Reproductive and Productive Performance of Poultry Kept in Rural, Peri-Urban and Urban Settings in Assosa District, Benishangul Gumuz Region, Western Ethiopia

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Abstract: This study was carried out from May, 2013- June, 2014 at urban, peri-urban and rural settings of Assosa District in Benishangul Gumuz Region, Western Ethiopia. The aim of the study was to compare reproductive and productive performance of poultry kept under small scale management condition at different locations of the study area. By using structured and semi-structured questionnaire, a cross-sectional systematic random survey of 150 households (50 from each study areas) was conducted and necessary information was gathered on reproductive and productive performance of poultry kept at different areas. The study employed different techniques of data analysis including descriptive statistics, ANOVA, index ranking and qualitative analysis. Income was rated as the primary aim of keeping poultry by all respondents in all study locations. Flock size per household was significantly higher ($p<0.05$) in the urban (12.93) than in peri-urban (10.4 poultry) and rural (8.4 poultry). Average holding of cattle, sheep and goat per household was considerably ($p<0.05$) higher in rural areas (6.96 cattle, 7.86 goats and 4.2 sheep) than in urban (2.53 cattle, 2.26 goats and 4.33 sheep (6.9) and peri-urban (4.7 cattle, 4.4 goats and 8.0 sheep). While households in urban areas attach highest importance to poultry, cattle followed by sheep and goats are ranked highest by peri-urban and rural households. Households' in all study areas rated income as the primary aim of keeping poultry. Average households' estimations showed that age at first egg lying time was earlier in urban (5 months) and peri-urban (5.5 month) than in rural areas (6 months). Difference in socio-economic status, growth and density of population; accessibility to social service, facility and infrastructure among urban, rural and peri-urban residents, resulted in variation on reproductive and productive performance of poultry kept under small scale management condition at three different locations of the study area. Therefore location based development interventions could help to improve reproductive and productive performance of poultry and there by enhance the livelihood of small holders.

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Introduction

In Ethiopia, the livestock sub-sector accounts for about 30 percent of the agricultural GDP and about 18 percent of the total GDP [1]. This report further noted that the livestock sub-sector provides annual per capita consumption of about 10 kg meat, 23.9 kg milk and 40 eggs in the country. The contribution of livestock to cash income of the smallholders of Ethiopia accounts for up to 87% and subsistence of some pastoral communities is entirely based on livestock and livestock products [2].

On one hand [3] reported that in Ethiopia the population of poultry is estimated to be 56.5 million making it the 2nd largest in African country next to Nigeria interims of total flock size. On the other hand a study by [4] indicated that chicken population of Ethiopia is estimated to be 65 million heads and the country has about 60 percent of the total chicken population of East Africa [5]. According to Alemu (1995) 99% of poultry population consists of local breed types under individual farm house hold management.

In Africa village poultry produce over 70% of poultry products and 20% of animal protein intake [6]. In Ethiopia they contribute almost 99% of national egg and poultry meat production [7]. Rural poultry production in Ethiopia represents a significant part of the national economy in general and the rural economy in particular, and contributes 90 and 92 percent of the national egg and poultry meat production respectively [8] with an annual output of 72,300 metric tons of meat and 78,000 metric tons of egg [9]. The per capital poultry consumption in Ethiopia is one of the lowest in the world: 57 eggs and 2.8 kg of chicken meat per annum [10].

It is reported that, although indigenous birds have a number of adoptive traits and genes with special utility in the tropics, the real value of indigenous chicken breeds is often underestimated mostly due to their poor appearance, relatively low productive and

alleged low "commercial" values [11]. To this effect, they have been neglected and little attention has been given by researchers, development workers and policy makers to put them in the research and development agenda. Understanding the roles and function of local chicken as well as production constraints is of considerable relevance in view of envisaging future research and development strategies [12].

Ethiopian food security plan launched in 1995 gives more attention for locally available resources, among which indigenous chicken is one. Poultry production is an important economic activity in Ethiopia. Besides its social and cultural benefits it plays significant role in family nutrition. Village poultry occupy a unique position in rural community through contribution to the supply of valuable protein food to the families of small holder farmer. This is particularly true in Ethiopia, because there are few alternative animal protein sources and no cultural or religious taboos of any kind relating to the consumption of egg and poultry meat as that of pig meat [13].

