

Full Length Research Paper

Socio-economic attributes of guinea fowl production in two districts in Northern Ghana

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The search for a sustainable solution to the growing household food insecurity in many Ghanaian homes calls for an effective harnessing of locally available resources for increased agricultural production. The study was conducted against the background that, although several studies have been conducted on the guinea fowl in Northern Ghana, very little attention has been paid to the socio-economic attributes of production. Such information is critical to understand the behaviour of farmers, especially, about technology adoption by understanding the opportunities and constraints confronting farmers. This allows a more holistic and informed approach to solve the problems of farmers. The study employed descriptive statistic by means of percentages, statistical means and frequency tables. The results indicate that guinea fowl keepers in both districts keep the birds for economic and socio-cultural reasons. Like any other economic venture, guinea fowl production is not without constraints. The main constraints to guinea fowl production include high keet mortality rates, inadequate access to veterinary services, low productivity of local breeds, unstable prices and poor management practices. It is recommended that there should be increased research to increase the productivity of local breeds of guinea fowls.

Key words: Guinea fowl, Ghana, socio-economic.

INTRODUCTION

Guinea fowls in the Ghanaian economy

The domestic guinea fowl (*Numida meliagriss*) is a poultry bird that derives its name from the guinea coast of West Africa where it originated (Moreki and Seabo, 2012; Annor et al., 2012). The commonest variety of guinea fowl raised in Ghana is the Peal helmeted guinea fowl (FAO, 2014). Its origin notwithstanding, the commercial viability of the guinea fowl on the African continent is yet to be realised in full (Moreki and Radikara, 2013). On the

contrary, guinea fowl production has proven to be commercially viable and is raised in large numbers in Europe and the United States of America where it has been successfully commercialized (Cassius and Radikara, 2013; Nahashon et al., 2006). In Africa, Guinea fowls are still raised as free range scavenging birds and have seen little improvement (Dognon et al., 2012). Guinea fowls are easier to manage by resource poor farmers with hardly any access to formal veterinary services because they are resistant to most poultry

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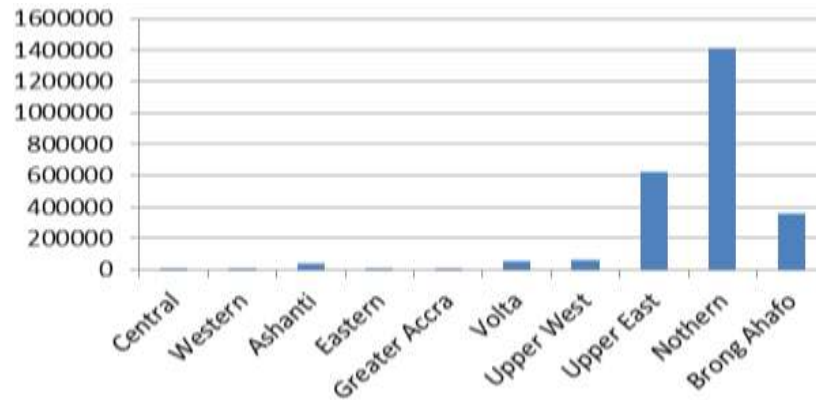


Figure 1. Regional distribution of guinea fowls in Ghana. Source: Adapted from FAO (2014).

diseases at the adult stage (Sayila, 2009). Housing is rudimentary and health management practices depend, largely, on ethno-veterinary medicine (Moreki and Radikara, 2013). Konlan and Avornyo (2013) have shown that 98% of guinea fowl farmers in Benin house their birds only at night and offer them a few handfuls of grains in the morning with the birds scavenging for feed the rest of the day. In Ghana, Guinea fowl production is restricted, generally, to the Northern Savannah zones of the country and is an integral part of the farming system in these areas (FAO, 2014). Guinea fowls are said to be the commonest poultry species in Northern Ghana (Agbolosu et al., 2012). The birds, apart from contributing to household income, play an important role in the socio-cultural lives of the people of Northern Ghana (Teye and Adam, 2000). The bulk of guinea fowls produced in Ghana are raised by subsistence farmers mainly from the rural areas in the Upper West, Northern and Upper East regions all in northern Ghana. The guinea fowl population has been estimated to constitute 7.1% of the total poultry population and 81% of all guinea fowls produced in Ghana (FAO, 2014) (Figure 1).

