

Socio-economic Characteristics of Subsistent Small Ruminant Farmers in Three Regions of Northern Ghana

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ABSTRACT

The study seeks to characterise socio-economic and farm characteristics of small ruminant farmers in three regions of northern Ghana. Two hundred and forty-nine (249) respondents were selected using multistage sampling procedure. Analytical tools included descriptive statistics and ANOVA. Majority of respondents were males (71.5%), household-heads (65.9%), married (73.5%), Muslims (62.1%) and uneducated (63.9%). Access to extension (29.8%) and credit (14.9%) services was low. Farmers' average age (47.29 ± 16.00 years) and sheep holdings (12.14 ± 9.60) were similar across the regions, but family size (11.56 ± 7.83), goat holdings (11.89 ± 9.32), and purpose of rearing small ruminants differ significantly. Adult children and female spouses contribute meaningfully to small ruminant management practices. Thus, socio-economic and farm characteristics offer significant input in designing effective livestock programs.

Key words: Small ruminants, socio-economic characteristics, subsistent households

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INTRODUCTION

In Ghana like many sub-Saharan Africa countries, subsistent agriculture production remains the primary employer of labour force of which livestock assume a critical role. The agriculture sector employs 60% of the population and contributes to 34.5% of the

country's Gross Domestic Product (GDP). The livestock sub-sector, including fisheries contributes 17.4% of the total agricultural GDP (Ministry of Food and Agriculture (MOFA), 2010). Despite such immense contribution of the livestock sub-sector, Ghana relies heavily on meat import to bridge the ever increasing meat demand in the country (Asuming-Brempong & Nyantang, 2003; FAO, 2012).

Northern Ghana is the hub of livestock production in Ghana (Adam & Boateng, 2012; Blench, 2006). In the sub-region, income from crop farming is seasonal because production is primarily dependent on rainfall, which is uni-modal in distribution. Livestock production has the potential to increase household income, particularly for the poor and food insecure in rural households (Asafu-Adjei & Dantankwa, 2001; Karbo & Agyare, 1997). Livestock production serves as insurance against food deficit during extended drought periods (typically spanning from November to May), and also provides households with income to purchase inputs for crop production (Asafu-Adjei & Dantankwa, 2001). The linkages between livestock and crop farming in northern Ghana and in sustaining rural livelihoods also highlight the importance of livestock production toward food insecurity and poverty reduction of the area (Karbo et al., 2007; Asafu-Adjei & Dantankwa, 2001). Livestock in the region is as a 'walking bank' of capital, and serve as a source of financial security during crop failure, economic stress, disasters, and ethnic conflicts (Terril, 1985a).

Various studies highlight the importance of emphasizing small ruminant livestock production, (as opposed to large ruminant and non-ruminant production) not only for ensuring food security in rural regions, but also for helping to reduce poverty and overall household wellbeing (Devendra, 2001; Devendra & Chantalakhana, 2002; Dossa et al., 2007; Lebbie, 2004; Otchere, 1986; Peacock, 2005). The emphasis is because sheep (*Ovis aries*) and goat (*Capra hircus*) (Wilson, 1991) are more efficient in converting non-grain feed into quality meat compared with beef, pork and poultry (Devendra, 1985; Peacock, 2005; Terril, 1985a). In subsistent agricultural economies, competition for productive inputs is less for small ruminants than for another livestock (such as pigs, cattle and poultry) (Terril, 1985a). Capital investment in housing and materials (such as iron sheets and wood) are lower for sheep and goat production compared with another livestock (e.g. cattle) (Devendra, 1985). The smaller size of small ruminants also makes them more suitable for home consumption among poor households, thereby helping to improve the nutrition and animal protein requirements and food security situation of rural households (Oluwatayo & Oluwatayo, 2012).

In tropical regions, sheep and goat often produce about 'twice as much meat per animal unit,' compared with large ruminants such as cattle (Terril, 1985a). Small ruminant animals are particularly relevant for subsistent agricultural systems in northern Ghana. The animals are of great importance because of their unique biological attributes, including short gestation period, high prolificacy, rapid growth rate, high feed use-efficiency from coarse roughage, and high tolerance to tannins and diseases, as well as marketability within one season (Lebbie, 2004; Peacock, 2005; Terril, 1985b).

Over the past few decades, Government of Ghana *via* MOFA and other Non-Governmental Organisations (NGOs) has initiated numerous programs to improve small ruminant production through research and technology. Programs such as the National Livestock Sector Project (NLSP), Livestock Development Project (LDP), Land Conservation and Smallholder Rehabilitation Program (LASCOREP), among others, have been promoted to improve subsistent small ruminant production and poverty alleviation in northern Ghana. However, the impact of such livestock programs on the livelihood of subsistent farmers had been negligible (MOFA, 2009). Such programs have minimal impact on livelihoods because majority

of the livestock initiatives is inconsistent with farm households' livelihood needs (Bosman, 1995). Studies (such as Ayalew et al., 2013) suggest that information on socio-cultural, socio-economic and farm characteristics of farm households is critical in designing effective and appropriate livestock programs that benefit local subsistent farmers.