Although difference in socio-economic status, growth and density of population, availability of social services, facility and infrastructure among urban, rural and peri-urban residents may cause variation in productive and reproductive performance of poultry, relatively no or little research [14] has been carried out to characterize understand and improve productive and reproductive performance of poultry based on location. For any development intervention to be undertaken and become successful location based accurate evaluation of productive and reproductive performance of poultry is essential. However, little has been done to evaluate and determine productive and reproductive performance of poultry particularly at rural, peri-urban and urban areas of Assosa district in Benishangul Gumuz Region, western Ethiopia. Therefore, this research work was initiated to explore the existing situations of productive and reproductive performance of poultry in relation to urban, peri-urban and rural locations so that it would be used as an input for further location based development interventions and researches.

Materials and Methods

Study area

The study was carried out at three locations (amba-16 that represent rural, amba-14 that represent peri-urban and Assosa town that represent urban) in Assosa district of Benishangul Gumuz Region, Western Ethiopia, located 660 km away from the capital, Addis Ababa, bounded by Sudan, Amhara, Oromia and Gambella Regional States of Ethiopia. Based on difference in (Socio-economic status, demand for poultry meat, poultry meat consumption habit, growth and density of) population and availability of (social services, facility and infrastructure) the three locations were classified as urban, rural and peri-urban. According to this classification urban areas were characterized by having population with (better economic status, higher density, good demand to poultry meat). Urban areas also have a good access to social services, facility and infrastructure. In contrary rural areas are characterized by having population with (relatively low economic status, lower density, and lower demand to poultry meat) rural areas also have a lower access to social services, facility and infrastructures. Peri-urban locations are intermediate areas in terms of socio-economic status and accessibility to facilities. This location difference was expected to have a variation on production and marketing of poultry as result the study was conducted in relation to location. Assosa district is located between geographical coordinates of 9o 30'N to 11o 39'N latitude and 34o 20'E to 36o30'e longitude [15]. It is 2330 km2 wide and range in altitude from 1300 – 1570 masl [16]. According to [17] the human population size of the BGRS is 670, 847 with 6.7 persons per km^2 and the majority (more than 91%) of the population living in rural areas [18]. Assosa zone comprises 39.9% of the regional population and 37.4 and 40.3% of the regional urban and rural population respectively. Based on [19], Assosa comprised of 28.0% of the zonal rural population [17]. The rainfall pattern of the district is mono-modal occurring for 6 or 7 months of the year usually between March/April and August/September. Mean annual rainfall is about 800 – 1200 mm [16]. Mean annual temperature in Assosa ranges between 25 – 30oc, and 21 – 35oc in. The hottest period in the district extends from January to May, the peak being March. Whereas, the coolest periods occur from June to November, the lowest being August [19].

Data Collection and management

Both primary and secondary data were collected on various aspects of productive and reproductive performance, primary data were collected from 150 sample respondents through semi-structured, pretested and restructured questionnaire. Focus group discussion and personnel observation were also carried out to support and strengthen the information collected from questioner based house hold survey. The questioner covers various aspects of poultry management at different locations. Parameters such as socio economic characteristics of households, purpose of keeping poultry, and age at first lay, egg laid per hen per annum, breeding system.

Sampling procedures

A three stage sampling procedure was used in the house hold survey. In the first stage, the three study locations were chosen purposively based on the availability of poultry and representativeness in terms

of the rural, peri-urban and urban areas of Assosa district. In the second stage, since, the study was intended to describe the poultry production situations, households who owned at least one or two birds (target population) were identified and listed from each location with the help of the livestock development agents of the location. In the third stage, based on the information obtained, a total of 150 households were chosen using systematic random sampling (50 farmers from each locations) to participate in the house hold survey. To complement the information collected by using house hold survey, three focus group discussions (one group discussion from each location) comprising five participants were held with the respective districts livestock production experts, veterinarians and development agents. Care full personal observation was also followed by household survey and focus group discussion.

Data Analysis

Data collected by different methodologies were analyzed by using SPSS statistical package [22]. Descriptive statistics, one way ANOVA, ranking and narrative analysis were also used in data analysis. Descriptive statistics was used to summarize information.

Results and Discussion

Religion, Family Size and Land holding

About 50% of the sample households in the present household survey were Orthodox Christians. But the rest were Muslims. Religion influences livestock consumption and marketing through festivities and fasting periods [20]. The average family size and land holding per household in rural, peri-urban and urban is presented in Table 1. Average family size for children less than fifteen years of age was comparable between the three study locations, while average family size for adults above fifteen years of age was significantly ($p<0.05$) higher in urban than in the other locations. This could be linked with the presence of unemployment in urban and immigration of adults from rural and peri- urban to urban. The average household size less than fifteen years observed in the three locations is around 3.7.

