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Contribution of Village Chickens to Animal Protein Consumption and Income of Rural Households in the Greater Accra Region, Ghana

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Abstract
A cross-sectional study was carried out to assess the contribution of village chickens to rural households' animal protein intake and income in three districts in the Greater Accra region. A total of 110 households were interviewed using a structured questionnaire. Village chicken products (eggs and meat) accounted for 2.71 percent and 5.1 percent of households' animal protein intake and income respectively. There was no significant correlation between flock size and protein security and flock size and net annual income of sample households. The relatively low contribution of village chickens to household protein security and income could be attributed to the small average flock size of about 13 birds per household and the low average egg production per hen per year of about 37 per household resulting from poor husbandry practices. Improvement of the husbandry system of village chickens will be required to increase production in order to enhance their contribution to rural households' food security and cash income.
Keywords: Village chickens, rural household, animal protein intake, income, Ghana

1. Introduction

Village chicken production systems in rural Africa is based on free-range indigenous domestic fowls (Gallus domesticus), the predominant species in the rural poultry sector (Kitalyi, 1998). Generally, the birds scavenge for most of their nutritional needs with no formal health control measures, and may or may not be housed (Muchadeyi et al., 2004). Although this production system is sustainable for the resource poor rural households, output in terms of weight gain and the number of eggs per hen per year are very low with high mortality rates (Matthewman, 1997). In Ghana, about 80 percent of village chickens are lost annually due mainly to Newcastle disease and a number of other causes (Awuni, 2002). Despite their low productivity, more than 70% percent of poultry products and 20% of animal protein intake in most African countries is reported to come from scavenging indigenous chickens (Kitalyi 1998)**.** A study in Tanzania showed that a single hen can produce after five years, 120kg of meat and 195 eggs (6.8kg) in a system where the investment is insignificant and runs by itself with little risk for the producers (FAO, 1997). In the Alfred District of South Africa, Swatson et al., (2001) found that freely scavenging chickens contributed 16.5% of the total meat consumed but a negligible cash income whilst Aboe et al. (2006) reported that rural household in the Accra plains of Ghana acquired 15% of their household income from rural poultry. Rural poultry production has been advocated as an efficient means of improving food security and income of rural households (FAO, 1997; Kitalyi, 1998; Todd, 1998; Guèye, 2000). Some reasons given by Todd for this assertion are that: Nearly all households (poor and landless) own poultry; poultry is mainly owned and managed by women and children; there are few religious taboos related to poultry; poultry is socio-culturally important; low cost technology is available; low investment is needed; land is not needed; it is environmentally friendly; 10 chickens under improved conditions are enough to make a difference for one household; poultry production can be self-sustaining and income generating system; and can serve to build up an entitlement base for poor women.

In Ghana, village poultry accounts for approximately 60%-80% of the national poultry population (FASDEP, 2002; Gyening, 2006) and nearly all households in rural communities keep local chickens (Aning et al., 2008). The production system and productivity of these birds in the country have been reported by a number of authors (See Williams, 1990; Dankwa et al., 2000; Awuni, 2002; Aboe et al. 2006; Awuni et al., 2006; Blackie, 2014). In all these studies flock sizes and productivity reported were very low with high mortality rates resulting mainly from diseases, poor nutrition and predation. A few reliable data on the contribution of these flocks to household income in some agro-ecological zones of the country is available (See Aboe et al, 2006; Birol et al, 2008) however, there is a dearth of quantitative data on the contribution of village chickens to households' animal protein security. This study was undertaken first to contribute to the available data on households' income due to chicken production and secondary to determine the proportion of rural households' animal protein intake that comes from home produced chicken in the Greater Accra Region of Ghana.

2. Material and Methods

2.1 Study area

The study was carried out in three out of six districts in the Greater Accra Region. These were Ga West, Ga East and Damgbe West districts. The region is located in the south central part of Ghana with a coastline of about 224 km and covers an area of about 3,245 square kilometres. Temperatures in the region ranges from 20ºC to 30ºC and the annual rainfall ranges from 630mm along the coast to 1140mm in the hinterland and is characterized by a bimodal pattern of distribution. The vegetation is basically coastal savannah interspersed with shrubs and short trees. The predominant occupation of the majority of the people in the study area is farming with free range local chickens forming an integral part of their farming system (Greater Accra Regional Administration).

2.2 Sampling procedure

A stratified random sampling technique was used for the study. Three districts with a high concentration of local chickens were purposively selected in consultation with the Agricultural Extension Agents. Twenty two villages (comprising seven from Ga East, seven from Ga West and eight from Damgbe West) and five households per village were randomly selected for the study. Overall, 110 households were involved in the survey.