The purpose of this study was to understand socio-economic and farm characteristics of subsistent small ruminant farm households in northern Ghana. Another objective is to compare such characteristics across the three regions in northern Ghana so as to increase the relevance of the study to livestock technical staff and policy makers.

RESEARCH METHODS

Study Area

The study was conducted in three administrative regions of northern Ghana, namely, Northern Region (NR), Upper West Region (UWR) and Upper East Region (UER). The three (3) parts are selected based on differences in agroecology and potential for livestock resources. The entirety of NR is Guinea savannah while both UWR and UER are found in Sudan savannah agroecological zone (Quansah et al., 2009). NR is ranked first in terms of livestock resources before UWR and Lastly UER (Karbo & Agyare, 1997). Northern Ghana covers 64% (149, 800 km²) of land mass in Ghana (238,539 km²). The area is at latitude 80 -110° N and longitude 00-30° W (Blench, 2006; Tsibey et al., 2003). Principal food crops cultivated include millet, maize, yam, guinea corn, sorghum and cassava. Others include rice, groundnuts and cowpea. Livestock (cattle, sheep, goats, and pigs) including poultry are also predominant, and such animals serve as risk coping strategies during the long dry seasons (Quaye, 2008).

Research Design and Data Collection

Research methods, including qualitative and quantitative approaches were used to collect data for the study. A combination of such research techniques allows data triangulation and systematic collection of field data (DeVaus, 1996). Qualitative approach such as in-depth focus group discussions was held to access farmers' perception and experience on small ruminant husbandry practices. On the other hand, a survey questionnaire was developed and pre-tested to collect quantitative data. Respondents were farm households engaged in agricultural production. Specific data collected include socio-economic characteristics of farm households, farm-related attributes (land ownership and size, crop production, livestock herd size and animal production systems), off-farm employment activities and access to institutions such as agricultural extension and banking services (credit and savings). Other data collected include labour allocation to household small ruminant management and purposes for raising small ruminant animals.

Sampling Procedure

Multi-stage sampling procedure was adopted to gather data from respondents (William & Bousmaha, 2001). In the beginning, three (3) districts from each region were selected based on accessibility and proximity to conduct the survey. At the second stage, a simple random method was used to select two (2) communities under each district from the three regions. Selection of farm households for the survey was at the third stage. Respective local district assemblies and agricultural offices provided a list of farm households for selection. In each selected community, a simple random approach was applied to choose a total of 300 farm households for the study. Of these households, 249 farmers raised at least a goat or sheep livestock animal. For NR, 174 (of which 143 raise at least a sheep or goat),

UWR, 72 (at least 61 own a sheep or goat) and additional 54 (i.e., 45 rear a sheep or a goat) farm households from UER were also selected.

Data Analysis

The survey data were analysed using SPSS version 16.0. Descriptive statistics was to describe the data. One way-ANOVA (Least Significance Difference) was used to test the null hypothesis that, means (respective continuous variables) for the three regions are not significantly different (Ayalew et al., 2013). Statistically, the model is;

$$Y_{ij} = \mu + \tau_i + \varepsilon_{ij} \quad (1)$$

where

Y_{ij} is the value of a continuous variable with respect to i th region ($i=3$, NR, UWR or UER). Continuous variables take any value within a range and those considered in this study are household size, age of farmers, land size, small ruminant and other livestock herd size.

μ is the overall mean of the respective continuous variable.

τ_i is the effect of the i th region ($i=3$, NR, UWR or UER) on the respective continuous variable ε_{ij} is the experimental error term, NID ($0, \delta^2$). For ordinal variables (ranking of values), the Kruskal-Wallis test (one-way ANOVA) was used. The values were ranked on a 4-point Likert-type scale (1= not important to 4= very important) to measure farmers' primary purpose of raising sheep and goat. **Hypothesis:** $H_0: \mu_1 = \mu_2 = \mu_3$, H_a : at least one of the mean of the respective continuous or ordinal variable of the three regions is different with $\alpha = 0.05$.