Guinea fowl meat has assumed a delicacy and meat of choice for most people in Ghana. This has led to increased demand for guinea fowl meat in other parts of Ghana. From the rural areas, in northern Ghana, traders transport large numbers of guinea fowls to the cities and big towns where they are sold to individual consumers and restaurants. It is a common sight to observe grilled guinea fowl at bars and along the roadside for sale in most cities in Ghana. Guinea fowl eggs are a common sight in most rural markets during the laying season. Thus, guinea fowl production plays a significant role in the economies of these districts. In recognition of this, government, under the Savannah Accelerated Development Authority, targeted the promotion of guinea fowl as a strategy to improve household income and to reduce poverty in Northern Ghana. Some other rural intervention programs have targeted guinea fowl

production as a means to poverty alleviation in Northern Ghana. These include the Northern Rural Growth Program that is currently supporting actors in the Guinea fowl value chain. Between 2009 and 2012, GIZ contributed to efforts to improve guinea fowl production in Northern Ghana by addressing key constraints in the guinea fowl value chain. Development of the Ghanaian poultry sector has centred on large-scale industrial chicken production. This has resulted in the neglect of smallholder poultry which produce a considerable proportion of domestic protein needs, especially, among rural folks. Large-scale industrial production of guinea fowls under intensive management is yet to be developed in Ghana. Lately, however, a few commercial Guinea fowl ventures have emerged in southern Ghana (Annor et al., 2012). Although some attempts at large scale, industrial production of guinea fowls have been made in northern Ghana these have failed largely and there is not much to show for it. According to the FAO (2014), exotic guinea fowl production is negligible in Northern Ghana.

Role of socio-economic factors in stimulating technology adoption

The role of socio-economic factors in determining technology adoption has been proven by several studies. A vast literature also exists in the specific case of the influence of socioeconomic factors on the adoption of technology among livestock farmers. Mlote et al. (2013) found that marital status, awareness and attitude towards technology influenced the willingness of pastoralist to adopt beef fattening technology in Tanzania. Mafimisebi et al. (2012) also found a positive relationship between a farmer's age, household size, distance to the nearest veterinary hospital and extent of travel on the utilization of plant medicine among livestock farmers in South-West Nigeria. In a particularly revealing article, Zander et al. (2013) have demonstrated that lack of knowledge,

inadequate support and failure to target local needs and conditions are potentially limiting to technology adoption. Thus, analysing the context within which a technology is diffused via socioeconomic analysis is critical in ensuring improve technology uptake. Several studies have been carried out on guinea fowls in Ghana. Most of these studies, however, failed to address the socio-economic aspects of guinea fowl production. Most studies carried out on the local guinea fowl in Ghana have been in the area of biology and reproductive performance. These include the works of Adjetei et al. (2014), Alidu (2014), Agbolosu et al. (2012), Donkoh and Zanu (2010), Teye et al. (2003), Dei et al. (2009), Dei and Nsawah (2009), Dei et al. (2006), Awotwi (1972) and Laate (1974). This trend was confirmed when several more recent studies that have been carried out by the animal science department of the University for Development Studies were reviewed. Consequently, the purpose of this study is to fill this important gap by examining key social and economic characteristics of guinea fowl production in the Tolon and Builsa North districts in the Northern and Upper East regions of Ghana which are noted for guinea fowl production. Understanding the economic and socio-cultural dynamics of guinea fowl production is important since these economic and social factors have been proven to affect technology adoption among farmers.

