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Permission

TABLE OF CONTENTS

Survival of the Ayensu Starch Processing Company: A Technical Efficiency Evaluation

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Abstract

The cultivation of cassava is vital for the production of industrial starch by the Ayensu Starch Processing Company in Ghana. The main constraint for starch production has been the unreliability of cassava supply to the factory. This paper estimates technical efficiency of out-growers under the Ayensu Starch Processing Company and identifies sources of efficiency using plot-level data. Stochastic frontier production function was used to estimate the efficiency indices while an econometric analysis of factors affecting the efficiency indices is conducted using the parametric two-step point method. We find that farmers producing cassava are inefficient, with a mean efficiency score of 58% across farms ranging from 2% to 99%. On the basis of the OLS estimation of the determinants of Technical Efficiency, plot size, farm distance and club membership were noted to be negatively significantly related to efficiency while years of farming experience, adoption of hybrid cassava and mono-cropping turned out positively significant. The study recommends that management of the company should negotiate lease of land for the farmers, the road infrastructure should be improved to allow easy access of the farmers to the factory, the out-growers should be encouraged to practise mono-cropping of cassava, the farmers should be given improved varieties of the cassava and the company finds incentives that will attract and retain young and experienced farmers to boost the supply of cassava to the factory.

Keywords: Stochastic frontier, technical efficiency

Background

The launching of the Presidents' Special Initiatives (PSI) in 2001 by the government of Ghana on cassava, oil palm, sorghum, maize, cotton, salt, garments and textiles were designed to achieve four strategic goals which were thought would promote the development of the national economy. These goals were:

- the diversifying of the economy to free it from decades of over reliance on the three major primary export products, namely, cocoa, timber and gold;
- bringing development to the doorsteps of the rural communities to make them part of the mainstream economic activities, generate mass employment and to expand the export revenue base of the country;
- generating multiplier effects on the economy through forward and backward linkages in respect of developing by-products as well as stimulating the growth of ancillary businesses; and
- expanding the export revenue base, through which the country's excessive reliance on external aid to finance her national development expenditure could be minimized (Business News, 2004).

The Presidents' Special Initiative (PSI) on cassava involved the creation of a starch manufacturing industry to help Ghanaian farmers increase the production of cassava and for that matter income. Cassava is a staple crop in Ghana and has historically been subjected to considerable post-harvest losses. The PSI on cassava was intended to build 10 cassava-starch production plants over a five-year period. The first of these plants was the Ayensu Starch Processing Company, established at Awutu-Bawjiase in the Central Region with some 10,000 smallholder farmers registered and organized into co-operative units to feed the company with cassava. Among other considerations, the company was also to explore

investment opportunities in the industrial starch sector by producing and selling commercial-grade starch, primarily to the European markets.

The incredible success of this enterprise from the beginning implied that the company might very well prove to be one of the sources of economic growth for Ghana and its continuous operation would have tremendous impact on the economy in achieving the goals outlined under the PSI document, particularly raising $4.4 million over a four-year period through cassava starch export (Daily Graphic, 2001).

Despite the potential of the company and widespread recognition of its importance as to its contribution to the economy, the supply of cassava has, however, been dwindling. The deterioration in output levels has led to a significant decline in starch production, thus worsening the revenue position of the company. What remains uncertain is whether or not the starch production can be sustained in view of the existing output gap and installed plant capacity. Understanding issues related to the technical efficiency of the out-growers might unearth strategies to be adopted to revive the Ayensu Starch Processing Company.

Objectives of the study

The ability of out-growers to produce enough cassava to meet plant capacity depends on their level of efficiency. The objective of production of out-growers in this case is to achieve the maximum output from a given set of inputs. Issues such as minimizing risks and ensuring that inputs are efficiently utilized with attention paid to eliminating waste are thus crucial if the production objective of farmers is to operate on their frontier output.

The objective of the study is to investigate technical efficiency and policy options that are evidently feasible in raising out-growers' level of performance. The specific objectives of the study are to:

- estimate plot specific technical efficiency of smallholder farms producing cassava, the main raw material for starch production.

- determine the influence of out-growers' socio-economic and institutional factors on their technical efficiency levels.
- analyse the relative technical efficiency of the production units
- provide policy options for improving cassava production.

Literature

Technical efficiency (TE) otherwise known as pure technical efficiency (PTE) like its counterparts (allocative, scale and scope efficiencies) according to Fare et al (1994), Farrell (1957), and Coelli et al (1998) is a major component of productivity, which in itself is a measure of a firm's performance. The level of technical efficiency of a particular firm is characterized by the relationship between observed production and some ideal or potential production (Baeur, 1990; Cornwell et al, 1990; Green,1993;)

The measurement of a firm's specific efficiency is based upon deviation of observed output from the best production or efficient production frontier. If a firm's actual production point lies on the frontier, then it is technically efficient, but if it lies below the frontier, it is technically inefficient. With the ratio of observed output to potential production, the level of technical efficiency of a firm or any decision-making unit can be determined (Coelli et al, 1998).

Agbabiaje (2003) empirically investigated the performance of intensive poultry farms in the Ogun State of Nigeria and estimated the technical efficiency by farm size. The stochastic frontier production functions analysis was adopted to determine the technical efficiency indices of the resources used on the different farm sizes. Maximum likelihood estimates of the econometric model revealed that flock size, labour, feed, fixed inputs and chemical input resources were the major factors associated with changes in poultry production.

The level of technical efficiency varied across farm sizes and efficiency was found to be higher among small and medium sized farms

than the large sized farm. The mean farm specific technical efficiency indices were found to be 0.9984, 0.9952 and 0.9771 for small, medium and large sized farms. He concluded that technical efficiency decreased with farm size. The limitation of this study is that farm size was the only variable considered in the estimation. This result is consistent with findings obtained by Tadesse and Krishnarmorthy (1997). Amo (2004) measured the technical efficiency of small-scale farmers in Nigeria by employing the stochastic frontier production function analysis. Results obtained indicate that farmers were in the rational stage of production as depicted by the returns to scale 0.27. The technical efficiency of the sole maize farmers was lower (0.52.66) compared with that of the mixed (yam/maize) cropping farmers (0.7172). A mean efficiency of 0.622 was observed for all farmers. Over fifty percent (50%) of the mixed crop farmers had technical efficiency exceeding 0.70 as compared with 100% sole farmers who had less than 0.60. The study further indicated that the years of schooling, farming experience, cropping pattern and access to credit positively affected technical efficiency while increase in the age led to a decrease in technical efficiency.

Amaza and Olayemi (2002) investigated technical inefficiency in food crop production among farmers in Gombe State in Nigeria . A stochastic frontier production function, which incorporates technical inefficiency effects, using the Maximum-Likelihood Estimation (MLE,) was used as the analytical technique. Given the specification of the stochastic frontier production function, the first hypothesis, which specified that the explanatory variable in the model for technical inefficiency factors have zero coefficients was rejected.

The study revealed that the explanatory variables such as plot size, age, extension services, and access to credit in the technical inefficiency effects contribute significantly to the explanation of inefficiency in food crop production in Gombe State, Nigeria. Predicted technical efficiencies varied widely among farms, ranging between 12% and 89%, and a mean technical efficiency of 69%.

Ahmed, Benin, Ehui and Gebremedhin (2001) applied the stochastic frontier production function and examined the technical inefficiency and the determinants of inefficiency of alternative land tenure arrangement in Ethiopia. This was against the background that the degree to which the prevailing tenure arrangement constraints agricultural productivity and the sources of inefficiency with land tenure system remained unresolved. The results show that sharecropping and borrowing land were less technically efficient than owner-cultivation or fixed rentals due to the restriction imposed on them by landowners and the interaction of the land market with other imperfect markets and the absence of a perfect input market. Thus, a policy to facilitate more efficient transaction of land between farmers and functioning of input market are expected to reduce inefficiency associated with these land tenure systems.

Ajibefun and Abdulkadri (1999) investigate technical inefficiency in production among the food crop farmers under the National Directorate of Employment in Ondo State of Nigeria. The study applied translog stochastic frontier production functions in which the technical efficiency effects were defined by three different sub models. Given the specification of the stochastic frontier production function, the null hypothesis, that the frontier is adequately represented by the Coo-Douglas function, was accepted, but the null hypothesis that the farmers were fully technically efficient, which implied that inefficiency effects were absent from the model was rejected. Furthermore, the null hypothesis of half-normal distribution for the inefficiency effects was rejected.

Predicted technical efficiencies varied widely across farms, ranging between 21.7% and 87.8% and a mean technical efficiency of 67.0%. Explanatory variables such as: farm size, credit availability, extension services and experience were found to have positively influenced the technical efficiency of the farmers. In other words, these variables decrease with technical inefficiency.

Theoretical framework

Economic efficiency at the micro-level focuses on the ability of firms to utilize the best available technology and to allocate resources productively (Chavas et al., 2005). It is typically decomposed into three sources: technical, allocative and scale efficiency. Technical efficiency is attained when the best available technology is used. The level of technical efficiency of a firm is characterized by the relationship between observed production and some ideal or potential production (Baeur, 1990; Cornwell et al, 1990; Green,1993;). The measurement of a firm's efficiency is then based upon closeness of observed output to the best production or efficient production frontier. Deviations from the frontier are assumed to be the result of technical inefficiency pertaining to the firm itself and other random events (Tong and Chan, 2003).

In estimating the stochastic frontier function of a firm and finding explanations for the differences in technical efficiencies, we applied the basic frontier model used by Aigner et al. (1977), Meeusen and van den Broeck (1977). The model used in the literature to describe the frontier function can be written as follows:

$$lnY_i = f(x_i,\beta)e^{(v_i-u_i)}$$

where lnY denotes the logarithm of the output for the *ith* sampled firm in a function such as Cobb-Douglas or translog functions, $(i = 1,...N)f(.)$ is a measure of the maximum output for any particular input vector x_i. x_i is a (1 x k) vector of the logarithm of the inputs associated with the *ith* sampled firm (the first element would be one when an intercept term is included) and β is a (k x 1) vector of unknown parameters. v_i is the stochastic disturbance term, which is normally distributed with mean zero (0) and variance σ_v^2, while, u_i is a one-sided disturbance which is half normally distributed of the form $u_i \sim |(0, \sigma_u^2)|$, reflecting the fact that each firm's production should lie on or below its frontier, but v_i and u_i are independent with variances σ_v^2 *and* σ_u^2 respectively. u_i is half-normally

distributed with mode of zero, implying that a high proportion of firms being examined are perfectly efficient. The total variance of output, σ^2, is expressed as $\sigma^2 = \sigma_v^2 + \sigma_u^2$ .The ratio of the two standard errors as applied by Jondrow et al. (1982) is expressed as $\lambda = \sigma_u/\sigma_v$, and this measures total variation of output from the frontier that can be attributed to inefficiency. The ratio of the variance of u_i to the total variances, $\gamma = \sigma_u^2/(\sigma_v^2 + \sigma_u^2)$, lies between 0 and 1. A γ value equals to 0 means that the inefficiency is not technical while a value close or equal to 1 implies that the inefficiency is technical (Kalirajan and Shand, 1985).

The stochastic frontier function is such that technical efficiency of a firm is defined as the ratio of observed output relative to what could be produced by fully efficient firms using the same vector

$$lnY_i = f(x_i,\beta)e^{v_i}$$

and the observed output written as x of inputs specified as

$$lnY_i = f(x_i,\beta)e^{(v_i-u_i)}$$

and the technical efficiency ratio is given as

$$Te_i = \frac{f(x_i,\beta)e^{(v_i-u_i)}}{f(x_i,\beta)e^{v_i}}$$

This would imply that

$$Te_i = e^{-u_i}$$

If the firm is efficient in production, then technical inefficiency is 0 and its technical efficiency is 1. In general, $0 \leq e^{-u_i} \leq 1$. If $Te_i = 1$, the firm is producing on the production frontier and is said to be technically efficient but if $Te_i \leq 1$, the firm is not producing on its frontier.

Let us consider that an out-grower is involved in cassava production characterized by the use of inputs x consisting of $\vartheta, \omega, \rho, \varphi$ and ∂ to produce an output Y, where ϑ is land area under cultivation, ω is the number of labour employed, ρ is the number of hoes employed, φ denotes the number of cutlasses used and ∂ is the quantities of stems planted. Let

us assume that, the general form of an out-grower's model is represented by the feasible set as follows

$$(\vartheta, \omega, \rho, \varphi, \partial; Y) \in x$$

This specification implies that the chosen inputs can feasibly produce an output and that cassava production is allowed to vary across different plots. The efficient transformation of these inputs into the output Y is characterized by the production function defined as

$$Y = f(\vartheta, \omega, \rho, \varphi, \partial)$$

The production function specified is assumed to allow for obtaining the maximum feasible output from the various input vectors, which are under the control of the out-growers. This information makes it possible to adopt econometric approach to assess the effects of the input vector on cassava output. This general form of the production function can be estimated using any theoretical form and testing which best fits the data involved.

Data and Estimation

The study area covers Awutu-Bawjiase, one of the operational zones under the company for cassava production and its supply. This area is selected for two reasons. First, it is well noted for cassava production owing to its proximity to the company, and second, it has a large number of small-scale farmers engaged in cassava cultivation.

Since the analysis of technical efficiency requires input-output data on cassava production, the main data were gathered through out-growers' questionnaire administered to 120 out-growers who were selected randomly. The sample frame was the 2006 farmers' register. Questions were asked on plot level output of cassava, the inputs used in the production process (including land, labour and other farm capital assets such as hoes, cutlasses and cassava stems) on each plot, the socio-economic and institutional characteristics of farmers.

Table 1: Measurement of Variables

Variables	Units of Measurement
Cassava	Quantity of cassava produce (in tons)
Land	Total land holding under cassava cultivation (in acres)
Labour	Number of labourers engaged in the cassava cultivation (in man-hours)
Hoes	Number of hoes employed (units)
Cutlasses	Number of cutlasses employed (units)
Stems	Number of stems planted (based on planting space)
Plot Size	Plot size under cultivation (acres)
Framing Experience	Years of cassava farming (years)
Farm Distance	Distance of plot from out-grower's home (km)
Formal Schooling	Years of formal schooling attained by out-grower (Years)
Hybrid Cassava	1 if the main type of cassava on the plot is hybrid, 0 otherwise
Club Membership	1 if out-grower belongs to farmer's association, 0 otherwise
Mono-cropping	1 if main crop on the plot is cassava, 0 otherwise
Tenure Contract	1 if out-grower practises any plot contracts, 0 otherwise

Table 2 reports summaries of the variables involved in the estimation of the technical efficiency and the determinants of technical efficiency. The mean farming experience was 16.4 years, implying that a majority of out-growers have been cultivating cassava for many years. The average years of farming experience could afford out-growers to accumulate knowledge necessary for planning, keeping of simple farm record, utilization of plot resources and managing their farm accurately. Accumulated experience could also help the farmers do early planting and timely weeding.

With schooling the mean was 4.28 years with a maximum of 13 years. The maximum years of schooling showed that the highest level of schooling attained by an out-grower was higher than primary school and this would suggest that illiteracy was low among the farmers.

Table 2: Summary of statistics on inputs/output of the stochastic frontier function

Variable	Mean	Standard Deviation	Minimum Value	Maximum Value
Cassava	28.00	21.50	4.00	29.00
Land	1.05	0.66	0.44	3.00
Labour	18.10	62.50	8.00	270.00
Hoes	12.30	10.50	2.00	49.00
Cutlasses	5.89	5.23	2.00	28.00
Stems	4149.00	2647.00	873.00	11907.00
Plot size	1.05	0.66	0.44	3.00
Experience	16.40	4.66	2.00	44.00
Distance	0.80	1.86	1.00	4.00
Schooling	4.28	2.16	0.00	13.00
Hybrid Cassava	0.90	0.28	0.00	1.00
Club Membership	0.79	0.43	0.00	1.00
Mono-cropping	0.73	0.46	0.00	1.00
Tenure Contract	0.80	0.40	0.00	1.00

Source: Computed from Survey Data, 2006

The mean farm distance was 0.8km with the longest being 4km. This would suggest that on the average out-growers would have to walk for almost 1km on daily basis in undertaking their farm activities. Again, if an out-grower had to travel a distance of 4km on foot before getting to his/her farm and a similar distance back home at the end of the day's work, it could reduce his/her productivity and efficiency.

The stochastic frontier function was estimated using the Cobb-Douglas and the Translog Production functions, following Battese et al. (1993). The Cobb-Douglas function had a better fit and was adopted for the study. The results of the estimation are reported in Table 3.

Table 3: Cobb-Douglas Stochastic Frontier Estimation

Dependent variable: Cassava Output

Variables	Parameters	Coefficients	Std err	prob>|t|
Constant	δ_0	0.5943	0.3145	0.066**
ln(Land)	δ_1	0.5734	0.1813	0.000*
ln(Labour)	δ_2	0.2635	0.0667	0.002*
ln(Hoes)	δ_3	0.0731	0.0837	0.084**
ln(Cutlasses)	δ_4	0.0398	0.0727	0.126
ln(Stems)	δ_5	0.2252	0.1598	0.061**
sigmaυ	σ_u	0.3359	0.1187	0.1681
	σ_v	0.3068	0.0474	0.2267
sigmaυ^2	σ_u^2	0.1128	0.1188	0.2042
sigmav^2	σ_v^2	0.0941	0.0472	0.8768
lambda	λ	1.0948	0.1597	0.7818
sigma^2	σ^2	0.2069	0.0586	0.0922
gamma	γ	0.5426	0.7654	
log*likelihood*		-49.99		
Number of observations		120		

Source: Estimation from Survey Data, 2006

From Table 3, the estimate of λ is 1.0948, implying a good fit. This implies that results obtained in the use of this function in estimating the technical efficiencies of the out-growers is efficient and reliable thus

authenticating distributional assumptions about the one-sided disturbance term in our analysis.

The estimated value of gamma, γ, is 0.5426. This result would imply that there is technical inefficiency in the production of cassava that is to say, the variation between the observed and the frontier production is due to technical inefficiency. The conclusion is that the production of cassava lies below the frontier and hence the frontier production of out-growers is characterized by technical inefficiency.

From the estimation of the stochastic frontier function, the ratios of technical efficiency were generated and are shown in the appendix. The lowest level of efficiency is about 2 percent and the best plot achieved a 99 percent level of efficiency. The average efficiency is 58 percent, indicating that out-growers are producing cassava far below their productive frontier. The low level of efficiency may be associated with production risk or bottlenecks (such as management and weather), which limit their ability to expand output considerably. The modal class is 61 percent to 80 percent and about 62 farmers representing 51.66 percent had efficiency scores below 61 percent.

The observed efficiency indices were regressed on the out-growers' characteristics in the final step

$$e^{-u_i} = f(\phi, \alpha)$$

where ϕ denotes a set of out-growers attributes and α being unknown parameters to be estimated.

Table 4: OLS estimates of Determinants of Technical Efficiency

Variables	Parameters	Coefficients	Std err	t-prob
Constant	α_0	2.0000	0.1757	0.001***
Plot size	α_1	-09287	0.0473	0.001***
Farming experience	α_2	0.1256	0.0342	0.001***
Farm distance	α_3	-0.2172	0.0395	0.080*
Formal schooling	α_4	0.0143	0.0145	0.346
Hybrid cassava	α_5	0.1973	0.0976	0.057*
Club membership	α_6	-0.0216	0.0658	0.060*
Mono-cropping	α_7	0.1215	0.0674	0.061*
Tenure contract	α_8	-0.1109	0.0478	0.142
$R-squared$	R^2	0.8743		
$Adjusted R^2$	$AdjR^2$	0.8687		
Number of observations N		120		

*** Significant at 1%, ** Significant at 5%, * Significant at 10%

Source: Estimation from Survey Data, 2006

The relationship between technical efficiency and out-growers' characteristics is estimated using the ordinary least squares and the results are indicated in Table 4. The coefficient of determination is very high with an estimated value of 0.87. This means that 87 per cent of the variation in the technical efficiency has been explained. While plot size negatively affected efficiency, experience had a positive effect on efficiency. On the other hand, farm distance, hybrid cassava usage, club membership and mono-cropping technology turned out significant at the 10 per cent level. While distance and club membership had negative effects on efficiency, hybrid cassava usage and mono-cropping had positive effects on efficiency.

Discussion

The positive coefficient obtained for years of farming experience follow our a priori expectation. Thus, more experienced out-growers were expected to improve upon their technical performance and hence would be more technically efficient by raising crop yield as compared to those with little or no farming experience. The significance of farming experience in this case might be attributed to the fact that experienced out-growers applied their farming experience acquired and which would positively improve productivity.

Regarding the coefficient of hybrid cassava, out-growers who grew hybrid variety of cassava were more technically efficient than those who did not. This result may be attributed to the fact that hybrid cassava variety gave more output than the traditional varieties. The positively significant effect of hybrid cassava on efficiency might be confirming that the policy intervention by the management of the company to diffuse newly improved cassava varieties has been embraced by out-growers.

In relation to mono-cropping, it was observed that where out-growers cultivated sole crop, it tended to improve crop yield. The positive sign obtained again confirmed our a priori expectation. Our conclusion is that out-growers' decision regarding the cultivation of sole crop on the land has significantly paid off.

By contrast, efficiency tends to fall with plot size. The negative and significant relationship with efficiency might be suggesting that the optimum combination of resources may not be achieved on large plot sizes. If the farmer is unable to manage the larger plot size and productivity falls, this would be reflected in the negative relationship.

The distance from the out-growers' home to farm plot was negatively related to efficiency. While the expectation regarding the sign was confirmed, this result revealed that home-to-plot distance could have a huge adverse effect on the ability of the out-growers to efficiently utilize their resources.

Social capital showed a negative relationship in our result. Although the result did not follow our a priori expectation, the effect

relised may be due to the presence of poorly functioning farmers' association where sharing vital information on crop husbandry was relaxed to the extent that many of the farmers may not have fully benefited from the social network of their association as they ought to.

Policy Recommendations

The policy implications of the study point to the need for major reforms in the organization of the out-grower of the Ayensu Starch Processing Company in order to improve the efficiency of out-growers so that the purpose for which the company was set up can be accomplished. The specific policy suggestions are:

- The company should focus on understanding the production pattern of farmers and factors affecting them so as to help improve upon their production. In view of the challenges, the policy interventions which would be appropriate at raising observed efficiencies at plot level are proposed below.
- A policy should be designed to make out-growers more specialized in sole crop production rather than producing two or more crops on the same piece of land. Evidence suggests that due to food insecurity in developing countries, rural farmers tend to cultivate two or more crops simultaneously on the same plot, this is to reduce risks of crop failure and to enable them harvest several crop at the same time. In order to motivate these out-growers to adopt mono-cropping, management of the company should as a matter of urgency introduce Agricultural Insurance Policy in the company in order to reduce the risk associated with single crop production.
- The company should implement a permanent crop policy that would focus on the cultivation of improved cassava varieties which can considerably improve output. The positive impact of hybrid cassava on efficiency requires that greater effort be taken to create the capacity at the various research institutions to continue to develop new varieties and their diffusion to farmers as evidence suggests that such yield increasing varieties can increase production substantially.

- A policy should be designed by management to encourage young but experienced out-growers to remain as farmers in the production of cassava as long as their health could permit them. This calls for the provision of incentives in the form of scholarship for their wards, housing schemes and insurance policy as it is done in the cocoa sector in Ghana.

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Appendix: Estimated Technical Efficiency Scores

0.6889	0.6152	0.5454	0.0698
0.5968	0.2295	0.6822	0.8967
0.9476	0.1625	0.9231	0.2798
0.5153	0.8150	0.0589	0.7305
0.4218	0.2899	0.5261	0.6544
0.2979	0.9198	0.5213	0.8133
0.3183	0.6191	0.8496	0.2316
0.5870	0.8822	0.3708	0.6687
0.0728	0.6697	0.9761	0.2972
0.9764	0.8657	0.7763	0.8822
0.2463	0.6148	0.2719	0.8345
0.5696	0.5577	0.6961	0.5466
0.8729	0.2022	0.8763	0.1721
0.6925	0.5419	0.4179	0.5499
0.4245	0.1917	0.3889	0.6465
0.5702	0.7917	0.4907	0.4029
0.6660	0.2424	0.8338	0.8563
0.3187	0.7311	0.7040	0.6889
0.6168	0.2505	0.1949	0.5670
0.4133	0.9315	0.9668	0.4265
0.5323	0.4953	0.6048	0.1124
0.7401	0.5036	0.2682	0.5542
0.3484	0.4683	0.6936	0.7076
0.7225	0.2847	0.2685	0.7961
0.2295	0.2294	0.7699	0.3946
0.8795	0.4700	0.9994	0.9581
0.5203	0.7324	0.8627	0.8356
0.0440	0.4120	0.1934	0.4618
0.0244	0.2536	0.6753	0.8846
0.8321	0.8569	0.0926	0.8070

Source: Estimated from Survey Data, 2006

Peri-Urban Agriculture and Land Tenure Dynamics in Southern Ghana

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Abstract

Peri-urban zones are characterised by strong urban influences including increased possibilities for marketing of farm produce, provision of inputs and services, and non-farm employment but also exacerbated competition for land, inequalities in its distribution and risks from pollution. In developing countries, the positive elements generally are less than the negative influences. Peri-urban areas – lying in the interface between the urban and the rural – therefore tend to experience the development problems associated with 'both worlds'. Rural problems of inadequate social facilities still occur at the same time that land pressures and poor environmental health problems associated with growing urban areas create typical urban problems. This study used structured interview schedules to collect primary data from 504 randomly selected households in 50 randomly selected peri-urban communities. These communities were sampled from five purposively selected districts, namely Cape Coast, Ho, Sunyani, Koforidua and Accra. The issues examined related to agriculture in the context of the increasing tendency towards freehold land titling. It was concluded that all the zones are facing severe land shortage, which is affecting agricultural production, given the deficiencies in agri-support services. Women tended to have even smaller farm sizes. The trend towards land title registration is putting women in disadvantaged positions as landholders bequeath their lands to sons, even in matrilineal societies. It is therefore recommended that any policy on land, especially the LAP project, should consider the interests of women and the peri-urban poor.

Key words: Agriculture, land tenure dynamics, peri-urban.

Introduction

The FAO (1999) estimated that at least 800 million people are involved in urban and peri-urban agriculture. This is happening amidst increasing poverty and malnutrition in cities due partly to the increasing numbers of poor rural migrants and impoverished urban families (Mougeot, 1999). Correspondingly, peri-urban agriculture has assumed increasing importance in the drive to food security as nations' populations grow and cities become larger and larger, and this is helping to feed the estimated 50 percent of the world's population who now live in cities (Brook & Davila, 2000). It is also estimated that by the year 2015 about 26 cities will have populations in excess of 10 million, and each of these cities will need minimum food imports of 6000 tonnes. Current estimates also indicate that 250 million hungry people in this world live in cities. The food security implications of these statistics have drawn attention to the practice of urban and peri-urban agriculture.

Peri-urban agriculture is practised generally for income-earning or food production (Fraser, 2002). It contributes to food security by increasing the amount of food and also allows fresh vegetables, fruits and meat products to be made available to urban consumers. Through these, it reduces food insecurity by providing households with direct access to home-produced foods and adds to the informal economy. It thus contributes to cities' economic base through production, processing, packaging and marketing of consumable products, resulting in increases in entrepreneurial activities, job creation opportunities, and reduced food costs. According to Lee-Smith (2004), rapid urban population growth is a factor in peri-urban agriculture, and this activity will grow further as the world's population approaches 7.5 billion by 2020 with 57 percent being urban. Lee-Smith adds that there will be 500 million urban Africans in 2020 and 200 million Africans will be practising urban and peri-urban agriculture.

The significance of peri-urban agriculture can be seen in the opportunities that it provides for productive employment through its low

barriers to entry, and the consequence ease of access allows women and other underprivileged people to partake in the informal economy, leading to empowerment (Mbiba, 1995). Women are able to combine this activity with their household tasks (Hasna, 1998), and the proximity of the farms to the consuming centres makes it energy efficient by reducing the costs of transportation (Pirog & Benjamin, 2003; Urban Agriculture Network, 1996). This significance is seen in the practices of peri-urban agriculture in both small and large cities across the world, including Cape Coast, Ho, Sunyani, Koforidua and Accra in Ghana.

However, the starting point from which to analyse the issue of peri-urban agriculture is from the dynamics of land ownership and use, produce quality and environmental damage. This is so because agriculture in Ghana, even for peri-urban areas, still remains relatively land extensive, though this is changing very fast in many peri-urban areas, and water availability is also a problem. Access to the use of land and other agricultural support services remains important in the quest for food security for low-income families, and land use rights therefore become essential to poverty reduction in these settings.

Peri-urban agriculture takes place mostly on vacant lands. These lands are owned by individuals (especially speculators), and the government, or may be held under customary practice. Land title registration enforcement in recent years implies that land belonging to individuals and the government that were purchased or acquired (with due compensation) are registered and have clearly demarcated boundaries. The use of such land for agricultural purposes by low-income peri-urban farmers throws up various risks. The farmer stands to lose all the crops if the landowner decides to develop the property. Customary lands on the urban fringe face even more intense pressures resulting from the urge to sell to speculators at the same time that such lands are required for food production. There is also the issue of clear ownership with respect to the sale of such lands. Situations where different family members sell the same plot of land to different buyers abound and account for a large share of the land litigation cases in the law courts.

Thus, increasing commercialisation of land, speculation and the breakdown in traditional land ownership patterns create new dynamics for land ownership and land use. It is in the peri-urban setting that these contradictions are more intense as all urban land would have been sold out and ownership established. However, it is also in the peri-urban setting that farming and other agricultural pursuits still provide a substantial portion of household income. The contradictions and pressures negatively affect incomes under conditions of difficult labour markets where off-farm and non-farm activities or employment opportunities are not easily available. The pressures and tensions affect land productivity in diverse ways. The effects could be negative as tenure insecurity reduces the willingness to invest in land and soil fertility improvements. It could also be positive if the lack of security and the limited land availability lead to more intensive land use, which is often the case, especially for vegetable cultivation and poultry farming.

Peri-urban areas, lying in the interface between the urban and the rural, therefore tend to experience the development problems associated with 'both worlds'. Rural problems of inadequate social facilities still occur at the same time that land pressures and poor environmental health problems associated with growing populations create typical urban problems in these areas. The Natural Resources Institute (see Blake et al., 1997) characterised the peri-urban interface as comprising the following:

- It is dynamic in space and time
- Areas within the zone are heterogeneous
- Competition for land between agriculture and non-agricultural uses
- Changing social and economic balance between indigenous and immigrant inhabitants
- Increasing dependence on the urban centre
- Increased facilities which may speed up development
- Increased pollution and waste disposal problems

Applying these characteristics to a study in the Kumasi metropolitan area, the peri-urban zone of the city was found to exhibit the following characteristics (Blake et al., 1997):

- Land tenure insecurity
- Short-term cropping systems predominate
- Women especially were under poverty threat
- Waste management systems were haphazard but improving
- Information gaps for planning and institutional hiatus.

