Scientific Research and Essays Vol. 7(37), pp. 3209-3217, 20 September, 2012
Available online at http://www.academicjournals.org/SRE
DOI: 10.5897/SRE12.140
ISSN 1992-2248 ©2012 Academic Journals

*Full Length Research Paper*

# Production practices and constraints to sheep productivity in two ecologically different and resource-poor communal farming systems of South Africa

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Accepted 3 August, 2012

**The objective of the current study was to determine the production practices and constraints to sheep productivity in ecologically different communal areas of South Africa. Direct observations and participatory techniques were also employed to capture data from farmers in Gaga and Sompondo communal villages. Most (70%) of sheep owners were men and were more involved in sheep flock management than adult females and youths. Mean sheep flock size per household was not significantly different between the two villages; Sompondo (18.3 ± 3.10) and Gaga (19.0 ± 3.10). There were significance negative correlations (r = -0.61 for Sompondo and Gaga, r = - 0.55; p < 0.05) between sheep flock sizes and cattle herd sizes kept per household. Shortage of feed and diseases/parasites were ranked by farmers as the most important constraints. In both villages, sheep houses were poorly constructed. Most mortalities were caused by heartwater (*Ehrlichia ruminantium)*, gall sickness (*Anaplasmosis*) and footrot. Few farmers owned rams, 39% in Sompondo and 36 % in Gaga, respectively. Dohne merinos were the common breed in the communal areas. Breeding season was undefined and mating system was largely uncontrolled in the villages. Differences in agro-ecological conditions, specific social and economic conditions at household level affected sheep management practices.**

**Key words:** rams, feed shortage, flock management, household, sweetveld, sourveld.

## INTRODUCTION

South Africa has approximately 25 million sheep and 25% of these are raised by communal farmers of Eastern Cape and Free State (CAPEWOOLS, 2007). Sheep play an important role in both commercial and subsistence farming systems and in South African livestock industry in general (Brundyn et al., 2005). In South Africa, sheep are widely distributed across the country where they contribute to the livelihoods of the rural population as a source of protein, wool, food security and poverty alleviation (Gatenby et al., 1997b).

The relative roles of sheep to a communal farmer varies from economic products, by-products, risk mitigation, property security, capital (Braker et al., 2002), cultural uses and prestige (Shackleton et al., 1999; Bayer et al., 2004). However, all these roles vary with production systems, agro-ecological regions, rangeland

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types, cultural values and socio-economic statuses of the farmers (Chimonyo et al., 1999; Botsime, 2006; Simela et al., 2006). Rainfall patterns and vegetation types determine the types of rangeland, and in South Africa they are either sweet or sour rangelands. Sour rangelands receive between 600 and 800 mm of rainfall per annum and are mainly composed of annual grass species, which lose nutritive value and palatability during the dry season (Ellery et al., 1995). For the sweet rangeland, in contrast to sour rangeland, precipitation is less than 500mm per annum and vegetation is comprised of perennial grasses that remain nutritious and palatable through out the year (Ellery et al., 1995). Constraints faced by communal farmers are not uniform across production systems (Botsime, 2006; Nqeno et al., 2009). The adoption of on-farm level recommendation depends upon the social, cultural, economic and environmental conditions facing the farmers who own and use livestock (Verbeek et al., 2007; Nqeno et al., 2009). To produce a viable and sustainable developmental programme for the resource-limited farmers these challenges and differences need to be understood. The information generated can act as a data base and can also assist policy makers to come up with sheep disease control and mitigation measures. The objective of this study was, therefore, to determine sheep production practices and constraints in two ecologically different areas. The null hypothesis tested was that there are no differences in sheep production practices and constraints in the two ecologically different villages.