METHODOLOGY

Study areas

The Builsa north and Tolon districts are major production and marketing centres for guinea fowl in Northern Ghana. The two districts share many common characteristics. Both are rural in nature with majority of their respective populations depending on crop and livestock farming as their main source of livelihood. They share similar vegetation and climatic conditions which are common to the Northern Savannah Zones of Ghana. The Northern Savannah Zone is largely made up of the Northern, Upper West and Upper East regions. Apart from the regional capitals the area is largely rural with majority of its population depending on subsistence agricultural as the main source of livelihood. The Builsa north and Tolon districts are located in the Upper East and Northern regions respectively.

Builsa North District

The Builsa North District is predominantly rural with agriculture as the main economic activity undertaken by self-employed farmers. About ninety percent (89.2%) of the population is rural. The population of the Builsa North District according to the 2010 Population and Housing Census is 56,477. Females constitute 50.8% and males represent 49.2%. The district lies between longitudes 1° 05' West and 1°35' West and latitudes 10° 20' North. The district covers an estimated land area of 816.44030 km² and has mean monthly temperatures ranging between 21.9 and 34.1°C.

The highest temperatures are recorded in March and this can rise to 45°C, whereas the lowest temperatures are recorded in January. The dry season is characterized by dry Harmattan winds. There is only one rainy season, which builds up gradually from little rains in April to a maximum in August-September, and then

declines sharply coming to a complete halt in mid-October when the dry season sets in. The district is characterized by Savannah woodland and consists mostly of deciduous, widely spaced fire and drought resistant trees of varying sizes and density with dispersed perennial grasses and associated herbs. Common tree species include *Adonsonia* spp., *acacia* spp, *Vitellaria* spp. and *Parkia* spp. which have been retained with time due to their economic importance (Ghana Statistical Service, 2014).

Tolon District

The Tolon District lies between latitudes 9° 15" and 10° 0 02' North and Longitudes 0° 53'and 1° 25' West. The district is characterised by a single rainy season, which starts in late April with little rainfall, rising to its peak in July-August and declining sharply and coming to a complete halt in October-November. The dry season starts from November to March with day temperatures ranging from 33 to 39°C, while mean night temperature range from 20 to 26°C. The mean annual rainfall ranges between 950 to 1,200 mm. The main vegetation is grassland, interspersed with guinea savannah woodland, characterised by drought-resistant trees such as *Vitellaria* spp., *Parkia* spp. and *Adonsonia* spp. The majority of the district's inhabitants are peasant and subsistent farmers (Ghana Statistical Service, 2014).

Sampling and source of data

Five communities each in the Tolon and Builsa North Districts were purposively sampled for the study. The main criterion employed in the selection of communities for inclusion was the relative abundance guinea fowl keepers in the each district. Six guinea fowl keepers were selected randomly from each community making sixty guinea fowl keepers in both districts.

Methods of data collection

A combination of quantitative and qualitative methods of data collection was employed in collecting data for the study to allow for statistically reliable information by way of triangulation. Primary data were collected by means of semi-structured questionnaire. Following the questionnaire administration one focus group discussion was conducted in each community to collect additional qualitative information and to ascertain aspects of data collected via questionnaires with a view to obtaining better understanding of issues. Each focus group discussion consisted of a minimum of 15 and a maximum of 20 persons per community. In order to capture intergenerational and gender differences participants in the focus group discussions were selected carefully to ensure that gender and generational parity was achieved as much as possible. Questionnaires were administered to all the 60 guinea fowl keepers in both districts. The main focus of the questionnaire was to generate quantitative data on guinea fowl performance and socio-economic characteristics of guinea fowl keepers. On the other hand, the focus group discussions served to collect background information and common practices of guinea fowl rearing in addition to helping to clarify the qualitative basis of the quantitative data collected through the questionnaires. Secondary data were obtained from the revenue departments of the respective District Assemblies on the numbers of guinea fowls traded in both districts. From the Ministry of Food and Agriculture, information was obtained on the nature of guinea fowl diseases and extension delivery to guinea fowl farmers. Key informant interviews were conducted among community elders to ascertain historical trends and to seek their perspectives on the findings from both the questionnaires and focus group discussion. A major problem encountered during data