RESULTS AND DISCUSSION

Farmer's Socio-economic Characteristics

Table I presents socio-economic characteristics of small ruminant farmers in northern Ghana. The result shows that male farmers were dominant (71.5%) across the three areas. The finding implies that men are the owners of small ruminants in the household. Another reason may be attributed to societal customs and norms in sub-Saharan African countries where males control household productive assets. The large proportion of male farmers is very crucial for transferring and adoptions of technology since men are mostly the decision-makers in most African societies (Turkson & Naandam, 2006). Similar results have been reported across sub-Sahara African countries (Ayalew et al., 2013; Baah et al., 2012; Oladeji & Oyesola, 2012; Turkson & Naandam, 2006). In contrast, Fakoya & Oloruntoba (2009) reported a high female participation of small ruminant farmers in Osun-state, Nigeria. Among the three regions, more female farmers were reported for UER (33.8%) compared with NR (26.7%) and UWR (25.9%).

Education is relevant if farmers are to access and apply livestock technology appropriately (Marinda et al., 2006). However, the data suggest a high illiteracy rate (63.9%) among small ruminant farmers across the three regions. This result is slightly lower than the 70.4% reported in the 2010 population and housing census (Ghana Statistical Service (GSS), 2010). There were more illiterates in NR (73.3%) than UWR (67.2%) while UER (45.1%) had the least uneducated farmers. This result concurs with findings from the GSS (2010) report where UER (69.9%) had the least uneducated adults before UWR (70.1%) and finally, NR (71.2%).

Majority (65.5%) of the respondents were household-heads while less than 35% were other family members. In a similar study in southern Benin, 60% of small ruminant farmers were also reported to be household-heads (Dossa et al., 2008). Turkson and Naandam (2006) equally important reported similar findings in NR of Ghana. However, the data also suggest that more family members in UWR (44%) and UER (43.7%) engaged in sheep and goat production with female spouses being the majority. This section of owners offers an

opportunity for poverty alleviation through improvement in sheep and goat production since such family members represent the most vulnerable in the household. Nearly three-quarters (73.5%) of the farmers were married. The highest are from UWR (81.0%) followed by NR (72.5%) before UER (69%).

Table I: Socio-economic characteristics of farmers

| | Regions | | | | | | | |
|-----------------------------|--------------------------|------|--------------------------|------|--------------------------|------|-------------|-----------|
| | Northern region | | Upper East region | | Upper West region | | Overall | |
| | N | % | N | % | N | % | N | % |
| <i>Discrete variables</i> | | | | | | | | |
| Sex of farmers | | | | | | | | |
| Females | 32 | 26.7 | 24 | 33.8 | 15 | 25.9 | 71 | 28.5 |
| Males | 88 | 73.3 | 47 | 66.2 | 48 | 74.1 | 178 | 71.5 |
| Education | | | | | | | | |
| Illiterate/None | 88 | 73.3 | 32 | 45.1 | 39 | 67.2 | 159 | 63.9 |
| Primary | 10 | 8.3 | 11 | 15.5 | 11 | 19.0 | 32 | 12.9 |
| JHS | 8 | 6.7 | 9 | 12.7 | 3 | 5.2 | 20 | 8.0 |
| SHS/O'level | 7 | 5.8 | 10 | 14.1 | 1 | 1.7 | 18 | 7.2 |
| Vocational/technical | 3 | 2.5 | 3 | 4.2 | 2 | 3.4 | 8 | 3.2 |
| Training college | 4 | 3.3 | 2 | 2.8 | 2 | 3.4 | 8 | 3.2 |
| Polytechnic | 0 | 0 | 1 | 1.4 | 0 | 0 | 1 | 0.4 |
| University | 0 | 0 | 3 | 4.2 | 0 | 0 | 3 | 1.2 |
| Household status | | | | | | | | |
| Head | 91 | 75.8 | 40 | 56.3 | 33 | 56.0 | 164 | 65.9 |
| Spouse (Wife) | 19 | 15.8 | 15 | 21.1 | 14 | 24.1 | 48 | 19.3 |
| Children | 5 | 4.2 | 10 | 14.1 | 6 | 10.3 | 21 | 8.4 |
| Others | 5 | 4.2 | 6 | 8.5 | 5 | 8.6 | 16 | 6.4 |
| Marital status | | | | | | | | |
| Single | 12 | 10 | 9 | 12.7 | 5 | 8.6 | 26 | 10.4 |
| Married | 87 | 72.5 | 49 | 69 | 47 | 81 | 183 | 73.5 |
| Divorced | 2 | 1.7 | 1 | 1.4 | 2 | 3.4 | 5 | 2.0 |
| Widow | 19 | 15.8 | 11 | 15.5 | 4 | 6.9 | 34 | 13.7 |
| Separated | 0 | 0 | 1 | 1.4 | 0 | 0 | 1 | 0.4 |
| Religion | | | | | | | | |
| Islamic | 112 | 94.1 | 12 | 17.1 | 30 | 50.8 | 154 | 62.1 |
| Christianity | 4 | 3.4 | 37 | 52.9 | 19 | 32.2 | 60 | 24.2 |
| African traditional faith | 3 | 2.5 | 21 | 30.0 | 10 | 16.9 | 34 | 13.7 |
| Extension access | | | | | | | | |
| Yes | 35 | 29.2 | 14 | 20 | 25 | 43.1 | 74 | 29.8 |
| No | 85 | 70.8 | 56 | 80 | 33 | 56.9 | 174 | 70.2 |
| Formal credit access | | | | | | | | |
| Yes | 21 | 39.9 | 14 | 20 | 2 | 3.4 | 37 | 14.9 |
| No | 99 | 82.5 | 56 | 80 | 56 | 96.6 | 211 | 85.1 |
| <i>Continuous variables</i> | | | | | | | | |
| | | | | | | | | Mean ± SD |
| Household size | | | | | | | | |
| Family size | 12.83±7.59 ^a | | 10.1±9.15 ^b | | 10.71±6.11 ^b | | 11.56±7.83 | |
| Age of farmers | | | | | | | | |
| Age | 48.29±13.99 ^a | | 46.56±17.82 ^a | | 46.09±17.65 ^a | | 47.29±16.00 | |