## MATERIALS AND METHODS

### Description of the study sites

The study was conducted in Gaga and Sompondo Villages in the Amathole District Municipality of the Eastern Cape. Gaga village, representing the sweet veld (rangeland), is located 10 km west of Alice town and falls under the administration of Nkokobe Local Authority. It is situated 32° 17′ E and 26° 55′ S at an altitude of 450 m above sea level. It receives a mean annual rainfall of 500 mm. The highest mean temperature is recorded in January (22°C) and lowest in July (9°C). Most of the rains are received between November and April. It is lowland characterised with steep, isolated mountains and the veld type is predominant of False Thornveld. It is situated closer to townships surrounding Alice town. The most common grass species are *Themeda trianda, Setaria sphacelate, Microchloa caffra, Ellonurus muticus* and *Heteropogon contortus* grasses. The dominant tree species are *Acacia karroo*, *Scutia myrtina* and *Maytenus polyacantha* (Ellery et al., 1995).

Sompondo, representing the sour veld, village is located 20 km east of Alice town and it is in highland. It has a unique natural character, i.e. geographically it lies between two high mountains with angulating topography. It lies on Longitude 32° 07′ E and Latitude 27° 30′ S at an altitude of 1440 m above sea level. The climate is semi-arid with the annual rainfall of about 800 mm, most of which occurs in summer. Mean monthly minimum and maximum day temperatures are recorded in July (11°C) and January (20°C), respectively. The village is relatively not closer to the townships surrounding Alice, but roads are in a relatively good condition. Sompondo communal area is mainly composed of *T.trianda*, *H. contortus, Sporobolus africanus* and *Microchloa ciliate*. *Euryops pyroides*, *Chrysocoma ciliate* and *Dyspyrose serabrida* are common bush species in the areas (Lesoli, 2008).

### Sampling of households

In Gaga, out of a total sample of 72 households, 33 were selected and in Sompondo 67 out of 120 based on simple random sampling using probability sampling method. Farmers in the chosen villages raise sheep together with other livestock species such as goats, cattle and chickens. Farmers were selected through probability sampling method and the technique chosen was simple random sampling. The method was chosen because it gives every farmer an equal chance of being selected. The PROC NUMBERS procedure of SAS (2007) was used to draw farmers who constituted the samples. Administration of a structured questionnaire was done on 100 sheep growers; 33 in Sompondo and 67 in Gaga. Only those farmers, who had sheep and were willing to participate, were considered. The sheep growers were selected from a register kept by the chairperson of the Sheep Growers Association with assistance of National Department of Agriculture, Local Sheep Growers Committee and Local Leadership and snowballing technique was used to select participants. The questionnaire was pre-tested for accuracy and clarity of questions.

### Data collection

The questionnaire was designed to gather data on sheep management systems, constraints faced by the farmers, flock size, flock composition, incidence of slaughter, sales, mortalities, theft, livestock species and number kept, purpose of sheep keeping, feeding practices, health management, breeds kept. Farmers also had to rank the purpose of sheep keeping. Key informants, such as chiefs, headmen, chairpersons of the sheep growers association of South Africa, local agricultural extension officers and veterinary personnel provided secondary information on cultural beliefs, livestock species kept, aspects of sheep production and role of agriculture. At most of the homesteads direct observations were made of the sheep breeds used, grazing areas and housing structures.

### Statistical analysis

The PROC FREQ procedure of the Statistical Analysis Systems (2007) was employed to generate frequencies for farmer profile, participation of the different gender groups and management practices in smallholder sheep production. To determine association between sex of head of household and sheep flock sizes, a chi-square test was computed. Comparison of household demography and flock sizes between villages was done using generalised linear model (GLM) procedures of SAS (2007). Pearson's correlation generated by PROC CORR procedure of (SAS, 2007) was used to determine the strength of the relationship between flock sizes and other species like cattle and goats. Ranks of functions of sheep between villages were compared using PROC NPARIWAY (Wilcoxon test) of SAS (2007).

