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LOW CATTLE MARKET OFF-TAKE RATES IN COMMUNAL PRODUCTION SYSTEMS OF SOUTH AFRICA: CAUSES AND MITIGATION STRATEGIES

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ABSTRACT

Market off-take rate is low in the communal cattle production system of Africa, with off-take rates of between 5 and 10%, compared to 25% in the commercial sector. Pre-tested structured questionnaires were administered between June and July 2007 to 183 smallholder farmers to determine factors that influence decision to sell cattle in the Eastern Cape Province of South Africa in three randomly selected municipalities. The average off-take rate in the sampled municipalities was 12%, which was much lower than that of the commercial sector (25%). Education, market distance, body condition, and herd size were significantly associated with municipality ($p<0.05$). Chris Hani had the highest number of the interviewees having reached at least primary education. Farmers in Amatole municipality sold their cattle in markets that were far away. The body condition of cattle in Chris Hani was the best. Lack of information access reduced cattle sales. Presence of markets that farmers like in or near their communities facilitated cattle sales. Smallholder farmers sold more cattle as transport became more available. The probability of smallholder farmers selling their cattle decreased as the body condition of cattle increases. As the household head changed from being male to being female, the probability of selling cattle increased. It is, therefore, evident that an integrated approach is likely to underpin an efficient livestock marketing system. This requires a joint effort by the government, municipalities, smallholder farmers, producer organizations, and private sector role players. Group marketing, decentralization of cattle information centers, and the involvement of communal farmers' in the dissemination of information plays a critical role in improving the decision to sell cattle amongst the smallholder farmers.

Keywords: Auctions; Marketing; Nguni cattle; Rural livelihoods; Smallholder farmers.

INTRODUCTION

For the poor, cattle have a multiple of functions (Musemwa, Chagwiza, Sikuka, Fraser, Chimonyo & Mzileni, 2007; Rege & Gibson, 2003; Chimonyo, Kusina, Hamudikuwanda & Nyoni, 1999). These include provision of draught power, manure, cash sales, among other socio-economic functions (Ayalew, King, Bruns, & Rischkowsky, 2003). Cattle, therefore, meet the multiple objectives that the poor thrive to meet. Most smallholder farmers in sub-Saharan Africa keep livestock because their land is largely marginal and not suitable for cropping (Hanotte, Bradley, Ochieng, Verjee, Hill & Rege, 2002; Chimonyo, Kusina, Hamudikuwanda, Nyoni & Ncube, 2000). The erratic rainfall and high incidence of droughts in the Eastern Cape makes a large majority of the population to depend on livestock and livestock products for their livelihoods (Musemwa et al., 2007; Musemwa, Mushunje, Chimonyo, Fraser, Mapiye & Muchenje, 2008). It is, therefore, not a coincidence that the Integrated Sustainable Rural Development Strategy (ISRDS, 2004) identifies livestock farming as the agricultural enterprise with the most likely chance of improving household food security,

alleviating poverty, and improving livelihoods in communal farming areas of South Africa (Coetzee, Montshwe & Jooste, 2004). Although livestock thrive well in the marginalized environments, the market off-take rate is low. Off-take rates between 5 and 10% have been reported, compared to 25% in the commercial sector (Nkhori, 2004).

With the increased demand for organic meat by consumers, there is a growing trend towards adopting livestock genetic resources that produce meat without the extensive use of chemicals, acaricides, growth promotants, and synthetic feeds (Wollny, 2003). Local cattle breeds, such as the Nguni cattle, of which most of them are found in the communal production system, have been shown to have a huge potential to produce high quality beef with little, if any, use of such chemicals (Mapiye, Chimonyo, Dzama, Raats & Mapekula, 2009; Muchenje, Dzama, Chimonyo, Strydom, Hugo & Raats, 2009). Besides its resistance to tropical diseases and parasites, such as tick-borne diseases (Marufu, Chimonyo, Dzama & Mapiye, 2009), Nguni is highly adaptable to poor quality grazing and conditions of excessive heat and humidity (Muchenje et al., 2008; 2009). They have a huge potential to produce high quality products under rangeland conditions (Wollny, 2003). In addition, the Nguni cattle have high fertility, a small calf, which makes for an easy birth, and have superior productivity indices compared to imported breeds (Bester, Matjuda, Rust & Fourie, 2005).