2.3 Data collection procedure

Sample households were interviewed using a structured questionnaire to collect data on the types of animal products they consumed and their sources of cash income over a specified period of time

2.3.1 Contribution of village chickens to household animal protein intake

The contribution of village chickens to animal protein intake of each household was estimated as the percentage of protein from home produced chicken and eggs in the total animal protein consumption of households. The different types of animal products consumed daily by each household for a period of seven days (based on recall) was recorded The quantities (gm) of each product consumed daily by the households were estimated by weighing equivalent amounts (¢) of the products obtained from the local market. The protein content in 100g of each product was obtained from the food composition data published by Food Research Institute (FRI), Council for Scientific and Industrial Research (CSIR), Ghana (1975). The protein content (gm) of each product-consumed daily by a household was calculated as follows:

$$PROT_i = \alpha_i \quad (1)$$

$$Q^c PROT_i = Q_i \quad (2)$$

$$PI_i = \alpha_i Q_i \quad (3)$$

$$TAPI = \sum_{i=1}^{n} \alpha_i Q_i \quad (4)$$

Where PROTi = protein content of the ith animal product.
Q^cPROT_i = quantity consumed of the ith animal product per day.
PI_i = protein intake per day
TAPI = Total animal protein intake
The proportion of animal protein intake that comes from family chicken products was computed as shown in equation 5.

$$PAPIC = PIC \big/ TAPI \quad (5)$$

Where PIC = Protein intake (gm) per household per day from family chicken products consumed and
TAPI = Total animal protein intake per household per day.
PAPIC = Proportion of animal protein intake coming from family scavenging chicken products,

The relationship between flock size (chicken numbers) and household protein security (kg protein intake /person /month were determined using Pearson's Correlation Coefficient, defined as:

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n(\sum x^2) - (\sum x)^2][n(\sum y^2) - (\sum y)^2]}} \quad (6)$$

Where r = correlation coefficient
n = number of data pairs
x = the independent variable, the family flock size
y = the dependent variable, the kilogram protein intake per person per month

The hypotheses tested were:

Ho: family flock size has no effect on rural household's protein security
Ha: There is a positive relationship between flock size and rural household's protein security

2.3.2 Contribution of village chickens to household income

Cash resulting from sale of chickens and eggs produced by households and cash value of chicken and eggs consumed or used for other purposes was used to estimate the contribution of village chickens to rural household net annual income. Data on cash resulting from sale of farm produce (both crops and animals) and cash value of chicken products consumed by household, and those used for other purposes such as sacrifices were collected. Data on non-farm income was also collected. The percent contribution of local chickens to the total income was obtained as:

$$ICC = \frac{IC}{THI} * 100 \qquad (7)$$

Where ICC = Income contribution from chicken
IC = Income from chicken products
THI = Total household income

The correlation between flock size and household net income was determined using Pearson's correlation coefficient as before. The hypotheses tested were: Ho: Flock size has no effect on household annual net income
Ha: There is a positive relationship between flock size and household net annual income.

2.4 Data management and analysis

Qualitative and quantitative data were analyzed using the Statistical Package for the Social Sciences. Descriptive statistics such as mean, frequency and percentages were used to summarize and present the results. The relationship between flock size (chicken numbers) and households' protein security (kg protein intake /person /month and flock size and households' cash income were determined using Pearson's Correlation Coefficient

3. Results and Discussion

3.1 Contribution of home produced chickens and eggs to households' animal protein intake

Table 1 shows the quantities of animal protein contributed by each protein source to the total animal protein intake of the sample households, the average quantity of protein intake, the minimum and the maximum protein intake and the percent contribution of each protein source. The total protein intake per month for the 110 households was 510 kilograms. Fish protein constituted 96.07% of animal protein intake of households. The contribution of village chickens to the protein intake was only 2.71% of the total animal protein intake of the households. This finding could be attributed to the small average flock size of about 13 birds and the low average egg production per hen per year of about 37 per household in the study zone (Blackie, 2014). Table 2 shows that fish was a cheaper source of protein compared to either eggs or chicken. Obviously, households would prefer selling their birds and use the income to purchase other cheaper sources of protein in order to meet other family needs. Analysis by Aboe et al. (2006) of FAOSTAT- Nutrition (FAO, 2004) statistics on the average protein intake of the population of Sub-Saharan Africa indicate that on the average poultry products contributed 2% of the total protein intake and nearly 11% of animal protein intake of households whilst backyard poultry farming in Asia was found to contribute a third of the protein intake for the average rural household (http://www.grain.org.org). The vast difference between the contributions of village chickens to household animal protein intake in this survey compared to the report from Asia could be attributed to the adoption of the Bangladesh Poultry model adopted by most Asian countries which addressed both technical and organisational issues of chicken production leading to increased production (**http://www.husdry.kvl.dk./htm/php/tune99/18-Permin.htm**).