## RESULTS

### Socio-economic profile of farmers

The socio-economic profiles of the respondents in

**Table 1.** Socio–economic characteristics, challenges and perceptions of respondents (percentage) on issues related to sheep production.

| Socio-economic characteristic | Village | |
|---|---|---|
| | Sompondo | Gaga |
| Male headed households | 70 | 54 |
| Married respondents | 67 | 52 |
| Age group above 70 years | 15 | 20 |
| Respondents with basic education (Grade 1-7) | 88 | 88 |
| Respondents with secondary and tertiary education | 9 | 12 |
| Respondents who were living on pension | 63 | 67 |
| Respondents resident on the farm | 85 | 73 |
| Farmers experiencing sheep mortality problems | 97 | 91 |
| Respondents without children | 33 | 36 |
| Farmers experiencing feed shortage | 64 | 61 |
| Farmers who do not keep records | 82 | 96 |
| Female farmers owning sheep | 29 | 46 |
| Male farmers owning sheep | 64 | 54 |
| Mixed (both males and females) owning sheep | 7 | 0 |
| Respondents who did not flock dip | 67 | 93 |
| Farmers who did not deworm | 58 | 91 |
| Respondents who acquired their sheep through purchasing | 90 | 80 |
| Farmers who got their flock through barter trading or exchange | 3 | 2 |
| Respondents who acquired their flock through inheritance | 12 | 28 |

Sompondo and Gaga villages are shown in Table 1. Most of the households were male-headed in these two villages. The mean household sizes for Sompondo and Gaga villages were 4.6 ± 0.45 and 5.6 ± 0.32 members respectively. There were more respondents with basic education (Grades 1-7) than those with secondary and tertiary education. The majority of the interviewees in Sompondo and Gaga were unemployed and survived on pensions and social grants. The greater number of farmers in Sompondo and Gaga acquired their flock through purchasing and fewer flocks were obtained through barter trading or exchange programmes and inheritance in both villages. Most of the respondents who inherited sheep in both villages were female widows who inherited sheep from their late husbands. Most of the heads of the households were resident on the farm. The majority of farmers across the villages reported that they were experiencing some sheep mortality problems.

Across the villages, the age group above 50 years were actively involved in sheep rearing. Women, boys and girls helped in the absence of men. The activities carried out by men included general health management of the flock, docking, shearing, purchasing of breeding stock, selling of wool and selling sheep. Hired labour and male youths were involved in the construction of housing and slaughtering of sheep. Women and young females participated in assuring that the flock was kraaled during the evening.

The majority of the farmers across the villages neither plunge dipped nor treated their sheep for internal parasites. Most of the respondents in Sompondo and Gaga did not keep records of their sheep. More than half of the respondents in the two villages experienced feed shortages for their livestock. In Sompondo village (79%) and Gaga (28%) of the respondents acknowledged receiving assistance from the sheep growers' association in marketing and selling of their wool but none in selling of their sheep.

## Sheep flock composition and their importance to the farmers

Sheep was ranked as the most important livestock species kept by the farmers, followed by cattle, goats and chickens (Table 2). Flock size was larger in Gaga than in Sompondo village (Table 2). Sheep flocks were mainly composed of ewes in both villages. Marital status, age, income, village, number of children had no significant effect on flock sizes ($p<0.05$). Respondents with secondary level of education had higher ($p<0.05$) numbers of sheep compared to those with primary level of education. As shown in Table 3, there were significant negative correlations ($p<0.05$) between cattle herd size and sheep flock size in both villages. Sheep and goat flock sizes were negatively correlated in Gaga village.

**Table 2.** Mean flock herd sizes of livestock species kept and sheep flock composition.

| Livestock species | Herd/Flock size | |
|---|---|---|
| | Village | |
| | Sompondo | Gaga |
| Cattle | 1.9 ± 0.16 | 2.1 ± 0.12 |
| Sheep | 18.3 ± 3.10 | 19.0 ±3.10 |
| Goats | 3.1 ± 0.14 | 2.8 ± 0.11 |
| Chickens | 3.6 ± 0.10[b] | 3.5 ± 0.11[a] |
| **Flock composition** | | |
| Ram | 0.8 ± 0.29 | 0.6 ± 0.15 |
| Ewe | 7.7 ± 1.64 | 8.5 ± 1.42 |
| Lamb | 5.4 ± 1.20 | 4.5 ± 0.93 |
| Gimmer | 2.2 ± 0.45[a] | 3.1 ± 0.84[b] |
| Wither | 2.2 ± 0.44[a] | 2.3 ± 0.52[b] |

[ab]Values with different superscripts, within a row, are statistically different (p<0.05).