The attributes of the Nguni have prompted a number of agencies to introduce them in rural communities in South Africa (Mapiye, Chimonyo, Muchenje, Dzama, Marufu & Raats, 2007). Its suitability for extensive production systems makes it an ideal breed for livestock production that reduces emission of greenhouse gasses into the atmosphere. Extensive animal production requires little, if any, manufactured feeds, which are a source of gases, such as carbon dioxide. These gases are a major contributor to global warming and climate change. Use of Nguni cattle, therefore, is environmentally friendly, as they require no dietary supplements and the product has no chemical residues. Unfortunately, the Nguni cattle populations are decreasing, largely due to the introduction of imported breeds and the indiscriminate crossbreeding.

The Nguni cattle development project was initiated in 1998 by the University of Fort Hare in collaboration with rural development agencies in the Eastern Cape Province, with the goal of expanding the program to all the nine provinces of South Africa. Details of the project are described by Mapiye et al. (2009). Briefly, interested communities are given two bulls and 10 in-calf heifers to allow them to build up a nucleus herd. All the existing bulls in the community are replaced by registered Nguni bulls. After five years, the community gives back to the project two bulls and 10 heifers, which are then passed on to another community. The 'pay it forward' system, where each community pays dividends of its original gift to another, is applied. One of the conditions of the project is that communities should have fenced grazing areas, a rangeland management committee, and practicing rotational resting at specified stocking rates. The long-term goal of the program is to develop a niche market for Nguni beef and skins and to position the communal farmers for the global beef market through organic production and product processing. The project has benefited about 45 communities to date out of the target of 100. The participatory approach of the University of Fort Hare model provides a quick, viable, and sustainable mechanism through the establishment of nucleus Nguni herds in the communal areas. The Nguni herd is under threat due to the introduction of exotic breeds, such as the Afrikaner in South Africa, by other livestock development programs that were put in place by the apartheid government. A project development committee, made up of interested stakeholders, is in charge of the development of infrastructure, training of farmers, and the redistribution of animals. The implementation of the model is conducted in collaboration with the Department of Agriculture in South Africa.

Although the Nguni breed is now accurately viewed as an appropriate genetic resource for low levels of management with a high potential to increase sustainability and improve rural livelihoods (Anderson, 2003; Simianer, Reist-Marti, Gibson, Hanotte & Rege, 2003), more effort is required to develop its marketing channels and identify and develop niche markets for the products from Nguni cattle. Certainly, as far as the market for Nguni is concerned, organic foods are in vogue. Despite the efforts, the market off-take in rural communities is low. To enhance the contribution of the Nguni cattle to create wealth among the poor, it is crucial to understand the reasons for the low off-take. Identifying the reasons for low off-takes enables policymakers and planners to provide a complete package to farmers that would encourage them to sell their animals. In addition, predicting off-take enables planners to predict cattle sales and enable the development of strategies to address the constraints farmers face. For example, in a survey conducted in the Eastern Cape of South Africa (Musemwa et al., 2008; Mapiye et al., 2009), it was reported that most smallholder farmers claimed to keep cattle mainly for selling. Despite this, actual cattle numbers sold were low. The objective of the current study was to determine the factors that affect the probability of smallholder farmers to sell their cattle as well as to come out with solutions to factors hindering farmers from selling their cattle.

MATERIAL AND METHODS

Description of study sites and farmer selection procedure

The study was conducted in Amatole, Chris Hani, and Alfred Nzo municipalities of the Eastern Cape, where the University of Fort Hare Nguni Cattle Project was initiated.