collection was the fact that farmers do not keep records. Consequently, the quality of quantitative data obtained depended very much on farmers' ability to recall. This was especially so with production costs and expenditure on guinea fowl production. This notwithstanding, a great deal of effort was made by the researchers to improve data quality by triangulation. Hence, it became necessary to conduct in-depth interviews with experienced and prominent guinea fowl keepers in both districts to ascertain the reliability of data collected. This yielded positive result as the results, generally, follows trends obtained elsewhere in Ghana.

Method of data analysis

Quantitative data were analysed statistically using frequency tables, statistical means and percentages while qualitative data were analysed simultaneously during data collection. Profitability of guinea fowl production was analysed using Benefit-Cost ratio.

RESULTS AND DISCUSSION

Gender and guinea fowl production

Males dominate guinea production in both districts. Ninety-eight percent of guinea fowl farmers in both districts are male. This is not much different from findings by Konlan and Avornyo (2013) who also reported that males constitute the majority (89.4%) among guinea fowl keepers in the Tolon District. Most females rearing guinea fowls were household heads. Male household heads indicated that their wives do not rear guinea fowls because of disputes over ownership while married women indicated that they do not rear guinea fowls because they do not have full control over them. However, married women usually help their husbands in taking care of guinea fowls, especially keets, while male children provide termites to feed them. Moreki et al. (2010) indicate that majority of beneficiaries of various guinea fowl projects supported by the government in Botswana were female. Although this situation appears to have been influenced by the possibility that females were deliberately targeted, it is an important lesson to the extent that it has demonstrated that females are capable of rearing guinea fowls if given the adequate support. Some married women, in the study area, did not see the need to rear guinea fowls as they prefer to concentrate on off-farm activities such as trading. Thus, it must be recognised that females must not be considered a homogenous group. Females have different needs, priorities and capabilities and the extent to which they participate in livestock rearing have been shaped by culture, tradition and history (Mupawaenda et al., 2008).

Contrary to the situation of women in small-scale crop farming, not much research has been conducted on the role of women in livestock production and this has often hindered effort to address inherent constraints affecting effective participation of women in livestock production (Quisumbing and Pandolfelli, 2010). The right questions must therefore, be asked taking into consideration

contextual and related factors such as culture in shaping responsive policies and interventions for a more inclusive female participation in guinea fowl production.

Age distribution

The age distribution of guinea fowl keepers in both districts is similar. Majority of guinea fowl farmers in both districts are between the ages of 30 and 50 years. This is not surprising since household heads, who are usually advanced in age, are the ones that undertake guinea fowl production. The situation, however, portrays a seeming lack of interest by the youth in undertaking commercial production of guinea fowls. This is reflected in the fact that only 10% of guinea fowl keepers are between the ages of 21 to 30. Further interrogation revealed lack of appreciable commercialization as a reason why the younger farmers are not undertaking guinea fowl production as an income generation activity. High keet mortality also means that it is not possible to predict income from guinea fowl production making guinea fowl as a commercial venture precarious, unreliable and unattractive to the youth who would rather migrate elsewhere to engage in other income generating activities. Younger farmers are more likely to adopt agricultural technology (Sezgin et al., 2011). Sustaining interest in commercial guinea fowl production therefore, requires more effort to make guinea fowl production more attractive to the youth (Table 1).

Literacy level of guinea fowl keepers

Majority (67%) of guinea fowl keepers have no formal education. This result is not peculiar to guinea fowl keepers as illiteracy rate among smallholder farmers in Ghana is generally (Table 2). Access to formal education is an important determinant of livestock production technology adoption (Zipora et al., 2011; Sezgin et al., 2011) to the extent that it has a positive influence on technology adoption. Therefore, the high rate of illiteracy among guinea fowl keepers is a potential drawback to large-scale commercialization of guinea fowl production (Table 3).