**Table 1.** Pearson's correlation co – efficient of numbers of different livestock species kept by sheep owners.

| Livestock species | | Village | |
|---|---|---|---|
| | | Sompondo | Gaga |
| Cattle | Sheep | -0.61* | -0.55** |
| | Goats | -0.55** | -0.14 |
| | Chicken | -0.29 | -0.37* |
| Sheep | Goats | -0.06 | -0.36* |
| | Chickens | 0.09 | 0.06 |
| Goats | Chickens | -0.43 | -0.44 |

Values with an asterisk show statistically correlations at (p<0.05) for * and P<0.01 for **.

Sheep and chicken flock sizes were however not correlated in the two villages.

Farmers gave various reasons for keeping sheep (Table 4). Most of the respondents across the two villages ranked income as the most important reason why they keep sheep. However, farmers in Sompondo village ranked investments as the second important reason of rearing sheep whereas in Gaga consumption was ranked second. Farmers in Gaga village attached more importance on socio-cultural ceremonies whereas farmers in Sompondo valued manure as more important (p<0.05). Farmers in both villages placed the same importance on pride and status attached to keeping sheep.

**Table 2.** Ranking of reasons for keeping sheep in Sompondo and Gaga Villages.

| Function | Rank (mean)[a] | | Sig[1] |
|---|---|---|---|
| | Village | | |
| | Sompondo | Gaga | |
| | n=33 | n=67 | |
| Raise income | 1[a] (2.36)[b] | 1 (2.27) | ns |
| Consumption | 3 (3.21) | 2 (2.68) | ns |
| Savings and investment | 2 (2.70) | 3 (2.71) | ns |
| Manure | 4 (3.30) | 6 (4.80) | * |
| Socio cultural ceremonies | 6 (4.97) | 4(2.93) | * |
| Pride and status | 5 (4.42) | 5 (4.46) | ns |

[a]The lower the rank of a reason, the greater is its importance, [b]Mean rank*Significant at p< 0.05, Sig = Significance level.

## Sheep production constraints

Diseases and parasites were reported as the primary constraints in both villages (Table 5). Marketing of sheep was ranked as a second and third constraint in Sompondo and Gaga respectively. The third most important constraint in Sompondo village was theft while in Gaga the same constraint was ranked second. Feed shortage was ranked as fourth constraint in Sompondo and seventh in Gaga village. The fifth most important constraint in both villages was poor housing. In Sompondo, lack of capital was ranked as a sixth constraint and the same constraint was ranked in Gaga as a fourth constraint. Lack of knowledge was ranked as seventh most important constraint in Sompondo and sixth in Gaga.

Households with educated heads of household had less (P < 0.05) challenges on feed shortages than those headed by uneducated heads of households. Male headed households reported less (P < 0.05) diseases and parasites problems than those headed by females. Most of the interviewees (66% in Sompondo village and 92% in Gaga village) neither dipped nor vaccinated their flock. They cited lack of funds to purchase medicines as the biggest challenge. However these farmers (100%) acknowledged using herbal/plant remedies in curing their flocks. *Aloe vera* was the medicine mainly used by farmers. Heartwater (*Ehrlichia ruminantium)*, gall sickness (*Anaplasmosis*) and footrot were ranked as the most common diseases by the respondents.