Table 1: Pedo-climatic conditions and the number of respondents for each community studied

Production System	Community	Respondents	Rangeland type	Annual rainfall (mm)	Mean annual temp (°C)	Altitude (m)	Soil type
Amatole	Dyamala	6	Swt	300-500	16	500-550	Loam
	Dyamdyam	11	Swt	800-1000	20	200-300	Sandy
	Ityali	12	Swt	450-600	16	500-550	Loam
	Kwamasele	26	Swt	450-600	16	400-600	Loam
	Kwezana	6	Swt	450-600	16	500-550	Loam
	Melani	14	Swt	450-600	16	500-550	Loam
	Msobubvu	6	Swt	450-600	16	500-550	Loam
	Ncera	13	Swt	450-600	16	500-550	Loam
	Ntselamanzi	16	Swt	450-600	16	500-550	Loam
Chris Hani	Upper Mnxe	18	Sr	650-1000	12	600-1400	Sandy
	Tiwane	13	Sr	650-1000	12	600-1400	Sandy
	Hex river	11	Sr	450-700	14	1350-1450	Sandy
Alfred Nzo	Caba-mdeni	13	Sr	600-800	12	1250-2000	Sandy-Loam
	Saphanduku	10	Sr	650-1000	14	600-1400	Sandy
	Mahobe	9	Swt	650-1000	14	600-1400	Sandy

Source: Acocks (1988) (**Swt**-sweet; **Sr** –Sour)

In each municipality, communities were randomly selected. The reason for selecting different municipalities was that the municipalities emerged from different administrations, which provided different support services to farmers, and thus might lead to differences in marketing constraints amongst the farmers.

The climate varies according to the distance from the ocean. Coastal areas enjoy mild temperate conditions ranging between 14 and 23°C, while the inland areas experience slightly more extreme conditions with temperatures of 5 to 35°C. Inland mountain areas experience winter snows and summer rainfalls. Table 1 shows pedo-climatic conditions and the number of respondents for each community studied. The Eastern Cape is the only one of South Africa's nine provinces to have all seven of its biomes, or ecological zones, and twenty-nine Acocks veld types within its boundaries (ECDC, 2003). This gives it a tremendous diversity of climates, allowing for a vast range of activities. The province has always been a livestock farming area. Today, the province is the country's premier livestock region and presents excellent opportunities for meat, leather, and wool processing. Selection of respondents was based on cattle ownership and farmer's willingness to participate in the research. All farmers willing to participate and owned cattle were interviewed. Household heads were interviewed individually at their homesteads. In the absence of household heads, any elderly member of the household was interviewed.

Data collection

Direct observations were made on the cattle housing structures of Nguni cattle project beneficiaries, availability and condition of infrastructure and condition of veld and cattle. Secondary data on cattle production and marketing in communal areas of the Eastern Cape was collected through interviewing University of Fort Hare Nguni cattle project officials, community leaders, extension officers, and academics who were doing livestock researches in communal areas of the Eastern Cape Province. In addition to these secondary sources of data, municipality officials were also interviewed about the cattle marketing services they provide to smallholder farmers. Following the secondary data collection, pre-tested structured questionnaires were administered, between June and July 2007, to 183 smallholder cattle farmers who had benefited from the University of Fort Hare Nguni cattle project.

Statistical analyses

Data analysis was performed using SPSS (2006). Tests of association of market availability, market distance, transport availability, transport affordability, information access, current market price and condition of cattle, herd size, method of payment, household size, sex, age, and level of education of head of household with municipality were performed. The market off-take rate in each municipality was calculated using the formula below:

$$Market\ \ offtake\ = \frac{cattle\ \ sold\ \ in\ each\ \ municipali\ ty\ in\ the\ last\ 12\ \ months}{Munisipali\ ty\ \ herd\ \ size}\ X\,100\,\%$$

Farmers in communal areas differ on how they market their cattle. Others sell, while others do not. Therefore, this implies that the problem that needs to be solved needed a method that was able to explain a binary endogenous variable (yes/no) by a set of covariates that determine the outcome of the decision. A typical method used to solve such dichotomous variables is the logistic regression (Hosmer and Lemeshow, 2000). Following Gujarat (2003), the cumulative logistic distribution function for factors affecting cattle selling was specified as

