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INFORMATION NEEDS OF COMMUNAL CATTLE FARMERS IN CONSERVATION AND TRANSFRONTIER AREAS: REPUBLIC OF SOUTH AFRICA

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ABSTRACT

The study investigated information needs of communal cattle farmers located on conservation and transfrontier areas in the Northern part of KwaZulu-Natal Province, South Africa. For triangulation of findings, key informant interviews, focus group discussions and 241 structured questionnaires were used. During focus group discussions, key findings showed that cattle management and handling as well as veterinary information are the most needed information by farmers from both study sites. Odds ratio estimates showed that older males (odds ratios 1.906 and 1.488) and literate farmers with tertiary education required more information on cattle management (odds ratio 5.878). Both study areas had common information needs on veterinary matters, conservation of cattle feeds, cattle management and handling as well as stock theft and depredation. This excludes alien invasive species which were reported to be a challenge by dominating communal grazing lands, hence reducing forage on conservation areas. A comprehensive action plan addressing information needs for cattle farmers located in the conservation and transfrontier areas by relevant stakeholders is crucial to minimise substantial economic losses caused by cattle diseases.

Keywords: Information needs, conservation, transfrontier cattle farmers

1. INTRODUCTION

Southern Africa has abundant and diverse wildlife, which are mostly concentrated on protected wildlife areas (Jori et al., 2011). African buffalo and lions are natural reservoirs of pathogens which transmit diseases to livestock and lead to economic losses (Jori et al. 2011; Jori & Etter, 2016). In many African countries, the majority of communal cattle farmers live at the borders of protected areas (Songorwa, 1999).

Livestock production, particularly cattle, is the most important element of rural development in these drier areas with poor arable land. In addition, most of these protected areas are found in remote locations with limited access to adequate health facilities for livestock leading to persistence of preventable diseases. These people occupy territory approximately 2.87 million km^2 in extent, 75% of which is arid or semi-arid (Thornton, 2002). A key constraint to successful integration of wildlife conservation and livestock production systems in southern Africa concerns the abundance of wildlife (Bengis et al., 2004). The separation of livestock from wildlife to create zones free from diseases that constrain livestock production and

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market access such as Foot and Mouth Disease (FMD) are seldom successful (Thornton et al., 2002).

The situation has contributed to under-investment in livestock with deficiencies in productive capacity and efficiency (Rich, 2009; Rich & Perry, 2011). As a result, southern Africa faces an ongoing limited access to high-value markets for animal products with little prospect for competition in these markets.

Information needs of cattle farmers that are in close proximity to protected areas (conservation areas) are unknown. There is, therefore limited information on the information needs related to cattle productivity in protected areas. Costs and benefits and/or impact of livestock farming and wildlife around protected areas (Chaminuka, Groeneveld, Selomane & van Ierland, 2012; Gillingham & Lee, 1999), as well as the possibilities of forming community-based wildlife conservation (Gibson & Marks 1995; Hackel, 1999) have been explored (Newmark & Hough, 2000). The information needs of farmers is assumed to be known. Yet, these are likely to vary with country, distance from game reserve and transfrontier areas. No previous researchers have investigated information needs of cattle farmers for optimum production of cattle. Some areas are in close proximity to the borders of neighbouring countries while others are close to game reserves/conservation areas which are normally confined within farming communities. Those that are close to the borders of neighbouring countries are known as transfrontier conservation areas (TFCA). This means that these areas are under an agreement signed by the Government of Mozambique, South Africa and Swaziland. Southern Africa TFCA are governed by the Peace Parks Foundation status, defining a TFCA as an area or component of a large ecological region that straddles the boundaries of two or more countries, encompassing one or more protected areas as well as multiple resource use (Spierenburg & Wels, 2006). The objective of the study was to determine information needs of cattle communal farmers which are located in the conservation and transfrontier areas.