## Communal sheep breeding practices

Most of the farmers preferred crossbreeds (90% in Sompondo village and 76% in Gaga village) and the main reasons for choosing crossbreeds were greater disease resistance and lower feed cost. Wool quality was also

**Table 3.** Sheep production constraints as ranked by respondents.

| Constraints | Rank (mean)[a] | | Sig[1] |
|---|---|---|---|
| | Village | | |
| | Sompomdo | Gaga | |
| Feed Shortage | 4 (4.24) | 7 (5.53) | * |
| Diseases and parasites | 1 (1.03) | 1 (1.45) | * |
| Inadequate marketing services | 2 (3.70) | 3 (3.60) | ns |
| Poor housing infrastructure | 5 (4.70) | 5 (4.64) | ns |
| Lack of capital | 6 (4.72) | 4 (4.63) | ns |
| Lack of production skills or knowledge | 7 (5.72) | 6 (5.09) | ns |
| Thefts | 3 (3.79) | 2 (2.94) | * |

[a]The lower the rank of a constraint, the greater is its importance. Sig= Significance level *Significant at p<0.05.

**Table 4.** Sheep breed breeding stock selection criteria used by respondents.

| Criteria | Rank (mean rank)[a] | | |
|---|---|---|---|
| | Village | | |
| | Sompondo | Gaga | Sig[1] |
| **Breed** | | | |
| Wool quality | 1 (2.09) | 1(1.72) | ns |
| Meat quality | 2 (2.30) | 2 (2.63) | ns |
| High growth rate | 3 (2.88) | 3 (2.81) | ns |
| Disease resistance | 4 (3.79) | 4 (3.22) | * |
| Low feed cost | 5 (3.97) | 5 (5.22) | * |
| Availability | 6 (6.33) | 6 (6.18) | ns |
| Colour | 7 (6.45) | 7 (6.22) | ns |

[a]The lower the rank, the greater is its importance of the parameter*significance at p<0.05, [1]Sig = significance.

ranked as the most important trait in both villages. High growth rate was the main reason for choosing a breed in both villages. Farmers in both villages attached little value on sheep colour when choosing sheep breeds (Table 6).

## DISCUSSION

Most of the households were male-headed. Kunene (2006) had previously reported similar findings in Northern Kwa-Zulu Natal. Most of the respondents had either received lower primary, higher primary, high school qualification or tertiary education, and this is in sharp contrast to the findings of Kunene (2006) where only one farmer was reported to have attained tertiary education and above half had not attained either primary or secondary level of education.

Sheep were used for functions such as food, income generation, cultural use, manure and investment. All the farmers in the two villages slaughtered and consumed sheep during cultural ceremonies. The fact that farmers slaughtered sheep for consumption concurs with what was reported by Bembridge (1984) in rural Transkei and in Swaziland. This study agrees with Kunene (2006) who reported versatile use of sheep to provide meat and wool for households as a source of income.

Maintaining and improving a good breeding stock (Tibbo, 2006) is an important element to sheep management. However, observation made in this study is that, most farmers in these communal areas don't have rams. Ewes dominated the flocks. The findings from this study indicate that farmers in Sompondo and Gaga villages did not separate breeding ewes from rams. There was also an indication that the farmers did not make use of breeding seasons nor implement selective mating. Open season breeding has some advantages for the farmers because it increases mating opportunities for their ewes (Mahanjana and Cronje, 2000). This is in disagreement to our findings in the two villages where there is uncontrolled breeding and that makes it difficult to control breeding and to keep reproductive records. Uncontrolled breeding practises compromises planning for mating periods and selection quality criteria because any animal can mate with another animal (Sölkner et al., 2001) whether it is closely related or have poor traits. As a result, sheep tend to lamb throughout the year. Under controlled mating, lambing could coincide with periods of better feed availability or planned supplementary feeding. Low breeding rams percentage observed in the two villages could be attributed to lack of knowledge and appreciation of the importance of keeping the breeding rams by Sompondo and Gaga sheep farmers. In most of the flocks with a breeding ram, Sompondo and Gaga, the proportion of the males to females was very high; this therefore increases the chances of rams mating their relatives.