The peri-urban zone, approximately 30 kilometres from the city centre, is characterised by strong urban influences, including increased possibilities for marketing of farm produce, provision of inputs and services, and non-farm employment, but also exacerbated competition for land, inequalities in its distribution and risks from pollution and other environmental problems. The peri-urban farmer is also likely to be an immigrant, farm sizes are small and the traditional large farm holdings of the mixed-crop, bush fallow, land rotation type are breaking down fast. These characterisations of the peri-urban zones relflect interesting issues that necessitate the examination of land dynamics and its influence on farming systems, food security, protection of the environment, and improvements in the incomes of women.

Peri-urban communities increasingly find that the lands on which they depend (for farming purposes) are appropriated for urban purposes. Residential construction, vegetable cultivation and commercial poultry farming are some of the new uses to which peri-urban lands are often required. High demand for land provides opportunities for land sales, which ultimately deprive poor farmers of their land. Women, in particular, find themselves at a disadvantaged position as land availability declines. Traditional forms of control over land break down in the face of the increasing demand for land. There is also the issue of the use of peri-urban lands as dumping grounds of the garbage produced in the city. The landfills in use for the cities in developing countries are not properly constructed and protected. The associated health burdens are realised by residents in these locations.

The land question in peri-urban locations throws up complex issues that require attention. These issues relate to the competition for land and the extent of land availability for farming – the main economic activity

in peri-urban zones, women's access to land, and the operation of land markets - customary patrilineal and matrilineal property rights and the statutory systems. Consequently, this study:

- evaluated the extent to which small farmers' access to agricultural land-holdings in the peri-urban areas under customary patrilineal and matrilineal property rights systems are preserved in the face of rapid urbanisation, active land markets and compulsory land title registration, and environmental problems, and
- examined the contradictions and frictions that exist in land transfer under customary and statutory systems and how they constrain agricultural investment in low-income peri-urban communities, including the inability of women to keep and control agricultural lands.

In the subsequent sections of this paper, we have discussed the conceptual issues that guided the study, and the methodology. These are followed by the discussion of the results, conclusions and policy implications.

Conceptual issues

Browder, Bohland and Scarpadi (1995) reviewed French literature on African cities regarding the peri-urban interface and used the phrase 'metropolitan fringe areas' in explaining urban and rural relationships and linkages. Nonetheless, the term 'peri-urban' has been used and explained in the literature as featuring a diversity of land uses that vary in relation with their urban and rural linkages. In their explanation, Browder et al. state that the land uses are transitional and show a pattern that becomes increasingly agrarian as one recedes from the city centre on the one hand, and on the other hand gives way to urban oriented activities near the city. They continued that such areas are mostly populated by poor residents who have migrated from rural areas and who engage in multiple income generating activities, predominantly in the informal economy.

Through literature reviews, Nottingham and Liverpool Universities (1998) encapsulated Browder et al.'s explanation in their definition of peri-urban as:

> A zone or area where urban and rural development processes meet, mix and interact on the edge of the cities. It is often not a discrete area, but rather a diffuse territory identified by combinations of features and phenomena, generated largely by activities within the urban zone proper. The development of a peri-urban area is an inevitable consequence of urbanisation. As cities in developing countries continue to grow, the peri-urban area moves outward in waves. (pp. 8-9)

Similarly, Adell (1999) cites Rakodi (1998) in using a definition of peri-urban area where the stress is on the relationship between the urban and the immediate rural areas over time. In this definition, the peri-urban interface is described as a dynamic zone both spatially and structurally. Spatially, it is the transition zone between fully urbanised land in cities and areas that are in predominantly agricultural usage. Such areas are characterised by mixed land uses and indeterminate inner and outer boundaries, and are often split among different administrative jurisdictions. This land area is dynamic as it shifts over time according as the cities grow. The area is also characterised by rapid economic and social structural change, with pressures on natural resources, changing labour market opportunities and changing land use patterns.

Peri-urban agriculture comprises various farming systems, from subsistence production and sometimes processing at the household level to fully commercialised agribusinesses of specialised production, processing and distribution units. These exist within heterogeneous resource utilisation situations, such as scarce as well as abundant land and or water resource conditions (de Zeeuw, Gundel &Waibel, 2000). According to de Zeeuw et al., peri-urban agriculture varies in terms of time and space, as well as in social and economic conditions. This is because it is transitory, interstitial, dominated by women and low income groups, and occurs or thrives where there are financial crisis and food shortages. It also occurs under a variety of policy environments relating to land use patterns, land tenure systems and land rights that can be prohibitive or supportive its existence and development.

There are implications of customary land tenure dynamics and land rights. Property rights economists argue that the flexibility and fluidity of customary land tenure arrangements is tantamount to tenure insecurity and leads to market inefficiencies (Dorner, 1972; World Bank, 1974). However, Toulmin and Quan (2000) also argue that land registration introduces simplifications which become difficult to implement within a complex and dynamic set of practices as occur in customary tenure systems. According to Kalabamu (2000), in the course of transmission over time, workable and key elements of the tenure system are retained and poor ones are dropped to suit new economic conditions. Such changes include the replacement of social value of land by economic value. Communal rights are also replaced by individual rights of ownership. In this regard, Torhonen (2004) explains that customary land tenure systems, like many social systems are subject to evolution, and reflect the changes in society and the pressure from the growth of urban areas.

Arko-Adjei, de Jong, Zevenbergen and Tuladhar (2009), in echoing Pottier (2005), explain that in customary land tenure systems, the people are linked to their land by virtue of membership in families and clans, which comprise the dead and living. Land is, therefore, held in custody for generations that are dead, born and unborn. As a result, the primary concern is about maintaining links with families and clans and not about rights to land per se. Arko-Adjei et al. conclude that links to people through whom land was acquired and by whom it could be used are crucial, and not the right to land itself.

Changing land use patterns introduce dynamics into land tenure systems and land rights, and these dynamics of land tenure, land rights and agricultural production in peri-urban areas reflect the important roles that tenure security can play in ensuring food security, improving incomes of farmers and enhancing environmental quality (De Soto, 2000). High urban population growth, active land markets and the rising phenomenon of speculation as well as the rapid decline of traditional forms of control over land are creating tensions with regard to land, especially in peri-

urban communities where modern social and economic values clash with the traditional ones. De Soto theorised that the granting of clear land tenure and property rights to the poor is essential to poverty reduction. Secure land tenure and property titles provide opportunities to access credit from the banks and to invest in better housing and soil improvements. He argues that it is precisely because poor urban dwellers (and this will include a significant proportion of peri-urban people) lack these rights that they are unable to utilise their properties as collateral for loans, and this perpetuates poverty.

Research on these issues has pointed to the complexity of the land issue and the need for caution in attributing poverty to the lack of security of tenure. First, it is important to point out that not one tenure system may operate in the same city, as for instance in Ghana. In Ghana, there are the customary and the legal systems, in addition to several other share-cropping arrangements that operate alongside each other in the same area (Micah & Kendie, 2002). The term land tenure refers "to how land is held or owned, or the set of relationships among people concerning the use of land. Land or property rights refer to what those who hold, own or occupy the land may do with that land and any development that takes place on it" (Payne, 2003, p. 1). These rights cover a whole range of issues including the right to occupy, enjoy and use; restrict others from entry; dispose, buy and inherit; develop or improve; cultivate or use for production; realise a financial benefit; sublet; and access services. Consequently, land titling has become a major policy issue and is supported in many developing countries by the World Bank. Ghana, for instance, has set up a Land Administration Project (LAP) with the view to passing a Consolidated Lands Act, which will govern land titling (Daily Graphic, October 13, 2007).

It has been argued that land and property titles per se are not sufficient collateral for securing bank loans as De Soto (2000) asserts, but rather a secure stream of income. Payne (2003), for instance, notes the advantages/disadvantages of these systems and that the tendency towards legal titles may disadvantage whole communities, women and

the poor, and disrupt cultural systems. Besides, as McLeod (2003) found, most bank lending in the developing countries is not asset, but rather revenue-based. Secondly, as Home (2003) and Djire (2007) point out, because of the bureaucracy and the associated costs involved in obtaining titles, not many households are interested in doing so.

Another aspect of the discussions is the fact that the growth of cities in the developing world is dynamic, diverse and disorderly, and increasingly space-intensive. The growth is occurring in the peri-urban areas, which often lack clear regulations and administrative authority over land use, and are characterised by pollution, rapid social change, poverty, land use changes and degradation of natural resources (United Nations Fund for Population Activities, 2007). The absence of clear regulations and administrative authority can create environmental degradation and health hazards as agricultural and industrial activities are mingled with residential use of land. This exposes residents to hazardous substances in the air, water and the food that they grow. This risk may be greater for the low income women and children who are more likely to spend most or all of their time in their homes and immediate environs. There is also land speculation, and the speculators hold on to land, expecting the values to increase. They do not bother to rent for fear that the users may gain some rights to continued use.

Historically and theoretically, land is communally owned in many parts of Ghana, and customary trustees such as chiefs and family heads hold the land in trust for their families, stools and skins (Arko-Adjei et al., 2009). These trustees hold the alloidal title from which all other rights are derived. Members of families have usufructory rights that allow them free entry. However, according to Arko-Adjei et al., pressure from modernisation has forced family heads to dispose of communal lands through sale or lease, and usufructory rights have been curtailed due to dwindling or non-existent idle lands.

It is important to note that one can have a high level of security to the land and yet be restricted in the use to which the land can be put, as the land cannot be sold or developed in ways departing from the original

intention. Security of tenure protects the user from forced eviction or forced loss of the property, but it does not confer unlimited use. Family lands under customary law have this characteristic, and under systems of law in many African countries, land ownership is anchored in patriarchy (Kameri-Mbote, 2005). Female access to and use of land is thus restrictive, though the women may have security of tenure when the land is under cultivation.

Methodology

The study incorporated one district each from Greater Accra, Eastern, Central, Volta and Brong-Ahafo Regions. The Natural Resources Institute study has advanced some understanding of peri-urban agricultural systems around Kumasi (Blake et al., 1997). Edmunson (1996) also studied the land and housing market in the urban fringe areas of Kumasi. Yankson and Gough (1999), on their part, examined the environmental impact of rapid urbanisation on the peri-urban areas of Accra. A wider spatial spread of such studies was deemed important to provide data for other types of cities and therefore permit comparison and broader understanding of the issues. This insight was the reasoning for selecting Cape Coast, Ho, Sunyani, Koforidua and Accra.

The very nature of the peri-urban areas made it difficult to ascertain the population that was engaged in agriculture. There was no sampling frame to use so a combination of probability and non-probability sampling procedures were used in the selection of a relatively small sample of peri-urban farmers for detailed study. The sampling was multi-stage. The first stage was the determination of the districts within the pre-selected regions. Five districts were purposively selected under the sponsorship of the Food and Agricultural Organisation (Ghana Office) of the United Nations. The Cape Coast Metropolitan Area (CCMA) has a large number of villages surrounding it. A large proportion of the population in these villages engages in agriculture purposively to serve the urban market. This situation is similar in Sunyani, Ho, Accra and Koforidua.

The second stage involved the listing of all communities within 30km radius of the cities and the random selection, using the lottery method, of 10 communities from each district. Thus, a total of 50 communities/villages were selected for the household survey. Given the resources available for the research, 10 households were selected in each community and this gave a sample size of 500 households. The field survey followed the methodology outlined as the agrarian systems diagnosis (FAO, 1999). A structured interview schedule was designed to capture the characteristics of the households, environmental issues, land tenure and land rights, land tenure dynamics, and peri-urban agriculture characteristics. The household heads or representatives were interviewed. Five hundred households were targeted, but four more were obtained in Sunyani* zone, so a total of 504 interview schedules were eventually returned as indicated in Table 1. The results and discussion are presented in the next section.

Table 1: The Distribution of Sampled Households

Peri-urban zone	Communities	Households	Total
Cape Coast	10	10	100
Sunyani	10	10	104*
Accra (Amasaman)	10	10	100
Koforidua	10	10	100
Ho	10	10	100
Total	50	50	504

Results and Discussion

The results are discussed along the lines of the characteristics of the households, environmental issues and land tenure and land rights. The other issues addressed relate to land tenure dynamics and peri-urban agriculture.

Characteristics of Farming Households

Household sizes varied marginally among the sampled localities with the largest family sizes occurring in the Accra zone (5.6) while localities around Koforidua reported low family size (4.8). There were more males (76% for Ho, 81% for Accra and 90% for Sunyani), and most respondents were married (76.8%) and aged between 31 and 60 years (82.9%). In addition, the study found that the majority (59.1%) of the respondents had some form of formal education up to the basic level, but Cape Coast (41%), Sunyani (25%) and Accra (Amasaman) (27%) zones reported more than 20 percent as without formal education, which were above the 24 percent for all the zones. Only seven respondents (1.4%) had tertiary level education.

One characteristic of peri-urban location is the changing social and economic balance between indigenous and immigrant inhabitants. The results do not reveal high levels of immigration, although the sample in the Accra zone showed more migrants (63%) than indigenous people. The communities around Ho (12%) and Cape Coast (13%) had the lowest proportions of immigrants in the population and this reflects the varying opportunities for economic advancement that the cities and towns in the sample offer. Accra has been a major attracting point for migrants compared to most other cities and towns in Ghana (Kendie, 1998). The low level of migration in the peri-urban locations was further revealed by the finding that 425 of the 504 respondents had lived in the communities for more than 20 years. The long stay in the villages by the majority of respondents implies some knowledge of the changing land market situation.

Most respondents (nearly 87%) were engaged in agricultural pursuits. Agriculture or farming was the only form of economic activity for about 58 percent of the 504 responding families as no off-farm employment was reported.

Environmental Issues

Peri-urban locations suffer some of the worst environmental health problems arising from the tendency of the city to dump its waste in these

zones. While this phenomenon was observed in the zones studied, the villages themselves lacked adequate waste disposal facilities. Most waste is dumped in public places, which are often not protected and controlled. Indiscriminate disposal or littering was also substantially practised. The waste disposal practices of the communities do not differ from what pertains in rural Ghana as a whole (see Kendie, 1990, 1996, 2002). Liquid wastes were equally not properly managed as wastewater was often left to run into soak pits or gutters. The use of wastewater in backyard gardening and the use of solid waste for composting were limited to only 10 and 27 cases, respectively. Although most households reported having bathrooms, these were usually rudimentary, the facilities being similar to bathroom systems in the urban low-income zones.

The health burdens associated with poor environmental sanitation manifest themselves in the nature of prevalent diseases found in the area. Malaria, intestinal worms, diarrhoea, bilharzia and skin diseases are the leading causes of morbidity and these reflect the national situation (Kendie, 2002). Intestinal worms and diarrhoea were particularly problematic in the Sunyani zone just as bilharzia and diarrhoea were of major concern in the Cape Coast area. These diseases are symptomatic of pollution, poverty, land use changes, and natural resource degradation. According to the UNFPA (2007), the absence of clear regulations and administrative authority can create environmental degradation and health hazards as industrial and agricultural activities mingle with residential activities. This mingling exposes residents to hazardous substances in the air, which can cause skin and respiratory diseases; and hazardous substances in water and food, which can cause diarrhoeal diseases.

Land tenure and Land Rights

While peri-urban communities would still depend to a very large extent on agriculture for their livelihood, the increasing competition for land would affect land access especially as speculation is often high in these settings (De Soto, 2000). Lands in southern Ghana are vested in stools and sub-stools occupied by chiefs and queenmothers who are the

custodians of the land. However, 'the custodians exercise (only) supervisory and administrative functions in respect of vacant and/or unallocated community lands and do so as titular holders, holding the land in trust for the whole community' (Arko-Adjei et al., 2009; Ben et al., 1997, p.87). Families and individuals hold the customary freehold in land so that these families must be the first 'point of call' when one is interested in acquiring land. The majority (51.6%) of the respondents acquired their lands for farming (Table 2) through the individual owners, the chief (25.6%) or the family head (21%). Access to available land was not a major problem as only 15 percent of the households said the land was difficult to acquire.

Table 2: Mode of Access to Land

Peri-urban zone	Chief	Individual land-owner	Family	LAC*	No.
Cape Coast	43	18	39	-	100
Sunyani	17	66	12	9	104
Amasaman (Accra)	36	48	16	-	100
Koforidua	23	71	6		100
Ho	10	57	33	-	100
Total	129 (25.6)	260 (51.6)	106 (21.0)	9 (1.8)	504

***Land allocation committee, which operates only in the Sunyani zone**

Land Rights

Long term knowledge of security in the use of land has implications for sustainable land management. In this study, we found that although it was quite easy to acquire land for farming purposes, this was not backed by the necessary security of tenure. Only 27 out of the 504 respondents had absolute rights to the land on which they farmed, and these were all in the Sunyani District. Twenty respondents had no rights at all and these were mostly in the Accra (Amasaman) and Cape Coast zones.

Also, 161 respondents (32%) had rights to the land for farming purposes only, and this occurred in all the zones with the highest incidence in Accra (40%) and Koforidua (41%). This finding of limited rights to the use of the land beyond agriculture was confirmed by the further finding that 403 respondents (80%) indicated that they had no right to sell the land. This was because 221 respondents (44%) had no outright ownership, 57 (11.3%) worked on family lands, 10 respondents (2.0%) worked on lands belonging to the chief and three respondents were occupying government lands. These findings suggest insecurity of tenure, which according to De Soto (2000), limits opportunities to access credit and invest in housing and soil improvements since they cannot use the land as collateral.

Mode of Land Acquisition

Most respondents operated on family lands (229 or 45.4%), but a substantial number operated on a leasehold basis (138 or 27.3%), which is the usual mode of land acquisition in urban Ghana. Other modes of land holding are the traditional 'abusa' and 'abunu' sharecropping systems.

As an urban centre expands outwards, the demand for land in peri-urban areas intensifies (Adell, 1999; UNFPA, 2007), and traditional modes of land acquisition are gradually replaced by the modern methods (Arko-Adjei et al., 2009). This situation is typified in Accra where only 27 respondents worked on family lands, the leasehold becoming the most frequent mode of land acquisition. Also in Accra, 53 percent of the respondents complained that they did not have enough land for expansion, as compared to Ho (15%), a comparatively smaller town. Respondents who had difficulty expanding their farmlands complained that much of the land was given out for residential purposes (23% for Accra, and 8% in Cape Coast). The land available, therefore, had become too small for the whole community (13% for Cape Coast and Accra, 18% for Koforidua and 14% for Ho).

There is a substantial increase in leasehold land titles, especially in Accra, and this, as was found out also for Bamako (Djire, 2007), does not

imply that peri-urban populations are registering their lands. Farm sizes are reducing because the urban middle classes (bureaucrats, businessmen and non-resident Ghanaians) are securing land in the peri-urban zone. The problems associated with the increasing appropriation of peri-urban land were manifested also in the sizes of farmland. Most farmlands were below four acres, the mode being two acres. This situation occurs in all the peri-urban zones except the Sunyani zone, where the mode was nine acres. This is to be contrasted though with the modal values of one acre in Cape Coast and Ho.

One constraining factor with regard to access to land generally was land shortage, which had to do with the gradual encroachment on peri-urban land for urban purposes, tantamount to what Nottingham and Liverpool Universities (1998) explain as the inevitable consequences of urbanisation. This restrictive access in the study areas was gender neutral. Over 54 percent of households in all the surveyed districts complained of the threat of urbanisation on the availability of land, the most pressure being in the Amasaman area of Accra. Residents of the peri-urban areas of Ho and Koforidua were also greatly affected by urban expansion as 70 percent and 63 percent respectively agreed that their communities were being threatened by urbanisation. The urban population growth rate in Ghana (about 4.8%) is generally higher than the national population growth rate (about 2.7%). This high rate of population growth in urban areas has implications for urban land use, and these have generally been in the direction of land acquisition in peri-urban locations for the purpose of home construction.

Peri-urban locations are often ideal for home construction by the rich in society. As the urban population increases and densities rise, there is the tendency to 'escape' into the suburbs. The peri-urban respondents see the pressures in the declining availability of land for farming and for the construction of their own homes. In the Accra and Cape Coast zones particularly, the signs of land shortage for farming purposes were obvious, and this also manifests itself in the small sizes of land available to female

farmers in all the peri-urban areas visited. Indeed, the tendency of the landowners (chiefs and clan heads) to sell to the highest bidder squeezes out the average peri-urban resident from the land market.

Private acquisition of lands occurred mainly for people from outside the peri-urban communities. Peri-urban families still operated under the customary law with the complaint that the registration processes were too costly and cumbersome. Where land titles had been secured, succession was tending towards patrilineal lines even in matrilineal societies as fathers bequeathed the lands to their sons. This finding makes it difficult to accept the conclusion by Benneh et al. (1997) that "the independent operation of women in the agricultural land market in all the study areas is progressive. The logical policy implication is that, as the social and economic systems change and given market opportunities, women (in the study areas) are well positioned to take initiatives and respond to the challenges towards improving their lot and that of their families"(p.65). Urban residents acquire land titles in peri-urban zones more easily and so the increasing conversion of customary holdings into the freehold system disrupts the cultural patterns of land acquisition and land use, and women in these zones are the hardest hit.

Women's Access to Land

The dependence of the peri-urban populations on farming in the study districts was obvious. Since farming is largely land extensive in Ghana, any activity that takes land from the household has implications for food security. In general, the external pressures on land (government acquisition, sale for residential and industrial development) have reduced the available land supply. Women are always the hardest hit in such conditions (Kameri-Mbote, 2005), and the very small farm sizes of the women farmers in the sample bear ample testimony.

Benneh et al. (1997) examined women's access to land in the peri-urban zones of Kumasi and also in the Wa and Nadowli Districts of the Upper West Region. The study found that tenure issues have often been

convenient scapegoats to explain low agricultural yields because most women had little or no difficulty in acquiring land for farming purposes. Thus, the independent operation of women in the agricultural land market in all the study areas was found to be progressive.

The present study found that women generally had access to farmland. Indeed 453 respondents asserted that there was no form of discrimination against women in so far as access to land was concerned, which is in line with the findings of Benneh et al. (1997). Nevertheless, the actual percentage of women engaged in agriculture was low, as only 35 percent (156) of the 448 households who responded to this question reported that their women had farms. Most farm sizes were small, the modal size being one acre and there was little variation among the districts. While, there appears to be no discrimination against women with respect to access to land, the actual size of farm-land was rather small, and rights were limited only to cultivation (80%).

Land Tenure Dynamics

The 50 communities surveyed in the five regions showed the conventional ownership patterns. These patterns are:

- Stool lands
- Family lands
- Private lands, and
- Government/public lands.

In some cases, there were ownership overlaps such as stool lands co-existing with family and public lands. In the Sunyani and the Koforidua zones, there were overlaps of all the four ownership patterns. The complex systems of ownership unearthed may be categorized into two land tenure systems as legally recognized in the 1992 constitution of the Republic of Ghana. These are the public and the customary (including private) land tenure systems.

In the public land tenure system, lands are vested in the President of Ghana on behalf of and in trust for the people of Ghana (Gough &

Yankson, 1997). Such lands may be acquired from stools with lump sum compensation, and administered by the Lands Commission. Significantly, all zones indicated government acquisition of lands in the peri-urban fringes. These lands were all registered at the Lands Commission and permanently lost by the stools.

The customary land tenure system retains its traditional characteristics of communal ownership and administration. It has, however, taken on the new characteristic of having to be registered at the Lands Commission. This further required that the exact boundaries, hitherto related to streams, trees etc. have to be determined and described. The registration is in response to the Compulsory Land Title Registration Law (1986) by which all land transactions have to be registered at the Lands Commission.

Private land ownership, which has become widespread in Ghana, has evolved from the customary land tenure system through the freehold sale of land to individuals who also offer portions of such lands for sale to other private individuals. In all the zones studied, family ownership and stool lands were the norm, implying the dominance of customary land tenure systems. Land titling (private ownership) is increasing, following the passage of the Law and is dominant in the Accra zone. The situation in the Accra zone affirms Kalabamu's (2000) conclusion that over time workable and key elements of the tenure system are retained and poor ones are dropped to suit new socio-geopolitical conditions.

Security of Tenure

The pressures and tensions of land tenure arising from the activities of the major actors in the land market produce varied degrees of tenure insecurity (Dorner, 1972; World Bank, 1974). In a positive vein, lack of tenure security and limited availability of land are known to have led to more intensive use of land in vegetable production and poultry farming often with knowledge and capital intensive technologies such as the use of agro chemicals and battery cage systems. However, it is the negative effects of tenure insecurity that are widespread in the peri-urban environs.

Tenure insecurity reduces the willingness of peri-urban farming households, which are generally resource poor, to invest in land and soil fertility improvement (De Soto, 2000).

Farming households surveyed demonstrated an understanding of the essence of land registration, which they asserted, helps to avoid litigation and land disputes, and provides the basis for legal action when there is a dispute. The respondents also indicated that a deeds registry document may be used as collateral security and this reason was prominent in Koforidua (26%) and Ho (18%) zones. Over 66 percent of farming households showed a general awareness of the Land Registry Act, (Act 122) of 1962. However, the survey revealed that in spite of farming households' awareness of the enforcement of the Land Registry Act and their recognition of the extreme importance of land registration, only a small proportion had undertaken the registration exercise (7% in Sunyani, 8% in Cape Coast, 12% in Accra, and Ho and 20% in Koforidua).

Various reasons assigned in order of importance for this low rate of registration were:

- the costly nature of the exercise (too expensive);
- ignorance of the procedures;
- procedures are cumbersome, and slow, and,
- corruption on the part of the state registration institutions.

Constraints identified in the land market that bring about tenure insecurity included:

- Prevalence of illegal and multiple sales, especially for family lands
- Share cropping arrangements which are not favourable
- Government acquisition of land without adequate compensation
- Land sold to sand winning contractors without concern for land degradation.

A development in the land market with many consequences for security of land tenure is the activities of land guards. Land guards act as

community watch dogs against illegal encroachment on land and thus enhance security of tenure. The concept of land guards was familiar to households in all the five zones, with the Accra zone showing the highest degree of awareness (70%), and lowest in Sunyani (31%). The activities of land guards are limited to the Accra, Koforidua and Ho zones, and to a lesser degree, the Sunyani and Cape Coast areas.

A major factor that determines the security of land tenure is the issue of succession. The evidence shows that the inheritance patterns conform to the traditional patrilineal (Greater Accra and Volta (Ho) Regions) and matrilineal (Central and Brong Ahafo Regions) systems. The Eastern Region (Koforidua), because of its multi-ethnic composition, was found to be partly matrilineal (Oyoko, Akwadum) and partly patrilineal (Adawso, Okorase, Nkurakan). There was a noticeable shift from matrilineal to patrilineal system of inheritance for privately acquired farm lands, and this was significant in the Accra and Cape Coast zones. This was attributed to the operation of the PNDC intestate succession law. This was to the disadvantage of women as patrilineal inheritance follows male lines. The implication is that as more lands get registered and private titles secured, females may lose out as even families in matrilineal societies will inherit land along patrilineal lines. This finding corroborates Kameri-Mbote's (2005) argument that under systems of law in many African countries, land ownership is anchored in patriarchy, and that while females may have security of tenure when the land is under cultivation, they experience restrictive access.

Generally, the study found that land in the peri-urban areas is sold and bought through several avenues:

- private purchases from individual land owners, which ranked first in Sunyani, Accra, Koforidua and Ho and second in Cape Coast.
- the chief as the focal point of contact, which ranked first in the Cape Coast area, second in Sunyani, Greater Accra and Koforidua but ranked third in the Ho zone.

- Through contact with clan and family head, which ranked third in all zones.
- In the Sunyani zone, a regional plot allocation committee was found to be operative.

It was generally felt in the surveyed communities that peri-urban land was too expensive to acquire and the procedures cumbersome and frustrating.

Peri-Urban Agriculture

From the survey, households were engaged mostly in food crop production. Crops grown include cassava, maize, yam, groundnuts, plantain and beans. Vegetable production is prominent in all the areas but more predominant in the Accra zone. Cash crop production was almost non-existent in the Cape Coast zone, the Accra zone, and the Ho zone. The Koforidua zone produced cocoa, cola, oil palm, and oranges in addition to the food crops and vegetables grown. In the Sunyani zone, cocoa and oil palm in addition to food crops and vegetables were cultivated. Small ruminant production, especially sheep and goats occurred in all the zones. Household poultry keeping was generally low. However, commercial poultry farming is growing in all the zones. In all, 249 such farms were counted in the study zones as shown in Table 3.

Table 3: Distribution of Commercial Poultry Farms

Zone	Number	Percentage
Cape Coast	42	16.9
Sunyani	95	38.1
Amasaman (Accra)	47	18.9
Koforidua	40	16.1
Ho	25	10.0
Total	249	100

The Sunyani area had the highest number of commercial poultry farms (95) while Ho zone had the lowest (25). The variation can be explained by the fact that the Sunyani area is one of the leading maize production zones in the country. Maize is an important input in poultry production and location in a production zone could lower costs substantially. It was further revealed that livestock production in the peri-urban areas was not properly integrated into the existing cropping systems. One could not therefore talk of mixed farming as a farming system in the peri-urban areas. In a few cases in Accra, Sunyani and Koforidua areas, mixed farming was prominent in backyard gardens where vegetables and fruit trees were integrated with small ruminants and poultry production. Fish farming and piggery production also featured in backyard gardens.

Technologies of Production

Peri-urban agriculture essentially employs traditional technologies of production and management systems. Hence the traditional implements and tools such as hoes, cutlasses, mattocks, and chisels are used, along with the traditional methods of mixed cropping, crop rotation and shifting cultivation/bush fallow to a lesser extent. In a few cases, modern capital goods such as irrigation equipment and pumps, tractors and implements for land preparation as well as garden tools were also in use.

The survey revealed a selection of modern techniques of farming employed in the regions to varying degrees. The use of chemical fertilisers ranks first in the techniques of farming employed in the zones (32% of households). Compost (22%), mulching (15%) and the use of pesticides (10%) followed in that order. The use of improved seeds (8%) offers the greatest scope for scale-neutral technical change for productivity improvements in peri-urban agriculture but the spread is still low. Agro-chemicals – fertilisers, pesticides and weedicides were said to be in short supply and were also extremely expensive. Farm labour was also in short

supply and becoming more and was more expensive as it faces competitive demand from off-farm urban employment opportunities.

Rain fed agriculture was found to be the norm in the peri-urban environs. There was no systematic use of surface and underground water resources for irrigation. Food crop production was therefore seasonal and erratic, totally dependent on the vagaries of the weather. The sourcing of knowledge resources by peri-urban farmers from the extension services of the Ministry of Food and Agriculture was also found to be defective. Farming households complained of a general lack of extension services and government support.

Conclusions and Policy Implications

It is important to recognise that peri-urban areas can be important sources of food (especially vegetable) supply to the city. Thus, intensive cultivation to offset declining land availability could reduce the cost of production, and the proximity to the city could further reduce the price to the consumer. Urban development policy ought to recognise this role of the peri-urban communities.