The differences in the two study areas are socio-political in nature. During apartheid, transfrontier areas were placed under Swaziland government until 1982 when it was repossessed by the KwaZulu government (Kalley, Schoeman & Andor, 1999). People remained intact and retained their traditional practices in transfrontiers. In addition, the movement of livestock, particularly cattle, is restricted during outbreaks of disease such as FMD. In contrast, the apartheid government removed people in conservation areas in order to establish Hluhluwe/iMfolozi Parks.

2. METHODOLOGY

Hlabisa and Jozini centres were selected. Hlabisa represents conservation area whereas Jozini represents TFCA. Both areas reflect the rural areas in South Africa that are in close proximity to red line zones. A red zone line is a line that extends about 15 km wide outside a national park or game reserve. These areas are regarded as having the potential for bi-directional transmission of diseases due to wildlife which serve as reservoirs of many livestock infections and state-controlled diseases, such as FMD and bovine tuberculosis. Hlabisa communal land is entirely surrounded by Hluhluwe-iMfolozi Park, situated in KwaZulu-Natal, South Africa. The park covers an area of almost 100 000 ha (Michel *et al*., 2006). Hlabisa is made up of three tribal authority areas, namely Matshamnyama, Mdletsheni and Mpembeni. Each tribal authority is governed by its own chief (*inkosi*).

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The two study areas fall under UMkhanyakude District Municipality in the north of KwaZulu-Natal (KZN) Province, South Africa. The district is located in the north-eastern part of KZN, sharing a boundary with Mozambique in the north, and Swaziland in the north-west. The district covers a total land area of approximately 13 859 km^2 and with a population totalling 625 846.

2.1. Sampling of households

The survey was conducted with a total of 241 participants. Participants were purposively sampled for cattle ownership and they were sampled based on their willingness to participate. Using this cattle ownership criterion, a total of 150 respondents from Hlabisa (conservation area) and a total of 91 respondents for Jozini (transfrontier area) participated. This imbalance was caused by Jozini farmers' unwillingness to continue with interviews. The unwillingness was caused by FMD outbreak in the area which found the majority of the cattle in that area positive for the FMD virus (although the disease was subclinical). Transportation of cloven-hoofed animals in and out of FMD infected zones were banned. This also led to an international ban of South African beef and other livestock products. Farmers were suspicious that the research was part of their cattle being 'eliminated' from the market.

2.2. Key informant interviews

The study was introduced to members of livestock association for each area by an animal health technician from the local Department of Agriculture Office. This was done to build trust for working relationships and also to gain an in-depth knowledge of the area and information needs of farmers. Local state veterinarians, retired farmers, animal health technicians, extension officers and the chairman of Jozini livestock association were used as key informants. These interviews were conducted to gain a generic overview of the area relating to livestock production and challenges, the criteria used for providing important information to farmers, information dissemination approaches used, dipping schedules, and other important stakeholders involved.

2.3. Focus group discussions

An invitation was sent to farmers by the livestock association chairman to all dip tanks. Farmers chose dip tank committee leaders for focus group discussions. Focus group discussions took place during informal group meetings at dip tanks during dipping days. For conservation areas, focus group discussions consisted of 35 participating farmers. They were grouped according to their tribal authority areas. Two groups comprised of 12 farmers each with a third group comprising of 11 farmers. Focus group discussions conducted in transfrontier areas consisted of 20 livestock association members. Each member represented a certain dip tank. Guideline questions for groups included livestock production related questions and challenges, information needs of farmers, and dipping schedules. The groups were separated into three sub-groups according to farmers' dip tanks.

2.4. Questionnaire administration

The questionnaire for the structured interviews was used to determine information needs of the two study areas. Each questionnaire covered farmers' demographics, cattle production and information needs. Furthermore, 10% of the registered cattle owners at each of the 15 dip tanks in Hlabisa were selected for the structured interviews. A total of 167 questionnaires

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were completed. For transfrontier areas, 30 dip tanks were selected, and five farmers were randomly selected from each dip tank for interviews. This resulted in 150 questionnaires used in the study.

Demographic data such as gender, age, herd sizes, and education levels were recorded (Table 1). Farmers from both sites were asked to list and rank their information needs in order of importance.