Many farmers in the two villages did not realise the value of owning and maintaining breeding rams (Berhanu and Avnalem, 2009), as they could not control access to other rams. Instead, they tended to castrate the males in

their flocks, as a measure of reducing straying or improving meat quality. Farmers in Sompondo and Gaga cull their sheep, but this is mainly due to old age or poor condition, which does not improve the breeding quality. Shortage of rams in the two villages had a negative impact on flock size. Therefore farmers' participation in programmes like ram exchange should be strengthened to reduce inbreeding in Sompondo and Gaga. Large stock like cattle, sheep and goats were owned by men in both villages whereas women owned small species like chickens which are mostly found close to the homesteads (Grandin et al., 1991; Bank and Qambata, 1999; Andrew et al., 2003).

In this study, the finding that households headed by females in both Sompondo and Gaga were prone to feed shortages and disease and parasites can be attributed to lack of accessibility to the credit facilities, lack of capital, poor technical skills and lack of access to extension services (Bank and Qambata, 1999). Women are more affected by these aforementioned factors than men hence it limits their participation and efficiency in sheep production. Therefore there is a need for an investigation into the control and accessibility to resources and benefits of sheep production by different gender groups in the two ecologically different communal area farming systems.

Most of the respondents in the two villages were pensioners. It suggests therefore that future investments will fall short of reliable information soon after death of the aging sheep rearing population across the villages except younger individuals begin to take interest. In addition, technologies meant to improve agricultural production might not be well received by the aging population (Agwu et al., 2008). Younger farmers are regarded as more receptive to new farming methods and they are more likely to take up the risk in implementing such new methods. Some young people perceive farming methods in communal areas as outdated and prefer formal employment in nearby urban areas (Starkey, 1996). If such perceptions are not corrected there may be a serious knowledge gap that will require a lot of attention to avoid the collapse of smallholder farming. This calls upon agricultural stakeholders and policy makers to reorientate the youth to take up vast opportunities from their elders in agriculture and more specifically communal farming. Findings that farmers in Sompondo and Gaga not only concentrate on sheep alone, but were involved in cattle, goats, and chicken ownership as well are an important feature for most African communal farmers (Mashatise et al., 2005). This is very important because diversification averts risks and promotes sustainable development in the two ecologically different communal areas. The integration of sheep with other enterprises observed in the two villages indicates a way of diversification in order to improve food security.

Cattle and sheep can be herded together in these two ecologically different villages using the same resources of labour hence realising a negative correlation between sheep and cattle sizes in both villages. As the number of sheep increases the number of cattle decreases. Sheep and goats do coexist on same grazing area, since goats are browsers while sheep are grazers these lucrative enterprise complement each other in Sompondo and Gaga. Indigenous sheep and goats, in developing countries are important for subsistence and socio-economic livelihoods of rural and peri-urban communities (Dovie et al., 2006; Kunene and Fossey, 2006; Kosgey and Okeyo, 2007). However, the issue of shared infections and effort to limit this should be prioritised among the farmers raising mixed species.

The observation that farmers in the two villages ranked reasons for rearing sheep differently suggest different perceptions and value each village attached to sheep. Sheep associates well with crop production for its manure can be applied to crops and small gardens while in return sheep may be feed on crop residues. The findings that sheep produce manure for fertilization are in agreement with those of Devendra (1992), who reported that sheep have a social-economic relevance and social-cultural roles and they produce manure to fertilize the land. Sheep manure was regarded more important in Sompondo village than in Gaga village and this is mainly attributed to the fact that there were more sheep in Sompondo village than cattle. Farmers in Gaga village applied cattle manure in the absence of fertiliser. In addition, more cropping was done in Sompondo village than Gaga village such that farmers in Sompondo made use of readily available sources of nutrients for their crops.