A first step towards the effective (and mutually beneficial) integration of the peri-urban areas into the cities and towns would be to ensure sanity in the land market, in order to facilitate access for women and the poor. The current situation of multiple sales, illegal sales, government acquisition of land without adequate compensation being paid to the landowners and the use of government acquired lands for other purposes, does not encourage stability and security in the land market. While these issues seem to occur throughout the urban areas, peri-urban areas are much more affected. The rapid replacement of traditional land tenure regimes with modern systems displaces people who are ill prepared to participate in the urban economy.

The LAP is collating views nationally in Ghana towards a consolidated law on lands. The following ought to be considered in this review:

- Land rights and land tenure are rooted in culture, which has evolved institutions and norms/rules governing land use and ownership. It is important that this cultural dimension be integral to the reforms.
- Freehold titles may actually increase the cost of land (a reality in many urban areas in Ghana) and thus squeeze out the poor, and peri-urban communities are at risk. Indeed this study has shown the tendency to transfer freehold titles from father to son even in matrilineal societies, so that women are disadvantaged.
- The indigenous institutions governing land tenure ought to be firmly involved. In this respect various researchers have suggested hybrid systems in which trained land surveyors provide the boundaries of community lands (Home, 2004), women actively participate in policy reforms to understand gender concerns in land tenure (Mari, 2003), and community levels of governance (Unit Committees, District Assembly and local courts) to operate simple procedures for land transactions.

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Does Access and Use of Financial Service Smoothen Household Food Consumption?

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Abstract

The study relies on Ghana's Living Standard Measurement Survey to test the hypothesis of no relationship between credit and household food consumption expenditure. Albeit the plausibility of endogeneity problems, we use single stage and pooled least squares, given the non-availability of national panel data in Ghana and lack of better instruments in the Living Standard data. The is does not provide enough evidence to reject the null hypothesis. This suggests that access to credit does not contribute to the smoothening of household consumption. This observation cuts across different sub-samples based on socio-economic classification. We recommend circumspection in propagating the ability of credit in smoothening consumption.

Keywords: Financial, Household, Consumption, Income

Introduction

The immediate past prolonged oil price hikes and the on-going global financial crisis culminated in diversion of food crop production to bio-fuel and decline of food aid supplies to developing countries. Pingali (2008) observed that a total of 82 high risk countries were expected to increase their spending by 40% as compared to 2007, with food import bills increasing by almost four times as compared to 2000. The adverse impact on food supply as a result of the tumbling global economy has led to high increases in food prices with African economies being the hardest hit (Von Braun 2008 and Pingali 2008). The severity on African economies can be logically inferred as it is the only continent struggling with the objective of halving poverty and hunger as stipulated in the Millennium Development Goals (United Nations 2008). The direct effect of international food price hikes on domestic markets in developing economies have varied depending on factors such as border measures and polices, and cost of intermediation and market structures. In response, households have had to adjust their food expenditure based on the relative weight of the domestic food price increase compared to other factors such as taste, cultural values, quality, convenience and other demographic factors.

Until quite recently, most studies (e.g.Strauss 1982, Strauss 1984 and Udry and Woo 2006, Shamim and Ahmad 2007) which are premised on the Engel's Law, placed premium on income elasticity in determining household food expenditure. These studies focused mainly on income measurement (permanent and transitory and expenditure), model re-specification to capture the nuances of data variability and extensions to reveal the effect of household demographics. From a different perspective, recent theoretical and empirical expositions have emerged in response to volatile income and peculiar living arrangement and coping mechanisms of households. This peculiarity characteristic of developing economies

[1]The Engel's Law states that household expenditures on food declines proportionately as income rise. That is the rate of increase in food consumption expenditure is lesser than the increase in income.
[2]Risk preference is defined in the context of idiosyncratic and covariate risk via income volatility.

accounts for a variant to the basic economic theory of household's consumption decision making under uncertainty (Morduch 2002). Specifically, behaviour based strategies such as risk preferences and financial service coping mechanism have been identified as important factors in explaining household decision making on food consumption. Exposition of exante behaviour based strategies such as accessing financial service to smoothen consumption have been minimally studied, compared to household decision making in the context of risk preferences. Characteristic of both studies is the assumption of either risk preference homogeneity for all households in the case of the former or perfect financial markets for the latter. Also, these studies (e.g. Kochar 1995, Morduch 1995 & 2002 & Heltberg and Lund 2008) have relied on data from Asia, with little empirical work in sub-Saharan Africa (e.g.Ayalew 2000). This paper builds on the scanty literature of household food consumption decision making based on constraints on financial markets.

Most developing economies have designed financial services to suite rural and agricultural need of poor households. The dispensation of designing financial services for constrained households is informed by the perceived capability of credit as a tool for long-term investment, seasonal input and consumption requirements. Recent evidence shows the degree to which access to finance, and specifically credit, in Africa remains a constraint to rural and agricultural households (Honohan and Beck 2007 and World Bank, 2008). Though recent studies, notably Claessens (2006), unveil the complexity and blurred connection between access and use of financial services, most policy prescriptions thrive on the assumption that access connotes potential use.

The era of global food crisis and policy prescription of access to financial service bring to the fore two waves of connections worth exploring. First, the global effect of food price increases makes the

[1]Isolating access to financial services from the broader context of coping and risk is implied by the peculiar characteristics of financial markets revealed by Stiglitz and Weiss 1981, Udry 1990 and others. Also the rhetoric of the role of finance as a policy instrument for developing economies and funds being invested into new emerging financial markets such as microfinance makes it imperative.

provision of consumption credit either through Social Safety Net Programmes or commercial consumption loans an imperative. Secondly, the backdrop of access is likely to increase current demand for food commodities with supply decreasing, prices tend to increase. Both scenarios suggest a positive relationship between access to financial service and food prices. As alluded to earlier, the different effect of the global food crisis on domestic countries requires the identification of the responsiveness of household food consumption on access to financial service on a location specific basis. On the presumption that access to financial services explains household demand for food consumption, it will in turn provide an initial platform for country-specific further studies that will estimate the type and amount of financial service required for combating the general increases in food prices. On the other hand, in a scenario where access to financial service proves statistically insignificant then a second best option of a complementary policy intervention must be considered. The latter offers a more intuitive approach based on the failure of Keynesian economics that promotes mainly a continuous increase in aggregate demand with much less emphasis on aggregate supply. By implication, some production incentive must accompany access to financial service to promote the supply of agricultural output with the aim at mitigating domestic output constraints. Also, from a method of study perspective, the potential bi-causal relationship between food prices and access to financial services signal the possibility of endogeneity.

This paper tests a null hypothesis of a lack of a statistical relationship between amount of credit and household food consumption expenditure. The study further tests the regional and time effects as well as potential endogeneity in the traditional structural form of food price determinant's equation. This study uses data from the last three waves of the Living Standard Measurement Surveys (LSMS) of Ghana to assess the nature of the connection between household food consumption expenditure and access to financial services. Using pooled ordinary least squares cross section regression, the study further tests for regional and

time effects based on fourth and fifth rounds of the LSMS. The model is specified based on the traditional structural equation of food consumption determinants with household income and credit received being the main exogenous variables. There are equations that control for the effect of household size, price differentials, and sex and age of the economic head of a household. The raw variables are elicited from the LSMS, merged and recalculated where necessary to fit the demands of both theory and econometric estimation. The main variable of interest, access to financial services, is measured by the total amount of loan received by the household. A limitation of this measurement is the assumption that all households applied for credit. This implied that households with zero amount of credit were not successful with their application. Though this potentially might lead to error in the variable, the definition of the unobserved variable, access to the use of financial service, is quite utopian.

Classens (2006) attempts to use a four point criteria of flexibility, continuity, convenience and reliability to provide at best a qualitative measure of access to and use of financial service. In the paper, other financial instruments such as the effect of savings are explored but prove widely uncorrelated with food expenditure and show a sparse distribution. A possible justification can be attributed to the view point of the peculiarity of Ghanaian rural household savings habits skewed to non-financial instruments (Aryeetey, 2004).

The paper is structured in four parts. In the next two sections, a brief theoretical review precedes the discussion of preliminary results. In the case of the former, the point of departure is household decision making under uncertainty, which sets the tone for modelling an empirical equation to test the effect of access to financial service on household food consumption. The discussion of the empirical findings separates the individual LSMS from the combined and socio-economic classification of households. This offers a validation for the pooled regression estimation. The last section of the paper draws a conclusion to ignite possible recommendation for both future academic work and policy direction. This

paper's contribution is empirical as it uses data from Ghana which to the best of our knowledge, no single paper at the country level has applied econometric tools of pooled independent ordinary least squares to estimate household food expenditure.

Theoretical Framework and Empirical Model Specification

Inter-Temporal Consumption Decisions under Uncertainty

The intertemporal consumption decisions under uncertainty are that the agent's attitudes toward intertemporal substitution and risk aversion are dishevelled. Intertemporal choice, in this view, involves a balancing of two qualitatively different, but both immediate, affective influences; immediate motivations to take specific actions based on immediate costs and benefits, and immediate emotions experienced as a result of thinking about the potential future consequences of our behaviour. Lucas (1976), concerted that there may not be anything that could properly be called a consumption or savings function; the relation between consumption, income and interest rate depends on the wider macroeconomic context and may not be stable overtime, even though consumers are always trying to maximize the same utility function. A higher expected real interest rate makes consumers defer consumption, everything else held constant. The magnitude of this intertemporal substitution effect is one of the central questions of macroeconomics. If consumers can be induced to postpone consumption by modest increases in interest rate, then, movements of interest rates will make consumption decline whenever other components of aggregate demand rise; total output will not be much influenced by changes in those component (Hall, 1988).

However, time and uncertainty represent indispensable ingredients to many of the most challenging resource problems. With respect to the time dimension, agents are generally assumed to have a pure time preference as well as a preference for smoothing consumption over

time. With respect to risk, agents are generally assumed to be Arrow-Pratt risk averse. The discounted expected utility model assumes that aversion to risk and aversion to intertemporal fluctuations coincide. (Traeger, 2009). Moreover, only for homothetic preferences of the risk aversion parameter for good would be independent of the levels of consumption of the other goods. Now, from our understanding, risk aversion of an individual should be a rather primitive quantity in the sense that it determines their general behaviour towards risk. It should not allow that in the same situation individuals are risk averse with respect to one commodity and risk seeking with respect to another when both good yield would give them the same welfare gain.

The consumption behaviour depends primarily on the relation between the long run rate of interest and the rate at which the consumer discounts utility. If the long run rate of interest is greater than the discount rate, then consumption grows without bound as long as the consumer earns a positive income in some period. Intertemporal consistency constraints require that the lower bound on current net wealth be consistent with the borrowing constraint the consumer will face in the next period. This implies that current wealth can never be so low that it may become impossible for the individual to satisfy his borrowing constraint in the next period even if nothing is consumed in the current period. If the long run rate of interest is equal to the discount factor, then consumption generally converges to infinity only if there is sufficient uncertainty in either the income or interest rate sequences. Almost all the empirics have established for the case where both the income and interest rate sequences may be stochastic. In many cases, however, the intuition behind the results and the meaning of the assumptions become more apparent when only the income sequence is stochastic (Gary, 1999).

There has been an extensive argument on optimal consumption-saving behaviour of expected utility maximizing risk averse individuals. There are, however, two limitations of such works. According to Basu, and Ghosh (1993), the widely used time additive Von Neumann Morgenstern

(VNM) preferences may not be suitable for analyzing choice problems in a dynamic context. Since for this class of preferences the coefficient of relative risk aversion turns out to be the reciprocal of the elasticity of intertemporal substitution, these preferences fail to distinguish between the importance of intertemporal substitution and risk aversion in determining the optimal choice for the individual decision maker. Secondly, in analyzing the comparative static effect of an increase in risk, the increase in risk has been usually captured by the mean preserving spread of the distribution of the underlying random variable. But, since the mean of the distribution is stipulated to be unchanged, the mean preserving spread, undoubtedly, provides a restrictive characterization of an increase in risk. In a clear departure from the expected utility maximizing analysis, under the non-expected utility maximizing approach, optimal saving tends to be determined by the elasticity of intertemporal substitution as well as the risk aversion parameter.

Moreover, the course of economic events is often unpredictable and choices about the future have to take into account of this uncertainty. This uncertainty may affect, for example, the future flow of income to the household. Let us consider the two-period and denote the stream of income flows by (Y_1, Y_2). Let us assume that income can take on only two values: Y^a (high) and Y^b (low). Uncertainty means that the actual outcome is a realization from a certain joint probability distribution $P(Y_1, Y_2)$. Given a realization of period-1 income, Y_1, one can use this distribution to calculate the conditional probabilities of period-2 income $P(P_2 \mid P_1)$. We normally assume that agents know this distribution; Therefore, agents can form expectations about the future course of events. For example, given the current realization Y_1, one can calculate the expected value of period-2 income conditional on the information contained in the current state:

$$E_1[Y_2] \equiv E(Y_2 / Y_1 ...) = P(Y^a / Y_1)Y^a + P(Y^b / Y_1)Y^b \qquad (1)$$

We, therefore, embed this form of uncertainty in our two-period model of optimal consumption/saving. Let us assume that there is no uncertainty in the first period so that Y_1 is known. And let us assume that agents use a

riskless bond with return r. All uncertainty is about the second-period value of the income flow Y_2 $E\{Y^{\alpha}, Y^{\beta}\}$. The budget constraint of this agent in the first period is standard: $A_2 = Y_1 - C_1$. Substituting the saving choice in the period-2 constraint, the following obtains:

$$C_2 = Y^{\alpha} + (1+r)(Y_1 - C_1) \quad \text{, with probability } P(Y^{\alpha}/Y_1) \quad (2)$$

$$C_2 = Y^{\beta} + (1+r)(Y_1 - C_1) \quad \text{, with probability } P(Y^{\beta}/Y_1) \quad (3)$$

Period-2 consumption is a stochastic variable as it depends on the realization of Y_2. Given this choice set, the objective of the agent is to maximize the expected value of utility by the appropriate choice of C_1 given by

$$\max_{C_1} E(U) = U(C_1) + \frac{1}{1+\eta} E_1[U(C_2)] \quad (4)$$

$$= U(C_1) + \frac{1}{1+\eta}[P(Y^{\alpha}/Y_1)U(Y^{\alpha} + (1+r)(Y_1 - C_1)) + P(Y^{\beta}/Y_1)U(Y^{\beta} + (1+r)(Y_1 - C_1))]$$

The first order condition that characterizes this solution is expressed as;

$$U'(C_1) = \frac{1}{1+\eta}[P(Y^{\alpha}/Y_1)(1+r)U'(C_2^{\alpha}) + P(Y^{\beta}/Y_1)(1+r)U'(C_2^{\beta})]$$

$$U'(C_1) = \left(\frac{1}{1+\eta}\right) E_1[(1+r)U'(C_2)] \quad (5)$$

This is the stochastic version of the Euler equation, which holds under more intricate stochastic structures and longer horizons.

On the other hand, let us consider testable implications of a particular version of the model of optimal consumption under uncertainty. We first consider an agent that lives for more than 2 periods so that the objective function is given by

$$E_1\left[\sum_{t=1}^{T} \left(\frac{1}{1+\eta}\right)^{t-1} U(C_t)\right] \quad (6)$$

The optimal decision of the consumer is governed by the same Euler equation as in the 2-period case

$$U'(C_t) = (\frac{1}{1+\eta}) E_1[(1+r)U'(C_{t+1})] \quad (7)$$

and by the intertemporal budget constraint, we can show that;

$$U'(C_1) = (\frac{1+r}{1+\eta})^{t-1} E_1[U'(C_t)] \quad \text{for all t=2,3....} \quad (8)$$

The budget constraint can now be written by taking expectation of the current period 1 to get

$$\sum_{t=1}^{T} E_1[(\frac{1}{1+r})^{t-1} C_t] = A_1 + \sum_{t=1}^{T} E_1[(\frac{1}{1+r})^{t-1} Y_t] \quad (9)$$

The household instantaneous utility function can be expressed in quadratic form as;

$$E[U] = E\left[\sum_{t=1}^{T} C_1 - \frac{b}{2} C_t^2\right] \quad b \succ 0 \quad (10)$$

assuming that, both interest rate and discount rate are zero, and individual wealth is such that the marginal utility of consumption is positive: $u'(c) \succ 0$

Although consumers choose different consumption level in different periods according to a certain consumption mode, they cannot make the choices for the future, since they cannot know certain information about their income, property profits and expenditure at the certain time in the future. So, it is unrealistic for consumers to determine their future consumption unless they have special needs (Mei and Wang, 2006).

To describe the household's behaviour, we use the Euler-equation approach. Along an optimal path, a reduction of current consumption C_t resulting in a rise of future consumption *Ct* should have the same marginal utility.

$$1 - bC_1 = E_1(1 - bC_t) \qquad \text{for all t=2,3} \qquad (11)$$

where, $1 - bC_1$ is the current marginal utility of consumption and $E_1(1 - bC_t)$ is future marginal utility of consumption, which implies current marginal utility of savings. The Euler equation now becomes

$$C_1 = E_1[C_t] \quad \text{for all t=2,3...} \qquad (12)$$

Now the budget constraint can be used to solve for current consumption

$$C_1 = \frac{1}{T}(A_1 + \sum_{t=1}^{T} E_1[Y_t]) \qquad (13)$$

The household consumes $\frac{1}{T}$ of her expected lifetime resources.

Things are not too surprising since we can informally regard this Euler equation as the stochastic version of the consumption-smoothen implications studied without uncertainty: it is optimal to adjust consumption so that it is not expected to change. Now this statement is in expected terms and, in general, consumption will change over time in this model due to the underlying structure of the shocks. This is good because in the data we observe changes in consumption.

The Euler equation says that current consumption suffices to predict consumption in the future. Provided that we can write future consumption as the current forecast plus a white-noise error term, $C_{t+1} = E_t[C_{t+1}] + e_{t+1}$ the Euler equation allows us to derive

$$C_{t+1} = C_t + e_{t+1} \qquad (14)$$

In other words, consumption follows a random-walk. This is a process where changes in consumption are permanent. It means that uncertainty exists in the next period's expenditure while current consumption makes inertial effect on it. What we are really interested in is the proportional part which the uncertainty accounts for in the next period's consumption, or,

whether uncertainty plays as a revised random factor, or as an important one determining the trend of future consumption.

More specifically, consumption will respond to unanticipated shocks that change the consumer's estimate of lifetime resources. To see this, we refer to the expression for consumption C_1 shown above, which conveys again the idea that consumption is determined by (expected) lifetime permanent income (the life-cycle/permanent-income hypothesis). Similarly, the expression for C_2 can be written and manipulated as follows

$$C_2 = \frac{1}{T-1}(A_2 + \sum_{t=2}^{T} E_2[Y_t])$$

$$= \frac{1}{T-1}(A_1 + Y_1 - C_1 + \sum_{t=2}^{T} E_2[Y_t])$$

$$= \frac{1}{T-1}(A_1 + Y_1 - C_1 + \sum_{t=2}^{T} E_2[Y_t]) + (\sum_{t=2}^{T} E_2[Y_t] - \sum_{t=1}^{T} E_1[Y_t]) \quad (15)$$

The changes in consumption between period 1 and 2 equals the change in the individual's estimate of his lifetime resources divided by the number of remaining time periods, which implies that changes in consumption are unpredictable. This occurs because of information that was not anticipated initially. Changes in permanent income that were anticipated are already built into the consumption plan.

Homogeneous Income (Equate Permanent and Transitory Income)

The Permanent Income Hypothesis is a theory that links an individual's consumption at any point in time to the individual's total income earned over their existence. The hypothesis is based on two straightforward premises that individuals wish to equate their anticipated marginal utility of consumption across time and that individuals are able to respond to income changes by saving and dis-saving (Aguiar and Hurst 2008). Permanent income hypothesis can be expressed in terms of consumption function as $C = Y^P$. Current income can also be expressed as

$Y = Y^P + Y^T$ where $Y^P$is the permanent income and $Y^T$is transitory income respectively: assuming that, $E(Y^P) = 0$ and $Cov(Y^P, Y^T) = 0$

Let us consider a regression of consumption on current income:

$$C_i = a + bY_i + e_i \qquad (16)$$

Where $\hat{b} = \frac{Cov(Y,C)}{Var(Y)} = \frac{Cov(Y^P + Y^T), Y^P}{Var(Y^P + Y^T)} = \frac{Var(Y^P)}{Var(Y^P) + Var(Y^T)}$

$$\hat{a} = \bar{c} - \hat{b}\bar{Y} = \bar{Y}^P - \hat{b}(\bar{Y}^P + \bar{Y}^T) = (1 - \hat{b})\bar{Y}^P$$

When the variation in permanent income is much greater than the variation in transitory income, almost all differences in current income reflect differences in permanent income. Across households, variation in income reflects such factors as unemployment and the fact that households are at different points in their life cycle. Over time, almost all of the variation in aggregate income reflects long-run growth and permanent income increases.

Binding Financial Access Constraints

The microfinance upheaval over the past decade shows some promise in extending financial services in the form of credit, insurance and savings to underserved areas and households.The effectiveness of these efforts nevertheless remains uncertain, especially the extent to which micro financial institutions allow populations previously unable to undertake higher-return activities to access sufficient working capital for investment. Without more widespread access to financial savings and credit, however, binding working capital constraints will continue to trap the poorest subpopulations of rural Africa in low-return, high-risk livelihood strategies (Barrett et al, 2001). The domestic financial markets may be repressed or inadequately developed, or capital controls which impede access to financial markets may exist. Furthermore, when information about the households' credit risk is incomplete or asymmetric, the possibilities of moral hazard and adverse selection indicate that would-be borrowers may be denied access to capital markets (Stiglitz and Weiss

1981). Furthermore, an important stabilization policy in an economy with an occasionally binding financial friction should be set as if the friction were not present when this is not binding, even though the constraint does distort private sector behaviour even in the non-binding state. When the credit constraint is binding, optimal policy is to intervene to subsidize the price of non-tradable consumption. This subsidy increases demand for non-tradable goods and the relative price of non-tradable goods. The increase in income increases collateral and alleviates the effects of the binding borrowing constraint. It was also ascertained that the optimal policy has a small quantitative effect on private agents' behaviour, and particularly precautionary saving. This, however, does not imply that the optimal policy has small welfare effects.

According to De Brouwer (1996), the financial integration affects the ability of households to smooth their consumption over time and constrained intertemporal optimization of consumption. Furthermore, the study suggests that liberalization of the capital account, combined with deregulation and expansion of the domestic financial sector, is necessary for constraints on consumption smoothing to be eased, and financial integration *does* have real effects on the time profile of consumption. An intertemporal budget constraint shows a sequence of one period borrowing constraint. It may well turn out that none of these constraints are actually binding at the optimum, and yet the consumer is still constrained to choose a consumption program whose present value does not exceed the present value of the income stream. Whenever the expected increment in disposable income in the following period is sufficiently small so that the expected marginal utility from consuming out of that increment would be infinite, the consumer chooses to consume less than his current wealth in the current period in order to pass on some of his wealth to the next period. If we allow the expected marginal utility of future income to be finite, however, the borrowing constraint may well be binding, at least occasionally. This will obviously be the case if income received in each period is growing at a sufficiently high rate over time so that the consumer wants to transfer future income to present consumption. But if the income stream is suitably stochastic, a much weaker set of conditions guarantees that the budget constraint is sometimes binding. (Gianluca et al, 2009).

Under the financial crisis, households faced the problem of reconciling realized income shortfall with a desirable level of stable consumption. Households have devised several methods, such as self-insurance and mutual insurance, to protect their levels of consumption against the ex-post risks of negative income shocks.

Let us consider the following expression:

$$\underset{\{A_{t+1}\}_{t=0}^{\infty}}{Max}\ E_0\sum_{t=0}^{\infty}\beta^t U(C_t) \quad \text{s.t.} \quad C_t + A_{t+1} = A_t + Y_t \qquad (17)$$

$$C_t \geq 0 \qquad A_0 \text{ is given.}$$

A first order optimality condition implies that;

$$E_t[C_{t+1}] = \beta_1 + \beta_2 C_t \qquad (18)$$

Euler equations with quadratic preferences are given by

$$U'(C_t) = \beta\, E[U'(C_{t+1})] \qquad (19)$$

$$\alpha_1 + \alpha_2 C_t = \beta\, E_t[\alpha_1 - \alpha_2 C_{t+1}]$$

Implies

$$E_t[C_{t+1}] = \frac{\alpha_1(\beta - 1)}{\beta\alpha_2} + \frac{1}{\beta} C_t$$

$$= \beta_1 + \beta_2 C_t \qquad (20)$$

If $\beta = 1$, this amount to $E_t(C_{t+1}) = C_t$ (21a)

The expression (21a) implies that there is no precautionary savings for the household. Now suppose the household faces the constraint $A_{t+1} \geq 0$, then, the lagrangian optimality conditions is given by

$$L = E_0\sum_{t=0}^{\infty}\beta^t[U(C_t) - \lambda_t(C_t + A_{t+1} - A_t - Y_t + \mu_t A_{t+1}] \qquad (21b)$$

First Order Conditions plus Complementary Slackness Conditions

$$U'(C_t) = \beta E_t[U'(C_{t+1})] + \mu_t \quad (22)$$

$$A_{t+1}\mu_t = 0$$

$$A_{t+1} \geq 0$$

$$\mu_t \geq 0$$

To show $U'(C_t) = Max\{U'(Y_t + A_t), \beta E_t[U'(C_{t+1})\}$ (23)

The budget constraint is given by

$$C_t = Y_t + A_t - A_{t+1} \quad (24)$$

Because $A_{t+1} \geq 0$, we know that $C_t \leq Y_t + A_t$ (25)

If $A_{t+1} = 0$: $C_t = Y_t + A_t$ and $U'(Y_t + A_t) < U'(C_t) = \beta E_t[U'(C_{t+1})]$ (26)

Hence $U'(C_t) = \max\{U'(Y_t + A_t), \beta E_t[U'(C_{t+1})]\}$ (27)

With quadratic utility we get

$$\alpha_1 - \alpha_2 C_t = \max\{\alpha_1 - \alpha_2(Y_t + A_t), E_t[\alpha_1 - \alpha_2 C_{t+1}]\} \quad (28)$$

This implies that

$$C_t = \min\{Y_t + A_t, E_t[C_{t+1}]\} \quad (28)$$

If we suppose that at time t the liquidity constraint is not binding while in t + 1 the realization of the income shock makes the household borrowing constrained then, the current consumption choices would not be affected by future consumption. Let's presume that in t + 1 the borrowing constraint is not binding, then $C_t = E_t[C_{t+1}] = E_t[C_{t+2}]$ by using the law of iterated expectations. But when in period t + 1, constraint is binding, then

$C_t = E_t[C_{t+1}] < E_t[C_{t+2}]$,Current consumption choices are affected by future potential borrowing constraints. Due to higher income uncertainty savings increase because agents are aware of their inability to smooth low income shocks via borrowing.

Empirical Model Specification

In this section we look at two strands of Ordinary Least Squares estimations. The first strand looks at the set of variables from the LSMS fourth and fifth rounds and the second strand considers the pooled data which was used for the regression. Suppose a households' income is specified as

$$Y = f(cdt, hhs, seh, aeh, pi, r_i) \quad (30)$$

Where Y is the income of the household: cdt is the credit availability: hhs depicts the size of the household: seh is the sex of the economics household head: aeh is the age of economic household head: pi is the price index and r_i represents the regions in Ghana, t ranges from 1 to 10. The equation (30) can be formalized as,

$$\log(Y_i) = \psi_1 cdt_i + \psi_2 hhs_i + \psi_3 seh_i + \psi_4 aeh_i + \psi_5 pi_i + \psi_6 r_{it} + e_i \quad (31)$$

We merge the fourth and fifth rounds of the LSMS dataset to estimate a model to explain household food consumption expenditure. In addition to the combined estimates for the entire dataset, the data was also disaggregated and estimated. The regression equation for the various categories was given by,

$$\log(Y_\tau) = \psi_1 cdt_\tau + \psi_2 hhs_\tau + \psi_3 seh_\tau + \psi_4 aeh_\tau + \psi T_\tau + \psi_5 pi_{i\tau} + \psi_6 r_{i\tau} + e_\tau \quad (32)$$

where Ψ_i are the estimated coefficients, T stands for the time effect dummies and $_\tau$ represent the pooled data set, i.e. Combined All; Combined Extreme; Combined Poor and Combined Non-Poor respectively.

Results and Discussion

Over time the household dataset of the last three rounds of the LSMS has almost doubled and has been revised to extract more robust information

based on the number and duration of visits (Coulombe and McKay 2008). Notwithstanding the fact that the LSMS is the only available composite national level data on community, households, enterprises and prices, its size, collection procedure and management of the dataset, provide a justification for its reliability. Like any other dataset, though the LSMS is susceptible to some theoretical questioning on the mode of aggregating, some indices such as calibrating absolute poverty lines, its usage is imperative in view of the above.

This paper relies on the household as the unit of analysis and extracts the variables of interest, which are food expenditure, total expenditure, total income, balance on savings account, and total amount of loan received, for the analysis. The LSMS dataset corrects and imputes both direct and indirect incomes and expenditure (See Coulombe and McKay 2008). Table 1 and figures 1-3, show a description of the dynamics over time and regional differences of household food consumption expenditure in relation to income, total expenditure and access to financial service. In each of the three rounds of the LSMS, household expenditure was at least 50 per cent more than income, which suggests the reliance on other coping mechanisms such as credit and remittances in maintaining an average household in Ghana. In spite of the huge proportion of food expenditure to total expenditure (more than 50 per cent), household income is observed almost fully by food expenditure.

In contrast to the Engel's law and consistent with earlier empirical work in Ghana (Udry and Woo 2006), household food expenditure does not fall dramatically as total expenditure increases. This is evidenced by the relatively elastic downward sloping curves from left to right by the graphs for total in all the figures. Significant regional variations are observed in each of the three rounds of the LSMS and over time. In the third round of the LSMS, the Upper West, Eastern and Central Regions, unlike the general pattern, revealed an almost perfectly inelastic curve, suggesting a lack of relationship between food expenditure and total expenditure. This signals the limited options for households to vary their consumption and indicates a survival livelihood system. In the same period, the Northern and Upper East Regions showed segments of positive

and inverse relationship. Over time, this changed as the Upper West and the Central Regions showed an inverse pattern in the fifth round of the LSMS. Obvious changes over time are observed in the Brong Ahafo Region. In the third round, it showed an inverse relationship, changed to positive coefficient in the fourth round and finally to an inverse but concave to the origin in the fifth round. The latter pattern suggests an initial fall in food expenditure at a higher rate as household total expenditure increases. This phenomenon is consistent with the Engel's law but circumspection with this interpretation is prudent as the manifestation is observed on only a segment of the curve. In a similar pattern, figures 1b, 2b and 3b show that the connection between household food expenditure and total expenditure revealed marked differences by poverty groupings in the respective rounds of the LSMS. The patterns were, however, fairly consistent over time relative to the dynamics observed in the case of the regional categorization. The within 'round' relationship between food expenditure and total expenditure for the different poverty groupings in part augments the regional variation on the premise of the stack differences in poverty by region and ecological zones (Ghana Statistical Service 2008). While the extreme poor does not dramatically show patterns consistent with the Engel's Law, other categories of respondents were modest in their deviation from the traditional Law of Economics. A striking observation was the consistent higher coefficient for the poor group compared to the non-poor group. Drawing conclusions at this stage on the coefficient between these two socio-economic groups may be misleading as the equations are simple (just one independent variable) but it is worthwhile noting them for further investigation.

