

Research Application Summary

**Enhancing productivity of traditional goat phenotypes among small holder farmers of Uganda: The role of research**

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**Abstract**

Goats have not only been important for food and income of many people in developing regions but have also contributed significantly to the economic development for millions of years. In Uganda, approximately 40% of the rural households rear local goats as an important socio economic activity. They are reared for food (milk, and meat), spiritual activities and cultural ceremonies; and are also sold for cash incomes. Despite their contribution, local goat resources are threatened by a number of factors including decreasing feed resources due to increased expansion of crop agriculture, indiscriminate crossbreeding with cosmopolitan breeds, emerging diseases induced by climate change, changing production systems, changes in physical environment, etc. There is therefore a large number of topics that necessitate research now and in the future if goats are to maintain the key roles they have played in the past. Given the ongoing indiscriminate crossbreeding, perhaps the most urgent for Uganda is defining the distinct local goat genotypes present before they are completely lost. This is against the background that Uganda has a varied physical and human landscape that provides unique opportunities for evolution of high diversity among livestock. Another important area that requires urgent attention is the determination of the different locally available browse species and their nutritional value. This would provide information that farmers can base on to domesticate the species with high nutritional value and have the potential to improve goat productivity. Changes in climate, farming systems, disease patterns, and market will certainly influence goat research trends in Uganda

Key words: Browse species, genetic diversity, goats, production, Uganda

**Résumé**

Les chèvres ont non seulement joué un rôle important dans l'alimentation et la génération des revenus de beaucoup de gens dans les régions en développement, mais ont également contribué de manière significative au développement économique pour des millions d'années.

En Ouganda, environ 40% des ménages ruraux élèvent des chèvres locales comme une activité socio-économique importante. Elles sont élevées pour la nourriture (le lait et la viande), des activités spirituelles et des cérémonies culturelles; et sont également vendues pour les revenus monétaires. En dépit de leur contribution, les ressources de chèvres locales sont menacées par un certain nombre de facteurs, y compris la diminution des ressources alimentaires due à l'expansion accrue des cultures vivrières, le croisement non discriminatif avec des races cosmopolites, les maladies émergentes causées par le changement climatique, l'évolution des systèmes de production, les changements dans l'environnement physique, etc. Il y a donc un grand nombre de sujets qui nécessitent des recherches maintenant et dans l'avenir si les chèvres doivent maintenir les rôles clés qu'ils ont joué dans le passé. Compte tenu de croisement non discriminatif actuel, peut-être le plus urgent pour l'Ouganda est de définir les génotypes distincts des chèvres locales présents avant qu'ils ne soient complètement perdus. Cette suggestion est basée sur l'information selon laquelle l'Ouganda a un paysage physique et humain varié qui offre des occasions uniques pour l'évolution de la grande diversité parmi le bétail. Un autre domaine important qui nécessite une attention urgente est la détermination des différentes espèces fourragères disponibles localement et leur valeur nutritive. Cela fournirait des informations sur lesquelles les agriculteurs puissent fonder pour domestiquer les espèces à haute valeur nutritionnelle et ayant le potentiel d'améliorer la productivité des chèvres. Les changements de climat, des systèmes agricoles, des modes de transmissions des maladies, et du marché vont certainement influencer les tendances de recherche concernant la chèvre en Ouganda

Mots clés: les espèces fourragères, la diversité génétique, les chèvres, la production, l'Ouganda

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## Background

Goats are the most abundant of domesticated ruminant livestock world over (Casey and Webb 2010). In East Africa in general, the most abundant species of livestock are sheep and goats followed by cattle (FAO, 2007). In Uganda, goat rearing is widespread throughout the country's agro ecological zones. Approximately 40% of all rural households in the country rear goats and 99.5% of the goats are indigenous (UBOS, 2008). Goats have a socio, economic and cultural importance attached to them. This animal category serves as a unique source of food (milk and meat) and cash income for the small holder farmers who cannot afford to maintain large ruminant livestock like cattle (Degen, 2007). This is true for many rural households of sub-Saharan Africa (Nwakor, 2004; Degen, 2007). For the rural poor, goats and sheep are cheap to manage, they mature early and breed quickly, thrive under poor conditions and are more drought tolerant than animals like cattle (Hulela, 2010). These characteristics make small ruminants easy to keep for many people even those living in marginal areas.

Despite the importance of goats, the amount of research on them has been relatively low compared to cattle. In recent years, local goat production has come under threat due to a range of factors including; population growth, expanding crop agriculture, political insecurities, changing climate and production systems, agricultural intensification, government policies

towards livestock improvement, alteration in physical environment, conservation policies, changing value attached to animal performance etc. These changing circumstances necessitate research now and in the future if goats are to maintain these key roles they have played in past years. In this paper we address two important areas for Uganda: i) defining the local genotypes present, and ii) examining availability and quality of locally feed resources in the different agro-ecological zones of the country.

