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Short communication

Goat flock productivity under smallholder farmer management in Zimbabwe

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ABSTRACT

Goats are able to utilise marginal land that is, otherwise, deemed unsuitable for crop production in dry agro-ecological regions. This study evaluated goat management practices under smallholder farming conditions, in order to determine flock productivity and potential for improvement. A multistage sampling approach was used to randomly select participants in a survey. Eighty households were randomly selected before a semi-structured questionnaire and key informant interviews were employed to collect data on; demographic details, general livestock and goat management activities, goat flock dynamics and major constraints encountered by goat farmers. A Chi-square test was performed in the IBM SPSS Statistical Package for Social Sciences (SPSS) version 22. Mean production indices recorded were: flock size 10.9 ± 7.82; age at first kidding, 13.29 ± 2.71 months; mating ratio (buck: doe), 1: 5.05; kids surviving to weaning, 5.58 ± 4.05 and age at castration, 5.4 ± 0.43 weeks. There was an association ($\chi^2 = 6.74$, df = 1, $P < 0.009$) between flock size and mean grazing area. Reasons for keeping goats were; source of meat (96.2%), manure (96.2), income (92%) and symbol of wealth (87.5%). Goat mortality was a major challenge with predators (35%), unknown incidents (25%) and diseases (23%) being the most common causes. There is scope for improved productivity since, in addition to the high literacy levels providing basis for effective training and information dissemination, farmers already utilise recommended practices such as castration.

1. Introduction

Goat production plays a vital role in the livelihoods of the smallholder farming community through the provision of meat, milk, manure, skins, cashmere and mohair (Haenlein and Ramirez, 2007) and income. Indirectly, goats contribute to food and nutrition security and poverty alleviation through milk and meat provision as well as cash earned from live sales and the sale of their products (FAO, 2005) to meet occasional cash needs (Barret, 1991). In Zimbabwe, goats are reared under extensive farming conditions, mainly for meat (chevon) and to a lesser extent, milk (Sikosana and Senda, 2010). Goats are an ideal vehicle for generating cash returns to meet household needs and improve the welfare of the communal dwellers (Rumosa Gwaze et al., 2009). They also serve significant socio-cultural roles in traditional ceremonies (Simela and Merkel, 2008; Maburutse et al., 2012). The majority of the world's goats are found in semi-arid and arid regions of developing countries (Rumosa Gwaze et al., 2009) such as Zimbabwe where almost all goats are found in communal areas (van Rooyen and Homann, 2008).

The indigenous breeds are more predominant under smallholder farming conditions while the exotics are raised under commercial settings. As the feed resource base continues to shrink due to the recurrent droughts and unreliable rainfall, goat production offers a realistic option for sustainable livestock production under smallholder, resource-constrained farmer management. In spite of such contribution and potential, goats remain marginalised and neglected by research, veterinary and extension support and sources of credit (de Vries, 2008). Consequently, very little is documented on the productivity of smallholder goat flocks. This impedes development efforts as stakeholders cannot readily access valuable information, making any improvement initiatives futile. In the face of the escalating climate-related uncertainty, indigenous goats present a realistic vehicle out of the abject poverty in rural areas of developing communities. This study was designed to assess the productivity of indigenous goats reared under typical smallholder farming conditions.

2. Materials and methods

2.1. Study site description

A survey was conducted in Katerere of Nyanga North district, Manicaland Province of Zimbabwe. Katerere lies 96 km south-east of Nyanga town. Nyanga district covers a total land area of 5781 km^2 and is home to a human population of 126 599 people (ZIMSTAT, 2012).

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Katerere is under agro-ecological region (AER) V which receives less than 500 mm of rainfall annually (Gwinji, 2011). The rainfall is very erratic and unreliable and the mean annual temperature is 35 °C. The topography is generally mountainous with predominantly sandy, stony and shallow soils making the area unsuitable for crop production. The little cropping activity focuses on small grains such as rapoko and millet which are drought tolerant. The most common land tenure system is communal holding.

2.2. Sampling and data collection

A multistage sampling procedure was used to come up with participants in a survey-based study. Four (1, 2, 4 and 5) out of 6 wards were randomly selected and from each ward, 5 villages were randomly selected. Four households were then selected using purposive sampling to participate in the survey making a total of 80 respondents. Sampling frames for the wards, villages and households were obtained from the Chief, Headmen and Village heads, respectively, while a list of households owning goats was obtained from the District Livestock Offices. This area was chosen on the basis that livestock production is the predominant activity. Goats were chosen based on their relative importance in the livelihoods of the smallholder communities, given their hardiness and adaptability.