The finding that most farmers in Sompondo and Gaga housed their sheep in open kraal means that they lacked the resources and awareness that appropriate shelter can prevent many diseases particularly footrot and scours, and reduce mortality rates especially for lambs in the two ecologically different communal areas. Lambs which are often born in cold or wet conditions, have low fat cover and have a high surface area to birth weight ratio, which exacerbates heat loss (Stephenson et al., 2001). Such lambs become highly vulnerable to cold and wet periods. Footrot is a common problem during the wet season when sheep are housed in muddy or water-logged conditions. Higher incidences of footrot observed in highland rangeland (Sompondo) compared to lowland rangeland (Gaga) could be attributed to high rainfall received in this area. Dry and well ventilated house has been proven as a method of reducing deaths during wet season (Adak et al., 2005). Many farmers in the two villages also seem to be unaware that very effective sheep shelters can be built from local materials costing little more than the price of labour. Proper housing in the two ecologically different villages would protect animals against wind, cold, disease risks, rain and muddy

conditions, which prevail during rainy season (Adak et al., 2005). Farmers in the two villages are therefore highly encouraged to provide well drained floors and provide roofs in their kraals to reduce kid and lamb mortality during the rainy season.

Most of the farmers, in the two villages reported having a problem of high tick infestation and tick-borne diseases especially during summer. This finding is in agreement with Perrett et al. (2000) and Marufu et al. (2010) in cattle. The reason being that Eastern Cape Province due to its proximity to the coast is characterized by the semi-arid climatic conditions which are favourable for growth of tick species especially during rain season (Muchenje et al., 2008; Marufu et al., 2010). The reported high incidences of parasitic infections could be attributed to uncontrolled communal grazing system practised by the communal farmers where flocks from different households, graze together and mate irregardless of their health status. This is compounded by lack of proper disease and parasites control infrastructure in the communal areas. These promote prevalence of disease and parasites under the communal production systems (Marufu et al., 2010). Adoption of local indigenous breeds like Dohne merino, Damara and Zulu which are resistance to ticks and tick-borne diseases will go a long way in alleviating some of the problems hence can assist in improving the livelihood of the rural poor (Morand-Fehr and Boyazoglu, 1999; Devendra, 2001). Farmers should also be made aware that they need to dip and vaccinate their sheep in order to reduce disease incidences. Housing management should also be improved so as to reduce pathogenicity. Farmers in the two villages perceive usage of locally available ethno-veterinary medicine such as *Aloe* as the best way of controlling ticks. However, research on the efficiency, dosage rates, and application methods need to be validated. Application of train and visit methods of veterinary extension to farmers would result in improved disease diagnosis and ultimately improved animal health and husbandry.

The high incidences of theft reported in Gaga village can be accredited to proximity of the village to Alice town and its surrounding townships, where there is a ready market for the mutton meat. Marketing channels of stock made it easer to trade in stolen stocks (Dzimba and Matooane, 2005). Lack of sheep identification and poor conviction and prosecution of sheep rustlers attributes to increased sheep thefts in the lowland (Gaga) whereas in upland (Sompondo) due to distance and terrain, sheep thefts were fewer. To reduce sheep thefts, community members should take turns to flock sheep during the day and kraal them at night. Formation of neighbourhood watch committees to patrol the villages during the evening can help (Kynock and Ulicki, 2001). Awareness on importance and methods of sheep identification by Department of Agriculture should be strengthened to the farmers so that it can assist farmers to trace their animals. Law enforcement agents should also augment farmers' efforts by carrying out regular day and night patrols in the village.

The observation is that farmers in the two ecologically different communal areas had a handicap in accessing information on sheep management as well as information on markets, inputs, and service provision from various sources; most information exchange was between farmers. While information flows from farmer to farmer are highly effective (Ferrington, 1994) sources of information or improved technologies were limited. Distance from town had an influence on availability of information especially sheep marketing and pricing. Farmers in the upland rarely sell their animals directly on the small ruminants market due to transport costs, the time required, and a strong bargaining position towards the traders (Rodriguez, 1995). Farmers most commonly sell their sheep through the local village collector, to whom they generally have easy access. Farmers are familiar with this person who lives in the same village and sometimes is a member of a farmers group in the village. However, farmers in the lowland are slowly but surely selling their sheep direct to small vendors, retail butchers and consumers. Though farmers felt that they were not in a position to bargain efficiently, because of the frequent need of selling sheep for urgent cash requirements they had to sell thereby compromising on the pricing.