2.5. Statistical analyses

Descriptive tables displaying survey data as well as frequencies and percentages to illustrate farmer narrative about information needs were used. Statistical analyses using SAS statistical software was also used to analyse data. The place (conservation area and transfrontier areas) is a key way to understand differences in information needs and other cattle related matters in this study.

3. FINDINGS

3.1. Demographic profile of respondents

The majority of communal farmers in both conservation and transfrontier areas were male (Table 1). Most of the farmers in transfrontier were over 60 years of age, while in the conservation area, the majority of farmers who participated in the study were between 31 and 45 years of age. Moreover, the majority of farmers around the conservation and transfrontier areas had primary school education. Few farmers went beyond matric (tertiary education) from both study areas.

Table 1: Farmers' demographic information

Characteristics	Conservation Area	Transfrontier Area
Gender (%)		
Female	14.7	28.6
Male	85.3	71.4
Age (%)		
<30	17.3	2.2
31-45	61.3	11.0
46-50	2.7	40.7
>60	18.7	46.2
Level of education (%)		
0-7 years of schooling	79	86
8-12 years of schooling	20	12
Post matric	0.67	2.3

3.2. Common livestock species

All farmers in this study kept cattle and they regarded cattle as the most important livestock species followed by goats and chickens. Conservation area had suffered a Newcastle Disease outbreak for chickens just before the study period, therefore few households reported having chickens. The average herd size for cattle was larger ($P<0.05$) in Jozini than in Hlabisa. Herd and flock size for cattle and goats respectively in Jozini were larger compared to Hlabisa

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(Table 2). Farmers around transfrontier areas did not possess any sheep due to their failure to survive in the area.

Table 2: Mean and standard deviation of the herd/flock sizes of livestock species in the conservation and transfrontier areas

Herd/flock sizes		
	Conservation area	**Transfrontier area**
Livestock species	n=150	n=91
Cattle	12.0 ± 8.57 [a]	19.7 ± 1.53 [b]
Goats	9.5 ± 1.10	12.8 ± 1.41
Chickens	15.3 ± 2.51	17.7 ± 2.12
Sheep	0.4 ± 0.18	0.0 ± 0.23

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

3.3. Information needs of farmers

Farmers reported their information needs in relation to cattle production (Table 3 and Table 4). It is important to note that information needs were deduced during both the focus group discussions and during semi-structured interviews through questionnaires.

Table 3: Common information needs of farmers for the conservation area

Information need(s)	**Conservation area (%)**
Cattle management	45.8
Veterinary issues	23.0
Conservation of cattle feeds	19.5
Control of invasive alien species	18.7
Stock theft and livestock depredation	17.4
Total	**125**

Table 4: Common information needs of farmers for the transfrontier area

Information need(s)	**Transfrontier area (%)**
Cattle management	50.5
Veterinary issues	20.4
Stock theft and livestock depredation	17.1
Conservation of cattle feed	16.0
Total	**104**

The percentages do not add up to 100% because farmers mentioned more than one information need(s). The above results were extracted from focus group discussions.

3.3.1. Cattle management and handling

Farmers reported cattle management and handling information to be the most important for both study areas. This type of information includes breeding, culling, castration, branding and dehorning. The majority of farmers do not have information on when to cull old cows and bulls. Farmers keep breeding cows and bulls until they die of disease. The branding of cattle was reported to be a long and difficult process. According to farmers, an application to Pretoria is required for the branding mark for each cattle farmer. Farmers with no reading and

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writing ability find this process tedious and difficult, hence their cattle remain unmarked. The information on this process of acquiring an individual mark was mentioned to be important by farmers. The precise timing for dehorning, branding and castration were reported to be a challenge since farmers seem to miss or have no idea of the right timing for the mentioned cattle management practices. Farmers reported that information on the precise timing of these activities would play a role in removing horns completely which would reduce losses caused by horns. Key informants such as animal health technicians and local veterinarians reported that training for branding was in place for farmers who were willing to acquire the skill of branding.