Rearing experience

Overall, about 55% of guinea fowl keepers have more than 10 years of experience rearing guinea fowls. It is obvious that guinea fowl farmers have a great deal of experience implying that farmers are repository of knowledge in guinea fowl rearing which can be exploited. In the Tolon district 66.7% of guinea fowl keepers have, at least, 10 years of experience rearing guinea fowls compared to 43.3% in the Builsa district. This is possibly because higher numbers of new entrants are attracted to

Table 1. Age distribution of guinea fowl keepers.

Age (Years)	Frequency	%
21-30	6	10.0
31-40	16	26.7
41-50	27	45.0
>51	11	18.3
Total	60	100

Source: Field survey (2013).

Table 2. Literacy level of guinea fowl keepers.

Educational level	Frequency	%
No formal education	20	67
Basic education	7	23
Secondary Education	2	7
Tertiary Education	1	3
Total	30	100

Source: Field survey (2013).

Table 3. Experience in guinea fowl rearing.

Experience (Years)	Frequency	%
Up to 5	14	23.3
6-10	13	21.6
11-15	9	15
16-20	11	18.3
>21	13	21.6

Source: Field survey (2013).

guinea fowl rearing in the Builsa North district.

Socio-cultural factors

In northern Ghana Guinea, fowls play an important role in the socio-cultural lives of the people (Teye and Adam, 2000). The study revealed that guinea fowls play a significant role in the social and cultural lives of the people in both districts. All the respondents interviewed cited social and cultural obligations among the reasons why they rear guinea fowls. Guinea fowls provide meat for traditional festivals, as well as, other celebrations like Christmas, Easter, and Eid. The birds play important roles in marriage ceremonies and are presented as gifts to important guests. In the both districts, parents-in-law are usually welcome to the homes of their children with guinea fowls. Thus, Guinea fowl production constitutes an important aspect of the culture and tradition of the people in both districts and every farmer keeps a few

birds to meet social and cultural obligations. The major problem with the commercialization of guinea fowls in both districts therefore, is a matter of how to increase production beyond subsistence level.

Flock size

Fifty percent of respondents kept flock sizes of up to 50 birds, 30% kept between 50 and 100 birds and 20% kept more than 100 birds. The mean flock size is 33 in the Tolon District and 40 in the Builsa North District. About forty-three percent of guinea fowl farmers in the Tolon district had flock sizes of up to 50 birds. Another 43.3% had flock sizes of between 50 and 100 with 13.3% of farmers having flock sizes of more than 100. Comparatively, 56.7 of guinea fowl keepers in the Builsa North district had flock sizes of up to 50 while 16.6 and 26.7% had flock sizes of 50 to 100 and above 100 respectively. By all indications therefore, guinea fowl production is on a relatively larger scale in the Builsa North District than in the Tolon District. High keet mortality rates largely accounts for the relatively small flock size. However, the wide disparity in flock size among respondents recorded during the study is a reflection of the level of skill and experience among guinea fowl keepers. The study revealed that some farmers are noted in, every community, as gifted with livestock rearing in general. The study confirmed that such farmers are, indeed, highly skilful in guinea fowl production and usually inherit rearing knowledge from their forbearers.

Management practices

Farmers in both districts raise guinea fowls under the free-range system with varying levels of supplementary feeding. The birds are left to scavenge for food in a boundless area and return home in the evenings to sleep in coops, usually small huts with thatch roofs, roost in trees or rooftops. Keets are provided intensive care for the first six weeks of age. The common practice in both districts is that keets are carried along to the farm daily and left to scavenge for feed while the keepers work on their farms until evening when they are brought home. This saves farmers much time in caring for the keets. Keets' diet is supplemented with sorghum grit or ground maize and termites. On the other hand, less attention is given to adult birds. Adult birds are fed with a few handfuls of sorghum or maize thrown on the ground for the birds to pick. Adult birds are fed with the main aim of taming them or attracting them to return home. Overall, 71.7% of guinea fowl keepers feed their birds three times a day. Ninety-three per cent of respondents fed their birds three times daily in the Builsa North District compared to 50% in the Tolon district. 43.3% of guinea fowl keepers in the Tolon District fed their birds two times

daily. Comparatively, guinea fowl keepers are more commercially oriented in the Builsa North District. This, possibly, accounts for the reason why farmers in the Builsa North District attach more importance to feeding their birds more regularly.