Within the same row, means with different superscripts are significantly different at 5% the level of significance (rejection of null-hypothesis), SD=standard deviation

This result implies that farmers have extra family members (i.e., spouses and children) to contribute to household small ruminant management practices. In addition, it may explain the rationale behind the positive relationship between animal ownership and married farmers

(Fakoya & Oloruntoba, 2009). The result is consistent with 72.5% of married small ruminant farmers reported by Fakoya & Oloruntoba (2009) in Osun-state, Nigeria.

With the exception of UER where majority (52.9%) of the farmers were Christians, NR (94.1%) and UWR (50.8%) were dominated by Muslims. The result is similar to the findings of GSS (2010) which reported that majority of the population in NR (60%) and UWR (38.1%) were Muslims while UER is a Christian (44.5%) community.

One important way to improve traditional livestock production is to link farmers to a relevant institution. Institutions such as agricultural extension services educate farmers on adoption of new technologies. However, the data report that 70.2% of the farmers do not access extension education. Given the high illiteracy rates in the study area, farmers are forced to rely heavily on traditional methods of livestock rearing. UER is the worst affected (80% without extension), before NR (70.8%) and lastly, UWR (56.9%). In addition, access to formal credit (14.9%) is low across the regions. This finding is consistent with the result reported by Quaye (2008) for northern Ghana.

The average family size was 11.56 ± 7.83 persons, which are higher than the 4.4 persons reported for the national level (GSS, 2012). There was a significant difference in household size between farmers from NR (12.83 ± 7.59) compared with both UER (10.1 ± 9.15) and UWR (10.71 ± 6.11). The high proportion of family size in northern Ghana is relevant for subsistent agriculture given that such agricultural system requires family labour to carry out farming activities. The mean age of farmers was 47.29 ± 16.00 years, which are closely related to the 47.5 years reported by Duku et al. (2011) in the transitional zone of Ghana. Farmers' age across the three regions was not significantly different. The low mean age gives an indication of youthful exuberant to carry out the drudgery activities involved in small ruminant production.

Crop-Land Acquisition and Holdings

The primary source of farmland acquisition (75.5%) in the study area was through family/own/lineage /inheritance (Table II). Only few farmers (18.1%) depend on communal lands for livestock and crop farming while purchasing land is negligible (1.2%). In support of this finding, Blench (2006) reported that land tenure system in northern Ghana is mainly based on lineage and usually not offer for sale. Adolwine and Dudima (2010) also made similar observations in Sissala East district of Upper West region. This form of land acquisition leads to land security and as such, farmers may be motivated to take pragmatic land conservation practices and managements.

Table II: Land acquisition and total holdings

| | Regions | | | | | | | |
|------------------------------------|------------------------------|------|------------------------------|------|--------------------------------|------|-----------------|------|
| | Northern region | | Upper East region | | Upper West region | | Overall | |
| | N | % | N | % | N | % | N | % |
| Land acquisition | | | | | | | | |
| Own/family/lineage | 91 | 75.8 | 53 | 74.6 | 44 | 75.9 | 18 | 75.5 |
| Lease/sharing | 5 | 4.2 | 1 | 1.4 | 0 | 0.0 | 6 | 24.4 |
| Purchase | 2 | 1.7 | 1 | 1.4 | 0 | 0.0 | 3 | 1.2 |
| Free communal land | 20 | 16.7 | 13 | 18.3 | 12 | 20.7 | 45 | 18.1 |
| Do not own land | 2 | 1.7 | 3 | 4.2 | 2 | 3.4 | 7 | 2.8 |
| Total land holdings (acres) | | | | | Mean\pmSD | | | |
| Land size | 6.32 \pm 4.47 ^a | | 3.55 \pm 3.33 ^b | | 11.12 \pm 12.87 ^c | | 6.69 \pm 7.75 | |