The data on savings and credit showed erratic patterns dominated by extreme outliers and suggesting potential flaws in drawing conclusions based on the averages. The phenomenon is possibly explained by the supply side dominance in determining amount of loan received and the poor's savings habit which is characterized by non-financial instruments. Notable, however, is the significance of credit that is 30 per cent of the difference between household total expenditure and income. Despite the enormity of the amount of credit, though it provides only an iota of

relevance, the source of credit in Ghana still casts doubt on the development of the financial sector. About 55% of households rely on friends, relatives and neighbours for credit compared to other sources, including formal and informal financial institutions. Though the evidence suggests a commendation of the structure and benefits of social capital and the extended family system, it leaves policy makers in a dilemma; as such, sources of loan are clandestine in nature.

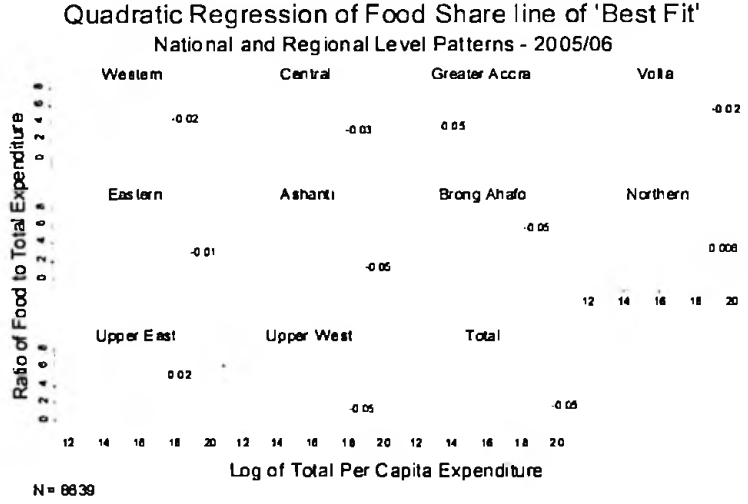
Table 1: Main Variables of Interest

Household Level Variables	*LIVING STANDARD MEASUREMENT ROUNDS OF SURVEYS*		
	THIRD – 1991/92 N = 4523	FOURTH -1998/99 N = 5998	FIFTH – 2005/06 N = 8639
Mean Total Expenditure	592.90	4,010.11	18,400.00
Mean Total Income	372.70	2,169.00	11,800 00
Mean Total Food Expenditure	330.70	2,271.28	9,389.38
Food Expenditure % of Total Expenditure	56%	57%	51%
Mean Amount of Credit	64.96	289.54	2,189.11
Mean Balance on Savings Account	98.29	351.56	3,066.82
Savings % of Income	26%	16%	26%
Credit % of Diff. b/n Expenditure & Income	30%	16%	33%
Major Source of Credit	Neighbour's – 67%	Neighbour's = 58%	Neighbour's = 53%

Source: Author's computation from raw data of the last three rounds of the Living Standard Measurement Survey's in Ghana.

- Mean Total Income and Expenditure are in Thousands of Cedis at current prices.
- These figures are more informative on the extent to which we are able to correct for the important inflation that occurred between 1991/92 and 2005/06. Ghana Statistical Service (2006) posits a national Consumer Price Index of 455.40 for November 2006 with respect to November 1997 as the base year. The World Bank database shows a respective yearly inflation of 20%, 14% and 13% for 1991, 1999 and 2006. The GLSS computation of household's expenditure accounts for regional price differences across the categories of both food and non-food items and housing.

Figures 1a



Figures 1 b

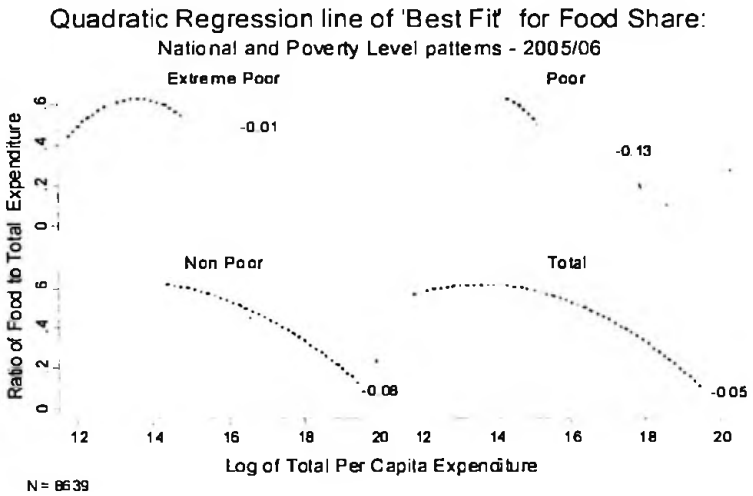
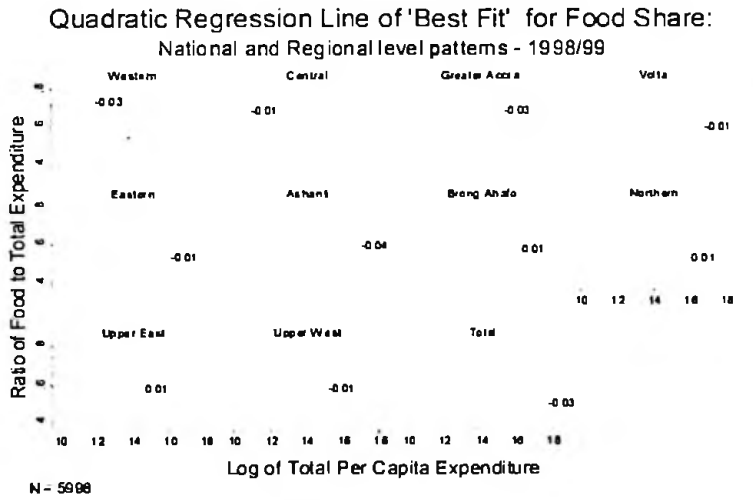


Figure 2a



Figures 2b

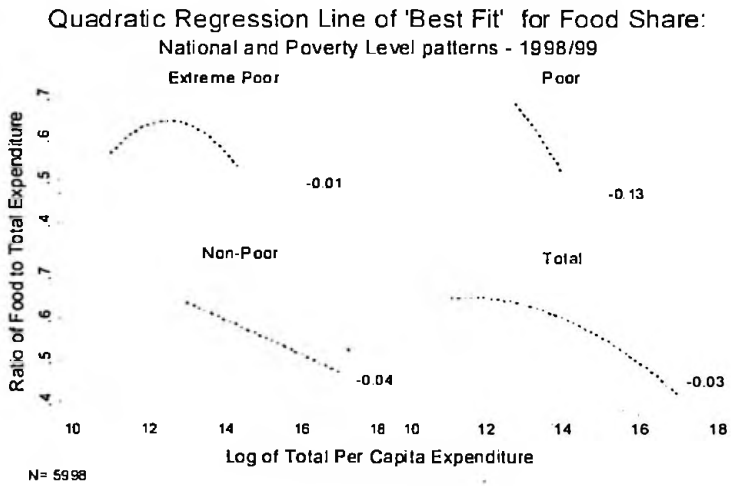
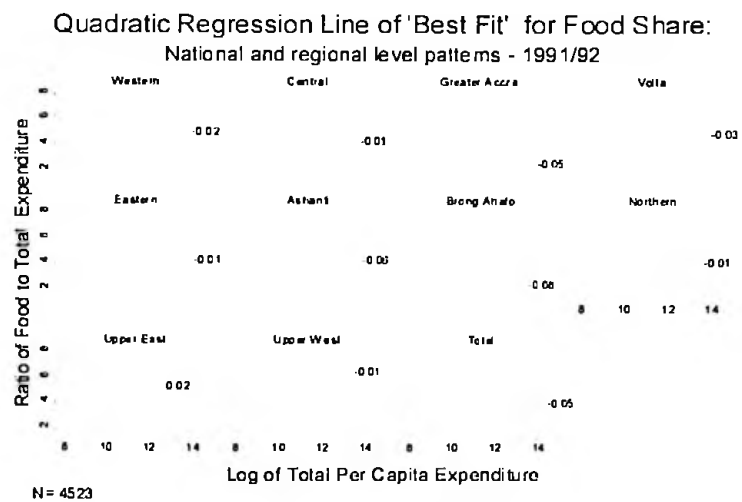
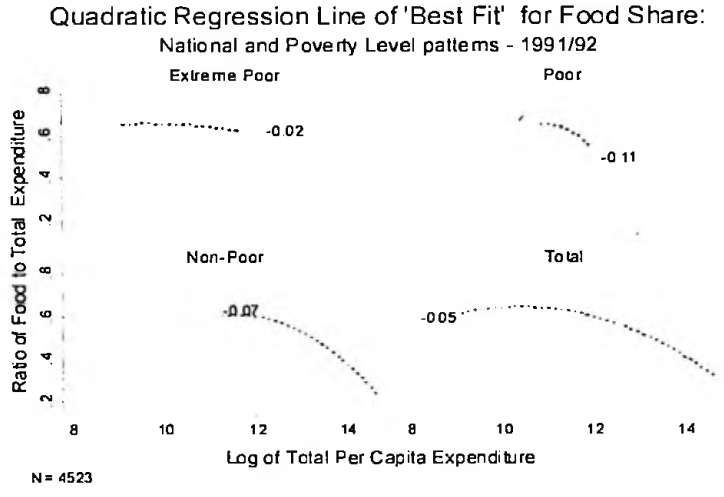


Figure 3a



Figures 3b



Estimation

The inciting observations offered by the descriptive statistics based on both regional and poverty patterns and trends provide the need for a relatively more rigorous analysis to assert possible attribution and identify coefficients to inform policy. As an initial empirical investigation, the current research is restricted to the fourth and fifth rounds of the LSMS. Table 2, shows the summary statistics of the main variables of interest identified for the regression analysis. It could be observed that both food expenditure and income increase over the last two rounds of the LSMS by about two log points over the six year duration. The summary statistics for credit offers huge standard deviations, which constraints a succinct interpretation of its sign and coefficient in the regression. The regression controls for the effect of household size, sex and age of the economic head of the household and price changes, both across regions and over time. Controlling for the effect of price index, especially across time, is imperative as the mean price index between the rounds of LSMS literally increased by almost 400 per cent. Economic head, defined by the Ghana

Statistical Service as the major earner, seem relatively constant according to age and sex between the last two LSMS.

The log of income coefficient, unlike the traditional total expenditure reveals a positive coefficient in both independent random samples of the fourth and fifth rounds of the LSMS (Table 3). This observation is consistent with basic economic theory strictly from the perspective of income (earning). In both regressions, food share is expected to rise slightly over 21 per cent, given a one per cent change income level. In a broader context, the constraints of Ghanaian households impinge restrictions on the current food consumption and that given the smallest increase in their income level, a fifth will be translated into food expenditure. Though a pill hard to swallow and the obvious data problems with the amount of credit, the sign of the coefficient varies in the two rounds and is approximately zero. This latter suggest the plausibility of the classical error in variable problem of least squares, which will be verified in a later version of this paper. Patterns of the location coefficient within each of the samples showed the expected results in view of the socio-economic characteristics in each of the regions. The order of changes in the magnitude of coefficients is fairly consistent with the ranking of poverty by regions in both LSMS's. The responsiveness of changes in food share is much higher in richer regions relative to the poorer regions. Comparing across the LSMS, the signs of the coefficients for location and price index vary, suggesting some degree of doubt in relying on individual estimates. Though the source of the problem is not eminently known and could be multiple, one approach to resolve such a problem is to pool the data. Wooldridge,(2006) asserts that in view of the obvious attribute of gaining a larger sample size, pooled independent random samples offer more precise estimators and tests statistics with more power.

Table 2: Variables for Multivariate Analysis: LSMS Rounds 4 & 5

Variables	*Round 4* *N = 5,998*		*Round 5* *N = 8,639*		*Combined* *N = 14,637*	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Log of Food Expenditure	14.41	0.70	15.81	0.74	15.24	1.00
Log of Income*	14.01	1.26	15.60	1.28	14.94	1.49
Credit+	128.5	589.00	654.98	4,911.73	444.35	3,831.16
Household Size	4.28	2.56	4.20	2.83	4.24	2.72
Sex of Economic Head	0.41	0.49	0.38	0.49	0.40	0.49
Age of Economic Head	43.85	15.26	42.82	15.32	43.24	15.30
Price Index (Accra = 99)	0.89	0.05	3.44	0.38	2.39	1.30
Poverty Status	1.47	0.82	1.60	0.75	1.55	0.78
Time effect (Dummy)	0	0	1	0	0.60	0.49
Regional Effect (Dummy)	-	-	-	-	-	-

* Some Households have negative income therefore the log generates missing values.

\+ Credit is measured in thousands of cedis.

Table 3: Robust Estimation of Household Food Consumption Expenditure - Ordinary Least Squares Regression

	Round 4 (1999)		Round 5 (2005)	
Explanatory Variables	Coefficients	t-statistics	Coefficients	t-statistics
Log of Income	0.21	[26.77]**	0.22	[32.89]**
Credit	-0.00	[-0.07]	0.00	[0.17]
Household Size	0.08	[27.07]**	0.08	[31.45]**
Sex of Economic Head	-0.01	[-0.43]	-0.01	[-0.89]
Age of Economic Head	-0.00	[-2.20]*	-0.00	[-3.83]**
Price Index (Accra=1999)	1.75	[7.86]**	-0.42	[-14.36]**
Western Region	-0.07	[-2.19]*	-0.46	[-13.13]**
Central Region	-0.27	[-8.78]**	-0.47	[-12.75]**
Volta Region	-0.20	[-5.66]**	-0.60	[-16.16]**
Eastern Region	-0.25	[-7.70]**	-0.42	[-11.27]**
Ashanti Region	-0.04	[-1.31]	-0.58	[-16.63]**
Brong Ahafo Region	-0.14	[-3.97]**	-0.63	[-16.25]**
Northern Region	-0.36	[-7.89]**	-0.82	[-19.13]**
Upper East Region	-0.37	[-7.02]**	-0.98	[-22.27]**
Upper West Region	-0.68	[-14.22]**	-1.38	[-30.62]**
Constant	9.76	[41.83]**	14.19	[82.89]**
N	5793	-	8330	-
Adj. R^2	0.418	-	0.420	-
F-Statistic	260.97	-	312.40	-
Log-Likelihood	-4582.74	-	-7011.26	-

+ p<.10, * p<.05, ** p<.01

[4]Other variants of least square estimation were explored to improve on the specification. Typically, the log of credit was used to examine elasticities but due to loss of data arising from zero responses, we did not report the results.

In Table 4, we merge the fourth and fifth rounds of the LSMS dataset to estimate a model explaining household food consumption expenditure. In addition to the combined estimates for the entire data set, the last three major columns of the table disaggregate the sample by socio-economic well-being. The rationale for using the welfare thresholds is to observe the responsiveness of the identified covariates for each of the socio-economic groups and overtime. This is employed to curb plausible heterogeneity bias, which arises due to the non-availability of a panel dataset at national level. A narrow assessment of the resilience of the pooled data relative to the individual regressions using the R-Squared shows that the models' fit almost doubles. Besides, the main hypothesis of the lack of effect of access to financial services on household food expenditure pooling the data offers a response to the question - what has happened to food expenditure over time after controlling for relevant factors?

Access to financial services measured by the amount of credit shows a positive sign but not statistically significant at even ten per cent with both the entire combined datasets and for each of the socio-economic groups. Though not conclusive at this stage, and through further investigation is necessary for correction of some potential problems, such as error in variable, the initial observation pointing to a lack of direct relationship, upholds the hypothesis of this paper. Holding the potential data problems constant, some explanations can be alluded for the positive, extremely low coefficient and lack of relationship between amount of credit and food share. Firstly, the positive relationship is expected as the constraints on income drive the use of credit for consumption. Secondly, a caveat to the expected positive relationship is the reason and nature of the contract of the credit. As mentioned earlier, amount of credit is potentially a supply-side (financial institutions) determinant or at best co-determined by both demand and supply agents. Hence, its outcome is dependent on the strength of bargain. This impedes the realization of a correlation between households needs such as food and credit. Thirdly, the major source of credit; relatives, friends and neighbours; as is evident from the descriptive statistics, shrouds reasons, nature and other characteristics of the credit in secrecy thereby blurring any expected potential effect on food share. Lastly, intended use of credit in most developing countries is

skewed to production rather than consumption needs. Though access to financial services intuitively is advocated as a coping measure, it is observed from this study that it does directly translate to significant increases in household food consumption expenditure.

Consistent with apriori expectation, household size shows a positive sign with food share showing that food consumption expenditure tends to increase with a greater number of household members. Female economic headed households tend to reduce household food expenditure relative to their male counterparts. This finding, quite intriguing, can be linked to other national-level socio-demographics such as female headed household being relatively well-off than their male counterparts in all the last three rounds of the LSMS. In a similar pattern, age of economic head of household shows an inverse relationship with food share. Thus, older household heads spend less on food expenditure relative to younger head of households. An additional merit of pooled cross section estimation is introduction of a time dummy variable that evaluates the unexplained changes in household food share over time after controlling for the identified covariates. The time effect variable from Table 4 turns out to be utterly significant in all four estimations, suggesting that holding constant household discriminatory factors, food consumption expenditure has changed between 1998/99 and 2005/06. Observing the t-ratio across the different socio-economic groups, the non-poor group offers the most significant changes over time. An early conclusion from this is the skewness of policies in favour or detrimental to non-poor households over the seven year period (1999-2005). This provides a platform for future work to investigate the effect of policies that were non-existent prior to 1999 such as National Youth Employment Programme (NYEP), Rural Infrastructure Project (RIP) and the Highly Indebted Poor Country Initiative (HIPC). Most of the interventions, including the NYEP, RIP and HIPC, at the beginning of the 2000 decade and during the initial tenure of the incumbent government were on pilot basis and scattered unevenly across the country. This potentially offered varied effect on spatial basis and indirectly accounted for different impacts on households with diverse socio-economic characteristics. In Ghana, this needs to be underscored as poverty, for ages has been endemically location-specific.

Across different socio-economic groups, log of income coefficient tends to vary and reveals a u-shaped curvature similar to the relationship between food share and log of per capita expenditure observed from the descriptive statistics. Though all (last three major columns of table 4) show a positive sign, indicating that households irrespective of the socio-economic background on the average will increase their food consumption expenditure as income increases, the coefficient varies. In spite of the need to assess the statistical difference between these coefficients prior to any deduction, the literally observed difference is worth underscoring. Identifying reasons for this pattern readily in this paper is insurmountable but, as alluded, it incite much concern for further academic and intuitive investigation as this will inform greatly the success of development policies.

Table 4: Robust Estimation of Household Food Consumption Expenditure - Ordinary Least Squares Regression

Explanatory Variables	Combined All	Combined Extreme Poor	Combined Poor	Combined Non-Poor
Log of Income	0.22	0.14	0.04	0.14
	[42.88]**	[12.89]**	[3.83]**	[27.65]**
Credit	0.00	0.00	0.00	0.00
	[0.31]	[1.16]	[0.43]	[0.04]
Household Size	0.08	0.13	0.17	0.13
	[40.53]**	[24.24]**	[28.97]**	[54.09]**
Sex of Economic Head	-0.01	-0.04	-0.07	-0.02
	[-0.56]	[-1.77]+	[-3.44]**	[-1.94]+
Age of Economic Head	-0.00	-0.00	0.00	-0.00
	[-4.93]**	[-2.20]*	[0.91]	[-3.32]**
Price Index (Accra=1999)	-0.28	-0.08	0.18	-0.15
	[-12.55]**	[-1.06]	[2.56]*	[-6.97]**

Western Region	-0.28	-0.11	0.15	-0.22
	[-12.93]**	[-1.48]	[2.64]**	[-10.64]**
Central Region	-0.37	-0.13	0.18	-0.25
	[-16.63]**	[-1.91]+	[3.16]**	[-11.41]**
Volta Region	-0.42	-0.13	0.13	-0.30
	[-18.22]**	[-1.99]*	[2.43]*	[-12.95]**
Eastern Region	-0.34	-0.24	0.15	-0.22
	[-15.00]**	[-3.16]**	[2.73]**	[-10.70]**
Ashanti Region	-0.34	-0.06	0.11	-0.25
	[-16.66]**	[-0.91]	[2.02]*	[-12.57]**
Brong Ahafo Region	-0.42	-0.13	0.19	-0.29
	[-18.06]**	[-1.76]+	[3.04]**	[-12.79]**
Northern Region	-0.62	-0.28	0.16	-0.28
	[-22.59]**	[-4.04]**	[2.47]*	[-9.79]**
Upper East Region	-0.78	-0.24	0.20	-0.34
	[-24.86]**	[-3.28]**	[2.86]**	[-9.02]**
Upper West Region	-1.13	-0.45	0.00	-0.55
	[-38.09]**	[-6.47]**	[0.01]	[-11.34]**
Time Effect (=1 if 2005)	1.80	1.25	0.74	1.54
	[30.74]**	[6.11]**	[4.07]**	[27.59]**
Constant	11.70	11.55	12.51	12.56
	[140.96]**	[57.41]**	[77.41]**	[156.19]**
N	14123	2589	1289	10245
Adj. R^2	0.689	0.732	0.861	0.727
F-Statistic	1870.76	421.16	418.91	1655.10
Log-likelihood	-1.2e+04	-1818.06	-364.55	-7016.77

t statistics in brackets — + p<.10, * p<.05, ** p<.01

Conclusion and Policy Recommendation

The main hypothesis of a lack of relationship between access to financial service and household food consumption expenditure is upheld. Both merits and demerits can be inferred from this observation. In some perspective, it can be argued that credit is intended for production and not for consumption; therefore, revealing undefined relationship with food expenditure is commendable. On the flipside, a plausible initial inference could be that the amount and targeting of credit intended to mitigate food constraints is ineffective. Though each of these responses is contestable household specific questions on patterns, beneficiaries, amount and usage of credit in Ghana are instigated. Either of the possible inferences requires in-depth studies and the correction of potential data and estimation problems including errors, variables and endogeneity.

Other main findings from this paper are that wide regional and socio-economic variations, especially for the coefficient of household income changes over time. Beyond variations based on household characteristics, pooling the last two rounds of the LSMS shows unexplained changes in household food consumption expenditure over time. Drawing definite conclusions based on the current findings is impeded by the nature of data and lack of further statistical test. This notwithstanding, the finding signals a call for circumspection and tailoring of credit access; for financial service should serve as an income boost for household food consumption.

Preliminary policy recommendation points to complementing access to financial service with other food crisis interventional options. Among the options to be verified empirically include provision of agricultural inputs, integrated financial services with a special focus on insurance and extension officers. These are of enormous essence as a stand alone policy of access to credit, at best merely increases food prices and, more importantly, has the potential of instituting a vicious cycle of poverty as insinuated by the World Bank.

The observed findings incite the need for a panel data to reveal both unobserved individual household food consumption expenditure characteristics and variations overtime. Though the pooled data provides relatively more precise estimates compared to individual cross section

regression, it does not capture individual household heterogeneity as sample units vary in the different rounds of the LSMS. Data on specific policy interventions between the two rounds of the LSMS will provide some details and clues to the sources of variations across time, region and socio-economic groups. Further estimation will explore the statistical significance of running separate regressions for the socio-economic categories or plugging into the main structural equation different dummies to test the differences. The Chow Test was applied to verify the statistical significance of the different regressions to offer a more resilient and justifiable results and conclusions.

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Sports Tourists' Satisfaction with the CAN 2008 Continental Sporting Event in Ghana

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Abstract

Satisfaction is essential for the successful marketing of events, yet most studies on events have been restricted to measuring economic impact. This study examined sports tourists' satisfaction with the African Cup of Nations (CAN 2008) tournament in Ghana as well as identified some of the factors that influenced their satisfaction. A total of 428 sports tourists from participating countries were purposively sampled and given questionnaires to self-administer. Secondary data on the performance of the various participating teams was obtained from internet sources. The results of the study suggest that respondents were generally satisfied with the event though they were more satisfied with the sociological aspects of the event. Ticketing, pricing and dissemination of information had the lowest ratings. The study has implications for both the management of future events and for research.

Keywords: CAN 2008, Satisfaction, Sports Tourism, Event, Marketing

Introduction

Governments of most tourist destinations have recognised the importance of sports as a tourism endeavour and are aggressively promoting sports tourism. As a result, the right to host mega events like the Olympic Games and FIFA World Cup is preceded by intense lobbying and bidding. A 1994 European Commission Report on the European

Community and Sport estimated that the sports industry is responsible for 2.5 percent of world trade (Commonwealth Australia, 2000). Also, growth rates for the sport tourism industry are estimated at about 10 percent per annum (Hudson, 2003).

The government of Ghana invested substantially into the successful hosting of the African Cup of Nations (CAN). Modern stadia were built in Takoradi and Tamale whilst the ones in Accra and Kumasi have been renovated, all at the cost of over $200 million. This placed enormous responsibility on the Local Organizing Committee (LOC) to stage the event successfully in order to justify the huge financial investments. But the success of the event also depends on the satisfaction to be derived by the attendees.

Glyptis (1991) believes the expanding market and opportunities in tourism and sport businesses are indications of the need for studies on sports tourism. However, most studies on sports tourism have focused on its economic impacts (Ritchie and Smith, 1991; Brunet, 1996; Dobson *et al.*, 1997 and Gratton *et al.*, 2000). Indeed most governments and local authorities commit substantial resources to the staging of events because of the anticipated economic benefits as asserted by McMahon-Beattie and Yeoman, (2004:188). According to these researchers, "The economic impact of major sports events is of critical importance when it comes to justifying the investments made". The overemphasis on economic impacts has the tendency of compromising the quality of such events. However, for sports tourists to continue attending subsequent events at the destinations, they have to be satisfied with previous events. This study therefore aims at examining sports tourists' satisfaction with the CAN 2008 sporting event. It also looks at the factors influencing sports tourists' satisfaction with the event.

Literature Review

Satisfaction is viewed generally as a post-purchase comparison of perceived performance of a product with expectations (Herrmann *et al.*,

2000; Lovelock *et al*, 2001). It has also been described as an evaluative, affective or emotional response to a consumptive experience (Shonk, 2006). However, Tse and Wilton (1988) are of the view that consumer dissatisfaction is only a function of the actual performance, irrespective of consumers' expectations. This is because consumers evaluate each transaction on its own terms without using their expectations as a reference point.

Satisfaction, which has been closely linked with value (Hollowell, 1996; Woodall, 2003), has also been defined severally. Fornell (1992) describes it as an overall evaluation of a purchase. It is also a judgement that a product or service feature, or the product or service itself, provides a pleasurable level of consumption-related fulfilment" (Oliver, 1997:13). Satisfaction has further been described as the psychological outcome of experiencing the service (MacKay and Crompton, 1990). There have also been attempts to distinguish between satisfaction with the consumption of goods and the consumption of services, because of the role of the consumer in the latter (Lovelock, 1991). Moreover, measuring tourists' satisfaction with a destination (which is the case of the CAN 2008 event), is conceptually different from measuring satisfaction at the transaction specific level (Foster, 1997). This is because the destination is an amalgam of services, facilities, products and infrastructure which must be effectively combined to meet the needs of the tourist.

Satisfaction has generally been viewed on two levels; transaction-specific level and cumulative level (Johnson *et al.*, 1995). The cumulative satisfaction is seen as the sum of the relative importance and the level of satisfaction experienced on all the single attributes (Ajzen and Fishbein, 1980). The cumulative satisfaction method is suitable for a study of a special event like the CAN 2008 because tourists' satisfaction is not based on a single expenditure item but a combination of the football matches, accommodation, transportation, entertainment, social interactions, food and other ancillary services such as ticketing and information dissemination.

Tourist satisfaction is important to the successful marketing of tourist products (Crompton and Mackay, 1997; Kozak & Rimmington, 2000). This is because it leads to customer loyalty (Fornell 1992; Musa *et al.*, 2004). It also results in increased positive word-of-mouth promotion, increased market share and increased profits (Fornell, 1992; Anderson and Sullivan, 1993; Kotler, 1994).

Some conceptual frameworks have been proposed to explain tourist satisfaction and these include expectation/disconfirmation (Francken & Van Raaij, 1981; Chon, 1989), equity (Fisk & Young, 1985; Oliver & Swan, 1989), norm (Cadotte, Woodruff, & Jenkins, 1987), and perceived overall performance (Tse & Wilton, 1988, Yoon and Uysal, 2005). In addition, Pizam and Ellis (1999) in their review of the literature identified other theories on satisfaction. These are assimilation of cognitive dissonance, contrast, assimilation-contrast, attribution, comparison-level, generalized negativity and value-precept. According to the expectation/ disconfirmation models, consumers have expectations about a product which they compare with actual performance. There is positive disconfirmation if the actual performance is better than their expectations and negative disconfirmation if the actual performance is worse than expectations. The equity models suggest that people are motivated when the costs of acquiring an experience equal the benefits to be derived. The perceived overall performance looks at the actual performance of a product or service without reference to consumers' expectations or their past experiences. This model is useful when tourists do not know about the situation at the destination such as in the case of the CAN tournament which is rotated among African countries every two years and no particular country hosts it two times in succession. This study therefore measures the perceived overall performance of the CAN 2008 event at the cumulative satisfaction level.

Though numerous studies have been done on customer's satisfaction, little work has been done on customer satisfaction in the context of sports tourism. Mullins (1985) identified club identification and

the win/lose phenomenon as two constructs that influence the satisfaction of sport fans. Madrigal (1995) tested a model of the cognitive and affective determinants of fan satisfaction with sport events. The model's cognitive variables were team identification, quality of opponent and expectancy disconfirmation whilst the affective variables were basking in reflected glory and enjoyment. These studies were, however, undertaken in the realm of sports psychology and marketing rather than sports tourism.

Wakefield and Blodgett (1994) on the other hand examined the effects of sport facility, perceived crowding, excitement and enduring involvement on customer satisfaction and repatronage intentions. Leeuwen *et al.* (2002) questioned the ability of the disconfirmation of expectancy model (DEM) to capture the complexity of sport customer satisfaction. This is because sports marketing is different from the marketing of other goods and services. They also criticized Madrigal and Blodgett's models as being narrow in focus because whilst the former explored satisfaction arising from the game, the latter focused on satisfaction derived from the sports facility. They subsequently proposed the Sports Spectator Satisfaction Model (SSSM) which looks at satisfaction arising from both the game and non-game components of the spectator services. However, these studies did not look at satisfaction at the cumulative level in the context of the tourist destination hosting a mega event.