**Is genetic diversity among local breeds of goats in Uganda under threat?** Since the colonial times, livestock improvement policies in Uganda have been biased towards milk and beef production for commercial purposes using mainly exotic germplasm (Kisamba Mugerwa, 2001). Post-independence policies have not been different and recently, there has been extensive efforts by government and non-governmental organizations to improve food productivity and household incomes in Uganda and in the livestock sector, with a focus on cattle. Extensive use of exotic breeds and cross breeds has been considered as the main, most effective and fastest way of improving productivity, food security and household incomes (Government of Republic of Uganda 2000; Kisamba Mugerwa, 2001). As a result, cross breeding and raring of exotic goats has been popularized among smallholder farmers at the expense of locally adapted breeds. If well accepted and adopted by local communities, this phenomena will affect animal genetic resources by decreasing the number of breeds and thereby losing the in-between and within breed genetic diversity among local goats.

Loss of locally adapted genetic resources has obvious influence on future breeding programs and livelihoods of the poor who depend on them. This is because the rural poor cannot afford the cost of maintaining industrial breeds which are not adapted to the heavy disease burden and harsh tropical conditions. One area in which there is a significant information gap is delineating the unique local goat genotypes present given Uganda's varied physical and human landscape that provides unique opportunities for evolution of high diversity among livestock. A previous study in Uganda's cattle has shown that the varied landscape has led to evolution of traits that fit agro-ecological zones (Kabi *et al.*, 2015). There is therefore need for basic studies to establish the extent to which local goats in Uganda are in danger of genetic erosion. This should also include an assessment of the willingness of local communities to adopt cross breeding. This would provide an indication about the future of local goat breeds. This is important given the worldwide rate of extinction of animal genetic resources in recent times. The rate of extinction has been estimated by FAO 2007 to be 6.9 breed/year in the last ten years and around 60 breeds of cattle, goats, pigs, horses and poultry have been lost in the last five years (Cardellino and Boyazoglu, 2008). The first step towards conserving breeds lies in defining what constitutes distinct genotypes before appropriate conservation steps are taken.

**Threats to feed resources of local goat breeds.** Goats in Uganda depend entirely on the natural resource-based subsistence system of livestock production that relies predominantly on free-range grazing of natural pastures. However, the area under browse production is continuously reducing due to competition with crop agriculture (Tabuti, 2009). The consequence is reduced nutrient supply to goats. Studies elsewhere have shown that areas of natural pastures contain many locally available forage plants that have the ability to

produce high yields of biomass ((Bakshi and Wadhwa, 2007). In these studies, fodder tree leaves were found to be rich in protein, soluble carbohydrates, minerals and vitamins, and showed great potential as an alternate feed resource. The potential value of browse trees lies in the provision of protein, vitamins and also the mineral elements that are lacking in grassland pastures during the dry season. In Uganda however, locally available forage tree leaves cannot be utilized for improvement of goat production because the information on their nutrient composition is limited to a few studies such as those of Kabasa *et al.* (2000) and Nabukenya *et al.* (2014). In addition, the actual amount of available browse resources for the goats in the country is not known. This is also complicated by the fact that there are 11 agro-ecological zones in Uganda with each of these zones presenting different combinations of browse species. An area that requires information is an assessment of the availability and nutritional value of native browse species in the different agro-ecological zones of Uganda with the view of providing information on the optimal combination of native browse species that can be deployed to improve goat productivity.

In addition to the varying nutritional quality of browse species, their continued availability is threatened by loss of habitats. Land-use change is the main driver of biodiversity loss (Sala *et al.*, 2000), particularly when agricultural intensification involves clearing of natural vegetation. It is therefore necessary to initiate interventions that lead towards the active on-farm management of browse species that are exploited by goats in traditional grazing systems (Tabuti *et al.*, 2009). One of the ways of ensuring sustainability and conservation of the useful browse species is by domestication. This could also be through promoting species that can be grown for live fencing or as part of other agroforestry systems and encouraging management practices that could improve their natural occurrence.

## Conclusion

Local goat resources in Uganda are threatened by a number of factors including decreasing feed resources due to increased expansion of crop agriculture, indiscriminate crossbreeding with cosmopolitan breeds, emerging diseases in the event of climate change, changing production systems, changes in physical environment, etc. There is therefore a large number of issues that require research now and in the future if goats are to maintain the key role they have played in past.

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