Within the same row, means with different superscripts are significantly different at 5% the level of significance (rejection of null-hypothesis), SD=standard deviation

In-depth discussions with respondents indicated that a larger proportion of land is allocated to arable crop and tree farming. Allocation of land purposely for cultivation of fodder or forage crops for livestock production is non-existent. According to Ayalew et al. (2013) and Karbo et al. (1999) few areas are allocated to forage compared with crop production largely due to increasing urbanization and population growth in sub-Saharan Africa. Hence, subsistent livestock producers depend on free communal lands or open range system for animal feeding. The average land holding per farmer in the study area was 6.69 ± 7.75 acres. Among the three regions, a significant difference in average land holdings was reported (Table II). Mean farmland holding in UWR was significantly higher than holdings in NR and UER. The observed disparities may be attributed to high human population in NR than UWR. Even though, UER is the least populated, land for crop production in the region is limited (scarce) due to the presence of iron pans which hinders crops cultivation (Obeng, 2000). The other reason might be due to differences in land size among the three study areas (i.e.; NR occupies 29.5%, UWR, 7.7% and UER, 3.3% of the country's land size) (GSS, 2010). The mean total land holding (6.69 ± 7.75 acres) reported in this study was slightly lower than 9.88 acres reported by Chamberlin (2007) for the three regions.

Crop Production and usage of crop residues

Major crop categories grown in the study area include cereals (42.6%) and leguminous crops (31.5%) and tuber crops (14.9%) (Table III). The most important cereal crop grown was maize (53.4%), followed by millet (22.7%), before the rice (14.8%), sorghum (4.7%), and guinea corn (4.4%). The proportions of tuber crops in the study area were the yam (78.2%), cassava (18.4%) and sweet potato (3.4%). Cassava was only grown in NR (23.8%) and UWR (18.4%) and not in UER. No farmer was reported to grow sweet potato in UER and UWR. The type of legume crops grown among the three regions is mixed. While the majority of the farmers from UWR (55.7%) and NR (52.0%) grows cowpea, nearly 60% from UER cultivated groundnuts. Other legume crops grown among the regions include groundnuts (45.2%) and soya beans (6.8%). The findings of this study agree with the reports by Karbo and Agyare (1999) and Quaye (2003) in northern Ghana.

Table III: Categories of crops grown

| Classification of crops grown | Regions | | | | | | | |
|-------------------------------|-----------------|------|-------------------|------|-------------------|------|---------|------|
| | Northern region | | Upper East region | | Upper West region | | Overall | |
| | N | % | N | % | N | % | N | % |
| Cereal crops | 96 | 41.9 | 64 | 49.2 | 55 | 37.7 | 215 | 42.6 |
| Tuber crops | 35 | 15.3 | 13 | 10.0 | 27 | 36.0 | 75 | 14.9 |
| Legume crops | 69 | 30.1 | 41 | 31.5 | 49 | 33.6 | 159 | 31.5 |
| Vegetables | 24 | 10.5 | 11 | 23.4 | 12 | 25.5 | 47 | 9.3 |
| Tree crops | 4 | 1.7 | 1 | 0.8 | 3 | 2.1 | 8 | 1.6 |
| Forage crops | 1 | 0.4 | 0 | 0.0 | 0 | 0.0 | 1 | 0.2 |

*Respondents chose more than one category of crops hence the number of responses is greater than the sample size.

Among the categories of crops grown, residues of leguminous crops (haulms) were mostly used to feed animals (Figure 1). The reason for this observation might be due to the nutritional importance of leguminous haulms in animal feed. The haulms of leguminous crops contain a high amount of nitrogen than most cereal straws. Hence, most farmers harvest and processed such haulms into hay to feed animals later in the long dry season.

Small Ruminants Ownership and Other Livestock Composition

In northern Ghana, the predominant farming system is mixed-farming (Blench, 2006; Karbo & Agyare, 1999). Livestock including small ruminants are raised as an adjunct to crop farming. The major breeds in this area were the indigenous West African Dwarf or Djallonke breed (Oppong-Anane, 2006). Majority of the farmers (49.4%) raised sheep and goats together while 37.8% and 12.9% reared goat and sheep alone, respectively (Table IV).