3.2 Contribution of family chickens to household Income

Income estimates for sample households is presented in Table 3. The average annual net household income at the time of the research amounted to ¢3,571,627.7. The relative contributions of the various income sources are shown in column three of Table 3. Household chickens accounted for a small share (5.1%) of household income. The contribution of chickens to household income in this study is far lower than the 15% estimated by Aboe et al. (2006) in the Accra plains of Ghana but higher than the 3.3% reported by Birol et al. (2008) in some agro-ecological zones of Ghana. Generally village chickens contributed only a small share of cash income of rural households in all the studies carried out in Ghana. Swatson et al, (2001) made a similar observation in the Alfred District of Kwazulu-Natal, South Africa and concluded that free-range chickens contributed a negligible cash income to resource poor households. The relatively low contribution of village chickens to rural household livelihood in the study zone is mainly due to a number of constraints to production such as diseases, poor

nutrition lack of or poor housing structures and predation (Blackie, 2014). The report by Smith (1990) showed that small improvement in feed supplementation increased significantly the number of eggs laid per hen per year and improved growth rate of village chickens. However, Muchadeyi et al, (2004) cautions that introduction of new technologies, such as feeding programmes disease vaccination programmes and record keeping aimed at improving village chicken production in poor rural households should be critically examined before implementation in order to sustain the balance in their livelihood activities.

Table 1 Animal protein intake by rural households in the Greater Accra Region

	Fish protein	Egg protein	Chicken protein	Beef protein	Mutton protein	Pork protein	Other	Total
Protein intake per month for 110 households (kg)	490.33	2.10	11.72	5.13	0	0	1.11	510
Mean protein intake per household per month (kg)	4.6	0,02	0.11	0.04	0	0	0.01	4.64
Minimum protein intake per household per month (kg)	2.47	0.01	0.02	0	0	0	0	2.5
Maximum protein intake per household per month (kg)	14.95	0.11	0.35	0.24	0	0	0.29	15.94
Standard deviation	3.27	0.02	0.08	0.06	0	0	0.29	3.72
Contribution to protein intake (%)	96.07	0.41	2.30	1.01	0	0	0.22	100

Source: Field data, 2006

Table 2 Prices of animal products and protein

Products	**Price (¢) per 100gm of product**	***Protein content (gm) per 100gm of product**	**Price (¢) per gm of protein**
Fish	1321.6	21.8	60.62
Chicken	1872.2	22.0	85.10
Egg	3333.3	12.0	277.78
Beef	3083.7	18.8	164.03

Source: Field data, 2006 *Data on protein content of animal products were obtained from Food Research Institute, Ghana.

Table 3 Income analysis for rural households in the Greater Accra Region.

Net income	Amount (¢)	% Contribution
Family chicken	182,840.7	5.1
Goats	580,454.8	16.2
Sheep	231,786.9	6.4
Crops	1,396,581.8	39.1
Off-farm income	1,179,963.5	33.0
Total household net income	3,571,627.7	100

Source: Field data, 2006

3.3 Flock size and household protein security and income

The expectation of the relationship between flock size and protein security and cash income of households was that increase in flock size would increase household protein intake and income. Pearson's Correlation Coefficient was used to determine the association between flock size and household protein security, flock size and household income, household income and protein security, family size and protein security, and family size and household income. The results of the correlations shown in Table 4 however indicate weak negative relationships between flock size and household protein security, flock size and household income, and household income and protein security, weak positive correlations between family size and household net income and family size and household protein security. Test of significance of the correlations showed that there was no significant association between all the paired variables**.** The work of Swatson et al, (2001) conversely showed that gross income per household increased with increasing chicken numbers, whilst protein security (Kg protein intake per person per month) decreased.

Table 4 Correlations between flock size, protein security and income of households.

		Net Income	Protein security	Flock Size	Family Size
Net Income	Correlation coefficient	1.000	-0.082	-0.002	0.025
	significance		(0.394)	(0.992)	(0.795)
	Sample size	110	110	42	110
Protein security (protein intake/person/month) in Kgs)	Correlation coefficient	-0.082	1.000	-0.263	0.121
	significance	(0.394)		(0.093)	(0.207)
	Sample size	110	110	42	110
Flock size	Correlation coefficient	-0.002	-0.263	1.000	-0.119
	significance	(0.992)	(0.093)		(0.454)
	Sample size	42	42	42	42
Family Size	Correlation coefficient	0.025	0.121	-0.119	1.000
	significance	(0.795)	(0.207)	(0.454)	
	Sample size	110	110	110	110

Source: Filed Data, 2006

4. Conclusion

Village chickens accounted for a small share of households' animal protein intake and net income. Households depended mainly on fish for their animal protein consumption. Their main sources of income came from crop cultivation followed by off-farm employment and small ruminant production. There was no significant correlation between flock size and protein security and flock size and net annual income of the respondents. The low annual off-take from chickens in the survey districts could be attributed to the small flock size and low productivity resulting from poor husbandry practices. Moderate transformation of the production system will be required to improve production and increase the contribution of the birds to rural households' livelihood. Such interventions should involve improved supplementary feeding, proper housing and control of diseases and parasites.

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