3.3.2. Veterinary issues

Veterinary issues comprise of vaccinations, specific veterinary medications, and various cattle diseases such as black quarter, red water, gall sickness and lumpy skin disease. The majority of farmers during focus group discussions reported that it is hard to apply correct dosages for cattle due to inability to read label information of any veterinary medicine. According to farmers, this is influenced by illiteracy rates amongst farmers and small font size. Therefore, this results in incorrect dosage application, thus lower impacts can be seen by farmers. Farmers located around the conservation area reported that their children assist them with reading since dosage is written in English whereas farmers located close to the transfrontiers reported font size as a major challenge. Farmers reported that information on animal or veterinary matters would be highly valuable and it would contribute to their cattle productivity.

3.3.3. Conservation of cattle feeds

Cattle feeds, especially in winter and drought periods, was the third priority of information required by the farmers from the conservation area whereas it was the fourth information need for the transfrontier area. Livestock feed scarcity was reported to be a challenge of cattle during focus group discussions. Farmers reported high rates of mortality of cattle during drought periods due to shortages of feed and water. Conservation of cattle feed such as silage and hay information were reported to be an important information need for their cattle to survive drought. Farmers mentioned that information on how to conserve fodder such as silage and hay bales for cattle would make a significant contribution in reducing cattle mortalities during drought periods.

3.3.4. Invasive alien species

Invasive alien species plants are those that are non-native to an ecosystem and which may cause economic or environmental harm or adversely impact biodiversity. This includes the decline or elimination of native species through competition, predation or transmission of pathogens and the disruption of local ecosystem and ecosystem functions (Butchart *et al*., 2010). During focus group discussions, farmers located in the conservation area reported invasive alien species (IAS) as another challenge for cattle since it reduces the forage availability. The most common invasive plants identified were bugweed and Spanish reed (*ubhici/ubukhwebezane* in isiZulu language). During focus group discussions, farmers reported that there were new types of invasive plants that were beginning to spread. Information on the control of these plants was reported to be important to have.

3.3.5. Stock theft and depredation

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Stock theft was reported to be a challenge by farmers. Farmers reported that there was no information on how thieves are being prosecuted, hence they get away with it. The South African judicial system finds it hard to prosecute stock thieves found with unmarked cattle. This makes it more difficult for cattle farmers to accept. Farmers reported that information on the terms and conditions of thieves to be prosecuted and arrested would be useful. Depredation of livestock, particularly goats and cattle, is common around conservation areas due to the escape of wildlife animals such as leopards to the farming communities. Farmers located around conservation areas reported incidents of livestock depredation and stated that Hluhluwe/uMfolozi Game Reserve is not compensating them when they suffer losses. Farmers in transfrontier areas did mention wildlife as a threat, however, the incidences have reduced tremendously since the old worn fences have been replaced with new fencing.

Table 5: Ranking of information needs

	Rank (mean)	
Information need category	**Conservation**	**Transfrontier**
Management and handling	1(1.50)	3(1.71)
Animal health	2(1.80)	1(1.60)
Feeds	3(1.82)	2(1.68)

No significance difference (P>0.05) was found between the two areas. The lower the rank, the greater the importance of information. The above results were extracted from the questionnaires.

The feeds information category includes the conservation of feed, proper winter feeds for the survival of breeding animals, and strategic grazing methods. Farmers around conservation areas ranked the feed information need category as the third most important after animal health. Farmers located close to the transfrontiers ranked animal health information category as the first, followed by feeds and lastly management and handling (Table 5). There were no significant differences (P>0.05) found on the information need categories of the two different areas.

Furthermore, the farmers ranked sources of information where they received information. There was a significant difference on farmers' days and meeting between the two study areas. Farmers located around conservation areas received more cattle information from farmers' days and meetings whereas farmers located around transfrontier areas received more information from animal health technicians (employed by the ministry of agriculture). Both study areas ranked radio as their second information source and there was no significant difference (P>0.05) on this source of information. Although farmers mentioned the inappropriate timing of agricultural programmes, they still use it as a major source for cattle information. Even though local radio stations broadcast agricultural programmes in vernacular language, agricultural programmes are scheduled to be in the early mornings of certain days, hence farmers engage in important daily roles such as going to the fields for weeding and taking cattle to the dip for dipping during the day.