The main data collection tool was a semi-structured questionnaire designed to capture data organised as demographic details, socio-economic household characteristics, general livestock rearing, goat production, management and related goat production details. Challenges faced by goat keepers in the study area were explored. The interviewees were informed of the objectives of the study and intended use of the data to be collected. The respondents, whose data are presented in this work, volunteered and consented to participate and approved of the subsequent publication of survey findings. The questionnaire was pretested on 10 randomly chosen subjects before the actual study data were gathered. Informal group discussions and key informant interviews were also conducted to gather information from a wide range of people thus improving the quality and diversity of the responses. Among the key informants were the Village heads, extension workers and the local veterinary officer.

2.3. Statistical analyses

Data edits were performed by simplifying responses to open survey questions, so as to correct faulty data, in order to improve the reliability of statistical inferences. Coded data were entered into Microsoft excel and then exported to the International Business Machines (IBM) Statistical Package for the Social Sciences (SPSS), version 22 (IBM SPSS Statistics, 2013) for analyses. The one-sample *t*-test was applied for continuous data using IBM SPSS Statistics (IBM SPSS Statistics, 2013). The Chi-square test was used to test for possible associations between management practices and goat productivity. Descriptive statistics were generated along with standard measures of dispersion. Cross tabulations were also performed to test for possible correlations among variables. Significance was considered at the 5% level of probability. Graphical data were presented using SigmaPlot version 10 (Systat Software Inc., 2006).

3. Results and discussion

3.1. Household demographics and socio-economic status

The average age of the household head was 52.4 ± 16.20 years. About 81.3% of the interviewed households were male headed, in agreement with Chinogaramombe et al. (2007) who reported 80 percent male headed households in Komani. About 41.3% of the respondents had more than 20 years of goat keeping experience. Approximately 39% had kept goats for between 6 and 20 years while 18.8% had 0–5 years goat keeping experience. Chi-Square test results show that there was a significant association between goat keeping experience and flock size ($\chi^2 = 4.30$, df = 1, $P < 0.038$). It would follow that the more experienced members of the community provide better care for their animals thus reduced incidences of mortality. On average, the household size was 6.7 ± 2.68. In this study, household size and the number of children per household are of significance because they are the main source of labour in the routine management activities of goats such as herding. The majority of the household heads were literate, having at least attained primary (62%) and secondary education (21%). None of the respondents in this study attained tertiary education. This is not surprising since most tertiary graduates migrate to cities in search of formal employment. The level of education is likely to have implications on extension-farmer information dissemination which are expected to impact on goat productivity.

3.2. General livestock production

In this study, goats were the most common livestock species kept by farmers. Other livestock types kept in the area were cattle, indigenous chickens, pigs and donkeys. Goats are generally hardy and drought tolerant animals and are suited to thriving under the dry conditions experienced in most parts of the year in this area. Their feeding habits enable survival on a diversity of plant material thus enhancing their survivability under the harsh environmental conditions prevailing in the area.

3.3. Goat flock sizes

The study showed that there was wide variation in flock size and structure in Katerere. The mean flock size observed in the current study is 10.9 ± 7.82 goats per household (Table 1) with a range of 1–31 goats per household. Wards 5and 1 recorded the smallest (7.9 ± 7.15) and largest (16.2 ± 9.19) mean goat flock sizes per household. This observation contradicts that of van Rooyen and Homann (2008) who reported that the majority (52%) of households in Zimbabwe keep flocks of fewer than 8 goats with 30% having between 8 and 20 goats. Kindness et al. (1999) reported an average flock size of 14 goats per household in Matobo and Bubi districts in Zimbabwe. Also contrary to the status quo is the observation of Barret (1991) where an average of 15 goats was reported in Zvishavane, which lies in a similar agro-ecological region. Kusina and Kusina (2002) recorded an average flock size of 12 ± 0.7 goats per household in Dande valley to the north of Zimbabwe. A small proportion (18%) of households surveyed had more than 20 goats in this study. These statistics seem to indicate a progressive decrease in flock size with time. This can be attributed to the

Table 1
One-sample *t*-test statistics and some performance parameters for goat flocks in Katerere, Nyanga North district, Zimbabwe ($n = 80$).

Parameter	Min.	Max.	Mean	Std. Dev.	*SEM*
Goat flock size	0	31	10.91	7.820	0.875
Age at first kidding (months)	9	18	13.29	2.710	0.303
Number of breeding males	0	5	0.70	0.920	0.103
Number of breeding females	1	16	5.45	3.770	0.422
Number of offspring per year	1	21	7.35	4.810	0.537
Number surviving to weaning	0	20	5.58	4.050	0.453
Volume (L) of milk per milking	0	3	0.21	0.630	0.070
Number of females serviced	0	12	0.34	1.814	
Age at first service (months)	0	12	5.37	3.822	
Litter size	0	3	1.31	0.518	
Average gestation length (months)	4	6	5.06	0.473	
Number of bucks	0	6	1.18	1.448	
Number of does	1	20	5.96	4.414	
Young males	0	6	1.51	1.322	
Young females	0	10	2.36	2.263	