Figure 1 Crop residue used by farmers

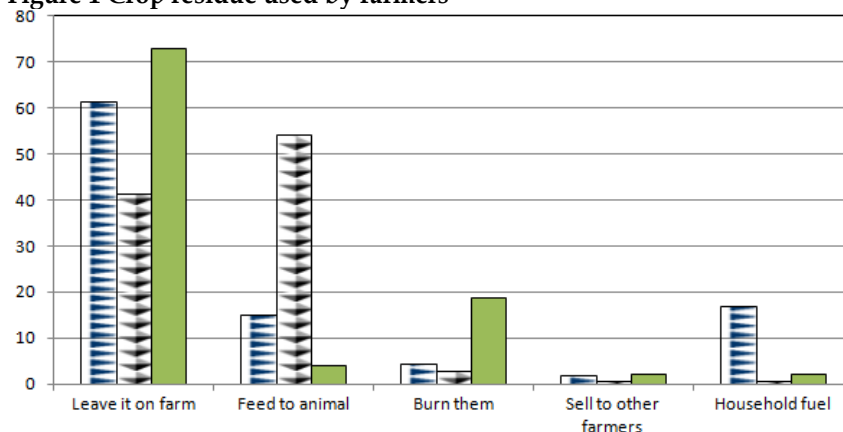


Table IV Small ruminant ownership and other livestock composition

| | Regions | | | | | | | |
|---------------------------------|--------------------------|------|--------------------------|------|--------------------------|------|-------------|------|
| | Northern region | | Upper East region | | Upper West region | | Overall | |
| | N | % | N | % | N | % | N | % |
| Small ruminant ownership | | | | | | | | |
| Sheep | 21 | 17.5 | 5 | 7.1 | 6 | 10.2 | 32 | 12.9 |
| Goats | 37 | 30.8 | 26 | 37.1 | 31 | 52.5 | 94 | 37.8 |
| Both sheep and goats | 62 | 51.7 | 39 | 55.7 | 22 | 37.3 | 123 | 49.4 |
| Small ruminant holdings | | | | | | | | |
| | Mean±SD | | | | | | | |
| Sheep | 13.06±8.82 ^a | | 10.82±10.67 ^a | | 11.64±9.98 ^a | | 12.14±9.60 | |
| Goat | 13.04±9.91 ^a | | 9.71±7.35 ^b | | 12.38±9.98 ^a | | 11.89±9.32 | |
| Other livestock holdings | | | | | | | | |
| | Mean±SD | | | | | | | |
| Cattle | 12.31±16.19 ^a | | 8.50±7.71 ^a | | 15.14±7.81 ^a | | 11.42±12.88 | |
| Donkey | 2.00±0.00 ^a | | 4.60±2.30 ^b | | 2.00±0.00 ^a | | 3.08±1.93 | |
| Pigs | 0.00±0.00 ^b | | 3.50±2.12 ^a | | 9.0±4.25 ^a | | 6.25±4.19 | |
| Poultry | 15.19±10.13 ^a | | 18.56±16.64 ^a | | 18.38±16.34 ^a | | 16.93±13.87 | |

Means across the rows with different superscripts are significantly different at 5% the level of significance (rejection of null-hypothesis), SD=standard deviation

The distribution of small ruminant ownership is similar to the findings by Karbo et al. (2007) in UER. The high proportion of goats alone ownership compared with sheep was more profound in UWR (52.5%) and UER (37.1%) than NR (30.8%). The differences could be attributed to the adaptive nature and socio-cultural importance of goat in both UER and UWR than the Northern region. Studies (including, Lebbie, 2004; Peacock, 2005) suggest that goats adapt very well in arid regions and are tolerant to drought conditions than another livestock except camels.

The mean size of sheep holdings (12.14±9.6) was similar across the three regions. However, a significant difference was reported for goat holdings (11.89±9.32). NR had the

highest number of goat's holdings (13.06 ± 8.82), followed by UWR (12.38 ± 9.98), and the least was UER (9.71 ± 7.35) (despite the high proportion of farmers owning goat alone than sheep in this region). Sheep holdings per farmer were higher than goat holdings even though goats were more prolific in giving offsprings than sheep. In this current study, the holdings of sheep and goats per farmer are lower than the 26 ± 18 sheep and 22 ± 11 goats reported by Turkson & Naandam (2006) in East Mamprusi of northern Ghana. Other livestock animals owned by farmers include cattle (11.42 ± 12.88) and poultry (16.93 ± 13.87), donkeys (3.08 ± 1.93) and pigs (6.25 ± 4.19). Predictably, no farmer from NR was said to own a pig. This observation supports the fact that Muslims dominate in NR and hence the prohibition of pig rearing in Islamic religion and communities.