Parents as a source of information was significant (P<0.05). Farmers located around conservation areas ranked it as number 4, whereas those that are located around transfrontier areas ranked it as number 3. Parents and other older members of the communities were regarded as people with knowledge and better experience for cattle farming. Furthermore, the

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television was ranked as number 6 by farmers around conservation areas while farmers located around transfrontier areas ranked it as number 4.

Table 6: The odds ratio estimates of rural farmers requiring information for cattle production between age, education and herd size

		Odds ratio	Lower CI	Upper CI
Information for cattle production				
Age:	Youth vs. adult	0.315	1.416	6.362*
	Old vs. Adult	1.906	1.031	3.521*
Education:	Primary vs. Tertiary	0.238	2.731	31.904*
	Secondary vs. Tertiary	0.468	5.878	73.904*
Gender:	Male vs. Female	1.488	0.802	2.760
Herd size:	Small vs. Large	0.953	0.929	0.978*

(*): Significant difference at P<0.05.

The odds of farmers requiring information for cattle production are shown in Table 6. The probability of farmers requiring information about cattle production is 3.17 higher for adults when compared to the youth.

The odds ratios of farmers requiring information about cattle production was 1.91 higher for the older age group when compared to the adult age group. The odds ratios of farmers requiring information about cattle production was 2.73 higher for farmers who have obtained tertiary education when compared to farmers who have only obtained primary education. The probability of farmers requiring information about cattle production was 5.88 higher for farmers who have attained tertiary education qualification(s) when compared to farmers who have only obtained a secondary education qualification. A unit increase in cattle herd increased the importance of requiring information about cattle production with 0.95.

4. DISCUSSION

Communal cattle farmers have information needs. It is important to note that good understanding of farmers' information needs will lead to relevant, effective, appropriate tools and usable content. There is a need to integrate various sources of information to facilitate empowerment and learning through the interaction of various stakeholders. This diversification of information sources will therefore enhance farmers' information needs. The availability of the majority of agricultural information is available through specific sources such as television and farming magazines (according to farmers). There is a need for a paradigm shift in providing information in an easy, accessible and user-friendly manner. The use of a pictogram system (with larger font sizes) to make messages more easily comprehensible for farmers with little ability to read and understand English and Afrikaans may be advisable.

Communal farmers have information needs that are disease-related; both cattle diseases (early diagnosis of different diseases for early treatment) and veterinary drug usage.

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According to Marufu, Qokweni, Chimonyo and Dzama (2011), cattle are exposed to external parasites such as ticks, and to diseases which reduce cattle performance, production and profitability on semi-arid rangelands. Ticks and tick-borne diseases are a great challenge to cattle productivity in semi-arid areas (Mapiye, Chimonyo, Dzama, Raats & Mapekula, 2009). It is therefore not a coincidence that farmers in both study areas ranked these two information needs as a priority. Communal cattle farmers mentioned the challenge of using veterinary drugs due to foreign language(s) on the leaflets/ labels of drugs that they do not understand. Thus, incorrect usage of drugs results. Marufu *et al*. (2011) argued that inappropriate and prolonged use of the same chemicals without rotations leads to development of acaricide resistance in ticks. Marufu *et al*. (2011) also stated that the prolonged use of acaricides will result in the contamination of meat, milk and the environment. In addition, Waichman, Eve and Da Silva (2007) found that in the Brazilian Amazon, the information displayed on product labels was not effective in promoting protective and safety measures. Thus, farmers located around transfrontier areas were not reading the labels due to small fonts and instructions and overly technical information.

Diseases such as black quarter, gall sickness, red water, lumpy skin disease, and spontaneous abortions are the diseases that challenge farmers. Devendra, Thomas, Jabbar and Kudo (2000) mentioned that diseases are a major constraint to the improvement of the livestock industry in the tropics. Farmers from both communities were unable to sell their cattle outside their District Municipality due to the international ban of moving cloven-hoofed animal products (including animals themselves) since 2011.