Shonk (2006) tested a multi-dimensional model of service quality applicable to travelling sports spectators to a major league All-Star sporting event in the United States. He evaluated their overall satisfaction of the event based on their perceptions of four major quality dimensions namely, access quality, accommodation quality, venue quality and contest quality. The study indicated that the most important dimension to the respondents was the quality of the contest itself. However, this study also did not explore the factors that influence sports tourists' satisfaction with the event.

Methodology

Data for this study was collected from both primary and secondary sources. Primary data were elicited from people attending the event through a survey from the 8th of January 2008 to the 10th of February 2008. It was not possible to get a sample frame of people attending the event since they did not pre-register. There was no data on people attending the event except a projection by the Local Organizing Committee (LOC) of CAN 2008 which placed the number of expected attendees at one million (Statesman, 3rd May, 2007; Africanews, 21st November, 2007). In view of this, a non-probability sampling method was employed. Specifically, the purposive method was used to sample attendees for the study. Respondents were approached either after a match or at their hotels and with their consent, questionnaires were handed over to them to be completed. To eliminate the incidence of double or multiple responses which was likely to occur in an event situation, respondents were first asked if they had already completed one of the questionnaires. Also, each Field Assistant was to target tourists from a particular country and had to identify people from those countries before handing over the questionnaires to them. Following Neirotti *et al.* (2001) and Madrigal (1995) who in a related study considered sample sizes of 400 and 232 respectively, the sample size of 565 for this study was considered appropriate (Table 1); however, 428 completed questionnaires could be retrieved, representing a response rate of 75.8%.

Table 1: Sample Size of Respondents

Group and Venue	Country	Sample	Response
	Guinea	40	36
A	Namibia	30	16
Accra	Morocco	35	33
	Ghana	60	56
	Nigeria	60	55
B	Ivory Coast	40	38
Sekondi	Mali	30	16
	Benin	30	17
	Egypt	30	22
C	Cameroun	30	24
Kumasi	Sudan	30	27
	Zambia	30	29
	Tunisia	30	10
D	Senegal	30	29
Tamale	South Africa	30	12
	Angola	30	8
Total		565	428

Questionnaires were the main instruments used for the study. Respondents had to indicate their satisfaction with various aspects of the event (hospitality, entertainment, information etc.) on a Likert scale. The original Likert scale by Likert (1970) ranged from strongly agree to strongly disagree. For this study, it was on a scale of 1-5 (1= poor – 5= Excellent) so that respondents level of satisfaction could be determined. The questionnaire also sought information on respondents' travel characteristics and socio-demographic characteristics. Aside the above information, data relating to the performance of the various national teams such as goal differences, team progression and FIFA ranking were

obtained from secondary sources such as FIFA.com and MTNfootball.com. In view of the fact that a large number of the participating countries were Francophone (Guinea, Morocco, Ivory Coast, Mali, Benin, Cameroon, Tunisia and Senegal), the questionnaire was translated into French for the benefit of those who could not read and write English because the questionnaires were to be self-administered.

The instrument was pre-tested during a local premiership match between Kessben FC and Tema Youth at the Robert Mensah Sports Stadium in Cape Coast, which was not one of the venues for the tournament. A total of 25 sports fans were purposively selected to complete the questionnaire. This afforded the researchers the opportunity to sharpen the instrument for the actual survey. For the actual survey, a total of ten undergraduate students were trained as field assistants. The actual fieldwork started after the first matches had been pl. . d and ended after the final match had been played.

Findings

Socio-demographic Characteristics of Respondents

From Table 2, it can be concluded that the respondents were relatively young, with ages mostly within the 30-49 age group. More than half of the respondents (54.2%) were within this age category with only six percent aged 50 and above. They were predominantly males (80.8%) which indicates that football matches in Africa are mostly patronized by young men. In terms of marital status, the proportion of those who were married, divorced or widowed (ever married) to singles was almost at par. The former formed 51.6 percent while the latter were 48.4 percent. The respondents were fairly well educated as about three-fourth of them (75.9%) had either completed or were in tertiary institutions such as universities, polytechnics and training colleges. In terms of religious affiliation, 59.6 percent were Christians whilst 38.1 percent were Moslems. This was expected since these are the two predominant religions in Africa.

A greater majority of the respondents (79.9%) were employed in various professions though 20.1 percent were unemployed. Apart from the students, a sizeable number of the respondents were pursuing careers in the media, business, finance and administration, artisanship and education.

Table 2: Socio-demographic Characteristics of Respondents

Characteristic	Frequency n =428	Percent
Age		
Under 29	170	39.7
30-49	232	54.2
50+	26	6.1
Sex		
Male	346	80.8
Female	82	19.2
Marital Status		
Ever married	221	51.6
Single	207	48.4
Level of Education		
Primary	10	2.3
Secondary	93	21.7
Tertiary	325	75.9
Religion		
Christian	255	59.6
Moslem	163	38.1
Other	10	2.3
Employment		
Employed	342	79.9
Unemployed	86	20.1

Occupation		
Media	64	14.9
Business	49	11.5
Finance and administration	61	14.3
Artisan	30	7.0
Education	28	6.5
Civil/government	26	6.1
Sports	21	4.9
Health	22	5.1
Tourism & entertainment	20	4.7
Student	82	19.2
Other	25	5.8
National Language		
Anglophone	168	39.3
Francophone	160	37.4
Arabic	92	21.5
Portuguese	8	1.9
Geographic Region		
Western Africa	271	63.3
Northern Africa	92	21.5
Southern Africa	65	15.2

The event attracted a large number of students (19.2%) since schools and universities were on recess and media practitioners (14.9%) since they were also covering the event for their organizations. These findings coincide with findings by Gibson, (1994); Attle, (1996); and Nogawa *et al.*, (1996) that sports tourists are likely to be males, young, highly educated and employed full time. Also, the event attracted almost the same number

of Anglophones and Francophones, representing 39.3 percent and 37.4 percent respectively. Only 1.9 percent was Lusophone since Angola was the only Portuguese-speaking country which qualified for the tournament coupled with the fact that few of their supporters attended the tournament. Geographically, most of the respondents (63.3%) were from the western part of Africa due to the fact that most of the countries that qualified for the tournament were from this part of the continent. Northern Africans and Southern Africans represented 21.5 percent and 15.2 percent respectively. East and Central Africans were not represented because countries from that region did not qualify for the tournament. Though Cameroon is politically a central African country, it has been placed among the West African countries because it is geographically located in the west of Africa which eases analysis.

Travel Characteristics

Table 3 suggests that most of the participants (69.2%) were attending a CAN tournament for the first time and travelled in groups with an average size of nine. Indeed, about a quarter (26.6%) attended the event alone. Nearly half (48.6%) of the respondents had planned to stay for the entire three-week duration of the event with only 4.2 percent indicating that they would stay for as long as their national team progresses. More than half of the participants (57.7%) stayed in hotels and guest houses during the event. However, about half of those who stayed in hotels (26.9%) had their meals from those hotels. Restaurants and chop bars were the main sources of food for participants (37.1%) but 28.5 percent prepared their own food. In terms of transportation to and from the match venues, rented vehicles and taxis were the most patronized, accounting for 36.2 percent and 22 percent respectively of the total means of transportation used. A marginal majority of respondents (42.1%) did not rely on travel intermediaries, preferring to make their own arrangements whilst 41.8 percent indicated that their trip was arranged by the groups or associations they belonged to.

Table 3: Travel Characteristics of Respondents

Variable	Frequency n = 428	Percentage
Participation in CAN events		
First time	296	69.2
More than once	132	30.8
Size of travel group		
Alone	114	26.6
2 - 10	134	31.3
11-19	51	11.9
20+	129	30.1
Length-of-stay		
1 week	57	13.3
2 weeks	74	17.3
3 weeks	208	48.6
1 month +	71	16.6
As national team progresses	18	4.2
Accommodation arrangements		
Friends and relatives	70	16.4
Hostel	111	25.9
Hotel/Guest House	247	57.7
Food arrangements		
Restaurant/Chop Bar	159	37.1
Hotel	113	26.4
Stands	34	7.9
Prepare own food	122	28.5
Means of transportation		
Private/own car	85	19.9
Taxi	94	22.0
Public Bus	72	16.8
Rented Bus/Car	155	36.2
Aeroplane	22	5.1
Travel arrangement		
Package Tour	69	16.1
Personal (own) arrangement	180	42.1
Group/Association arrangement	179	41.8

Satisfaction with the CAN 2008 Event

In order to determine their level of satisfaction with the CAN 2008 event, respondents were asked to indicate their level of satisfaction with various aspects of the event on a scale of 1-5 (1= poor, 5= excellent). The average ratings ranged from good to very good as indicated on Table 4, showing a general satisfaction with the event. Aspects of the event which received the highest (very good) ratings were hospitality (3.87), matches (3.86) and social interactions (3.64). Aspects of the event which received the lowest (good) average ratings were ticketing (2.88), cost of participation and prices (3.05), and provision of information on the event and signage (3.10).

Table 4: Respondents' Level of Satisfaction with the Ghana CAN 2008 event

	Percentage of Respondents						
Aspect of Event	Excellent	Very Good	Good	Average	Poor	Mean	Standard Deviation
Food	18.5	31.3	32.0	12.0	6.3	3.44	1.11114
Hospitality	38.1	29.3	18.3	10.2	4.0	3.87	1.15096
Accommodation	11.5	37.0	31.7	14.3	5.5	3.35	1.03621
Transportation	13.1	31.1	36.7	15.6	3.4	3.35	1.00432
Matches	30.2	37.1	22.7	8.3	1.7	3.86	0.99853
Social interactions	25.6	32.3	26.8	10.8	4.4	3.64	1.10864
Entertainment	21.0	27.2	30.4	16.0	5.4	3.42	1.14624
Cost/prices	12.4	23.3	30.2	25.0	9.2	3.05	1.15982
Spectator facilities	21.1	26.0	35.4	13.3	4.2	3.47	1.09105
Ticketing	11.2	21.7	27.5	22.9	16.8	2.88	1.24614
Information/signage	12.0	27.6	31.3	16.4	12.7	3.10	1.19239
Overall satisfaction	18.7	42.1	28.6	9.5	1.2	3.68	0.92443

Note: Respondents were asked to rate their level of satisfaction with the various elements of the events on a scale of 1-5 (1 poor, 2 average, 3 good, 4 very good, 5 excellent

From Table 4, it appears respondents were less satisfied with the cost of participating in the event, issuance of match tickets and information dissemination. Ticketing for instance, was rated by 16.8 percent of respondents as poor whilst 11.2 percent rated it as excellent. On the other hand, most respondents were satisfied with the level of hospitality, quality of matches and the opportunities for social interactions. More than a third (38.1%) of the respondents rated hospitality as excellent and 29.3 percent also rated it as very good, with only 4% indicating it was poor. Also, 30.2 percent and 37.1 percent of respondents rated the matches as excellent and very good respectively with only 1.7 percent rating it as poor.

Satisfaction by characteristics of respondents and performance of their teams

In order to determine what influences sports tourists' satisfaction with a mega sporting event like CAN, the chi-square test of significance was used to determine if there is any relationship between satisfaction, socio-demographic characteristics, travel characteristics and performance of their national teams. The chi-square results are presented on Tables 5, 6 and 7.

Table 5: Relationship between satisfaction and socio-demographic characteristics

Variable	Excellent (%)	Very Good (%)	Good (%)	Average (%)	Poor (%)	x^2 (*P*-Value)
Sex						
Male	18.6	41.0	28.6	10.3	1.5	
Female	19.5	48.1	27.3	5.2	0.0	(0.448)
Age						
Less than 20 years	23.8	42.1	25.0	7.9	1.2	
30-49 years	14.2	42.2	31.1	11.1	1.3	
50 years and above	20.0	48.0	24.0	8.0	0.0	(0.456)
Marital status						
Ever married	14.8	42.6	30.6	11.1	0.9	
Single	22.0	42.5	26.0	8.0	1.5	(0.285)
Level of education						
Primary	26.8	37.5	21.4	12.5	1.8	
Secondary	19.4	37.5	30.6	11.1	1.4	
Tertiary	16.7	44.9	28.6	8.7	1.0	(0.654)
Religion						
Christian	20.0	45.3	25.3	7.8	1.6	
Moslem	14.6	36.9	35.0	13.4	0.0	
Other	30.0	60.0	0.0	0.0	10.0	(0.003*)
Geographic region						
Western Africa	21.6	43.1	28.6	5.6	1.1	
Northern Africa	14.4	38.9	26.7	18.9	1.1	
Southern Africa	12.5	42.2	31.3	12.5	1.6	(0.026*)
Employment status						
Employed	18.3	42.5	27.8	10.1	1.2	
Unemployed	21.4	39.3	31.0	7.1	1.2	(0.851)
National Language						
English	19.9	46.4	26.5	6.6	0.6	
French	20.6	38.8	31.9	7.5	1.3	
Arabic	14.4	38.9	26.7	18.9	1.1	
Portuguese	0.0	57.1	28.6	0.0	14.3	(0.007*)

*Significant at $p<0.05$

Table 5 presents the respondents' overall satisfaction with the event and their socio-demographics. There was no significant relationship between most of the socio-demographic characteristics and respondents' overall satisfaction with the event with the exception of religion ($p = 0.003$), geographic region ($p = 0.026$) and national language ($p = 0.007$).

From Table 5, Christians appeared to be more satisfied than Moslems. Whilst 20 percent and 45.3 percent of the Christians rated the entire event as excellent and very good respectively, 14.6 percent and 36.9 percent of the Moslems rated it as such. Also, West Africans seemed to be more satisfied than those from North and Southern Africa. 21.6 percent of West Africans, 14.4 percent of North Africans and 12.5 percent of Southern Africans rated the event as excellent. This appears to reflect the performance of their national teams since three West African Teams (Cameroon, Cote d'Ivoire and Ghana) were in the finals. Moreover, the Lusophone were the least satisfied since 14.3 percent rated the event as poor compared with 1.1 percent of Arabic, 1.3 percent of Francophones and 0.6 percent of Anglophones who did like wise.

Table 6: Relationship between satisfaction and travel characteristics

Variable	Excellent (%)	Very Good (%)	Good (%)	Average (%)	Poor (%)	x^2 (*P*-Value)
Travel arrangement						
Package tour	30.2	36.5	27.0	6.3	0.0	
Personal arrangement	17.8	43.8	30.1	7.1	1.2	
Group arrangement	14.6	45.6	26.3	12.3	1.2	(0.434)
Food arrangement						
Restaurant/Chop Bar	21.1	36.2	30.9	9.9	2.0	
Hotel	20.5	42.9	25.9	10.7	0.0	
Stand	12.5	37.5	37.5	12.5	0.0	
Prepare own food	17.2	50.0	25.0	6.9	0.9	(0.729)

Accommodation						
arrangement						
Friends and relatives	26.9	44.8	17.9	7.5	3.0	
Hostel	19.8	41.5	32.1	6.6	0.0	
Hotel/Guest House	16.0	42.0	30.3	10.8	0.9	(0.141)
Means of transport						
Private/own car	12.2	37.8	34.1	12.2	3.7	
Taxi	19.5	44.8	27.6	6.9	1.1	
Public Bus	21.5	46.2	23.1	9.2	0.0	
Rented Bus	21.7	43.3	28.0	7.0	0.0	
Aeroplane	4.8	28.6	42.9	23.8	0.0	(0.064)
Length of stay						
1 Week	15.7	43.1	39.2	2.0	0.0	
2 Weeks	20.0	40.0	29.2	10.8	0.0	
3 Weeks	20.0	42.1	26.8	10.0	1.1	
1 Month and beyond	19.4	44.8	25.4	7.5	3.0	
As team progresses	11.8	17.6	29.4	41.2	0.0	(0.17)
Participation in CAN						
events	19.7	43.3	29.8	6.6	0.7	
First time	17.1	38.8	27.1	15.5	1.6	(0.054)
More than once						
Size of travel group						
Alone	23.0	38.9	33.6	3.5	0.9	
2-10	16.7	43.6	29.2	9.1	1.5	
11-19	20.0	37.1	22.9	20.0	0.0	
20 and above	12.5	43.8	12.5	31.3	0.0	(0.028*)

**Significant at $p<0.05$*

Though there was no significant relationship between satisfaction with the entire event and most of the travel characteristics of respondents, there was a significant relationship between size of travel group and

satisfaction with the event (p = 0.028). From table 6, those who were not tied to any group appeared to be more satisfied than those belonging to larger groups. Also those who had attended previous events in different countries appeared to be less satisfied since 16 percent and 1.6 percent of them rated the event as average and poor respectively whilst about seven percent and 0.7 percent of those who were attending the event for the first time rated it as such.

Table7: Relationship between Satisfaction and Team Performance

Variable	Excellent (%)	Very Good (%)	Good (%)	Average (%)	Poor (%)	x^2 (*P*-Value)
Team Progression						
Semi Finals	20.9	48.9	23.7	5.8	0.7	
Quarter Finals	17.9	47.2	25.5	7.5	1.9	
First Round	17.4	33.7	34.3	13.5	1.1	(0.052)
FIFA Ranking of Team						
1-4th Rank	20.6	54.4	22.8	1.5	0.7	
5-8th Rank	20.8	40.9	26.6	10.4	1.3	
9-12th Rank	13.1	34.4	31.1	19.7	1.6	
13-16th Rank	15.3	27.8	41.7	13.9	1.4	(0.000*)
Number of CAN Titles						
Never	18.7	43.3	30.0	6.0	2.0	
Once	13.6	26.3	35.6	23.7	0.8	
Twice	20.4	46.3	29.6	3.7	0.0	
Fourth	27.8	51.9	17.7	1.3	1.3	
Fifth	9.1	72.7	18.2	0.0	0.0	(0.000*)
Goal difference						
6 to 10	20.9	48.9	23.7	5.8	0.7	
1 to 5	10.4	33.3	25.0	27.1	4.2	
0 to -4	19.3	38.6	32.9	9.3	0.0	
-5 to -9	18.8	41.7	31.3	6.3	2.1	(0.001*)

**Significant at p<0.05*

Respondents' satisfaction with the event appeared to have been influenced by the performance of their national teams. The chi-square test indicated a significant relationship between respondents' satisfaction and team performance benchmarks like FIFA ranking (p = 0.000), number of CAN titles won (p = 0.000) and goal difference (p = 0.001). From Table 7, respondents whose national teams progressed to the semi-finals appeared to be more satisfied, with 20.9 percent and 48.9 percent of them rating the event as excellent and very good respectively. Furthermore, 17.9 percent and 47.2 percent of those whose national team reached the quarter finals rated the event as excellent and very good respectively whilst 17.4 percent and 33.7 percent of those whose national teams could not go beyond the first round rated it as such. Using the FIFA ranking of January 2008 as a benchmark, respondents whose teams were ranked higher (1^{st} - 4^{th} rank in Africa) seemed more satisfied than those with lower rankings. More than half of the respondents (54.4%) from the 1^{st} to 4^{th} ranked teams rated the event as very good whilst only 0.7 percent of them rated it as poor. However, 27.8 percent and 1.4 percent of respondents from the 13^{th} to 16^{th} ranked teams rated the event as very good and poor respectively. Clearly, respondents whose teams performed better in the tournament and in the FIFA rankings such as Ghanaians, Camerounians, Nigerians and Egyptians appeared more satisfied than those whose national teams performed badly such as South Africans, Tunisians and Angolans.

Discussion

Customers' satisfaction is important to the successful marketing of products and services and so is the satisfaction of sports tourists important to the successful marketing and hosting of events, since satisfied customers are more likely to attend subsequent events (Shonk, 2006) and convince others to attend. The success of an event is also determined by the number of people who attend the event especially in the case of sporting events. No matter how interesting a match, the absence of fans will render it

uninteresting because even the players take inspiration from them. The issue of attracting sports tourists to mega events like CAN and meeting their needs is therefore imperative. The fact that respondents were generally satisfied with the event (overall satisfaction = 3.68) is therefore important so far as attendance to subsequent CAN events like Angola 2010 is concerned. This is because judgements made on satisfaction serve as important predictors of future patronage (Madrigal 1995). This will in turn impact on profitability since satisfaction is closely related to customer loyalty and profitability (Fornell 1992; Greenwell *et al.*, 2002; Musa *et al.*, 2004). This is underscored by the fact that 73.6 percent of the respondents indicated that they will be willing to attend the subsequent CAN event.

The study shows that with the exception of the religion ($p = 0.003$), geographic region ($p = 0.026$), national language ($p = 0.007$) and size of travel group ($p = 0.028$), most of the socio-demographic characteristics and travel characteristics of tourists did not significantly relate to respondents' satisfaction with the event. Thus sports tourists' satisfaction with the CAN 2008 event was not influenced by their age, sex, marital status, level of education as well as other travel characteristics like travel arrangement, food arrangement and accommodation arrangement. However, religion, language and geographic regions which distinguish the sports tourists from different parts of Africa, clearly affects their satisfaction with the event. There are differences in perceptions among the Northern Africans who speak Arabic, Anglophone and Francophone West Africans and Anglophone South Africans. Size of travel group also significantly related to satisfaction with the event.

Also, the study shows the effect of national team performance on the satisfaction of sports tourists. National team's progression in the tournament ($p = 0.052$), FIFA ranking of team ($p = 0.000$), number of CAN titles won ($p = 0.000$) and goal differences in tournament ($p = 0.001$) were found to significantly influence sports tourists' satisfaction with the event. Respondents whose teams performed better were found to be more satisfied than their counterparts whose teams did not fare well. This

supports the concepts of team identification and win/lose phenomenon proposed by Madrigal (1995) and Mullin (1985) respectively as factors determining sports satisfaction.

Generally, respondents were more satisfied with the sociological aspects of the tournament such as hospitality (M = 2.13), the matches (M = 2.14), and social interactions (M = 2.36) than the operational aspects of the event such as cost/price (M = 3.05), information/signage (M = 3.10) and ticketing (M = 2.88). It is not surprising that hospitality received the highest ratings as Ghanaians are widely recognized as hospitable (*proverbial Ghanaian Hospitality*). The tournament also promoted social interactions by bringing people from different parts of Africa and the rest of the world together to socialize. This was effectively captured by the theme of the event, 'sharing passions at the centre of the world.' Respondents were generally satisfied with the high quality of the matches which they attributed to the quality of the stadia and pitches coupled with good officiating and the fact that most of the players were playing regularly in top-flight leagues in Europe.

Aspects of the event which respondents were less satisfied with were those related to organizational deficiencies. These were cost of participation and prices of goods and services in general (M = 3.05), ticketing (M = 2.88) and dissemination of information on the event (M = 3.10). For instance 16.8 percent of respondents rated ticketing as poor, compared with 11.2 percent who rated it as excellent. The manner in which tickets for the matches were issued and the accreditation process for journalists received a lot of criticisms which were captured by the media. There were news reports of people forming long queues for tickets and confusion with the accreditation process (The Statesman, 9th January 2008; Daily Graphic, 19th January 2008; Ghanaian Chronicle, 14th February 2008). There were also instances where tickets for some matches ran out but on the day of those matches, the stadia were not filled and some people were seen selling tickets at the gate at exorbitant prices. There were middlemen who were seen selling tickets at exorbitant prices at the match venues.

These problems underscore the importance of prudent ticketing, accreditation and pricing arrangements to the successful staging of mega sporting events. Issues relating to ticketing, pricing and information dissemination are purely administrative and could be addressed by the Local Organizing Committee (LOC) with the right management intervention.

Conclusions and Implications

This study sought to examine the satisfaction of sports tourists from different parts of Africa with the CAN 2008 event as well as what influences their satisfaction. The results of the study suggests that sports tourists were generally satisfied with the CAN 2008 event but appeared to be more satisfied with the sociological aspects of the event like hospitality and social interaction than with ticketing and information dissemination arrangements. The study has marketing, management and research implications.

First of all, the results of the study clearly point out the fact that mega sporting events like CAN 2008 are attended by well-educated and full-time employed young males and this has implications for marketing. Marketing efforts for subsequent events should be directed at people with these socio-demographics since they are more likely to attend. Single male professionals, who are usually in groups of 10 and above and make their own travel arrangements and youth groups, should particularly be targeted. There is the need for organizers to pay equal attention to marketing rather than just investing huge amounts of money into the construction of stadia and other facilities based on the belief that *if you build it they would come*. This is against the backdrop that during the event some of the matches were played in virtually empty stadia.

Moreover, the study has implications for the organization of future events, especially with the issuance of tickets, dissemination of information and the pricing of other goods and services related to the event. There should be opportunities for people to buy tickets in advance

of the matches from designated outlets in their home countries before embarking on the trip to the host country. Also, e-tickets should be issued on-line so that people could purchase advance tickets irrespective of where they are located. This would work especially in a situation where people are informed that advance tickets are cheaper than those bought at the gate or a few days to the match. It would also lead to the elimination of ticket touts. Additionally, information on upcoming matches and events should be displayed at vantage points such as airports, bus terminals and major hotels. Furthermore, the organizers should provide information centres at all the match venues. The content of the information should not be limited to only the matches but other activities, attractions and facilities that would be of interest to tourists. Since there is the tendency for operators of transport, attraction sites, hotels and restaurants to capitalize on the event and hike their prices, organizers would have to build consensus with operators on the appropriate prices to charge for their services. In fact the LOC could reach an agreement with the various trade associations on appropriate price ceilings for their services.

Finally, the study has implications for further research into other factors that influence sports tourists' satisfaction. This is particularly imperative since studies on factors influencing satisfaction with sports events have been conducted on sports fans and spectators with very little on sports tourists. However, sports tourists are different because they have to travel usually over long distances and their motivations go beyond a mere desire to watch the matches or support their national teams but also a desire to explore the host destination and its tourism resources. The study indicates differences in satisfaction among Moslems and Christians as well as West Africans, North Africans and South Africans. It is therefore imperative to conduct further research on the psychographics of these different market segments and customize event packages to meet their needs.

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Impact of Import Liberalization on Aggregate Imports and Tariff Revenue in Ghana

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Abstract

In contributing to the ongoing debate on the impact of trade liberalization, this paper investigates the quantitative effect of import liberalization on imports and tariff revenue in Ghana. The Johansen cointegration and error correction technique was employed to determine the impact of import liberalization on aggregate imports, and inferred from the estimated results, how liberalization affects import tariff revenue. The findings of the study indicate that import liberalization has been in conflict with the revenue objective of economic reforms in Ghana. It has been suggested that public policy should focus on the identification of the major sources of duty revenue leakage and also focus on complementary measures such as tax replacement, for example substituting sales taxes for tariffs.

Keywords: trade liberalization, import liberalization, aggregate import, tariff revenue, import tax, Ghana

Introduction

Trade liberalization has formed a very important component of economic reform programmes in Ghana since 1983. In terms of sequencing, Ghana did not go through the normal intermediary stage of translating quantitative restrictions into equivalent tariffs before gradually

reducing tariffs. Most quantitative restrictions, including import licensing, were eliminated at the same time as the country went ahead to reduce the level and range of tariffs.

The main reason for import trade liberalization under economic reforms was to reduce the wedge between the official and the parallel exchange rates. Also important was the need to provide foreign exchange to ease import suppression with the aim of increasing output, particularly in the export sector. In this regard, the long-term goal was to replace quantitative restrictions with price instruments.

More recently, the impact of the liberalization on trade tax revenue has been a subject of debate. There are concerns about existing ambiguity in both theory and empirical evidence on the relationship between trade liberalization and trade tax revenue in the global context. In theory, liberalization in the form of lower tariff rates and the simplification of rates causes direct trade tax revenue loss, on the one hand, but on the other can also amount to an increase in volume of imports, and hence the tax base and revenue. The net effect depends on a host of factors, including the initial trade regime and the extent of increase in demand for imports. Empirical studies confirm this ambiguous relationship suggested in theory (see Tanzi, 1989; Ebrill et al., 1999; Glenday, 2000; Khattry et al., 2002; Agbeyegbe et al., 2003; UNECA, 2004; Suliman, 2005).

The only known country-case study that employs an econometric analysis is the study by Suliman (2005) for Sudan. The time series properties of the variables of interest are, however, not investigated. This could amount to a spurious regression.

Oduro (2000) asserts that trade liberalization was fiscally incompatible in Ghana during the 1990s even though Jebuni et al. (1994) find it fiscally compatible for the second half of the 1980s. Such studies rely only on descriptive analyses of changes in tax revenues and they do not apply testable models in investigating the exact impact of trade liberalization on trade tax revenues in Ghana. In order to validate Oduro's assertion, this study used regression analysis applied to testable models, to examine the short and long-run dynamics of such relationships from observed data.

The basic objective of the study is to evaluate the short and long run impact of import liberalization on aggregate imports and tariff revenue in Ghana.

To meet the stated objectives, this study estimated the aggregate imports equation and inferred from the estimated results how liberalization affects import tariff revenue in Ghana. The use of this approach differs from what can be found in literature for both country case and cross-country panel studies which simply rely on simple multivariate regression and cross-country panel regression analysis respectively.

Methodology

The approach to analysis involved a time series (short and long run) regression analysis of the determinants of aggregate imports in Ghana. More specifically, we assessed the impact of import liberalization on aggregate imports for the Ghanaian economy and then inferred from the estimation results how liberalization, in the form of reductions in the average official import tax rate, affected import tariff revenue in Ghana. This was done by substituting results obtained from estimating equation 4 into equation 2. The assumption is that import liberalization causes an upsurge in imports and the taxable base and consequently the country's capacity to generate greater revenue from tax on imports even at lower tax rates.

Method of Analysis

We first make a presentation of an identity for import tax revenue as follows:

$$TR=\tau^*M \qquad (1)$$

where TR is import tariff revenue in current year, τ is effective tax rate on imports and M is the Cedi value of imports in current year.

When expressed in log form we get the following:

$$\text{Log } TR = \log \tau + \log M \qquad (2a)$$

or

$\Delta \log TR = \Delta \log \tau + \Delta \log M$ (2b)

where Δ denotes change and 'log' denotes logarithm.

However, in view of the fact that effective tariff rate 'τ' may simply be a reflection of rate of revenue collection by the customs agency and may not be an indication of trends in official rates, the effective collection rate can be replaced with the official average tariff rate 'Tm' to reflect the focus of the study. Thus, equation 2 can be re-written as:

$\text{Log } TR = \log Tm + \log M$ (3a)

or

$\Delta \log TR = \Delta \log Tm + \Delta \log M$ (3b)

The estimation equation for aggregate real imports expressed in log form is presented as follows:

$Log\ M_t = b_0 + b_1 log\ RPM_t + b_2 \log GDP_t + b_3 \log IR_{t-1} + b_4 \log FXR_t + u_t$ (4) In view of the focus of the study, an estimation of the import equation, with the introduction of the average tariff rate instead of the relative import price was also attempted.

$Log\ M_t = b_0 + b_1 log\ Tm_t + b_2 \log GDP_t + b_3 \log IR_{t-1} + b_4 \log FXR_t + u_t$ (5)

where *RPM* is relative prices of imports, *Tm* is average tariff rate, GDP is proxy for income, IR_{t-1} is international reserves lagged one period, FXR is foreign exchange receipts and u is error term. All variables are measured in logs and real terms.