The second sources of information were government departments and non-governmental organisation. However, information from these sources was generally weak and interaction was irregular. Appropriate ways of communicating with farmers across the two villages need to be found and relevant information must be made accessible to them. Information dissemination and documentation on sheep production and marketing it through the electronic and print media can be useful in improving smallholder farmers' sheep production skills if it is done in local languages. In addition, enabling farmers to use new information or knowledge also requires access to inputs: improved dry season feeds is often impossible because of a lack of genetic material, knowledge regarding growing, processing and storage of feed and duel purpose crops (Slingerlands, 2000; Devendra, 2002; Dubeuf et al., 2004). Similarly, animal health was weakened by the lack of infrastructure (Lebbie and Mastapha, 1985; Tambi and Fomunyam, 1985; Philipsson et al., 2006) such as dip tanks for sheep, high cost of acaricides, and other animal health care products. Success in improving the current situation thus depends on greater access to information, know-how and the relevant inputs.

Stress, pain and painful husbandry procedures on management decisions have been noted in this study. The findings in this study are that there are some pain associated with husbandry procedures like tail docking,

and castration. Most of the farmers in Sompondo and Gaga castrated their male lambs that are not intended for breeding using a common knife, although some few shepherds chose to avoid the procedure for ethical, economic or practical reasons. Docking, which is the shortening of a lambs tail, is practised by most of the farmers in the two villages for perceived health reasons. However, both operations inflict pain to sheep but level of pain differs. Castration has been reported to inflict more pain than tail docking (Molony et al., 2002).

The finding that almost all farmers in the two villages did not use sheep dogs to herd their sheep is in support of finding by Kilgour and de Langen (1970) that dogs bite sheep and cause pain and stress to sheep. Pain and stress inflicted on sheep infringes on the welfare rights of sheep. Noise and sudden movements has also been noted in this study, this appears to influence sheep behaviour and this may contribute to stressfulness of routine procedures, although this requires further investigation. All the farmers in the upland and lowland do shear their sheep in the two villages. Observations have been noted in the two ecologically difference areas where sheep become reluctant to be sheared due to stress and pain, and this finding is in line with the observation found by Rushen (1996). Evidence from relevant literature is strongly suggesting shearing is associated with physiological indicators of stress (Fulkerson and Jamieson, 1982; Jephcott et al., 1987; Hargreaves and Hutson, 1990). However, there is also stress associated with gathering though little evidence exists. Movements for handling is usually brought about by the use of fear – evoking stimuli (Hutson, 2000) to elicit a flight response and sheep show behavioural and physiological indicators of stress when moved by a shepherd with that stress increasing considerably when dogs are used (Terlouw et al., 2008).

## Conclusions

Though the ranking of constraints faced by farmers from the two villages varied, shortage of feed and diseases/parasites were perceived to be the most important ones. Farmers keep their sheep in a free range type of grazing where there are no paddocks. According to the farmers' perception, sheep were reared for income generation. Cross breeds were the most preferred sheep breeds by farmers and the reasons being their ability to resist diseases, high growth rate and high feed conversion efficiency. Therefore, farmers' socio-economic factors and agro-ecological conditions should be considered when planning strategies for sustainable sheep breeding programmes which will alleviate poverty in communal areas. However, complexity of sheep production systems in two ecologically different communal areas calls for the determination of efficiency of sheep production systems for devising interaction strategies as a driving force towards improved sheep productivity and rural livelihood.

## ACKNOWLEDGEMENTS

The authors are very thankful to the Gaga and Sompondo community for availing their sheep and information. We also give thanks to Eastern Cape Provincial Department of Agriculture, Alice for giving invaluable information and the sponsors, Govan Mbeki Research and Development Centre (Project 263), University of Fort Hare, and the National Research Foundation (T134) for financing this research project.

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