Alien Invasive Species (AIS) are one of the biggest threats to ecosystems and biodiversity worldwide (D'Antonio & Kark, 2002). Richardson and Van Wilgen (2004) argue that South Africa has a long history of problems with invasive aliens even though the Working for Water Programme was initiated in 1995 to conduct and coordinate alien-plant management. Hlabisa/conservation area's cattle farmers had concerns of AIS since these types of plants dominate grazing lands and are difficult to control. Farmers mentioned that IAS limit forage for their cattle. In addition, Bester, Matjuda, Rust and Fourie (2003) argue that in rural areas, there are limited and inadequate veld management practices resulting in overgrazing and overstocking. Further research on how these plants spread and their appropriate control is crucial.

Farmers mentioned a lack of knowledge on how to conserve feed to supplement during winter and drought periods. Lesoli (2008) reported that reduced feed and water supply increases cattle mortalities. Cattle should be given supplements to improve milk yield, growth rate and body condition (Mapiye *et al*., 2009). Furthermore, Andrew, Ainslie and Shackleton (2003) and Mapiye *et al*. (2006) continue to affirm that small-scale farmers' purchase of feed resources and adoption of fodder conservation technology is high compared to communal farmers who are resource poor.

Farmers from both study areas reported that cattle management and handling is an important information need due to their poor productivity rates. Uncontrolled mating, weak with small body frame bulls and infertile cows dominate their herds. In communal areas, herds from different households are allowed to graze together and mate regardless of their health status (Marufu, Chimonyo, Dzama & Mapie, 2010). Mapiye *et al*. (2009) found that the breeding season was undefined and mating system was largely uncontrolled in the communal areas with no record keeping. Therefore, there is no controlled breeding for improved genetics.

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The probability of information required by farmers are shown through high odds ratio estimates. The observation that adult farmers require more cattle information compared to the youth farmers was reported by Swarts and Aliber (2013). Their study shows that black youth are not choosing to take up agriculture as a career or as a key component of a livelihood strategy. Research on strategies of how to engage youth in farming, particularly in communal lands, is required. Farmers with tertiary qualifications required more cattle information compared to farmers with primary and secondary education. This shows that education has a strong influence for requiring information.

The study shows that veterinary authorities pay more attention to FMD during the outbreak and after it. There is also a need of on-going awareness programmes that assist farmers on how to prevent such diseases, especially since their cattle stand high chances of contracting state controlled diseases due to their geographical location. FMD is considered as one of the most important infectious animal diseases in the world, mainly because it imposes severe economic losses due to the restrictions in the trade of livestock and its products within infected countries (Thompson *et al*., 2002). Custom feeding cattle programmes (a type of feeding operation which finishes beef cattle prior to slaughter) need to be considered for communal cattle farmers. Custom feeding cattle programmes may help farmers to escape challenges of limited forage and water availability due to drought, alien invasive species which dominate communal grazing lands, as well as stock theft.

5. CONCLUSIONS AND WAY FORWARD

The use of various participatory methods such as key informant interviews, focus group discussions and semi-structured interviews using questionnaires facilitated the identification of key information needs of communal cattle farmers. Research shows that communal cattle farmers have common information needs in both conservation and transfrontier areas, although their priority rankings were slightly different. The location of farmers for both study areas did not portray any significant difference ($P>0.05$) in terms of information needs. The non-existence of research on the social impact caused by cattle theft calls for research topics within an array of academic fields since cattle contributes to food security of the country. A comprehensive action plan addressing specific information needs for livestock farmers located in the red line zone by relevant stakeholders is crucial to minimise substantial economic losses caused by cattle diseases transmitted by wildlife. There is therefore a need for policy reform to protect such farmers from losing their livestock. These policy reforms will play a role in poverty alleviation developmental programmes and initiatives for rural farming communities in close proximity to conservation and transfrontier areas.

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