Table 1. Age, family size and land holding per household in urban, peri-urban and rural areas

Variables	**Area (Mean±SD)**			**P-value**
	Urban N=50	Peri urban N=50	Rural N=50	
Children less than 15 years	3.5±1.58[a]	3.78±1.69[a]	3.82±1.77[a]	0.974
Adults greater than 15 years	4.08±1.8[a]	3.2 ±1.4[ab]	3.12 ±1.39[b]	0.0071
Land holding(ha)	0.31±0.45[b]	0.93±0.62[ab]	1.26±0.75 [a]	0.0021

* Levels not connected by same letter are significantly different within rows ($p<0.05$),
*SD= standard deviation, n=Number of respondents

Households in rural tended to have significantly ($p<0.05$), bigger land than households in urban and rural (Table 3). This could be linked with the presence of low human population/density and availability of cropping land in rural areas. The average land holding in urban and peri-urban is within the range of holdings of 0.25 to 1.00 ha for all urban households and 80% of peri-urban households. However, average land holding found in rural is within the range of 1.01-2.00 ha for all rural households.

Income sources of poultry keepers

Sample households in rural and peri-urban study areas ranked crop production as the main source of income followed by livestock production including poultry farming and off farm income sources (like petty trading, carpenter, masonry and pottery) (Table 2). But, for urban house holds the primary and main source of income was off farm income sources (like petty trading, carpenter, builder and pension) followed by livestock production including poultry farming. Farmers assume that poultry are considered to be of secondary importance after other agricultural and off farm activities.

Table 2. Households' ranking of sources of income in urban, peri-urban and rural study areas.

Variables	**Area N (%)Rank**		
	Urban	Peri-urban	Rural
Crop production	48 (96.)3	49 (98) 1	47 (94) 1
Livestock production	47(94)2	47(94) 2	50 (100) 2
Off farm activities	50 (100)1	25 (50)3	28 (56)3

*N=Number of respondents,*Rank 1=most important,*Rank 3 = less important

Breeding management in rural, peri-urban and urban locations

Type of mating and sources of breeding males

Indigenous chicken were the most dominantly observed breeds at the study locations. Even though their number and performance was not significant few exotic chicken breeds were also raised at the study areas. A study conducted by [14] in five agro ecological regions of Ethiopia noticed that, indigenous chickens were the predominant poultry species in the study villages. Rural farm households did not keep other domesticated birds (such as turkey, guinea fowl, ducks or geese). According to the result indicated on Table 3 of this cross-sectional survey, controlled mating/breeding was virtually unknown. All respondents in all locations revealed the use of flock mating /uncontrolled mating. This result implies lack of intentional mating system to avoid unwanted mating. In the traditional system of poultry production, mating is uncontrolled and type of mating practiced is flock mating. Majority of respondents in all areas had used their own cocks for breeding purpose.

Table 3. Sources of breeding males in urban, Peri-urban and rural locations

Source of cock	**Area N (%)**		
	Urban n =50	Rural n=50	peri-urban n=50
Own breed	43(86)	45(90)	41(82)
Bought	4(8)	2(4)	2(4)
Neighboring	3(6)	3(6)	7(14)

Attributes of poultry for selecting breeding Stock

The major attributes of chicken used by farmers in selecting breeding stock are given in Table 4. Higher percentage of respondents in the three surveyed locations indicated the use of body size followed by color, productive and reproductive performance as the main criteria during selection of breeding flock in their order of importance. Farmers use multiple attributes of poultry**.** [21] reported that hens are often identified based on her past performance and [22] also reported that households consider hatching and mothering ability in selecting hen for brooding. Table-4 presents households' estimate on the (re) productive performance of poultry in rural urban and peri-urban areas.

Table 4. Poultry attributes for selecting breeding flock in urban, peri-urban and rural locations

Attributes	**Area N (%)**		
	Urban n=50	Rural n=50	peri-urban n=50
Body size	42(84)3	45(90)3	39(78)4
Color	38(76)4	42(84)4	40(80)3
Productive performance	48(96)1	46(92)2	49(98)1
Reproductive performance	45(90)2	47(94)1	45(90)2
Percentages exceed 100% as respondents mentioned two or more sources of Breeding Males			

Age at slaughter and first lay

As shown on table. 5, there is no significant difference on age at first lay. Age at slaughter is comparable in all locations under study. As revealed from the result of the study average age at first lay and slaughter was more than 4.5 months in all studied locations. According to respondents of the three locations Local birds lay three times a year. [23] reported that, a breeding female chicken attained sexual maturity at the age of 6.8 months and the overall mean egg laying performances of hens for the first, second and third clutches were 17.0, 20.9 and 24.8 eggs respectively.

