R)	Nima/ Madina (GAR)	Winneba (C/R)	Abuadzi/Takoradi (W/R)		
Foreign matter (stones)	1	1	2	2	Gas (flatulence)	1
Damage level (weevils)	4	3	3	3	Foreign matter (stones)	2
Gas (flatulence)	3	2	1	1	Damage level (weevils)	3
Lengthy cooking time	2	4	5	5	Lengthy cooking time	4
Mode of presentation	8	5	4	4	Mode of presentation	5
Price of products	5	6	6	6	Price of products	6
Products scent	6	7	7	7	Products scent	7
Products taste	7	9	11	8	Products taste	8
Size of beans	10	10	8	10	Size of beans	9
Testa color	12	8	9	9	Testa color	10
Ignorance about prodt	8	12	12	11	Ignorance about product	11
Unavail. of product	10	11	10	12	Unavail of product	12
No. of Consumers	**39**	**42**	**40**	**45**	***No. of Consumers***	**166**
Coefficient of Concordance (W)	**0.1375 13.75%**	**0.1868 18.68%**	**0.2035 20.35%**	**0.2880 28.80%**	***Coefficient of Concordance (W)***	**0.1885 (18.85%)**

Source: Authors Computations

The result of the Logit analysis showed that, among the various socio-economic factors of the consumer and products characteristics, sex (gender), income, education, marital status, sustainability (satisfying) of product and taste, influence the consumer's preference for the cowpea products. Sex (males), marital status (single - bachelor/spinster), sustainability and taste exert positive influence on preference for the products, while income and education exert negative influence on the preference for the products (Table 6).

Table 6: Logit Analysis on Factors Influencing the Preference for Cowpea Products

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-1.109004	1.286893	-0.861769	0.3888
Sex	1.203198***	0.432085	2.784629	0.0054
Income	-6.44E-07*	3.63E-07	-1.772922	0.0762
Essec	-1.450965**	0.674059	-2.152579	0.0314
Etert	-2.593890***	0.748859	-3.463791	0.0005
Msing	1.908392***	0.633784	3.011106	0.0026
Sust	1.304174*	0.736504	1.770763	0.0766
Taste	1.348201*	0.721530	1.868530	0.0617
Mean dependent var = 0.475904 S.D. dependent var = 0.500930 LR statistic (15 df) = 66.21596 Probability (LR stat) = 2.09E-08 McFadden R-squared = 0.288222; Obs. with Dep=0: 87 Obs. with Dep=1: 79 Total obs. = 166				

Note: *, **, ***, denotes significance at 10%, 5%, and 1%, respectively. ESSEC = education at secondary level, ETERT = education at tertiary level, MSING = single for marital status, SUST = sustainability (satisfying) of products.

Processing cowpea into the various food types was found to be relatively profitable in the study area. On the average, for every *olonka* of cowpea processed into *Kosai*/*Akla*, processors in all the communities generated ¢26.31 profit for every ¢100.00 sales in a day; ¢36.72 for *yo ke gari* processors; and ¢30.95 for *waakye* processors. However, there were disparities in profits among the various communities (Table 7).

Table 7: Financial Benefit of Processing Cowpea

	Akatsi (V/R)	Winneba (C/R)	Abuadze & Takoradi (W/R)	Nima & Madina (GAR)	Average (ALL Communities)
Akla / Kosai					
	Amount (¢)	*Amount (¢)*	*Amount (¢)*	*Amount (¢)*	*Amount(¢)*
TR/olonka/day	43,000.00	54,049.30	49,295.75	43,173.96	**47,379.75**
TC/olonka/day	35,000.00	41,725.35	35,211.27	27,716.98	**34,913.40**
NR/olonka/day	8,000.00	12,323.95	14,084.51	15,456.98	**12,466.36**
PM/olonka/day	**0.1860 (18.60%)**	**0.2280 (22.80%)**	**0.2857 (28.57%)**	**0.3580 (35.80%)**	***0.2631 (26.31%)***
Yo ke Gari					
	Amount (¢)	*Amount (¢)*	*Amount (¢)*	*Amount (¢)*	*Amount(¢)*
TR/ olonka/day	52,971.00	57,937.21	72,237.88	40,646.25	**55,948.09**
TC/ olonka/day	36,374.93	33,538.73	47,370.89	24,322.82	**35,401.84**
NR/olonka/day	16,596.08	24,398.48	24,866.99	16,323.43	**20,546.25**
PM/olonka/day	**0.3133 (31.33%)**	**0.4211 (42.11%)**	**0.3442 (34.42%)**	**0.4016 (40.16%)**	***0.3672 (36.72%)***
Waakye					
	Amount (¢)	*Amount (¢)*	*Amount (¢)*	*Amount (¢)*	*Amount(¢)*
TR/ olonka/day	139,601.14	79,086.54	92,862.82	63,090.91	**93,660.35**
TC/ olonka/day	87,172.13	60,010.52	62,784.09	48,705.05	**64,667.95**
NR/ olonka/day	52,429.01	19,076.02	30,078.13	14,385.86	**28,962.26**
PM/olonka/day	**0.3756 (37.56%)**	**0.2412 (24.12%)**	**0.3239 (32.39%)**	**0.2280 (22.80%)**	**0.3096 (30.96%)**

Note: TR = Total Revenue, TC = Total Cost, NR = Net Return, PM = Profit Margin. Olonka of cowpea weighs approximately 3kg. Exchange rate: 1 US Dollar = ¢8,775.40 Ghanaian Cedi.

Conclusion and Recommendations

Based on the results of the study, it is concluded that consumers in the study area have different levels and forms of preference for cowpeas. The characteristics of the cowpea products and socio-economic features of consumers also have influence on the level of preference. Key socio-economic factors and consumer characteristics that influence consumer preferences include gender, marital status, income, education, product taste and sustainability (satisfying) of products. The processing cowpea into various food types is also relatively profitable.

Recommendations drawn from the results of the study are that: (1) the production and utilization of cowpea in the study area and in other parts of Ghana should be encouraged as it would help both improve the nutritional status of consumers and also help generate income to cowpea producers and processors; (2) there should also be more research into the disliking intrinsic characteristics of cowpea; and (3) to solve the problem of malnutrition, particularly protein malnutrition, and also improve the living standards of people in the study area and Ghana at large and elsewhere, there is the need for structural development support such as the establishment of an effective producer-processor linkage and an efficient food research and standardization, instead of symptomatic nutrition intervention activities.

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