Access to extension services

Access to extension services is a major driver in the adoption of agricultural innovation. However, access to extension services by guinea fowl farmers is very poor as revealed by this study. Agricultural extension, in general, has witnessed dwindling prospects over the years as a key driver of agricultural innovation in Ghana due to a major drift in agricultural policies over the years. The result is that public delivery of veterinary services, like other sectors, has received progressively dwindling financial and human resources while there has been little investment in physical infrastructure (Amankwah et al., 2014). Employment in the agricultural sector, like other sectors, has stagnated in recent years. The expectation was that private service providers would fill the gap. Unfortunately, this has not been the case as rural poultry farmers in Ghana still rely, to a large extent, on public veterinary services (FAO, 2014). All the respondents interviewed in both districts decried the lack of veterinary extension services as a major constraint to guinea fowl production. Unlike crop production the participation of private extension services, notably NGOs, is lacking in the case of guinea fowl production. The recent state sponsored interventions aimed at improving guinea fowl production in Ghana have rather concentrated on increasing production without adequate attention to the provision of complementary services such as veterinary services. Thus, poor access to veterinary services by guinea fowl farmers in Ghana is rather institutional.

Reproduction

The best time to raise keets in both districts is from March to June and September to October when there is abundance of feed for the birds to scavenge on and the warm weather makes brooding conducive. Using brooding chicken hens to incubate and raise keeps is the common practice in both districts. Guinea fowl keepers in both districts indicated that they do not allow their birds to hatch and raise keets because they would lose all keets in the bush while scavenging through carelessness and long treks. In addition, keets hatched and raised by guinea fowls are difficult to tame. Farmers also indicated that when guinea fowls are allowed to go broody it curtails their ability to lay eggs early. Breeding stocks are usually birds left over from the previous season's flock. Respondents revealed that the hatchability rate when ducks are used to incubate guinea fowl eggs is much

higher than that of chicken hens. A duck is capable of incubating an average of 30 guinea fowl eggs compared to an average of 20 for chicken hens. The disadvantage of using ducks to incubate guinea fowl eggs, however, is that there is the likelihood of losing all the keeps through drowning if they are not taken away immediately upon hatching as ducks would usually take the keeps out to swim. Moreover, ducks often peck and kill keeps. A male: female ratio of 1:4 to 1:6 is the case in the Talon and the Builsa North Districts respectively. Adam (1997) reported the commonest male: female ratio in the Damango District, also in northern Ghana, is 1:4. Guinea fowl keepers in both districts indicated that higher ratios are possible. This, however, is not desirable as the flock is dispersed making it difficult to trace eggs and also results in fighting among males over the females.

Breeding season

The laying season for guinea fowls in both districts is during the months of March to September when temperatures are relatively mild. The egg laying ability of eggs by guinea fowls is influenced by environmental factors and the feeding regime. Some farmers indicated that guinea fowls are capable of laying outside the main laying season if fed well. In addition, guinea fowls raised near large water bodies are said to be capable of laying continuously throughout the year due to favourable temperature conditions. This is supported by Konlan and Avornyo (2013) who reported that the egg laying ability of guinea fowls found in communities near water bodies in the Tolon District was significantly higher than those found in drier environments were.