Objectives/Purposes for Managing Small Ruminant Animals

Mean rank for primary objectives/purposes for raising small ruminants in northern Ghana is presented in Table V. In NR, the main purpose of raising small ruminants is for sale or market (mean rank = 135.62). This result is in agreement with the findings by Baah et al. (2012) who reported financial motivation was a key in raising sheep and goats among urban households. On the contrary, the use of sheep and goats to perform non-faith based cultural functions (144.43) was an important reason for rearing small ruminants in UER. Synonymous with this finding, Apori et al. (2010) reported that subsistent households in derived savannah of northern Ghana reared sheep and goats to perform various socio-cultural functions. Among farmers from UWR, the use of small ruminants to satisfy an urgent need of cash (130.03) such as settling unforeseen expenditures was the main reason in managing sheep and goats despite the insignificant difference from the two regions. Numerous studies (including Bosman et al., 1996; Dei et al., 2007; Dossa et al., 2008) also support this finding.

Table V Mean rank of reasons for raising small ruminants among farm households

| Reasons | Northern region | Upper East region | Upper West region |
|---------------------------------------|---------------------|---------------------|---------------------|
| | Mean Rank | | |
| For sale | 135.62 ^a | 114.06 ^b | 116.38 ^c |
| Meat for home consumption | 133.48 ^a | 126.36 ^b | 104.19 ^c |
| Manure for fertilizer | 118.16 ^a | 136.00 ^a | 123.64 ^a |
| Skin/hide | 132.46 ^a | 132.41 ^b | 99.05 ^c |
| Non-cash saving needs | 123.84 ^a | 129.96 ^a | 121.47 ^a |
| Urgent need of cash (insurance) | 126.59 ^a | 118.04 ^a | 130.03 ^a |
| Food risk management | 115.64 ^a | 131.46 ^a | 129.64 ^a |
| Gifts | 132.32 ^a | 119.33 ^a | 114.86 ^a |
| Religious rituals/faith based rituals | 114.12 ^a | 139.63 ^b | 129.77 ^c |
| Non-faith based cultural functions | 112.70 ^a | 144.43 ^b | 126.97 ^c |

Kruskal-Wallis test- one-way ANOVA test, p-values less than 0.05 denote significance at 5 percent level within row. The test shows horizontal ranks among the sectors.

The differences in purposes for managing sheep and goats among the regions justify the numerous roles small ruminants play in the livelihood of the poor. Hence, strategies to improve the traditional small ruminant production system should not be concentrated on a single criterion for northern Ghana. Apart from meat for home consumption, skin/hide and faith-based functions, there was no significant difference for the remaining functions among the three study regions.

Small Ruminant Household Division of Labour

Subsistent small ruminant production in sub-Saharan Africa dwells more on family labour with little or no hire labour (Duku et al., 2011). Majority of the farmers (34.7%) suggested herding/tethering of small ruminants is taken by adult children in the home (Table V).

Table VI Farm household labour distribution (%) for small ruminant management

| Management practices and regions | Share of management practice among household members | | | | |
|----------------------------------|--|------|------------------------------|-----------------------------|--------------|
| | Husband | Wife | Adult children (11-18 years) | Young children (9-10 years) | Hired labour |
| Northern region | | | | | |
| Herding/tethering | 22.9 | 20.0 | 40.0 | 15.2 | 1.9 |
| Feeding | 36.3 | 18.6 | 37.3 | 2.6 | 0.0 |
| Cleaning of pens/kraals | 20.7 | 40.2 | 25.6 | 13.4 | 0.0 |
| Provision of water | 15.5 | 23.9 | 46.5 | 14.1 | 0.0 |
| Caring for sick animals | 55.6 | 12.2 | 14.4 | 4.4 | 13.3 |
| Construction of pens/kraals | 72.5 | 5.8 | 20.3 | 1.4 | 0.0 |
| Marketing of animals | 75.0 | 9.2 | 15.8 | 0.0 | 0.0 |
| Upper East region | | | | | |
| Herding/tethering | 39.3 | 32.1 | 26.2 | 2.4 | 0.0 |
| Feeding | 41.6 | 32.5 | 23.4 | 2.6 | 0.0 |
| Cleaning of pens/kraals | 43.3 | 31.7 | 21.7 | 3.3 | 0.0 |
| Provision of water | 42.5 | 34.2 | 20.5 | 2.7 | 0.0 |
| Caring for sick animals | 48.5 | 25.0 | 11.8 | 0.0 | 14.7 |
| Construction of pens/kraals | 64.7 | 15.7 | 15.7 | 0.0 | 3.9 |
| Marketing of animals | 66.7 | 23.5 | 9.8 | 0.0 | 0.0 |
| Upper West region | | | | | |
| Herding/tethering | 34.0 | 24.5 | 37.7 | 0.0 | 3.8 |
| Feeding | 44.2 | 25.6 | 25.6 | 4.7 | 0.0 |
| Cleaning of pens/kraals | 40.9 | 31.8 | 18.2 | 9.1 | 0.0 |
| Provision of water | 40.0 | 30.0 | 20.0 | 10.0 | 0.0 |
| Caring for sick animals | 66.7 | 13.3 | 10.0 | 0.0 | 10.0 |
| Construction of pens/kraals | 78.3 | 8.7 | 8.7 | 0.0 | 4.3 |
| Marketing of animals | 80.0 | 12.0 | 8.0 | 0.0 | 0.0 |
| Overall | | | | | |
| Herding/tethering | 31.0 | 25.2 | 34.7 | 7.4 | 1.7 |
| Feeding | 39.6 | 24.8 | 30.2 | 5.4 | 0.0 |
| Cleaning of pens/kraals | 32.8 | 35.5 | 22.6 | 9.1 | 0.0 |
| Provision of water | 30.5 | 29.3 | 31.7 | 8.5 | 0.0 |
| Caring for sick animals | 54.8 | 17.0 | 12.8 | 2.1 | 13.3 |
| Construction of pens/kraals | 70.6 | 9.8 | 16.8 | 0.7 | 2.1 |
| Marketing of animals | 73.0 | 14.5 | 12.5 | 0.0 | 0.0 |

