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Production system and participatory identification of breeding objective traits for indigenous goat breeds of Uganda

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ABSTRACT

The success of breeding programs in improving indigenous livestock breeds in Uganda has hitherto been limited due to lack of involvement of the key stakeholders. Thus, participatory approaches are being promoted for designing community based improvement programs. The aim of this study was to characterize the indigenous goat production systems and assess in a participatory manner farmer preferred traits for establishing breeding objectives for indigenous goat breeds in Uganda. 217 farm households representing three goat production systems (combinations of breed and region) were individually interviewed to assess the socio-economic characteristics of the regions and the preferences of the farmers for indigenous goat breeds. The three breed/region combinations were 78 households with the Small East African breed in Arua, 81 with the Mubende breed in Mubende and 58 with the Kigezi breed in Kabale. An index based approach was used to rank farmers' choices of traits considered important for their production systems. Descriptive statistics show that overall the production systems were not significantly different in terms of the nature of the farms and the trait preferences of the farmers. The sale of live animals was considered a primary objective for keeping goats by farmers across all the production systems studied. Adaptation traits (disease resistance, heat tolerance and survival) were considered critical in the farmers' preferred breed. Production traits (better prolificacy and faster growth rate) and marketing ease were other characteristics considered by the farmers. The results from the study are useful for designing farmer-participatory breeding programs for goats in the different production systems in Uganda.

1. Introduction

Goats are amongst the earliest animals domesticated and have been associated with humans symbiotically for over 10,000 years (Ensminger and Parker, 1986). They are amongst the most important livestock species used for meat production around the world producing over 5 million metric tonnes of meat (FAOSTAT, 2014).

Goats show a high degree of diversity due to their ability to adapt to varying environmental conditions and nutritional regimes. There are over 576 breeds currently documented of which Africa is home to 96 breeds (FAO, 2015). The global goat population has continued to increase over the last decade to currently over 1 billion goats, with Africa contributing 36.2%, Asia 58.2%, Americas 3.5%, Europe 1.7% and Oceania 0.4% (FAOSTAT, 2014). The goat population in Uganda is approximately 14.0 million (UBOS, 2015). Over 95% of this population is comprised of indigenous goat breeds. Furthermore, there is a small

proportion of exotic breeds composed of Boer, Savannah, Anglo-Nubian, Toggenburgs and Saanen among others (UBOS and MAAIF, 2009). Goats contribute significantly to the net cash income derived from livestock production in the crop–livestock production system, although the annual meat production from goats is relatively small compared to the number of heads (MAAIF, 2011).

In Uganda, goats are mainly kept by smallholders composed of mainly the rural poor and vulnerable women headed households (Semakula et al., 2010a). They contribute substantially to the livelihoods of these households as a source of income, food (mainly meat) and non-food products like manure and skin. Goats also serve as a means of risk mitigation during crop failures, property security, monetary saving and investment, and have many other socio-economic and cultural functions such as dowry for marriage, sacrifice and in-kind payment of fines on breach of cultural norms and taboos (Kugonza et al., 2001).

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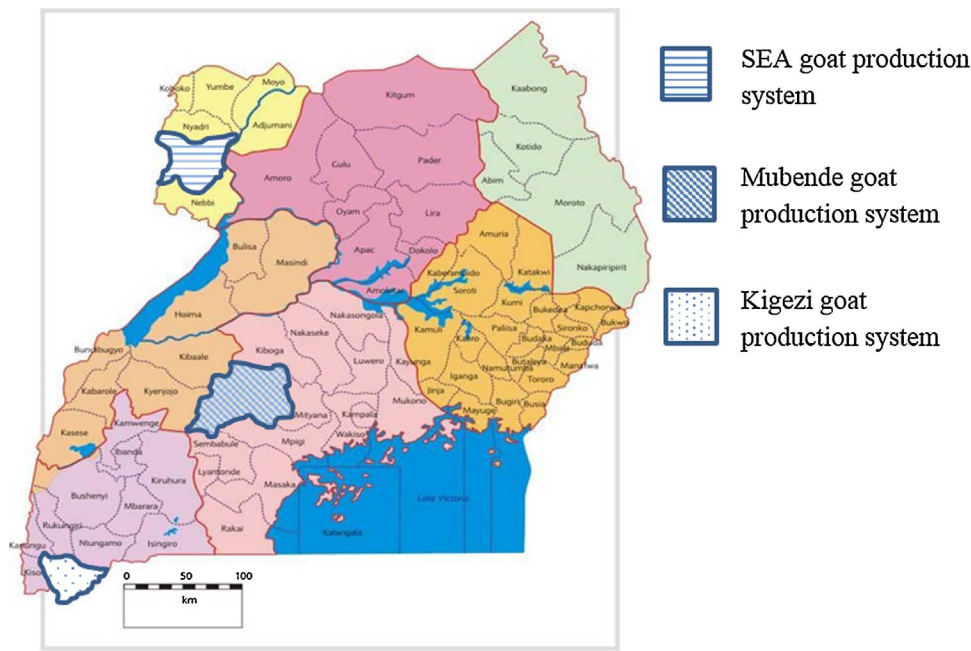


Fig. 1. Map of Uganda showing the districts selected to characterize production systems for SEA, Mubende and Kigezi goats.