Hatchability

Hatchability appears to be directly related to egg fertility rate since the hatchability rate of 72% reported in this study compares favourably with a fertility rate 77.4 and 80.4% for the Upper East and Northern Regions respectively as reported by Agbolosu et al. (2012). However, the study could not confirm this since it is based on respondents' accounts. More than 97% of respondents in both districts indicated that they could not achieve their desired flock size mainly due to poor hatchability of eggs and high keet mortality rate. The commonest source of eggs for incubation is the market. Farmers, usually do not have any idea of the source of eggs or how long eggs have been kept prior to sale. Guinea fowl keepers also indicated that eggs laid early in the laying season are more viable than those laid later in the season are. Some farmers attributed the poor hatchability of eggs to the inefficiency of some brooding hens. These reasons notwithstanding, the most important reason cited by farmers for the poor hatchability is the

Table 4. Main causes of keet mortality.

Cause of mortality	Frequency	%
Diseases	57	95.5
Rain/Cold	12	20.0
Predators/theft	15	25.0

Source: Field survey, 2013.

low fertility of eggs. Thus, it is important that any serious attempt to commercialize guinea fowl production in Northern Ghana should be accompanied by a breeding program that will ensure the availability of fertile and certified eggs for incubation.

Keet survival

The most delicate period for keets is from day-old up to six weeks of age when high keet mortality rates are recorded. On the average, 34 and 32 keets are lost per keeper annually in the Tolon and Builsa North Districts respectively. These figures are significantly high compared to the mean flock size of 33 and 40 in the Tolon and Builsa North Districts respectively. It is common for a farmer to lose all of his/her stock of keets. Teye and Gyawu (2001) have reported keet mortality of up to 100% in Northern Ghana. This suggests that losses to guinea fowl keepers, due to keet mortality are enormous. Three factors were found to be responsible for the high keet mortality. These are indicated in Table 4.

Diseases constitute the most important cause of keet mortality. Apart from 10% of farmers in the Tolon district who employ veterinary services in treating their birds, all other respondents mentioned diseases as the major cause of keet mortality. Although bad weather and predators/theft were mentioned these did not constitute major causes. Access to veterinary services is therefore, critical to reducing the high keet mortality rates experienced by farmers.

Laying performance

The average age of first lay in both districts is 29 weeks. Guinea fowls raised under intensive management in Ghana start laying between 32 and 40 weeks of age (Awotwi, 1987). Teye and Gyawu (2001) reported in their study of the performance of guinea fowls in northern Ghana that guinea fowls are capable of laying at 22 weeks under improved management conditions. In the Tolon District, farmers reported age of first lay of between 24 and 32 weeks with 70% of farmers reporting 28 weeks. In the Builsa North District, farmers reported the age of first lay of between 24 to 40 weeks with the majority (47%) reporting 32 weeks. Majority of farmers in

both districts (58 and 75% of farmers in the Tolon and Builsa North Districts respectively) reported collecting up to 100 eggs per guinea fowl per annum. Number of eggs collected ranged between 50 and 250 eggs and 51 to 210 eggs per guinea fowl per annum in the Tolon District and Builsa North Districts respectively. An estimated 20% of eggs are lost to theft and predators as most of the eggs are laid in nearby bushes. This brings the total number of eggs laid to between 252 and 300 eggs annually. The result is similar (301) to that reported by Agbolosu et al. (2012) for the Upper East region but lower (362) than that of the Northern region. Teye and Gyawu (2001) in an earlier study of the guinea fowl in northern Ghana recorded 200 to 300 eggs per guinea fowl per annum. Generally, free ranging birds have been reported to lay fewer eggs (Sonaiya, 1998). As discussed earlier guinea fowl, keepers in the Builsa North districts feed their birds more frequently than those in the Tolon districts. There is therefore, the possibility that the feeding regime has contributed to better laying ability of guinea fowls in the Builsa North district.