The consumer theory of demand forms the basis for explaining demand for imports with emphasis on the important roles played by income and relative prices in explaining individual demand. Summing up the individual demand for imports constitutes the aggregate imports demand for the entire economy (Harrod and Hague, 1963). The inclusion of foreign reserves (lagged one period) and foreign exchange receipts is to capture the role of foreign exchange availability (Hemphill, W. L., 1974). This model has been extensively used in explaining imports demand behavior in country specific studies, as in Egwaikhide (1999) and Mwega (1993).

Based on theory and existing literature, we assume the coefficient b_1 to be less than zero. In Ghana, imports are considered as one of the important factors that drive the domestic economy, as most development activities are import-driven. A significant percentage of imports to the Ghanaian economy are non-competitive in nature, particularly over the liberalization period. Thus, the demand for imports in the aggregate, is expected to be less elastic. The expected signs of the remaining coefficients b_2, b_3 and b_1 are also positive, suggesting that a rise in real incomes and foreign exchange availability (for an economy with foreign exchange constraints) improves the total value of imports.

Approach to analysis involved an investigation of the time series properties of the variables for the aggregate imports functions. The Johansen's Co-integration procedure was used to establish the long-run relationship between the relevant variables and to generate the error correction term for the aggregate imports function. The study period was from 1965 to 2007.

Data Sources and Definition of Variables

Annual data collected from various sources were used for the study. These include the International Monetary Fund (IMF) database, the World Bank database, United Nations' Commodity Trade Statistics, Ghana Statistical Services, Customs, Excise and Preventive Services, and the Ministry of Finance and Economic Planning.

For this paper, the following variable definitions are applied. Real import tax or duty revenue was calculated by deflating nominal import duty revenues with the consumer price index. Aggregate relative import price was computed as the import price index for aggregate imports deflated by the consumer price index for respective years. The values of real imports were obtained by deflating nominal imports with import price indexes. Real GDP is nominal GDP deflated by a GDP deflator. Real foreign or international reserve was defined as nominal foreign reserves deflated by aggregate import price index. Real foreign exchange receipts

were also calculated as nominal foreign exchange receipts deflated by aggregate import price index. The average import duty rate variable used in the estimation exercises is the average official duty rates for imports. The real exchange rate was computed by deflating the nominal exchange rate by the consumer price index.

Estimation and Analysis of Aggregate Imports Equation

This section reports on research findings based on the estimation of the aggregate imports equation and infer from the estimation results, how import liberalization affects import duty revenue. The section begins with an investigation of the time series properties of the data used in the estimation exercise. This is followed by a test for (weak) exogeneity to enable us to draw an inference about causality.

Time Series Properties of Data

The test results indicated that all the series were non-stationary in levels but stationary after first differencing. The null hypothesis of non-stationary could not be rejected at 1% significance level for the real imports, relative import price, import tariff rate, the dispersion of duty rates, real foreign reserve series and real GDP. For the real exchange rate, the null hypothesis of non-stationarity could not be rejected at the 5% significance level. Consequently, the series are integrated of order one. Results of the Augmented Dickey-Fuller and Philips-Perron tests of the series are reported in Table A1 (under appendix A).

Weak Exogeneity Test

The model specification of the estimation equations 4 and 5 suggested the assumption that the independent variables were least weakly exogenous. To test the validity of this assumption, the pairwise granger causality test was done, using EVIEWS econometric software, on the individual independent variables of equations 9 and 10 at 5%

significance level to test for strong exogeneity. We test for strong exogeneity because the presence of strong exogeneity necessarily implies that weak exogeneity also exists (Johnston and DiNardo, 1997). The test is a simple autoregressive distributed lag test for the significance of adding the history (lags) of the dependent variable to the independent variable in a bivariate regression equation. The test is against the null that the dependent variable does not Granger-cause the independent variable i.e. implying that the independent variable is strongly exogenous (Adam, 1992).

The F statistics and their corresponding probability values shown in Table A2 indicate that the dependent variable does not granger-cause any of the independent variables. This, therefore, reveals that Ghana has not experienced strong feedback effects from real import tax revenue to real exchange rate, real GDP, import tax rate and relative import prices. Thus the assumption of weak exogeneity is validated. Therefore, to finally arrive at a parsimonious model, time series analysis is pursued.

Estimation and Analysis of Aggregate Imports Equation

In undertaking the test for the existence of cointegration for aggregate imports, the relative import price, average tariff rates and effective tariff rate were used in alternating fashion as trade or tariff policy variable in the import equation. The test results for the aggregate imports function indicate the existence of one cointegrating vector for all cases. The cointegration test results are presented as tables A3, A4 and A5 respectively (see appendix A). One cointegrating vector was found implying that there is a stable long run relationship among the variables in all cases. The long run relationship for the imports function is then derived from the first row of the unnormalized vectors reported in tables A6, A7 and A8 (See appendix A). The derived long-run relationships among the series are presented as follows:

$$LM = -1.089 + 0.241\ LGDP + 1.017\ LFXR + 0.004\ LIR - 0.018\ LRMP \quad (6)$$

(0.060) (0.074) (0.065) (0.043)

$$LM = -0.631 + 0.155\ LGDP + 0.781\ LFXR + 0.250\ LIR - 0.062\ LTM \quad (7)$$

(0.089) (0.092) (0.098) (0.082)

$$LM = 0.460 + 0.414\ LIR + 0.721\ LFXR - 0.088\ LGDP - 0.255\ L\tau \quad (8)$$

(0.107) (0.092) (0.146) (0.116)

All the estimated coefficients have the expected signs, except for the sign of the coefficient for real GDP in the third case. This confirms the results obtained by Mwega (1993), Egwaikhide (1999) and Lopez and Thomas (1990). With the exception of the trade policy variable, all the other variables, namely real income, foreign exchange receipts and international reserves impact positively on the demand for imports.

Of the three factors, foreign exchange receipts have the greatest impact on demand for imports. The results clearly show that a 100% increase in foreign exchange receipts causes not less than 70 percent increase in demand for imports (in all cases) in the long run. Similarly, build-up of the nation's international reserves have also been an important factor influencing growth in demand for imports in the country as indicated by the estimation results in equations 7 and 8. This means that an improvement in foreign exchange availability during the period of liberal imports and exchange regime has been hugely responsible for growth in imports over this period. Economic reforms have been characterized by substantial increase in exports earnings and supported by a massive inflow of foreign donor assistance, coupled with a substantial build-up of foreign reserves. Imports, in general, have been immensely financed with foreign donor assistance over the period of liberalization. The outcome of the estimation results also indicate that shortage of foreign exchange during the period of strict import and exchange controls also account for the decline in imports over that period.

Growth in real domestic income also accounts for the increase in demand for imports in Ghana (in the first two cases) in the long run. A 100 percent increase in real domestic incomes leads to more than 15% increase in demand for imports in the first two cases.

The policy variables, relative import prices, average official tariff rates and the effective tariff rate, used in alternating fashion, have an inverse relationship with demand for imports. Demand for imports has increased in response to reductions in the average tariff rates (which reduces the relative import prices). The sign of the coefficients of relative price of imports and average duty rates conform to traditional theory that a reduction in price of imports, following reduction in average duty rate, increases demand for the imports. The response of demand for imports to changes in the price and tariff rate variables has however, not been significant in the long run.

The error correction terms (ECM1 and ECM2) were computed from equations 6 and 7 and are presented below:

$$ECM1 = LM - (-1.089 + 0.241\ LGDP + 1.017\ LFXR + 0.004\ LIR - 0.018\ LRMP) \quad (9)$$

$$ECM2 = LM - (-0.631 + 0.155\ LGDP + 0.781\ LFXR + 0.250\ LIR - 0.062\ LTM) \quad (10)$$

$$ECM\ 3 = LM - (0.460 + 0.414*LIR + 0.721*LFXR - 0.088*LGDP - 0.255*L\tau) \quad (11)$$

The error correction terms were used for the dynamic modeling. As usual, the general to simple estimation procedure was adopted and the preferred dynamic import demand functions are presented as Table 1 below.

Table 1: Results of the Preferred Error Correction Model for Real Imports

S/n.	Regressors	ECM model 1			ECM model 2		
		Co-ef	SE	t-value(prob)	Co-ef	SE	t-value(prob)
1.	Intercept	-0.01	0.01	-1.22(0.234)	-0.003	0.01	-0.24(0.809)
2.	DLRM_1	0.485	0.14	3.44(0.002)	0.242	0.16	1.52(0.139)
3.	ECM1(_1)	-0.992	0.15	-6.78(0.000)	--	--	-- --
4.	ECM2(_1)	--	--	-- --	-0.762	0.14	-5.42(0.000)
5.	DLRFXR	0.432	0.07	5.91(0.000)	-0.404	0.08	4.86(0.000)
6.	DLRFXR_1	-0.407	0.12	-3.48(0.002)	-0.280	0.13	-2.17(0.038)
7.	DLIR_1	-0.032	0.05	-0.64(0.527)	-0.076	0.06	-1.22(0.231)
8.	DLRGDP	0.263	0.17	1.55(0.132)	--	--	-0.16(0.874)
9.	DLRGDP_1	--	--	-- --	-0.031	0.20	-0.16(0.874)
10.	DLRMP_1	0.304	0.08	3.77(0.001)	--	--	-- --
11.	DLTM_1	--	-	-- --	0.004	0.11	0.03(0.975)

Diagnostic test results		
	ECM model 1	ECM model 2
Autocorrelation test from lags 1 to 2: F(2,27)	0.92781(0.4077)	1.6777[0.2057]
ARCH test with order 1	0.63849[0.4312]	0.1692[0.6840]
Normality test: Chi2(2)	2.3646[0.3066]	5.3501[0.0689]
Hetero test: F(14,14)	0.85205[0.6157]	1.0094[0.4931]
RESET test: F(1,28)	11.777[0.0019]**	5.8831[0.0220]*

Source: Computed by the authors using PCGive 10.0 econometric software

The results for the dynamic real imports functions presented above indicate growth in foreign exchange receipts as the most important factor explaining growth in real imports in both cases. A 100 percent increase in growth of foreign exchange receipts improved growth in imports by more than 40 percent in the same period. However, the response of growth in imports to growth in foreign exchange receipts has been negative for subsequent periods.

Growth in real income has not been particularly important in explaining short term increases in imports in Ghana. Its impact on demand for imports only becomes important two years hence (shown in Table A12). Growth in demand for imports has also responded negatively to growth in international reserves in the subsequent period, though not in a significant way.

In addition, even though growth in imports has been less responsive to reductions in the average duty rates (representing import tariff liberalization), its responsiveness to changes in the relative import price (used as an alternative import policy variable) and effective tariff rates has been quite significant. A 100 percent increase in growth of relative prices has caused an increase in growth of demand for imports by 30 percent in the subsequent period. In either situation, the results suggest that the demand for imports did not increase in response to reductions in average tariff rates and prices (indicating import tariff liberalization) in the short run as anticipated.

The error correcting terms are also negative and significant. The significance of the error correction terms confirms the validity of an equilibrium relationship among the variables used for the cointegration tests. The coefficients of the error correcting terms indicate that about 99 percent of past disequilibrium is rectified after the first period in preferred ECM model 1, and 76 percent of the past disequilibrium is rectified after the first period in preferred ECM model 2.

[4]See table A12 under appendix A for the preferred ECM model with effective tariff rate as import policy variable.

Table 1: Results of the Preferred Error Correction Model for Real Imports

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		Co-ef	SE	t-value(prob)	Co-ef	SE	t-value(prob)
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3.	ECM1(_1)	-0.992	0.15	-6.78(0.000)	--	--	-- --
4.	ECM2(_1)	--	--	-- --	-0.762	0.14	-5.42(0.000)
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9.	DLRGDP_1	--	--	-- --	-0.031	0.20	-0.16(0.874)
10.	DLRMP_1	0.304	0.08	3.77(0.001)	--	--	-- --
11.	DLTM_1	--	-	-- --	0.004	0.11	0.03(0.975)

Diagnostic test results

	ECM model 1	ECM model 2
Autocorrelation test from lags 1 to 2: F(2,27)	0.92781(0.4077)	1.6777[0.2057]
ARCH test with order 1	0.63849[0.4312]	0.1692[0.6840]
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Source: Computed by the authors using PCGive 10.0 econometric software

The results for the dynamic real imports functions presented above indicate growth in foreign exchange receipts as the most important factor explaining growth in real imports in both cases. A 100 percent increase in growth of foreign exchange receipts improved growth in imports by more than 40 percent in the same period. However, the response of growth in imports to growth in foreign exchange receipts has been negative for subsequent periods.

Growth in real income has not been particularly important in explaining short term increases in imports in Ghana. Its impact on demand for imports only becomes important two years hence (shown in Table A12). Growth in demand for imports has also responded negatively to growth in international reserves in the subsequent period, though not in a significant way.

In addition, even though growth in imports has been less responsive to reductions in the average duty rates (representing import tariff liberalization), its responsiveness to changes in the relative import price (used as an alternative import policy variable) and effective tariff rates has been quite significant. A 100 percent increase in growth of relative prices has caused an increase in growth of demand for imports by 30 percent in the subsequent period. In either situation, the results suggest that the demand for imports did not increase in response to reductions in average tariff rates and prices (indicating import tariff liberalization) in the short run as anticipated.

The error correcting terms are also negative and significant. The significance of the error correction terms confirms the validity of an equilibrium relationship among the variables used for the cointegration tests. The coefficients of the error correcting terms indicate that about 99 percent of past disequilibrium is rectified after the first period in preferred ECM model 1, and 76 percent of the past disequilibrium is rectified after the first period in preferred ECM model 2.

[5]See table A 12 under appendix A for the preferred ECM model with effective tariff rate as import policy variable.

Implication for Import Tax Revenue Mobilization

The short-run and long-run results from estimating the imports function have implications for import tax revenue. In view of this, an attempt has been made to combine results from the estimation of the aggregate imports equation with knowledge of changing tariff rates in equation 1. First, the log of real imports in equation 2 is substituted for the long run equation for real imports and solved for the long run elasticity of duty revenue to a change in the average tariff rate.

$$\text{Log TR} = \log \tau + (0.46 + 0.41 \log IR + 0.72 \log FXR - 0.09 \log GDP - 0.26 \log \tau) \quad (12)$$

This gives us:

$$\text{Log TR} = 0.46 + (1 - 0.26) \log \tau + 0.41 \log IR + 0.72 \log FXR - 0.09 \log GDP \quad (13)$$

Which implies that:

$$\text{Log TR} = 0.46 + 0.74 \log \tau + 0.41 \log IR + 0.72 \log FXR - 0.09 \log GDP \quad (14)$$

We read from the above long run solution that liberalization, in the form of reduction in average tariff rate, had both direct and indirect effects on tariff revenue. A 1 percent reduction in average tariff rate directly caused revenue loss by 1 percent as indicated in equation 13, but improves tariff revenue by causing an upsurge in imports by 0.26 percent. The total net effect of a 1percent reduction in the average tariff rate is a revenue loss of 0.74 percent. This suggests that liberalization has amounted to a duty revenue loss in the long run since direct revenue loss from tariff rate reductions outweighs the revenue enhancing effect. The short run solution adds nothing new to the analysis of the direct and indirect effects of liberalization on tariff revenue, hence its omission from the report.

Conclusions and Policy Implications

The basic objective of the study was to assess the impact of import liberalization on aggregate import and tariff revenue in Ghana. To do this, we estimated the aggregate import equation in Ghana. We then inferred from the estimation results, how tariff liberalization has affected tariff revenue in Ghana.

The regression analysis of the imports equation revealed that tariff liberalization improved the demand for imports (in the aggregate) in the long run. However, the reductions in tariff rate do not induce a revenue-compensating increase in imports. It is inferred from the long-run regression results that the overall effect of tariff reductions has been a net reduction in tariff revenue.

In sum, this study supports Oduro's (2000) assertion that import liberalization in the form of tariff rate reductions has been in conflict with the revenue objective of economic reforms, as research findings indicate that the revenue-enhancing effect of import tariff reductions has not been enough to offset the direct revenue loss from tariff rate reductions.

These results provide useful insights for public policy. First, the study indicates a possible continued existence of substantial amounts of leakage and inefficiencies in the customs collection system. Thus, customs administration requires further strengthening to generate more duty revenue from imports. Leakages in the customs collection system could in part be attributed to the exploitation of widespread duty exemptions, outright smuggling and import under-invoicing in the country. Public policy should focus on the identification of the major sources of duty revenue leakage. Again, the pervasive use of exemptions creates a gap in the tax base, especially through abuses of the exemptions offered. A further review of the rationale for the duty exemption programme and reduction in range of items exempt from duty payments in Ghana will be required.

Secondly, the study indicates that the fiscal incompatibility of import trade liberalization may not be an issue as long as complementary policies such as a liberal exchange rate regime are in place. Deductively, import liberalization in Ghana may not be fiscally incompatible if the liberalization coupled with other policy measures such as tax replacement, for example substituting sales taxes for tariffs, improves total tax revenue sufficiently. Thus, the fiscal policy issue may be whether these suggested measures improve revenue sufficiently to compensate for tariff revenue loss due to import liberalization.

Appendix A: Cointegration Tests and General Dynamic Specifications

TableA1: Augmented Dickey Fuller (ADF) and Philips-Perron (P-P) tests of unit roots

Variables	Assumption	ADF Test statistic			Philips-Perron Test Statistic	Order of integration
		Levels	Lag length	1st Difference	Levels	1st Diff.
LM	I	-1.878	1	-4.122	-1.812	-4.170
I(1)		(-3.617 – 1%)		(-3.623 – 1%)	(-3.612– 1%)	(-3.617– 1%)
LRMP	I	-1.588	1	-4.608	-1.315	-4.543
I(1)		(-3.617– 1%)		(-3.623– 1%)	(-3.612– 1%)	(-3.617– 1%)
LTm	I	-1.773	1	-5.172	-1.539	-6.019
I(1)		(-3.617– 1%)		(-3.623– 1%)	(-3.612– 1%)	(-3.617– 1%)
LT	I	-2.643	1	-6.555	-2.083	-6.535
I(1)		(-3.617 – 1%)		(-3.623 – 1%)	(-3.612 – 1%)	(-3.617 – 1%)

LIR I(1)	I	-3.311 (-3.617- 1%)	1	-5.172 (-3.623- 1%)	-1.539 (-3.612- 1%)	-6.019 (-3.617- 1%)
LGDP I(1)	I	-0.072 (-3.617- 1%)	1	-4.326 (-3.623-1%)	-0.012 (-3.6117- 1%)	-6.198 (-3.617- 1%)
LFXR I(1)	I	-2.122 (-3.617- 1%)	1	-5.748 (-3.623- 1%)	-2.576 (-3.612- 1%)	-8.284 (-3.617- 1%)

The notation 'I' denotes the assumption of an intercept only.
Source: Computed by authors using "E-views" computer software.

Table A2: Pairwise Granger Causality Tests

Null Hypothesis	Obs	F-Statistic	Probability
1. LGDP does not Granger Cause LM	37	0.83445	0.44334
LM does not Granger Cause LGDP		0.04426	0.95676
2. LRMP does not Granger Cause LM	37	1.39807	0.26176
LM does not Granger Cause LRMP		0.99596	0.38053
3. LIR_1 does not Granger Cause LM	36	3.34486	0.04838
LM does not Granger Cause LIR_1		4.65527	0.01707
4. LFXR does not Granger Cause LM	37	2.13013	0.13536
LM does not Granger Cause LFXR		1.55471	0.22679
5. LTm does not Granger Cause LM	37	0.57341	0.56929
LM does not Granger Cause LTm		1.04294	0.36409
6. LIR does not Granger Cause LM	37	4.92048	0.01370
LM does not Granger Cause LIR		1.16026	0.32623
7. LT does not Granger Cause LM	37	1.10964	0.34203
LM does not Granger Cause LT		0.57425	0.56882

Source: Computed by authors using Eviews 3.0 econometric software.

Cointegration Tests and General Dynamic Specifications

Table A3: Cointegration Test for Aggregate Real Imports LM, using relative import price as policy variable

Sample: 1965 - 2003

Included observations 37

Series: LM LGDP LFXR LIR LRMP

Lags interval: 1 to 1

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.69	86.8	68.5	76.1	None**
0.52	43.7	47.2	54.5	At most 1
0.27	16.7	29.7	35.7	At most 2
0.12	4.9	15.4	20.0	At most 3
0.01	0.2	3.8	6.7	At most 4

*(**) denotes rejection of the hypothesis at 5% (1%) significance level. L.R. test indicates 1 cointegrating equation(s) at 5% signficance level.
Source: Computed by authors using "E-views" econometric software.

Table A4: Cointegration Test for Aggregate Real Imports LM, using average official duty rate as policy variable

Sample: 1965 - 2003

Included observations:37

Series: LM LGDP LFXR LIR LTM

Lags interval: 1 to 1

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.63	75.18	68.52	76.06	None*
0.46	38.90	47.21	54.46	At most 1
0.26	16.15	29.68	35.65	At most 2
0.13	4.98	15.41	20.04	At most 3
0.00	0.00	3.76	6.65	At most 4

L.R. test indicates 1 cointegrating equation(s) at 5% significance level

Source: Computed by authors using "E-views" econometric software.

Table A5: Cointegration Test for Aggregate Real Imports LM, using effective tariff rate as policy variable

Sample: 1965 - 2003

Included observations:37

Series: LM LGDP LFXR LIR LT

Lags interval: 1 to 1

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.65	85.2	68.52	76.07	None**
0.47	46.4	47.21	54.46	At most 1
0.35	23.15	29.68	35.65	At most 2
0.17	7.22	15.41	20.04	At most 3
0.006	0.21	3.76	6.65	At most 4

L.R. test indicates 1 cointegrating equation(s) at 5% significance level

Source: Computed by authors using "E-views" econometric software.

Table A6: Unnormalized Cointegration Coefficients, using relative import price as policy variable

LM	LGDP	LRMP	LFXR	LIR
2.11	-0.51	0.04	-2.15	-0.01
-0.28	0.41	-0.26	1.36	-1.12
-1.15	0.15	0.70	0.77	0.53
-0.31	0.56	-0.30	0.52	0.07
-0.04	0.98	-0.10	-0.05	0.07

Source: Computed by authors using "E-views" econometric software.

Table A7: Unnormalized Cointegration Coefficients, using average official duty rate as policy variable

LM	LGDP	LFXR	LIR	LTM
1.85	-0.29	-1.44	-0.46	0.12
-1.42	0.12	1.97	-0.99	-0.56
0.22	0.49	0.74	-0.28	0.94
-0.61	1.05	0.04	-0.24	0.51
0.12	-0.71	-0.12	-0.02	0.23

Source: Computed by authors using "E-views" econometric software.

Table A8: Unnormalized Cointegration Coefficients, using effective tariff rate as policy variable

LM	LGDP	Lτ	LFXR	LIR
1.85	0.16	0.47	-1.33	-0.77
-0.75	1.41	1.03	1.38	-1.05
1.80	0.95	1.65	2.01	0.11
-0.40	095	0.29	-0.57	-0.11
0.50	1.15	0.44	-0.45	0.01

Source: Computed by authors using "E-views" econometric software.

TableA9: General Dynamic specification for real imports, using relative import price as policy variable.

	Coefficient	Std.Error	t-value	t-prob	Part.R^2
DLM_1	0.568	0.185	3.06	0.006	0.320
DLM_2	0.245	0.215	1.14	0.269	0.061
Constant	-0.026	0.014	-1.80	0.087	0.139
DLGDP	0.371	0.197	1.88	0.075	0.150
DLGDP_1	0.112	0.186	0.60	0.553	0.018
DLGDP_2	0.320	0.254	1.26	0.222	0.074
DLFXR	0.391	0.112	3.48	0.002	0.377
DLFXR_1	-0.740	0.255	-2.90	0.009	0.297
DLFXR_2	-0.272	0.188	-1.45	0.163	0.095
DLIR	-0.021	0.061	-0.34	0.736	0.006
DLIR_1	-0.044	0.061	-0.72	0.482	0.025
DLIR_2	-0.025	0.060	-0.41	0.685	0.008
DLRMP	-0.022	0.101	-0.21	0.833	0.002
DLRMP_1	0.274	0.105	2.61	0.017	0.254
DLRMP_2	0.140	0.136	1.03	0.316	0.050
ECM1_1	-1.396	0.320	-4.37	0.000	0.4883

Source: Computed by authors using "PcGive 10.0" econometric software.

Table A10: General Dynamic specification of real imports, using average import duty rate as policy variable

	Coefficient	Std.Error	t-value	t-prob	Part.R^2
DLM_1	0.478	0.20	2.43	0.025	0.228
DLM_2	0.144	0.208	0.69	0.497	0.023
Constant	-0.017	0.015	-1.08	0.294	0.055
DLFXR	0.222	0.128	1.73	0.099	0.131
DLFXR_1	-0.733	0.245	-2.99	0.007	0.308
DLFXR_2	-0.330	0.187	-1.77	0.092	0.135
DLIR	0.082	0.079	1.05	0.308	0.052
DLIR_1	-0.184	0.078	-2.35	0.029	0.216
DLIR_2	-0.098	0.069	-1.43	0.169	0.093
DLGDP	0.309	0.239	1.29	0.211	0.077
DLGDP_1	-0.004	0.208	-0.02	0.984	0.000
DLGDP_2	0.428	0.259	1.65	0.114	0.120
DLTM	0.006	0.124	0.05	0.961	0.000
DLTM_1	0.085	0.120	0.71	0.487	0.024
DLTM_2	0.022	0.140	0.15	0.879	0.001
ECM2_1	-1.431	0.318	-4.50	0.000	0.503

Source: Computed by authors using "PcGive 10.0" econometric software.

Table A11: General Dynamic specification of real imports, using effective import duty rate as policy variable

	Coefficient	Std.Error	t-value	t-prob	Part.R^2
Constant	-0.014	0.013	-1.06	0.301	0.053
DLM_1	0.231	0.243	0.95	0.353	0.043
DLM_2	-0.027	0.199	-0.13	0.895	0.001
DLFXR	0.258	0.137	1.87	0.076	0.149
DLFXR_1	-0.455	0.274	-1.66	0.113	0.121
DLFXR_2	-0.165	0.191	-0.86	0.399	0.036
DLIR	0.168	0.078	2.15	0.044	0.187
DLIR_1	-0.171	0.101	-1.69	0.106	0.126
DLIR_2	-0.095	0.073	-1.31	0.207	0.079
DLGDP	-0.066	0.211	-0.31	0.758	0.005
DLGDP_1	-0.106	0.212	-0.50	0.622	0.012
DLGDP_2	0.394	0.229	1.72	0.101	0.129
DLτ	-0.268	0.108	-2.48	0.022	0.235
DLτ _1	-0.014	0.155	-0.09	0.929	0.0004
DLτ _2	-0.053	0.145	-0.36	0.719	0.007
ECM3_1	-1.074	0.339	-3.16	0.005	0.334

Source: Computed by authors using "PcGive 10.0" econometric software.

Table A12: Preferred Error Correction model for real imports, using effective import duty rate as policy variable

	Coefficient	Std.Error	t-value	t-prob	Part.R^2
Constant	-0.016	0.011	-1.45	0.159	0.078
DLM_1	0.267	0.137	1.94	0.063	0.131
DLFXR	0.248	0.106	2.35	0.027	0.181
DLFXR_1	-0.486	0.147	-3.31	0.003	0.305
DLFXR_2	-0.187	0.107	-1.74	0.093	0.109
DLIR	0.156	0.060	2.60	0.015	0.213
DLIR_1	-0.186	0.063	-2.97	0.006	0.261
DLIR_2	-0.112	0.053	-2.12	0.044	0.152
DLGDP_2	0.418	0.193	2.16	0.040	0.157
DLτ	-0.246	0.085	-2.91	0.007	0.253
ECM3_1	-0.991	0.213	-5.18	0.000	0.517

AR 1-2 test:	F(2,23)	=	0.11185 [0.8947]
ARCH 1-1 test:	F(1,23)	=	6.5250 [0.0177]*
Normality test:	Chi^2(2)	=	0.94647 [0.6230]
hetero test:	F(20,4)	=	0.32361 [0.9608]
RESET test:	F(1,24)	=	9.9661 [0.0043]**

Source: Computed by authors using "PcGive 10.0" econometric software.

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Beyond Science: Traditional Concept of Preservation and Biodiversity in Ghana: Focus on Two Traditional Areas in Central Region

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Abstract

Since time immemorial, indigenous knowledge systems of different geographical environments across the globe have been used to protect and conserve groves. Presently, while some of these edifices are being preserved for various reasons, others are facing extinction due to diverse challenges. The study, underpinned by dimensions of indigenous knowledge and indigenous ecological knowledge frameworks within the paradigm of endogenous development, explores the beliefs and practices that have been used to preserve groves in three selected communities in the Central Region of Ghana. It also explores some of the benefits associated with the groves, and focuses on the intangible benefits to these communities. In-depth interviews and focus group discussions, as well as community institutional resource mapping and observation were used to collect data from chiefs, priests and elders. The results show that groves were owned and managed by either clans or communities, or both. Traditional sciences have been used to preserve these groves. Groves preserve community histories, ancestral and local knowledge. However, the breakdown of traditional values threatens the existence and preservation of such heritage.

Keywords: **Indigenous Knowledge, sacred groves, biodiversity preservation, traditional, endogenous development, sustainability.**

Introduction

Dating back to antiquity, social organisations have one way or the other preserved their natural environments for various purposes. One of such natural environments that have been preserved mainly for religious and socio-cultural purposes is the grove (Asare, 2002; Nakashima et al, 2000). The immense recognition for preservation of groves can be traced to the worldviews (or cosmovision) of and benefits to a society based on that society's indigenous knowledge. While some serve as abodes of gods and ancestors, others provide platforms to solicit spiritual, social and economic fortunes (Esia-Donkoh, 2007).

Groves (also known as sacred groves) constitute patches of natural vegetation that have been preserved with local knowledge for cultural, religious and socio-economic purposes. Jarayajan (2004) defines groves as isolated patches of forest comprising trees and other forms of life and geographical features, created and protected by cultural communities or clans with the worldview that such patches of vegetation in a relatively undisturbed state are necessary for expressing one's relation to the divine and/or nature.

Groves were created mainly to serve as abodes of deities such as the ancestors and the gods. The ancestors are considered as the real owners of environmental resources and therefore are consulted on issues that touch on the environment. The gods, like the ancestors, are deities primarily serving as intermediaries between humans and God. In order to preserve their spiritual significance and sanctity, such vegetations were created and preserved with cultural laws and practices. For instance, taboos and fearful imageries about groves were created in the minds of the people to prevent them from accessing the groves, or any other biological or non-biological resources in them without permission. In times of need, however, herbs and dead trees could be collected from the groves, but on permission by the priest or local authorities.

