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Sustainable smallholder livestock systems: A case study of Limpopo Province, South Africa ☆

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ABSTRACT

A study was conducted in the Vhembe District, located between 22° 85' latitude and 30° 71′ longitude in the Limpopo Province of South Africa. The objective of the study is twofold: to analyse herd dynamics and efficiency parameters in relation to cattle productivity, and to explore the multifunctionality of livestock keeping and to link key functions to breeding objectives. Data was collected by means of a structured questionnaire, focus group discussions and Participatory Rural Appraisal (PRA) methodology. The results indicate that almost 60% of farmers own less than 10 head of cattle. Female animals constituted the largest component of the herd (55.0%). Although the bull–cow ratio was extremely high (1:3.7), the calving rate is low at 35.6%, with a very high herd mortality of 15.7% and a low offtake of 8.7%. The benefits obtained from cattle by smallholder livestock farmers were ranked in descending order of importance: selling and meat consumption, wealth, status and savings, socio-cultural activities and draught power. The "cattle complex" where cattle are kept for prestige and status, is still clearly evident, although cattle make a more significant contribution with respect to selling and meat consumption. It is concluded that benefits obtained from cattle forms the basis of decision-making by smallholder livestock owners with respect to production.

1. Introduction

With the adoption of the Millennium Development Goals (MDGs), the international community has agreed to the eradication of extreme poverty and hunger as one of its primary targets. Livestock contribute to the livelihoods of an estimated 70% of the world's rural poor, and account for about 20% of the global trade of agricultural products (Ali, 2007). Livestock is one of the fastest growing agricultural sub-sectors in developing countries (Van der Zijjp et al., 2010). It is estimated that meat, milk and eggs provide about 20% of the protein in African diets, and around 70% of the human population of SSA are primarily or partly dependent on livestock (Lenné and Thomas, 2006). It is clearly evident that livestock is well positioned to continue contributing to social transformation as a strategic asset of poor populations. Benefits and products derived from livestock by smallholders are summarised in Table 1.

In smallholder systems, the benefits obtained from livestock are derived from products or activities usually not sold on the market. Kosgey (2004) refers to them as "intangible" and Tapson (1991) refers to these as Z-goods (basic commodities from livestock that are not marketed but are consumed by the household).

Population growth, urbanisation and rising income are increasing demand for animal source foods in developing countries, described as the Livestock Revolution (Delgado et al., 1999). Total livestock production in SSA will have to grow at an average rate of 4.2% per year by 2015 (Swanepoel and Stroebel, 2009). This growing demand for animal protein in developing countries provides opportunities for the poor to improve their livelihoods (McDermott et al., 2010; Moyo, 2008). Within this

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Table 1
A summary of benefits and products derived from livestock (Pell et al., 2010).

Benefit	Products
Food	Milk; meat; eggs; blood; fish; honey; processed products.
Clothing	Wool; hides; skins; leather.
Work	Draught power — cultivation; transport of goods and people; threshing; milling; pumping water.
Monetary	Capital wealth; investment and savings; income from hiring working animals; sale of products and animals.
Social	Lobola (bride price); ceremonial; companionship; recreational; status.
Manure	Fertiliser (soil amelioration); fuel; flooring.
Other benefits	Feathers; bone meal; soap production.

context, the contribution from increased efficiency of livestock production would therefore be desirable in order to meet the growing demands of the human population, which emphasise the increased importance of the role of livestock in smallholder farming systems. The objectives of this study are to analyse herd dynamics and efficiency parameters in relation to cattle productivity, and secondly to explore the multifunctionality of livestock keeping and to link key functions to breeding objectives.

2. Material and methods

This study was conducted in the Vhembe District of the Limpopo Province of South Africa, located between 22° 85′ latitude and 30° 71′ longitude. Average temperatures range between 15 °C and 26 °C. The mean annual precipitation is 780 mm, of which 80% occurs during the summer months (October–March). Livestock and crop farming are the predominant forms of agriculture, with communal (open system) cattle farming enterprises comprising approximately 50% of the farming in the area. Smallholder farms are located throughout the area, characterised by low levels of productivity and average holdings of 1.5 ha per farmer. Production is primarily for subsistence purposes with little marketable surplus. A nonprobability sampling method was used to select a sample of 128 households for the survey. The selection of the sample was purposive, as it was assumed that most of the households in the selected villages were typical, based on previous studies in the area. Methods of data collection included completion of a structured questionnaire, focus group discussions and Participatory Rural Appraisal (PRA) methodology. Information gathered through the structured questionnaire was used to compile information regarding herd dynamics and efficiency parameters presented in Tables 2, 3 and 4 respectively. Focus group discussion is a well-accepted research technique for acquiring qualitative data in further exploring attitudes, understandings, perceptions, participation, behaviour, beliefs and values. There is a substantial body of published literature on the use of focus group discussion (Klein et al., 2007, Esposito, 2001). Esposito (2001) highlights issues relating to focus groups in situations where there are translations from indigenous language to English, applicable to this study. The qualitative information obtained though focus groups was used to construct a model of functions and benefits obtained from cattle, linked to desired characteristics and breeding objectives, presented in Table 6. In addition, this qualitative information contextualised the discussion of the results. For example, the proposition that the multiple objectives for keeping livestock suggest that it is misleading to consider livestock as a conventional, isolated production activity, in the context of the Sustainable Livelihood Framework (SLF) (Carney, 1998) conceptual model, was informed by this valuable qualitative information. PRA techniques have been used to gather information on the reasons for farming with cattle, presented in Table 5. Data analysis was performed using Statistical Package for Social Sciences (SPSS) (SPSS, 2000).

Table 3
Herd size summaries (N = 128).

Herd size category	Number of households (N)	%
1–10	76	59.2
11–20	43	33.4
21–30	3	2.6
31–40	5	4.0
>40	1	0.8
Total	128	100.0

3. Results and discussion

3.1. Herd dynamics and efficiency parameters

The herd structure and number of cattle, the herd size summary and efficiency parameters are illustrated in Tables 2, 3 and 4 respectively:

It is widely reported and accepted that herd size and composition are regarded as a major constraint to increasing cattle productivity under smallholder communal (open) systems. The number of cattle owned varied from one to 55, with an average of ten head of cattle per household (Table 3). Moorosi (1999) reported that the average herd size was 10.8, while Stroebel (2004) reported an average of 10.3 in an earlier study also in the Venda region. According to the results in Table 3, 59.2% of the respondents owned ten or less head of cattle, with only one household owning more than 40 head of cattle. According to the results in Table 2, breeding females constituted the largest group of the herd (55.0%), which is in

Table 2
Herd composition (N = 1563).

Herd Class	Number	%
Cows and heifers	860	55.0
Bulls	232	14.8
Calves	307	19.7
Steers	164	10.5
Total	1563	100.0

Table 4
Efficiency parameters.

Factor	Time (months)	%
First calving age	34.3	
Calving rate		35.6
Weaning rate		34.2
Herd mortality		15.7
Offtake		8.7