Marketing

Beside the need to keep a few guinea fowls to meet social and cultural obligations, guinea fowls are kept mainly for cash in both districts. This reflects in the fact that only 3.3 and 6.7% of guinea fowl keepers in the Tolon and Builsa North District respectively, mentioned meat and eggs for home consumption among reasons why they rear guinea fowls. The rest of the respondents in both districts mentioned income as their main reason for keeping guinea fowls. It is common practice for rural people in northern Ghana to rear guinea fowls, like other livestock, as a traditional option for investment as they provide a readily convertible source of immediate cash for most households. The study confirmed that the sale of guinea fowls and eggs provide substantial income for farmers in both districts. Majority of farmers in both districts indicated that their birds are usually ready for the market at about 28 weeks of age. The need for immediate cash is the major determinant of the age at which guinea fowls are sold. While some farmers sold their birds after 20 weeks of age, others kept their birds up to 52 weeks. An average of 17 and 26 birds were sold per keeper annually in the Tolon and Builsa North District respectively. This accounts for 52 and 65% of total flock size in the Tolon and Builsa North Districts respectively. Thus, this confirms the fact that commercialization is not the sole reason why farmers keep guinea fowls as discussed above. Moreover, farmers rely on their current stock for breeding and therefore retain some birds for that purpose. Guinea fowls are sold mainly live in local markets, usually, on market days. The urban centres and major cities are main destinations for guinea fowls in Ghana. The birds are usually sold live. Information collected from the revenue collection unit of both district

Assemblies show that during the peak production season an average of 1,498 and 1,150 live guinea fowls are transported by traders from the Builsa North and Tolon Districts, respectively, every week for sale in other parts of the country. This brings to a total of, at least, 77, 896 and 58,800 guinea fowls traded annually in the Builsa North and Tolon District respectively. Like other livestock guinea fowl meat is hardly processed for sale. This marks a major challenge confronting local agricultural production in general. Thus, they are unable to compete favourably with processed imported meat products that have seen an increase in recent years.

Profitability of guinea fowl production

Average net returns from the sale of guinea fowls ranged from USD 532 to UDS 1,750 per annum. The sale of live guinea fowls constituted 70.7% while sale of eggs constituted the remaining 39.3% of total revenue from guinea fowl production. Returns from the sale of eggs constituted a smaller proportion because a substantial number of eggs are lost to predators in the bush and theft. Some eggs are also reserved for incubation. Of the total cost of production, cost of eggs used for incubation constituted 76.4% while the cost of housing constituted 14.6%. The cost of supplementary feeding was 10% of total cost of production. The cost of medication and treatment were assumed negligible as keepers in both districts hardly purchased drugs for treating their birds or employed the veterinary services. Overall, the benefit cost ratio of 8.2 indicates that guinea fowl production is profitable and provides a good return on investment.

Conclusion

The study has demonstrated that farmers rear guinea fowls mainly for cash beside the need to meet social and cultural obligations. Therefore, the fundamental conditions exist for effective commercialization guinea fowl production in both districts since the will exists among farmers to commercialize. Income from guinea fowl production can result in considerable reduction in household food insecurity in the rural areas of northern Ghana if efforts are made to improve the management conditions under which they are currently raised. The potentials of the guinea fowl production as a commercial venture are enormous due to high and increasing demand of guinea fowl meat as meat of choice by most Ghanaians. Besides, it is profitable as shown by this study. This development is significant against the background that the production and demand for exotic guinea fowl production in Ghana is low (FAO, 2014). These potentials can be realised if guinea fowl production is developed under smallholder farmer conditions and not necessarily large scale intensive management conditions.

Therefore, research should rather be directed at improving guinea fowl guinea fowl production under farmer conditions, as these systems are well adapted to the farming system and is profitable. Any attempt to promote guinea fowl production without providing the necessary conditions such as access to adequate veterinary service, drugs, feed supplements and proper housing conditions will alienate large numbers of smallholders who do not have the resources to invest adequately in an intensive production system. Again, as demonstrated by this study, socio-economic and cultural parameters, largely defined by contextual factors, are important in innovation and technology development. These and institutional constraints such as inadequate access to extension services must be taken into consideration to enhance technology adoption by guinea fowl farmers.

Conflict of Interests

The authors have not declared any conflict of interests.

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