Besides, such heritage also serves as refuge for biodiversity (Subramanian, 2010). For example, some of these vegetations have varieties of flora and fauna species, some of which are regarded as totems (of clans and families) or sacred (for rituals and medication) species (Asare, 2002). The above benefits associated with groves have contributed to biological-cultural (biocultural) diversity (Valderrama and Arico, 2010) as well as judicious ecosystem utilization (Subramanian, 2010).

It is of such importance that at international fora, world governing bodies such as Convention on Biological Diversity (CBD) and the Convention on the Protection of Intangible Cultural Heritage under the United Nations Educational, Scientific and Cultural Organisation (UNESCO) have recognized the significance of traditional knowledge in their respective policy frameworks. For example, Article 8j of CBD indicates that:

> ...subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices' (United Nations, 1992, p6)

Article 8 of CBD also fulfils the objectives of most environment-related ministries and departments at the local level within the contexts of conservation of biological diversity and sustainable use of its components. The decentralization policy of Ghana requires planning, implementation,

monitoring and evaluation at the local level, where, to a large extent, the people rely on their traditional knowledge for livelihood as well as the sustainability of their natural environments. For instance, Dickson and Benneh (2004) record that indigenous knowledge has contributed to the conservation of Ghana's forest cover through the establishment of groves.

This does not, however, suggest that groves and the knowledge that sustains the survival of such heritage are not at risk. Sacred groves, like any other natural environmental resource, are being threatened. Reliance on western science to guide formal development, foreign religious beliefs and urbanization (Appiah-Opoku, 2007) constitute a challenge that continues to shake the foundation upon which groves were created. It is therefore imperative to develop appropriate pathways to protect and preserve these edifices.

In most cases, value is placed on a grove owing to its structural characteristics such as density, geographical coverage as well as variety of flora and fauna species that inhabit it. As indicated by Jayarajan (2004), the rationale for the establishment of groves includes the perceptions of intangible benefits associated with these resources. However, according to him, such information about groves is limited. This study, therefore, guided by the dimensions of indigenous knowledge (COMPAS/ETC, 2006) and indigenous ecological knowledge (Woodley, 2004) frameworks, within the paradigm of endogenous development, explores some of the beliefs and practices that have been used to conserve a selection of groves in three communities in the Central Region of Ghana. It also explores the benefits associated with the groves, and focuses on some of the intangible benefits.

Theoretical, Empirical Conceptual Issues

Since 1972, the international community has made conscious and consistent efforts at addressing global environmental changes including deforestation. For example, in *Our Common Future* (World Conference on

Environment and Development, 1987), the Rio Summit in 1992 and the Johannesburg Summit in 2002, calls were made to address the depletion and near extinction of environmental resources through biodiversity protection, conservation and sustainability with the use of appropriate technology and knowledge including the use of indigenous knowledge.

Traditional societies have known species protection and biodiversity preservation even before the call of these international conferences (Kendie and Ghartey, 2000). For example, the Uluguru Mountain in Eastern Tanzania (Kendie and Ghartey, 2000), the Malshegu Sacred Grove in Bongo (Asare, 2002) and the Monkey Sanctuary at Boabeng and Fiema (Appiah-Opoku, 2007) all in Ghana, show how traditional societies have preserved some parts of their forests as groves. It must, however, be emphasised that groves are not necessarily forests. Groves do not need to possess all the characteristics of a forest (Dickson and Benneh, 2004). In fact, a patch of vegetation becomes a grove because of its cultural and spiritual connotations, but not the geographical size, nor the array of various sizes of trees and their forestry features. Notwithstanding this, a number of these edifices are either primary or secondary forests (Dickson and Benneh, 2004).

In Ghana, groves are commonly created and managed by clans. Among the Akans and many other ethnic groups in the country, it is common for every clan to have its own grove for the burial of its elders, and/or abode of gods and totems. Anecdotal evidence suggests that the number of groves in a settlement can be determined by the number of clans in the settlement. Thus, a settlement with the full number (seven or more) of clans (Braffi, 1992), is likely to have such a number of groves. In other instances, one can find a grove established and managed by the entire community. Examples of such groves include Malshegu (Asare, 2002) and Monkey Sanctuary at Boabeng and Fiema (Appiah-Opoku, 2007).

Traditional societies use their cosmovision, or traditional sciences, embedded in their indigenous knowledge, which is based on the interrelationships and interdependence of the spiritual, social, and

economic dimensions (Figure 1.) to protect their groves. Ocholla (2007) defines indigenous knowledge as a dynamic heritage of the sum total of knowledge, skills and attitudes that belongs to, and practiced by a community over generations, and expressed in the form of actions, objects and language for communal use. Thus, indigenous knowledge comprises three main interrelated dimensions such as beliefs and rituals (spiritual dimension), community development, communication and entertainment (social dimension) as well as agricultural technology, architecture and blacksmithing (economic dimension). Most importantly, some of the spirits such as gods need the natural environment as their abodes. Hence, reverence of these spirits leads to the preservation of rocks, rivers, and other vegetation cover.

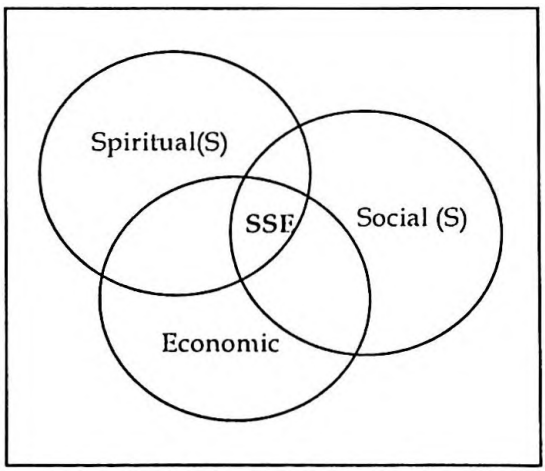


Figure 1: Dimensions of indigenous knowledge.
Source: Based on COMPAS/ETC (2006).

The cosmovision of traditional societies encompass the three dimensions namely the spiritual, social, and economic dimensions as shown in Figure 1. These dimensions are interrelated and interdependent to enhance a perfect harmony for sustainability of resource-use. This

interrelationship indicated in Figure 1 as SSE (Spiritual, Social and Economic) has contributed immensely to the preservation of groves in traditional societies. For instance, groves serve as abodes of ancestors and gods (spirit dimension), a refuge for various plant species for medicinal use (social dimension), and avenues to collect dead wood for cooking and heating (economic dimension).

This relationship, according to Nakashima et al (2000), explains the complex but holistic approach to sciences (not science), and ecologically resourcefulness of indigenous knowledge. In contribution, Woodley's (2004) Indigenous Ecological Knowledge (IEK) framework (Figure 2) explains how within an ecosystem, a group perceives the environment leading to biodiversity preservation.

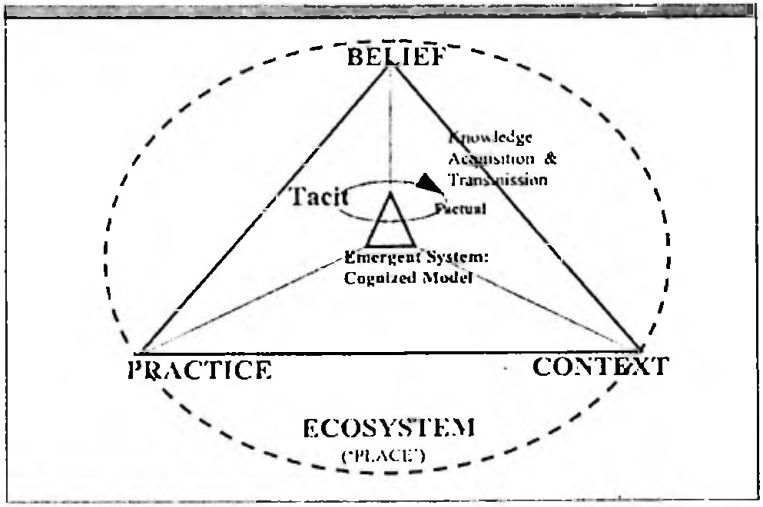


Figure 2: Indigenous Ecological Knowledge (IEK) Framework
Source: Woodley (2004)

Woodley's framework comprises three main constructs, namely, context, practice and belief. By context, knowledge is acquired through history, demographic factors and biophysical features of an area mainly

through the oral mode. Physical interaction and experience constitute knowledge by practice while belief depicts the influence of spirituality, values and mores on actions of people within the ecosystem.

Within a system, there is a metaphorical mental model which conceptualizes the environment from a contextual perspective and provides reasons for actions in daily life. Such mental images are not created to conform to the reality of the outsider, but rather, it represents how people relate with nature within the ecosystem than abstract understanding. The framework also incorporates spatial and time dimensions. The spatial dimension is holistic and place-specific (or place-based). It signifies the situatedness within the socio-cultural, historical and biophysical components of a place. The time scale on the other hand is the change that may occur in any of the elements within the structure and its influence on the emergent systems (see also Boulding, 1956). The time scale is shown in the diagram as the cycle of knowledge acquisition and transfer (the cycle in the center of the triangle). The framework also explains that there are both factual (explicit) knowledge and tacit (implicit) knowledge within the mental or cognized model. The application of the IEK framework to grove preservation is appropriate because it provides a guide to the historical and place-specificity of groves in relation to natural and spiritual sciences of traditional knowledge in a 'homogenous' community such as a clan.

It must be emphasised that indigenous knowledge and contemporary dynamics in societies, from homogenous entities to heterogeneous ones, call for a participatory paradigm that takes into account local and external support. The endogenous development (ED) paradigm is one of such participatory frameworks. Kendie et al. (2004), cited in Kendie and Guri [2010], define ED as 'development from within, based mainly, though not exclusively, on locally available resources, values, institutions and knowledge' (pp 55).

According to Hooft (2006), a key criterion for endogenous development is that it is controlled by local actors. This approach to development needs to be channeled through traditional structures and

authorities that are very known, respected and readily available for accountability and responsibility (Millar, 1999). Thus, indigenous knowledge and indigenous institutions, such as clans, are vital in grove preservation. Endogenous development does not, however, imply that all local values and beliefs should be embraced uncritically, and all external development options rejected (Hooft, 2006).

Data Sources, Sampling Procedures and Sample Size

The study made use of primary data in addition to relevant literature from books, journals, scholarly magazines and internet sources. Primary data were obtained from key informants such as priests, chiefs as well as elders and caretakers from the respective study sites. This was done to assess the preservation practices used, their associated benefits and challenges faced.

The study focused on groves in Mankessim and Eshirow in the Mfantsiman Municipality, as well as Breman Asikuma in the Asikuma-Odoben-Brakwa District (Map 1). There are eight groves located in Mankessim. Seven are owned by different clans (see Braffi, 1992), and one is owned by the entire community as an ancestral abode. In Eshirow, two groves were identified. The Anona Clan owns one of the groves (as an abode of ancestors and a god), while the other is owned by other clans and individuals who do not belong to the Anona Clan. There are three groves in Breman Asikuma. These are owned by the Royal Asona Clan (for the burial of royals), the Lower Asona Clan (as an abode of a god) and Assi Asona Clan (as an abode of a god).

Three sacred groves were purposively selected from these sites. The selection was influenced by a number of factors. Firstly, the study considered ownership and management of the groves. It considered those owned by the clan and the community. Secondly, it took into account the extent of threats to the grove and how the threats are being managed. Lastly, the primary purpose for the creation of the groves (for instance, as

an ancestral grove or an abode of a god) was considered for selection. In all, two groves were selected from Mankessim and Eshirow in the Mankessim Traditional Area, and one from Breman Asikuma in the Breman Traditional Area (Table 1).

Table 1: Sampled Groves in Selected Communities

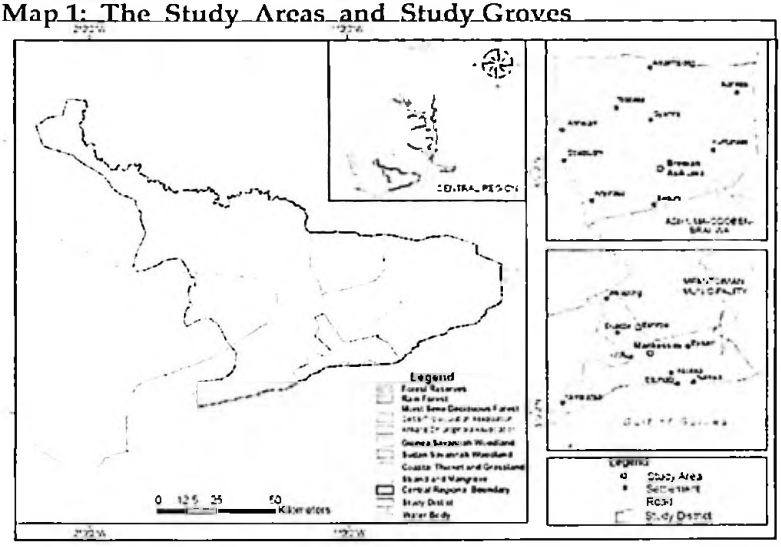
Name of Grove	Name of Community	Traditional Area	Purpose of Establishment	Ownership and management	Description of Grove
Nananom	Mankessim	Mankessim	Ancestral grove	Community	Severely threatened
Nsofa	Eshirow	Mankessim	Abode of god and ancestral grove	Clan	Preserved
Obo Sonsonshen	Breman Asikuma	Breman	Abode of god	Clan-community	Threatened

Source: Fieldwork (2009)

In-depth interviews (IDI) and focus group discussions (FGDs) were conducted at each study site. In all, one chief, one caretaker/priest and two elders constituted respondents for the IDI at each study site. Six to eight other opinion leaders (both males and females) constituted members of the FGDs. At least two members of the FGDs at each study site were females. Observation was also conducted with the aid of a digital camera at the grove sites to complement other tools and methods that were used to collect the data.

Another method that was employed was community institutions and resources mapping (CIRM), a methodological tool developed for local level development by the Centre for Indigenous Knowledge for Organisational Development (CIKOD) (see Guri and Laate, 2009).

Map 1: The Study Areas and Study Groves



Source: Geographic Information Systems Unit, Department of Geography and Regional Planning, University of Cape Coast (2010)

The purpose was to allow respondents to describe the features of their groves over a period of time by drawing the groves and describing verbally, the changes that have taken place over time. The method followed the following steps:

1. Two groups (comprising opinion leaders) were formed for FDGs on the issues. There were three or four members in a group with, at least, one female in each group.
2. Each group was provided with the needed and appropriate drawing materials.
3. Participants then described the groves as follows:

a. The features of the grove ten years ago,

b. The features of the grove currently, and

c. The features of the grove in the next ten years.

4. The drawings and discussions for the groups were compared to ensure clarity, consistency and consensus.

Study Sites

The study sites were Nananom, Nsofa and bo Sonsonhyen. Nananom and Nsofa are located in Mankessim and Eshirow respectively in the Mankessim Traditional Area in Central Region. Reports from early European visitors and existence of some patches of forests within the traditional area suggest that the locale was once forested, but has been modified by human activities (Dickson and Benneh, 2004; Adu-Boahen, 1966). The groves lie within the dry equatorial climate with annual rainfall between 74 centimetres and 89 centimetres and monthly average temperature of 27°C. The double maxima rainfall which characterises the area supports grassland and coastal scrub.

Nananom was formerly a dense ancestral grove with variety of flora and fauna species, some of which were considered as sacred. Some of the flora species included trees of different sizes and types (e.g. odum, wawa, sapele, etc.), herbs, shrubs, creepers and climbers as well as flowers. Other variety of animal species were insects (e.g. grasshoppers, bees, butterflies, ants, etc.), birds (e.g. parrots, pigeons, owls, eagles, etc.), reptiles (e.g. snakes, lizards, tortoise, crocodiles, etc.), mammals (e.g. bears, wolves, tigers, lions, etc.), as well as other perceived fearful beings.

There were priests who resided in the grove and interacted with the ancestors on behalf of the general public and also individuals who visited the grove with peculiar needs. The grove, thus, provided spiritual, material and economic supports to the people. For instance, the ancestors were believed to have assisted the community with rains and good harvest, as well as children to those who needed. These features and significance are similar to those of Nsofa. The only difference is that Nsofa has a caretaker who is not resident in the grove.

Obo Sonsonhyen lies within the wet semi-equatorial climate with an annual rainfall between 125cm to 175cm and monthly temperatures between 26°C and 30°C. The grove is located in Breman Asikuma in the Breman Traditional Area, within the Asikuma-Odoben-Brakwa District.

The climatic characteristics of the area and the district support moist-deciduous forest. According to Dickson and Benneh (2004), part of the original moist-deciduous forest has been modified to a secondary forest as a result of expansion in the cocoa cultivation.

Ɔbo Sonsonhyen provides support to the people of Breman Asikuma, and specifically the Mbraa community, as well as other surrounding villages. Notably, it provides security to the vulnerable, such as children, women and strangers. For instance, the god was believed to have assisted children who got missing to locate their families. It is also believed that the god provides security for the people against internal and external physical and spiritual aggressions. Other roles played by the god include ensuring the adherence of good morals by punishing and rewarding culprits and those to good behavior respectively. Ɔbo Sonsonhyen presented itself in many forms. At times, it showed itself as a huge giant with a dog and cowries at the ankles, an old man/woman or a child to perform its duties accordingly.

Results

History and Cosmovision Associated with the Groves

The histories and cosmovision associated with Nananom, Nsofa and Ɔbo Sonsonhyen were mainly ascertained from information provided by the chiefs and other respondents. Although, limited, some information was sourced from other documented literature. It must be indicated that the information from the focus group discussants was largely consistent with those collected from the in-depth interviews.

Nananom

The history indicates that the people of Mankessim, commonly known as the Fantes, trace their ancestry to the indigenes of Techiman in the Brong Ahafo Region. On arrival from Techiman, before the end of the 15th century, the Fantes met the Etsiifo, the indigenous occupants of Mankessim. After series of ethnic conflicts, the Fantes overpowered the

indigenous people and settled in Mankessim. In order to have a grove to bury their elders and revere them as ancestors, *Nananom* was established at Adowagyir near Twafo, all in Mankessim. Some of their ancestors who were revered in the grove were Oburmankoma, Odapagyan and Oson. The name *Nananom* literally means 'chiefs' or 'ancestors'. The earlier European writers referred to it as *Nananom Pow* which translates as *Ancestral Grove* (see Adu-Boahen, 1966).

Nananom covered a substantial part of Mankessim. There were priests who resided in the grove. The priests were mandated by the ancestors (who are regarded as powerful beings) to manage the grove. They (priests) ensured that rules and regulations that governed the use of the grove were strictly adhered to. For instance, it was a taboo for anyone to hunt, farm or collect any flora or fauna from the grove. Punishments ranged from fines, ostracization or even death depending on the gravity of the offence. The priests performed periodic rituals, sacrifices and prayers regularly to solicit fortunes for social and economic enterprise, seek forgiveness of sin(s) committed against the ancestors, as well as avert impending calamities and punishment on behalf of individuals and the entire community.

The Fantes used their cosmovision to preserve Nananom. However, the cosmovision was challenged in the 17th century when the colonial authorities introduced Christianity and the conventional court system. While Christianity challenged the beliefs of the people of Mankessim and the environs, the colonial courts overturned some of the judicial decisions held by the traditional authorities (TAs). For instance, a fine imposed by the TAs on a male-hunter who went hunting in Nananom was challenged by the Wesleyan Church, and the decision (imposition of fine) was quashed by the colonial court upon appeal. The colonial court then ruled that all the resources in the grove were a common good. This affected the preservation of Nananom.

Nsofa

Oral history shows that the Anona Clan of Eshirow migrated from

Akyim Ewisa in the Eastern Region to Eshirow, near Mankessim between the 18th and 19th centuries. The indigenous fishermen at Eshirow gave the clan a portion of land to settle as well as farm. The elders of the clan demarcated and preserved part of the land as a grove. The leader of the clan later became the *Odikro* after putting out a fire which destroyed farms and property in the village. This enhanced the preservation of the grove with the use of their cosmovision. The grove was named Nsofa, the name of the clan's god which resides in the grove. Part of Nsofa is also used as a burial ground for elders of the clan, who are revered as ancestors.

The grove has contributed to the preservation of a variety of plant and animal species. At present, it has been selected and demarcated as a Protected Area by the Forestry Commission, in collaboration with the Anona Clan and other international organisations such as the United Nations Development Fund (UNDP) and Global Habitat Project (GHP). The size of the grove now stands at about five hectares from its initial four hectare coverage before the external intervention about two decades ago.

Obo Sonsonhyen

Obo Sonsonshen (Obo means stone) is a huge igneous rock (believed to be a god) situated within a forest in a suburb called Mbraa in Breman Asikuma. The people of Mbraa, and specifically, the Asona Clan (now Lower Asona) migrated from Asante Breman in the Ashanti Region to Breman Asikuma in the 18th century, and became the *kyidom* (back-bearers) to the chief and the people of Breman Asikuma. According to the chief and elders of Mbraa, Obo Sonsonshen revealed its status as a god to the Lower Asona Clan when one of the members got possessed by the god.

The clan then began to revere the deity. They preserved the area with beliefs and practices. Annually, as well as in times of emergent need, sacrifices and prayers were offered to the god to seek various forms of solutions to problems of individuals and the clan. There were taboos and other regulations that were instituted to preserve the dignity and sanctity of the grove. For example, it is a taboo to farm, hunt or cut a tree in the

grove. One could only fetch dead trees and herbs for domestic and medical purposes respectively after permission had been sought from the elders. Formerly, there was a priest attached to Obo Sonsonshen who served as a mouthpiece for the god and the general public. Presently, the grove, which covers about half a hectare, has a caretaker whose mandate is to ensure that the rules and regulations that were instituted are adhered to.

Previously, the chief, elders and the people of the Lower Asona Clan were the custodians of the grove. At present, Obo Sonsonhyen has been adopted by the elders of Breman Asikuma as their principal god. The arrangement was made after the chief god of Breman Asikuma left the community about a century ago because the people could no longer fulfill some of its demands.

The belief that gods and ancestors have a say and play significant roles in the affairs of the living, including the perpetuation of the lineage, formed the basis for their reverence, hence, the preservation of the groves. These deities, according to the worldviews of traditional societies, serve as intermediaries between God and humans. They serve as channels of blessings or punishments to those who adhere to, or ignore their standards.

Preservation of the Groves

Preservation practices were similar to all the three groves studied. Rules were used to regulate their use and preservation. The basic belief was that such areas were sacred and occupied by spirits who are powerful to bless and punish people accordingly. For instance, no one was permitted to do any activity contrary to the set rules. Attacks of wild animals and meeting of fearfully mysterious beings, including dwarfs, were some of the likely encounters an offender was destined to face. These presented the groves as fearful environments as illustrated by one of the chiefs.

> When we were young, the forests looked very fearful. We were afraid to go into them even for

> firewood. Those who performed rituals in the forests feared to go into it anyhow. [A community chief, 80 years]

Although generally, herbs and dead trees were harvested on specific days, this was only possible after permission is sought from the priest or chief and elders. Who to seek permission from depended on the type of ownership and management system instituted. Three types of ownership and management systems were identified. These are clan ownership and management, community ownership and management, and clan-community ownership and management systems. For instance, Nananom is owned and managed by the community, Nsofa is owned and managed by a clan and Ɔbo Sonsonshen is jointly owned and managed by a clan and the community. However, in the case of Ɔbo Sonsonshen, it is the clan which nominates the caretaker for the grove.

Threats to Preservation of the Groves

There were both general and specific threats. The general threats to the preservation of the groves were introduction of Christianity and western education. All the respondents opined that disregard of beliefs and practices by the church and western science has restricted onward transmission of indigenous biodiversity preservation practices from the older generations to the younger generations. For instance, on the effect of western education on grove preservation, the respondents were of the view that the system is not the problem, but the content of the system. They explained that education must be context-essential rather than abstract thinking. Thus, to them, the formal school system must teach the knowledge of the community within which the school was situated, in addition to other relevant knowledge systems. If this is well-structured, there would not be knowledge conflict but rather knowledge sharing.

The specific threats related to Nananom and Obo Sonsonhyen were counter-ruling by colonial court and encroachment respectively. With respect to Nananom, respondents explained that the counter-ruling by the colonial court in a case between the Wesleyan Church (now The Methodist Church) and the Judicial Committee of the Traditional Council disregarded and denigrated the cosmovision of the traditional authorities and the local people.

Historical accounts of the case indicate that a male-hunter called Budu Atta went hunting in Nananom. He was arrested and fined by the traditional judicial committee. He, assisted by a friend, called Akwasi, petitioned the Wesleyan Church. The church took the issue to the colonial court. The court overturned the earlier ruling by the traditional judicial committee and made a pronouncement that all environmental resources, including those in the grove, were accessible to all and sundry with no restrictions. This ruling paved the way not only for an onslaught on the resources in Nananom for domestic and economic gains, but also, the denigration of the sacredness of the grove. This led to the adage '*Akwasi egu Nananom pow*' which literally means '*Akwasi led the destruction of the sacred grove of Nananom*'.

An elderly man described the subsequent outcome of the judgement with this sentence; '*... Nananom has now lost all its sacredness and dignity*'. In describing the impact of the church on traditional beliefs and practices, a chief concluded that '*Christianity is now linked to civilization and modernization, and that has made the church more powerful than the traditional authorities*'. Although a limited portion of the grove has been preserved by some of the elders, the fear that the future generations may meet an extinction of some beliefs and practices that are vital for its preservation was expressed.

With respect to Obo Sonsonhyen, the grove faces the challenge of encroachment, partly, as a result of urbanization, and largely due to a growing population. For example, about six private schools, some owned by Christian Missions and others by individuals, as well as other houses,

have been constructed in portions that used to be part of the sacred grove (Plate 1). Some of these portions of land were acquired legally, while others did not use the approved acquisition channels and protocol. The elders were of the view that the breakdown of traditional beliefs and cultural values, largely due to influence of Christianity and western education, has contributed to the untoward acts by some individuals or groups.

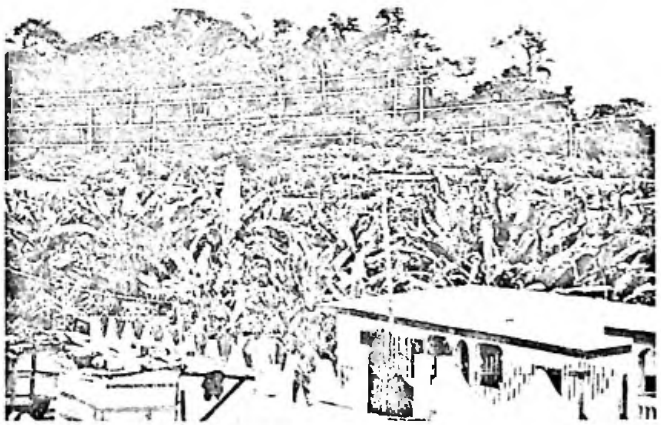


Plate 1: Encroachment threatening Obo Sonsonshen (grove behind)
Photo by: Esia-Donkoh (2009).

An issue that was raised in almost all the three sites was the penchant for material gains by some individuals at the expense of the preservation of the groves. Felling of trees and fetching of other resources in the grove illegally for economic purposes were mentioned. For instance, during the period of the data collection, some unknown individuals were secretly conducting quarrying activities in one of the groves. Generally, the respondents, apart from those in Eshirow, were pessimistic about the future of their groves. This was expressed in the statement below:

> There were big trees in the grove. But today, chain-saw operators and some of our members have felled the trees for the purposes of farming and wood for furniture. In the past, there were a variety of trees in the grove. But now, the place is almost occupied with houses and farms. [An elder, 62 years]

The case of Nsofa was different. The effects of the general threats on the grove motivated the leaders of the clan to constitute a committee to protect the heritage. Three members of the clan were selected to monitor activities that were likely to affect the dignity and sacredness of the grove. Any contrary belief that was thought to be an affront on the preservation of the grove was strongly resisted.

The clan, further, entered into a partnership arrangement with UNDP, GHP and the Forestry Commission to develop a framework to preserve the grove. Together with the clan, new varieties of trees were planted around the grove (Plate 2) to promote and ensure its preservation and sustainability. The clan was responsible for the management of the grove and accountable to all the partners. The elders believed that in the next decade or so, the grove would not only be richer in density with a variety of plant and animal species, but with a preserved dignity and sacredness.

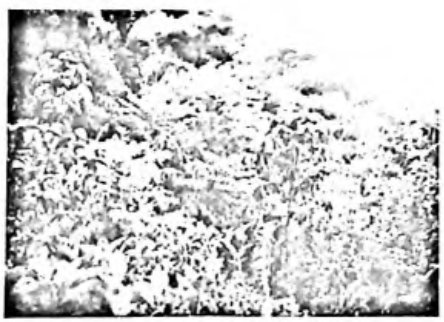


Plate 2: Nsofa with Young Variety of Trees.

Photo by: Esia-Donkoh (2005)

Benefits Associated with the Groves

There were a number of benefits associated with the groves. Some of the benefits were tangible while others were intangible. Among the tangible benefits were the preservation of streams as well as flora and fauna species. For example, the preservation of Obo Sonsonhyen has also contributed to the preservation of six streams that flow through the grove. The streams serve as drinking water to a number of villages around the grove.

> There are about six streams that flow through the sacred grove which provide us with water for drinking and daily use. A number of farmers and neighbouring villages also use these streams. [An elder, 59 years]

The variety of the flora species in some of the groves provides sources of herbs for prevention and treatment of ailments. At the sites of Nsofa and Obo Sonsonshen, clan and community members largely depended on the groves to address various health-related issues. Apart from contributing to healthy societies, the caretakers received some economic rewards for their assistance. The caretakers usually assisted people to identify and fetch the needed herbs.

The intangible benefits associated with the groves were common to all the three groves. Firstly, they provide grounds for rituals. Elders solicit blessings from the gods and ancestors for fruitful farming season and harvest. Again, in times of calamities such as outbreak of diseases or lack of rains, sacrifices and prayers were performed in the grove to avert such calamities. A chief who had performed rituals of this kind in Eshirow, shared his experience:

> In the past, whenever we lacked rains in this community, rituals were performed in the grove to our god for help. Three 'odwonhataa' [sacred leaves] were put in the mouth of a man

> dressed like a woman with a scarf and another leaf in the mouth of a man whilst the last one is placed in front of the god. The leader then went to fetch water from the river three times. A prayer was said and the water was poured into two depressions beside the god. We had rains after the rituals. [A chief, 88 years]

According to the chief, this led to the adage '*Eshirow ɔbɔw to sen Mankessim nsu*' which literally means that '*the dew of Eshirow is heavier than the rains of Mankessim.*' These practices indicate a knowledge system that is associated with varied sciences (see also Vandana, 2000).

Secondly, the histories of the communities were attached to groves. Each of the communities recounted its history with reference to its grove. Thus, the groves served as references for acquisition of historical knowledge, as well as the cosmovision of the custodians of the heritage. For instance, Nananom holds the history of the Fantes of Mankessim, and most importantly, about their leaders, namely, Oburmankoma, Odapagyan and Ɔson who led the Fantes through wars from Techiman to their new settlement. All these ancestors, including the remains of those who died before reaching Mankessim (such as Oburmankoma and Odapagyan) were buried at Nananom.