The Ugandan indigenous goat breeds are generally characterized by small body size, slow growth rate and low carcass weight. However, these indigenous goat breeds have evolved in diverse and stressful environments resulting in unique adaptive traits like disease and heat resistance, water scarcity tolerance and ability to cope with poor quality feed which has enabled them to survive and remain productive in these environments. To improve the productive performance of the indigenous goats for meat, cross breeding with South African Boer goats was started in early 1990's (Nsubuga, 1996). This offered short term solutions for increasing goat meat production. However, in the long run continuous cross breeding may lead to disappearance of the resilient indigenous breeds. Anecdotal reports indicate that there might be no net gains from crossbreeding with Boer goats since a larger proportion of kids succumb to pre-weaning mortality arising from intestinal worm infections. The indiscriminate and unplanned cross breeding with the adapted indigenous breeds may lead to breed replacements. This may have a negative bearing on future breeding programs for goats. Although the threat level of Uganda's indigenous goats is not quantified, already 3% of the world's goat breeds is extinct, 6% is at critical level and the risk status of some 32% is unknown (FAO, 2004, 2009, 2011). In order to qualify the uniqueness of indigenous goat breeds, there is need to characterize the breeds and their production system so as to properly assess the value of breeds and to guide decision making in livestock development and breeding programs (Kosgey et al., 2006).

The most important indigenous goat breeds of Uganda are Small East African, Mubende and Kigezi goats (Mason and Maule, 1960; Nsubuga, 1996). The Small East African (SEA) goats have an adult live body weight of 20–25 kg and are distributed extensively in the northern and eastern savannah ecological areas and drier areas of central Uganda, contributing approximately 83.3% to the total indigenous goat population. The Mubende (MUB) goats are larger animals with adult live body weight of 30–35 kg and popular also for their high quality skin. They contribute approximately 14.5% to the indigenous goat herd and are mainly found in Mubende and Ssembabule district. The Kigezi (KIG) goats have an adult live body weight of 25–30 kg and are distributed widely in the south western highlands and make up 2.2% of the total indigenous goat population in Uganda (UBOS and MAAIF, 2009).

As seen in many tropical developing countries, the animal production systems in Uganda are very diverse mainly due to the agro-ecological conditions and the level of commercialization (Wurzinger et al., 2006; Gizaw et al., 2010). The more market oriented commercial

farmers tend to focus more on livestock production compared to the subsistence smallholder farmers. The aspirations of the farmers are also as diverse as the number of communities that may be involved in keeping the goats. Therefore, the identification and characterization of local production environment of indigenous breeds, and the associated context of their utilization and development is a first step towards breed improvement programs.

The failure of breed improvement programs in tropics in the past decades has mainly been attributed to lack of involvement of the farmers in defining the breeding objectives (Kahi et al., 2005; Wurzinger et al., 2011). The use of participatory approaches should be an integral part in defining breeding objectives (Kosgey, 2004; Duguma et al., 2010). These approaches have been used in defining breeding objectives for mixed livestock and pastoral systems for small ruminants in Kenya and Ethiopia (Kosgey et al., 2008; Bett et al., 2009b; Mirkena et al., 2012; Gebreyesus et al., 2013), and recently as a benchmark for defining breeding goal traits for Nile tilapia (*Oreochromis niloticus*) in Kenya (Omasaki et al., 2016).

In Uganda, there has hardly been any comprehensive study that describes the production environment and defines breeding objectives for indigenous goat breeds. This study was therefore designed to characterize the indigenous goat production systems and to develop a participatory definition of farmer preferred traits for establishing breeding objectives for indigenous goat breeds in Uganda.

2. Material and methods

2.1. Study sites

A survey was conducted in Arua (3.03°N, 30.91°E and 1157 m above sea level (masl), Mubende (0.59°N, 31.36°E and 1324 masl) and Kabale (1.33°S, 30.00°E, 1864 masl) districts of Uganda (Fig. 1). The average annual rainfall is 2875 mm in Arua, 1377 mm in Mubende and 1018 mm in Kabale. The average monthly temperatures were 26.6 °C, 22.9 °C and 17.2 °C for Arua, Mubende and Kabale respectively. The agro-ecologies have been described by MAAIF (2010). Arua lies in the north western savannah grassland characterized by gentle undulating plains suitable for cotton, millet, sorghum, legumes (beans, groundnuts), sesame and cassava. Livestock reared includes cattle, poultry and small ruminants, but production is limited by tsetse fly infestation. Mubende is located in western savannah grassland, which can be

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