Egg production

At one laying period birds lay 7-10 eggs in rural, 11-13 eggs in urban and10-11 eggs in peri-urban. The production level of scavenging hens is generally low, with only 40-60 small sized eggs produced per bird per year under small holder management conditions. A study at the college of Agriculture, Alemaya, has indicated that the average annual egg production of native chicken was 40 eggs under farmer's management, but under experimental conditions with improved feeding housing and health care the level of production was elevated to 99 eggs per hen per year [24]. Similarly [25] reported that, in rural areas of Lilongwe and Mzuzu Agricultural Development Divisions in Malawi, for indigenous chicken, age to

point of lay, number of eggs per clutch, and hatchability averaged 25.6 and 30 weeks, 13.1 and 12.3, 89.7 and 81.1 percent respectively. According to the results of [22] the total output of scavenging birds is low, not only because of low egg production, but also due to high chick mortality as half of the eggs are hatched to replace birds that have died, and the brooding time of the mother bird is long in order to compensate for its unsuccessful brooding. Eggs laid per annum were significantly ($p<0.05$) higher in urban than rural and comparable with peri-urban locations. In a study at Soddo, by [23] it was reported that, the egg production of indigenous birds as 84 eggs per bird per year. According to another study average annual egg production of the native chicken is 30 to 40 eggs under village conditions and that this could be increased to 80 eggs when birds are provided with an improved feeding, housing and health care. A study at the Assela live stock farm revealed that, the average production of local birds in Arsi was 34 eggs per hen per year with an average egg weight of 38 g under scavenging condition [26]. Similarly the average egg weight of local birds was found to be about 40 g [8], [27] and [21] but 46 g was also reported by [14].

Table 1. Households' estimate on (re)productive performance of poultry in rural,peri-urban and urban

Reproduction Parameters	**Area (Mean±SD)**			**P-value**
	urban n=50	Rural n=50	peri-urban n=50	
Age at first lay(month)	5.02± 1.05[a]	4.86 ± 0.97[a]	4.76 ± 1.06[a]	0.321
Age at slaughter (month)	4.75±1.21[a]	4.7 ± 1.18 [a]	4.54 ±0.99[a]	0.961
Number of eggs laid per annum	27.5±1.21[b]	30.1± 5.18 [ab]	36.5±8.99[a]	0.012

Levels not connected by same letter are significantly different within rows ($p<0.05$), *n (N) =Number of respondents

Incubation and brooding

All respondents undertake natural incubation practices no one of them utilize artificial incubation. Incubation period lasts 21 days for efficient egg incubation. Brooding is growing of chicks. All respondents across the three locations under take natural brooding. It is identified that there is no artificial brooding in the study areas. Average natural brooding period in urban was 2 month, this in rural and peri-urban was 2.5-3month. [21]estimates that under scavenging conditions the day of incubation phase and finally a 56 day brooding period will follow. [17] found that, pre incubation storage up to twelve days can maintain the maximum hatchability in Eastern Wollega. All respondents brood their chicks naturally most of respondents loss their chicks during brooding. The cause for loss is disease and predators /rat cat & wild birds/ local hen is used for brooding and incubation.

Conclusion

The study was undertaken in rural, urban and peri-urban locations of Assosa district in Benishangul Gumuz Region of Ethiopia. To explore poultry management practices and constraints related to small scale poultry management. In the urban area large numbers of poultry were kept compared to rural and peri-urban. Poultry in urban was the second next to cattle, whereas in rural and peri-urban poultry were the fourth important livestock species preferred by the household next to cattle, sheep and goat. Income/sale was the main purpose of keeping poultry followed by consumption in the three locations. The result of this study indicated that the attention given to poultry, particularly in breeding and production of adequate egg and poultry meat was very low in all the surveyed locations. Hence better breeding management and good egg and poultry meat production technique could increase the productivity of birds. Continuous location based training and awareness creation should be done on better breeding techniques and effective poultry egg and meat production mechanisms so that productivity will be enhanced and meaningful change in the livelihood of small holders will be assured by exploiting the existing poultry resource in the three areas The survey presented in this study has produced a range of insights use full for further research and development activities. More generally the finding of the study indicate options for up scaling and intensification of poultry breeding and production of poultry egg and meat in locations (urban) with better market access feeding and housing resulted in relatively higher return as compared to the rural locations. Thus urban households with better market access and consumer may opt to more use of inputs. Overall, the study showed the presence of different preference for poultry and other livestock holdings the study also indicated the presence of poor poultry breeding practices and limited egg and poultry meat production efficiency in urban, peri-urban and rural locations. This implies that any area based development interventions aiming to improve the

productivity of poultry and thereby enhance the livelihood of small holder farmers should be planned and implemented in relation to the felt need of the farmers to promote productivity of poultry.

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