Lastly, the groves constitute sources of ancestral knowledge embedded in the cosmovision of the custodians. Ancestors represent an important aspect of the livelihood of traditional people. The qualities and values associated with ancestors, their status in the spiritual world, and their influence in the social and economic worlds, make their reverence in general, and the emulation of their character in particular crucial in the spiritual, social, and economic dimensions of the people. In Nsofa, the values, qualities, good deeds, as well as the abilities of the ancestors are recounted anytime a member of the clan is buried in the grove. This is an informal process of moral and religious education.

Pathways to Grove Restoration and Preservation

Two main pathways towards restoration and preservation of the groves were practiced. There were attempts to fence the grove to physically protect it from encroachers at Obo Sonsonhyen, and a partnership between a local organisation (Anona Clan) and external organisations (UNDP, GHP and Forestry Commission) at Nsofa to preserve and sustain the grove. The partnership, which has contributed to the restoration and preservation of Nsofa comprised nine main steps as summarized below.

1. There were discussions among the clan and representatives of organisations concerned on the state of the grove and the need to restore it.
2. Needs assessment was conducted.
3. Levels of management were structured.
4. Authority, responsibility and accountability were assigned to various levels of management.
5. A committee (made up of members of the clan) to manage the grove was set up.
6. New trees were planted around the grove, marked and numbered to enhance monitoring and stock taking.
7. Weekly monitoring and monthly inventory were conducted and recorded by the committee.
8. Perpetrators found were handed over to the Police.
9. Members of the committee were given monthly allowance by partner organisations.

The partnership arrangement has so far been successful. For instance, the grove has still been preserved, and the young trees that were planted (see Plate 2) have been left undisturbed by human activities. Some of the young trees which died were replaced to maintain the number of trees planted. The entire community is also aware of the purpose of the partnership arrangement as well as the consequences should anyone go contrary to the set rules regarding the grove. It must be emphasised that

the partnership arrangement appreciated the worldviews of the clan and respected the cultural values and spiritual attachments associated with the grove.

Discussion

Various societies have similar and different purposes for establishing and protecting their groves. Irrespective of such similarities and differences, the core significance that groves provide is vital, specifically to the custodians of the heritage. In fact, groves portray the essence of relationship between the three dimensional worlds in traditional societies. This relationship transcends (western) science because it incorporates empirical evidences through systematic interactions with the social and economic dimensions of livelihoods, as well as their spiritual dimension (see Figure 1). Thus, traditional knowledge is composed of both empirical and spiritual sciences.

The use of traditional sciences enhances harmonious interactions with nature, spirits and humans for survival, co-existence and judicious utilization and preservation of natural and non-natural resources. As explained by the indigenous ecological knowledge framework (see Figure 2), within a context, there is a creation of a knowledge system which is transmitted from generation to generation, mainly through informal modes of learning. So, in many traditional societies, their knowledge systems project the interrelationship of the dimensions of existence (spiritual, human and nature). This explains the creation and preservation of groves.

The significance of groves to local communities goes beyond the preservation of flora and fauna. Its significance is primarily intangible in the sense that groves are created to enable societies to interact with their deities (ancestors and/or gods) through nature. Hence, for a society to revere and preserve the sanctity, dignity and status of such deities, it needs to preserve nature to enable traditional communities to relate well with the spiritual entities. In so doing, flora and fauna species are preserved, and at times, used for spiritual, social and economic purposes judiciously.

Groves reveal the histories of the custodians. Histories of traditional societies, and their ancestors, which are attached to groves, also relate to the three dimensions of indigenous knowledge. These histories connote the relationships that existed, and exist between the people and their gods and ancestors in the past and present. This makes such objects a resource for historical research about a group of people, communities or settlements.

There are aspects of traditional sciences, which are, to some extent, similar to western or empirical science. Such similarities to a large extent, relate to the social and economic dimensions. For instance, use of herbs for curative purposes, other reasons associated with preservation of biodiversity, economic activities and principles of sustainability are tenets in traditional sciences and western science (see Bodeker, 2010; Valderrama and Arico, 2010; Bavikatte, et al. 2010). Some of these similarities motivated UNDP with other agencies, and the Anona Clan to develop a partnership arrangement to restore and preserve Nsofa. This intervention is relevant in as much as it does not denigrate or downplay a particular belief or practice.

Beyond the challenge, however, is how to package traditional sciences to be acceptable, not as a universal knowledge, but to be recognised by western or scientific communities. This has become critical because traditional communities are no longer a homogenous entity within an ecosystem. Thus, the growing pace of heterogeneity, as a result of influx of different beliefs and practices makes the justification for recognition and cooperation crucial. The call to demystify indigenous knowledge in general, and certain beliefs and practices in particular, can be helpful. These, when addressed, would enhance cordial understanding between traditional sciences and other knowledge systems such as Christian knowledge and western science.

Conclusion

The essence of groves in traditional communities is undoubtedly obvious in the entire life of the people in such environments. The essence manifests in both tangible and intangible realms in traditional societies. The need therefore to explore and assess such heritage for sustained preservation is significant to traditional societies and indigenous knowledge. Over the years, studies into groves have more or less focused on the tangible relevance. It is, however, evident from this study that the intangible benefits associated with such edifices contribute to the preservation of the tangible benefits.

The adage that '*one cannot cover the face of God with one hand*' or similarly, '*one hand cannot encircle the baobab tree*' becomes meaningful in contemporary preservation of groves in traditional communities given the general and specific threats to the heritage. This makes frameworks that recognise and support traditional societies in their quest to restore and preserve their groves important. Locally-developed participatory frameworks, such as endogenous development frameworks, become meaningful to traditional societies for grove preservation.

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Willingness to Pay for Efficient Waste Management: The Case of Bolgatanga Municipality

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Abstract

This study sought to determine how much individual households are willing to pay for efficient solid waste management in the Bolgatanga municipality as well as what factors influence people's demand for the services at a particular price. In pursuance of this, the contingent valuation method which employed the biding game was used. Using cross tabulation and Analysis of Covariance (ANCOVA) the calculated mean willingness to pay (WTP) was ¢16,750. The income variable was found to have a significant effect on the individuals' WTP. Through the interaction dummy variables model, the income elasticity was 0.37. It was also found that occupation (OCC), level of education (EDU), the interaction between sex and occupation (SOC) and the interaction between sex and education (SED), as well as income (lnY) which is the covariate were all significant. Thus the antilog of the differential effects of OCC, EDU, SOC and SED were found to be; 0.64194, 1.65571, 1.69476 and 0.44884, respectfully. Thus the mean WTP of SOC was higher by ¢2.3367, while the mean WTP of SED was also higher by ¢2.10455. It is recommended that differential pricing as well as door-to-door refuse collection in selected areas among other services be put in place to ensure efficient refuse management in the municipality.

Key words: Contingent Valuation, Willingness to Pay, ANCOVA

Introduction

Solid waste management has always been a herculean task especially in large towns and cities all over the world. Huge sums of money are spent on collecting volumes of waste, especially refuse generated by human activities, in order to avert possible disasters that this refuse could cause if not well managed. Solid waste management has attracted much public attention. The regional capitals of Ghana are currently facing serious crisis in terms of collecting and managing refuse to keep the cities clean. For instance, the Kumasi Metropolis is reported to generate about 1,000 tonnes of waste daily which it plans to use to generate electric power (Daily Graphic, Monday, may 7, 2007 No. 150041 page 1.).The Bolgatanga Municipality is not new to this refuse collection problem. It collects about 340m3 of refuse per week. This does not include areas like Zaare, Sunbrungu, Zuarungu, etc which are not covered by the refuse collection services of the municipality.

Unlike other public good, the price refuse collections cannot be determined by market forces. It is therefore difficult to determine how much people must pay for the collection of refuse. Thus the Willingness to Pay (WTP) using Contingent Valuation (CV) method is more suitable in determining how much the people in the municipality are willing to contribute to the collection of refuse to make it more sustainable and as such keep the environment clean.

The CV method is not only suitable for determining how much people are willing to pay for a particular non- market service / goods but also the factors influencing how much they are willing to pay. According to the World Bank Water Demand Research Team, in World Bank Research Observer (1993), three sets of characteristics jointly influence a household's willingness to use or pay for improved water supply:

- The socio-economic and demographic characteristics of the household, including education of family members; occupation; size and composition of family; and measures of income, expenditures, and assets

- The characteristics of the existing or traditional sources of water versus those of the improve water supply, including the cost (both financial and in time required to collect water), the quality, and the reliability of the supply.
- Households' attitudes toward government in the water supply sector and their sense of entitlement to government services.

The team noted surprisingly that, family size and composition rarely showed any significant effect on household willingness to pay for or use improved water services, thus collaborating with the findings of Lockwood et al (1993) in their study.

In related studies by Bhati and Fox-Rushby (2002) on the WTP for treated mosquito nets in Surat, India and also by Cho-Min-Nang et al (2000), on the WTP for the ICT malaria *pf/pv* test kit in Myanmar, both using regression analysis found out that education, income, beliefs and the ideological acceptance of health care was positively associated with the WTP.

Writing on the WTP by Victorians' to preserve unprotected East Gippsland national estate forests in national parks, Lockwood et al (1993) noted that attitudinal questions included in the survey revealed that Victorians consider the non-market values associated with these forests to be more important than market values. The median WTP per respondent household for preserving the forest was $52. However, a sub-sample of Gippsland residents showed that people living in or adjacent to East Gippsland placed relatively more emphasis on market values and had significantly lower WTP for preserving the forest. This suggests that while a majority of the Victorians would prefer non-market values be placed on non-market goods and services, a sub-sample would rather market values be placed on all goods and services be they market or non-market goods or services. Also it was found out that the ratio of females to males, age, and number of people per household did not have a statically significant effect on the magnitude of WTP as the t-values were less than one, however, income and number of years of education both had a significant influence on WTP (Lockwood et al, ibid).

Loomis and Larson (1994) tested for the consistency of an individual's WTP responses for increases in the quantity of an environmental public good (whole populations) along three lines. First, they test whether WTP for 50 percent and 100 percent increases in whole populations are statistically different from zero. Second, they ask whether the incremental WTP from a 50 percent increase to a 100 percent increase is statistically significant. Finally, they test whether there is diminishing marginal valuation of the second 50 percent increment in gray whale populations. The paired t-tests on open-ended WTP responses supported all three sets of hypotheses. Both visitors and households provided WTP responses that were statistically different from zero and increased (but in a diminishing fashion) for the second increment in WTP. In this survey, both visitors and households provided estimates of total economic value (including non-use or existence values) for large changes in wildlife/fishery resources that were consistent with consumer theory.

Willingness to pay for an improvement of environmental quality by Cho-Min-Nang et al (2000), simulation results indicate that the precision of welfare estimates increases with individuals income levels and decreases with the price of the quality-related good. The dependence of the consumption of the quality-related good on the environmental quality also affects the reliability of welfare estimates.

In a telephone survey, 1000 adults were confronted with pairs of life saving programs that differed in number of lives saved and asked which program in each pair they would choose to implement. Respondents were also asked to rate qualitative program characteristics on 10 point scales. For most respondents, lives saved are significant in explaining program choices, as are psychological risk characteristics. The rate of technical substitution between these characteristics and lives saved is, however, inelastic. It is noteworthy that for about 20 percent of respondents, choices among programs appear to be insensitive to lives saved (Subramanian and Cropper, 2000).

In Boyle and Bishop (1988), three commonly used techniques for asking contingent valuation questions are compared: iterative bidding, payment cards, and dichotomous choice. The results revealed that no single contingent valuation technique was neutral in the elicitation of hicksian surplus and each technique has its strengths and weaknesses. The iterative bidding estimates contain a starting point bias, while the payment card and dichotomous choice estimates were influenced by the interviewers soliciting the contingent values. Finally, the analysis of dichotomous choice responses involves unresolved issues that warrant further investigation. On the other hand, dichotomous choice is the easiest technique to administer in a survey setting. Though the biding game contains a starting point bias, it gives the respondents the opportunity to finally decide whether to pay a value higher or lower than the starting point consistent with their marginal utility of consuming the good under valuation.

In the light of the above, we wish to value solid waste management in the Bolgatanga Municipality. The Municipal Assembly has been saddled with logistic constraints and has been unable to effectively provide for the management of waste in the municipality. It is thus, common sight to find heaps of refuse left uncollected for days. These heaps of refuse that litter the Municipality are potential breeding grounds for mosquitoes and other pathogens which can easily lead to an epidemic. Interestingly, the people who generate the waste do little if not nothing at all to help in its management and continue to depend on the efforts of the Municipal Assembly to keep the municipality clean.

Desirably, if individuals and households are sensitised and willingly accept to pay for solid waste management, it will go a long way to augment the efforts of the authorities to effectively and efficiently manage waste in the municipality to avert disasters such as those that have hit especially Accra and Kumasi in recent times.

Following from the above therefore, pertinent questions that come to mind are: how much is an individual household willing to pay in ord

to enjoy an efficient and effective waste (refuse) management system in the municipality? And what factors influence the amount households are willing to pay for the solid waste management?

Objectives

The main objective of the research was to determine through Contingent Valuation, how much individual households are willing to pay for refuse management in the municipality and to also find out what factors inform an individual's willingness to pay for refuse management.

Methodology

In pursuance of the objectives of the study, Contingent Valuation (CV) was used in order to determine how much individuals and households are willing to pay for efficient solid waste management in the municipality. The CV method involves directly asking people, in a survey, how much they would be willing to pay for specific goods and services that are not traded in the marketplace (environmental services). In some cases, people are asked for the amount of compensation they would be willing to accept to give up specific environmental services. It is called "contingent" valuation, because people are asked to state their willingness to pay, contingent on a specific hypothetical scenario and description of the environmental service (Carson, 2000)

The theory underpinning this study is grounded on Compensating variation in consumer theory. Compensating variation can be used to find the effect of a price change on an agent's net welfare. CV reflects new prices and the old utility level. Compensating variation can be elicited by asking a person to report a willingness to pay an amount. For instance, the person may be asked to report his WTP to obtain the good. Formally, **compensating variation** is defined as the amount that must be taken away from the person's income while keeping his utility constant, which is represented as:

$$V(y - WTP, p, q_1; \mathbf{Z}) = V(y, p, q_0; \mathbf{Z}) \quad (1)$$

Where V denotes the indirect utility function, y is income, p is a vector of prices faced by the individual, and q_0 and q_1 are the alternative levels of the good or quality indexes (with $q_1 > q_0$, indicating that q_1 refers to improved environmental quality). **Z** is a vector of individual characteristics (Markandya, 2005). Compensating variation is the appropriate measure when the person must purchase the good, such as an improvement in environmental quality. From (1) the indirect/inverse demand for efficient solid waste management can be estimated by regressing WTP on y, p,q:Z

In pursuance of the above, data was collected from all the localities in Bolgatanga and involved 50 students as well as the researcher who conducted the survey. In all 216 people were interviewed. This sample size was chosen using systematic sampling technique. However, 16 of the returned questionnaires were rejected from inclusion in the analysis because they were either incomplete or wrongly completed. The close-ended questionnaires were administered using the in-person interview.

As regards the WTP, the biding game method was used. This was done by first choosing an arbitrary starting point and respondents were asked if they will accept to pay that amount. If yes then the amount was increased, this continued to a point where respondents were no longer WTP. On the other hand, if the initial amount was not accepted then the amount was reduced to a point where respondents will accept to pay. This approach is more advantageous because it affords the respondents the opportunity to state a price which will be consistent with their utility maximisation.

Data collected from the field were analysed using cross tabulations and Analysis of Covariance (ANCOVA) regression model with the aid of PcGive, Doornik and Hendry (2001). This model enabled us to isolate the income effect on WTP, on one hand, and combined effect of qualitative variables on WTP, on the other once the regressors were a mixture of both quantitative and qualitative variables.

ANCOVA Model Specification

$$lnWTP = \beta_1 + \beta_2 D_{2i} + \beta_3 D_{3i} + \beta_4 D_{4i} + a lnY_i + \varepsilon_i \quad (2)$$

Where:

$lnWTP$ = The natural log of willingness to pay

$lnYi$ = natural log of Income of the respondents

D_{2i} = dummy variable, 1 if the respondent is in formal employment and 0 if informal

D_{3i} = dummy variable, 1 if male respondent and 0 if female

D_{4i} = dummy variable, 1 if respondent has had high level of education and 0 if low level of education

ε_i = error term

β_2 = differential effect of being in formal employment

β_3 = differential effect of being a male

β_4 = differential effect of having high level of education

a = *income elasticity or percentage change in income*

Equation 2 assumes that the differential effect of each of the dummies is constant across the two categories of the other remaining dummies. This is to say that if the mean WTP of males is higher than their female counterparts, this is so whether they have low or high education, or, they are in formal or informal employment. Thus the dummies and the income variables are additive.

However, the effect of each dummy variable may not be constant across all the other dummy variables as there could be an interaction among the dummy variables. In this case the variables multiply each other (Gujarati, 2003). In this wise a model was specified to find the effect of the interaction among the variables on the WTP of respondents.

Interaction Model

$$lnWTP = \beta_1 + \beta_2 D_{2i} + \beta_3 D_{3i} + \beta_4 D_{4i} + \beta_5 D_{2i} D_{3i} + \beta_6 D_{2i} D_{4i} + \beta_7 D_{3i} D_{4i} + \alpha lnY_i + \varepsilon_i \quad (3)$$

Where:

D_i = being dummy variables as explained in (1.0)

B_5 = differential effect of being in formal employment and a male

B_6 = differential effect of being in formal employment and with a high level of education

B_7 = differential effect of being a male with high level of education

Data Analysis and Discussions

Table1: Frequency Distribution of WTP

WTP Interval	DATA (FREQ.)	FREQ. DISTRIB. (%)
1 – 10,000	89	44.5
11,000 – 20,000	39	19.5
21,000 – 30,000	30	15
31,000+	42	21
TOTAL	200	100

Source: Field survey (2010)

From the above table, 89 respondents representing 45% of the total respondents are willing to pay within the lowest range. Also, 42 respondents representing 21% are willing to pay within the highest range of 30,000 Cedis and above. Thus, about 64% of the total respondents are willing to pay between 0 – 20,000 Cedis per week.

Table 2: Income distribution by WTP

INCOME(¢)/WTP(¢)	1-10,000	11,000 – 20,000	21,000 – 30,000	31,000+	TOTAL	FREQ. DISTRIB (%)
100,000 – 500,000	37	12	7	5	61	30.5
600,000 – 1,000,000	24	11	9	3	47	23.5
1,100,000 – 1,500,000	13	9	4	10	36	18
1,600,000 – 2,000,000	6	7	5	12	30	15
2,000,000+	10	0	5	11	26	13
TOTAL	90	39	30	41	200	100

Source: Field Survey (2010)

Table 2 shows that 61 respondents, that is 30.5% of the respondents, fall within the lowest income range. As income increases, the number of people who fall within the various income range decreases. The region is the poorest in the country with about 90% of the total population being poor (Ghana Poverty Reduction Strategy 2003 – 2005). This may partly explain why about 45% of the respondents are willing to pay the lowest amount, thus collaborating with the findings of Bhati and Fox-Rushby (2002), Cho-Min-Nang et al (2000) and the World Bank Water Demand research Team (1993) that income, among other factors, was positively associated with WTP.

[6]WTP amounts are quoted in old currency

Table.3: WTP Distribution by Education

WTP/EDUCATION	LOW	HIGH	TOTAL
1 – 1,000	48	41	89
11,000 – 20,000	25	14	39
21,000 – 30,000	12	18	27
31,000+	11	31	42
TOTAL	96	104	200
%	48	52	100

Source: Field survey (2010)

Note: Low – below secondary school level, High – secondary school level and above.

From table 3 above, 104 respondents (52%) have had high education as against 96 (48%) with low education. Though illiteracy is very high in the municipality, the results obtained from the survey may be due to the fact that a great majority of the respondents reside in the Bolgatanga Township who may have an appreciable high level of education. At low WTP more respondents with low education are willing to pay, while more respondents with high education are also WTP at high education levels. Therefore, education could be found to be positively related to the WTP as asserted by Cho-Min-Nang et al (2000) and Bhati et al (2002).

Table 4: WTP Distribution by Sex

WTP(¢) /SEX	MALE	FEMALE	TOTAL
1 – 10,000	60	29	89
11,000 – 20,000	21	18	39
21,000 – 3,000	17	13	30
31,000+	28	14	42
TOTAL	126	74	200
%	63	37	100

Source: Field survey (2010)

Table 4 above shows that 126 respondents representing 63% of the total respondents were males and 37% were females. It was found out that males were more disposed to pay higher at all the intervals of WTP. This could be due to the fact that males as family heads have the task of meeting most of the financial commitment of the family. A more plausible explanation could be due to the fact that more males (126) constituted the sample size than their female counterparts.

Table 5: WTP Distribution by Occupation

WTP/OCC.	FORMAL	INFORMAL	TOTAL
1 – 10,000	40	49	92
11,000 – 20,000	17	22	39
21,000 – 30,000	17	13	27
31,000+	30	12	42
TOTAL	104	96	200
%	52	48	100

Source: Field survey (2010)

From Table 5, 49 respondents in informal employment have the WTP at the lowest interval of 0 – 14,000 Cedis per week; where as 40 respondents in formal employment are WTP at the said interval. However, the situation is different at the highest WTP interval of 30,000 Cedis and above per week, as 30 respondents are in formal employment and 12 are in informal employment. This suggests that at higher levels of payments, may be those in formal employment will be able to afford. This situation could be so because those in formal employment are sure of regular income flows that will enable them meet their expenditures including paying for refuse collection services. This confirms the economic theory that future expectations can determine peoples' demand for a particular commodity or service. In the informal sector, income flows are very volatile and as such too irregular to let people make any future financial commitments.

Table 6: WTP Distribution by Mode of Payment

WTP/ PAY MODE	MONTHLY	TWO WEEKLY	WEEKLY	ON COLLECT DAYS	TOTAL
1- 10,000	60	15	10	4	89
11,000 - 20,000	19	9	7	4	39
21,000 - 30,000	16	4	7	3	30
31,000+	26	8	6	2	42
TOTAL	121	36	30	13	200
%	60.5	18	15	6.5	100

Source: Field Survey (2010)

From the table above, 121 respondents representing 60.5% of the total respondents will want to pay monthly. Possible reason could be that more people are salary workers or are in formal employment and would naturally want to wait till the end of the month to get their salaries to enable them pay for the services.

Table 7: Estimation of Benefits from WTP

WTP INTERVALS	FREQ.	%	WTP MIDPOINTS(¢)	BENEFITS(¢)
1- 10,000	89	46	5,500	489,500
11,000 - 20,000	39	19.5	15,500	604,500
21,000 - 30,000	30	13.5	25,500	765,000
31,000+	42	21	35,500	1,491,000
TOTAL	200	100	82,000	3,350,000

Source: Field Survey (2010)

The total WTP (benefits) as per the respondents is ¢3,350,000 per week. Given the total number of households in the municipality it is possible to determine the total benefits to be derived by multiplying the various percentages by the number of households and multiplying the product by the respective WTP midpoints and then take the sum. That is where price discrimination or differential pricing is used. From the above table, the mean WTP can be calculated: thus, ¢3,350,000 / 200 = ¢16,750. To ensure one price for the services in the municipality, the average or mean WTP could be used as the price to be paid by individual households.

Econometric Analysis – OLS ANCOVA Model

When the OLS ANCOVA was estimated and the various diagnostic tests conducted, there existed the problem of heteroscedasticity which resulted in a very low R^2. These results and the diagnostic test are shown in appendix one. In order to correct the problem of heteroscedasticity, the weighted least squares (WLS) was use and the improved results are shown below.

Results

Table 8: Estimation of ANCOVA model

Variable	coefficient	Std error	t-value	t-prob
Constant	4.72402	1.252	3.77	0.000 ***
lnY	0.354609	0.09630	3.68	0.000***
OCC(D_{2i})	0.0224308	0.1463	0.153	0.878
SEX(D_{3i})	-0.157011	0.1114	-1.41	0.160
EDU(D_{4i})	0.0224308	0.1463	0.153	0.878

Source: Field survey (2010)

*** = significant at 1%, ** = significant at 5%, * = significant at 10%

sigma 0.750375 RSS 109.797145

R^2 0.305879 F(4,195) = 5.773 [0.000]**
log-likelihood -223.819
no. of observations 200 no. of parameters 5
mean(LWTP) 9.43624 var(LWTP) 0.613995

From table 8, only the income (Y) coefficient is significant at 1% given its t-probability ratio of 0.0650. This means that the mean WTP varies by 0.3546% with a 1% variation in income. In other words, the income elasticity of WTP is 0.3546. Thus, the effect of the income changes on the mean WTP is constant irrespective of the sex, occupation and educational status of respondents. However the other dummy variables were found not to be significant. The estimated R^2 is at 31% suggesting that only about 31% of variation in the mean WTP is explained by the explanatory variables.

Table 9: Estimation of ANCOVA Interaction Model

	Coefficient	Std.Error	t-value	t-prob
Constant	4.44558	1.241	3.58	0.000***
OCC(D_2)	-0.443260	0.2643	-1.68	0.095
SEX(D_3)	-0.0331430	0.1642	-0.202	0.840
EDU(D_4)	0.504234	0.2822	1.79	0.076*
SOC(D_2D_3)	0.527543	0.2890	1.83	0.069*
EDOC(D_2D_4)	0.0416443	0.2764	0.151	0.880
SED(D_3D_4)	-0.801082	0.2881	-2.78	0.006***
lnY	0.371389	0.09554	3.89	0.000***

Source: Field survey (2010)

Note: *** = significant at 1%, ** = significant at 5%, * = significant at 10%

sigma 0.740925 RSS 105.402129
R^2 0.141669 F(7,192) = 4.527 [0.000]**

log-likelihood -219.734
number of observations 200 no. of parameters 8
mean (LWTP) 9.43624 var(LWTP) 0.613995

From the results of the estimated interaction model in table 9 above, OCC, EDU and SOC could be accepted to be significant at 10%, while SED and lnY are significant at 1%. This implies that holding income (covariate) constant and taking the antilog of these coefficients, we can find the actual differential effects of formal employment, high education, being a male with formal employment and being a male with high education, on the mean WTP as 0.64194, 1.65571, 1.69476 and 0.44884, respectfully. Therefore, if the coefficients of OCC and SOC are added we obtain: 0.64194 + 1.69476 = 2.3367. This means that the mean WTP of males in formal employment is higher by ¢2.3367. Also if the coefficients of EDU and SED are added we obtain: 1.65571 + 0.44884 = 2.10455. This implies that the mean WTP of males with high education is higher by ¢2.10455. The income elasticity is now 0.371389, a bit higher than what was obtained in the previous model. The estimated R^2 is 0.136878, indicating that only about 14% of variation in the mean WTP is explained by the exogenous variables.

From the diagnostic test, the presence of heteroscedasticity was rejected at the 5% significant level for the various test of heteroscedasticity test. Again, the test for residual autocorrelation was also rejected at the 10% significant level from lag 1 to lag 3. Autocorrelation was, however, present from lags 4 and above.

Conclusions

The conclusion drawn from the study is that 89 (44.5%) of the respondents were willing to pay at the lowest range of 1- ¢10,000 per week, while 42 (21%) of the respondents were willing to pay at the highest range of ¢31,000+ per week for the same service. The calculated mean WTP was ¢16,750 per week. Also from the cross tabulation, it was found out that respondents in formal employment as well as those with high education

were more disposed to pay at higher rates than their counterparts. This fact was established through the ANCOVA interaction model. However the differential effect of being a male with high education (SED) as well as the differential effect of being a male with formal employment (SOC) was found to be positively related to the WTP.

Recommendations

From the findings and the conclusion drawn thereafter, it is recommended that:

- Differential pricing should be used, with those living in well planned (government) residential areas paying higher than the mean WTP since these categories of individuals have high education, are in formal employment and earn appreciable level incomes
- Collection points should be used like the current system where refuse containers are place at vantage points for people to drop refuse, but house-to-house collection of levy should employed, the levy should not be below the mean WTP.
- Refuse collection levies should be paid monthly.

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Appendix A

Table 8a: Estimation of ANCOVA model

Variable	coefficient	Std error	t-value	t-prob
Constant	4.72402	1.252	3.77	0.000 ***
lnY	0.354609	0.09630	3.68	0.000***
OCC(D_{2i})	0.0224308	0.1463	0.153	0.878
SEX(D_{3i})	-0.157011	0.1114	-1.41	0.160
EDU(D_{4i})	0.0224308	0.1463	0.153	0.878

Source: Field survey (2010)

*** = significant at 1%, ** = significant at 5%, * = significant at 10%

sigma 0.750375 RSS 109.797145

R^2 0.115472 F(4,195) = 5.773 [0.000]**

log-likelihood -223.819

no. of observations 200 no. of parameters 5

mean(LWTP) 9.43624 var(LWTP) 0.613995

Table 9: Estimation of ANCOVA Interaction model

	Coefficient	Std.Error	t-value	t-prob
Constant	2.34578	1.241	3.22	0.008***
OCC(D_2)	-0.443260	0.2643	-1.41	0.095
SEX(D_3)	-0.0331430	0.1642	-0.12	0.840
EDU(D_4)	0.504234	0.2822	1.73	0.076*
SOC($D_{2i}D_3$)	0.527543	0.2890	1.22	0.069*
EDOC($D_{2i}D_4$)	0.0416443	0.2764	0.61	0.880
SED($D_{3i}D_{4i}$)	-0.801082	0.2881	-2.99	0.006***
lnY	0.371389	0.09554	3.89	0.000***

Note: *** = significant at 1%, ** = significant at 5%, * = significant at 10%

sigma 0.740925 RSS 105.402129
R^2 0.031561 F(7,192) = 4.527 [0.000]**
log-likelihood -219.734
no. of observations 200 no. of parameters 8
mean(LWTP) 9.43624 var(LWTP) 0.613995

Diagnostic Tests
AR 1-2 test: F(2,190) = 4.5389 [0.0119]*
ARCH 1-1 test: F(1,190) = 6.1351 [0.0141]*
Normality test: Chi^2(2) = 27.859 [0.0000]**
hetero test: F(8,183) = 2.7675 [0.0065]**
hetero-X test: F(15,176)= 2.7146 [0.0009]**

Testing for error autocorrelation from lags 1 to 3
Chi^2(3) = 9.2863 [0.0257]* and F-form F(3,189) = 3.0676 [0.0292]*

Testing for heteroscedasticity using squares
Chi^2(8) = 21.586 [0.0057]** and F-form F(8,183) = 2.7675 [0.0065]**

Testing for heteroscedasticity using squares and cross products
Chi^2(15)= 37.578 [0.0010]** and F-form F(15,176)= 2.7146 [0.0009]**

Where the interaction dummy variables being:
SOC: interaction between sex and occupation
EDOC: interaction between education and occupation
SED: interaction between sex and education

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