In northern Ghana, small ruminants and other livestock are allowed to roam freely for feed during dry seasons. However, in the wet season (i.e., cropping season), the animals are either sent to communal lands or confined within homesteads or farms for feeding. According to Blench (2006), such arduous task of feed management is traditionally left for adult children while young children are in school. Other family members, in-charge of this task were the husbands (head) (31.0%) and female spouses (wife) (25.2%). Similarly, the data suggest that feeding of small ruminants (i.e., harvesting of fodder or browse and kitchen scraps to feed animals) is mostly carried by male spouses (39.6%) and adult children (30.2%) before female spouses (24.8%) and young children (5.4%) in the study area.

Female spouses (35.5%) were accountable for cleaning of small ruminant pens/kraals followed by male spouses (32.8%) and adult children (22.6%) across the three regions. This result concurs with the findings by Javed et al. (2006) who reported that women (female spouses) were responsible for cleaning pens/kraals of household livestock management. With regards to water provision, male (30.5%) and female spouses (29.3%), as well as adult children (31.7%), were tagged with such responsibility in the family. This general observation of high involvement of female spouses (women) in household small ruminant management corresponds with the studies by Aqeela et al. (2005) and Farhana et al. (2011) for various developing countries.

Farmers across the three regions reported that caring for sick animals (54.8%), constructions of animal pens/kraals (70.6%) and marketing of animals (73.0%) were the responsibility of male spouses. In conclusion, female spouses were involved in less physically demanding livestock management activities, including feeding, water provision, tethering/herding and cleaning of barns/kraals/pens. On the other hand, men were responsible for animal protection, construction of pens/kraals and marketing/sales of animals.

CONCLUSION

The results of the study suggest that farmer's socio-economic and farm characteristics are relevant towards understanding and improving small ruminant production for various reasons. First, the majority of farmers are uneducated and also lacked access to livestock extension training and credit facilities. For improved sheep and goat production, it is recommended to have an alternative option to improve farmers' technical knowledge. For instance, setting up producer associations could provide an accessible platform for farmers to access group extension training, share farming experience and source credit from micro-finance schemes. Importantly, the study suggests that the purpose of rearing small ruminants differs significantly among the three regions. Farmers in NR raised sheep and goat mainly for sale or markets. Thus, for improved small ruminant production, market incentives such as good road networks are relevant in the area. In UER, the high importance of small ruminants to satisfy non-faith based cultural functions means strategies to improve small ruminants to enhance rural livelihoods is relevant. On the other hand, sale of sheep and goat, only when a farmer is in dire need of cash (insurance), was paramount in UWR. Such livestock insurance strategy demands alternative investment options such as formal insurance for farmers. With such official institution in place, subsistent farmers become responsive to market conditions and improve on livestock production in the region. In a nutshell, the study recommends that livestock technical officers should consider the disparities in purposes for raising small ruminants among the three regions in devising sustainable small ruminant strategies in northern Ghana.

Lastly, adult children and female-spouses contribute meaningfully to small ruminant management practices. Hence, it is futile to ignore women and adult children during extension visits or education. The major policy implication of these results is that considering socio-economic and farm characteristics of farmers in designing livestock programs would improve small ruminant production in northern Ghana. In addition, the findings provide a basis to select farm households for small ruminant programs.

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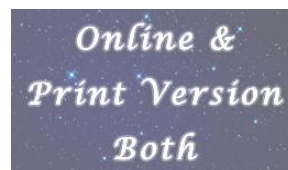
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