$P = \frac{1}{1+e^{-z}}$; where P was the probability of selling cattle by a farmer and Z is a function of m explanatory variables (X). B is the set of coefficients explaining the effect of each variable X and was expressed as:

$$Z = B_0 + B_1X_1 + B_2X_2 + \ldots B_mX_m.$$

The probability of not selling was given by:

$$1 - P = \frac{1}{1-e^{z}} \quad .$$

The conditional probability of the outcome variable follows a binomial distribution with probability given by the conditional means $P_{(i).}$ The logistic model in terms of logs is:

$$\log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k$$

Where $\log \frac{p}{1-p} = Z$

The log of odds ratio is not only linear in X, but also linear in the Bi variable and, as a result, OLS is used. Taking the stochastic term μ into account, the logit econometric model to be used was:

$$Z = B_0 + B_1X_1 + B_2X_2 + \ldots\ldots\ldots\ldots B_mX_m + \mu.$$

This econometric model was used and treated against the potential variables, which are assumed to affect the marketing in communal areas of the Eastern Cape. Variables included in the model were market availability, market distance, transport availability, transport affordability, information access, current market price and condition of cattle, herd size, method of payment, household size, sex, age and level of education of the head of household.

RESULTS

Farmers' socioeconomic profile

The majority of the households in Alfred Nzo (91 %), Amatole (87 %), and Chris Hani (64 %) municipalities were male-headed. Mean household size across all the municipalities was 7 ± 4 members. Most of the interviewees in Amatole (85 %), Alfred Nzo (72 %), and Chris Hani (61 %) were aged above 50 years and relied on pensions for their livelihoods (Table 2).

Table 2: Sources of income amongst the sampled households per municipality

	Rank (mean rank)[a]		
Source of Income	**Amatole** (n=110)	**Chris Hani** (n=41)	**Alfred Nzo** (n=32)
Crop sales	3 (1.83)	5 (2.44)	5 (2.40)
Livestock sales	5 (1.93)	3 (1.83)	4 (1.74)
Salary	2 (1.20)	2 (1.30)	2 (1.60)
Pension	1 (1.09)	1 (1.16)	1 (1.09)
Piece Jobs	3 (1.83)	4 (2.00)	3 (1.67)

[1] The lower the rank of source, the greater is its importance.

[0] Mean rank

The majority of the interviewees had at least primary school education (52% Chris Hani, 51% Amatole, and 50% Alfred Nzo) and did not specialize in cattle production (77, 83, and 97%), respectively. Level of education significantly varied with municipality ($p>0.05$). Chris Hani has the highest number of the interviewees having reached at least primary education. The majority of households in Alfred Nzo (82%), Chris Hani (78%), and Amatole (70%) acquired their cattle through buying. On average, 80% of the farmers in the three sampled municipalities did not have access to credit.

Livestock species kept, cattle herd composition

Cattle are the most important livestock species in Amatole, Chris Hani, and Alfred Nzo district municipalities compared to other livestock species, as shown in Table 3. In all the sampled municipalities, cattle were the most important livestock specie, followed by sheep and goats.

Table 3

Rank of livestock species kept by farmers in the E.C province of South Africa.

	Rank (mean rank)[a]		
Livestock species	**Amatole** (n=110)	**Chris Hani** (n=41)	**Alfred Nzo** (n=32)
Cattle	1 (1.19)	1 (1.39)	1 (1.19)
Goats	3 (2.18)	3 (2.44)	3 (2.00)
Chickens	4 (2.68)	5 (3.62)	5 (3.20)
Sheep	2 (1.95)	2 (1.71)	2 (1.80)
Pigs	5 (3.71)	4 (2.80)	8 (5.00)
Horses	7 (4.60)	7 (4.17)	6 (3.67)
Donkey	6 (4.33)	8 (4.67)	7 (4.00)
Turkeys	- [a]	6 (4.00)	4 (2.55)

[1] The lower the rank of species, the greater is its importance.

[a] No turkey ownership was reported in Amatole district municipality.

There was a significant variation of herd size across the sampled municipalities. Chris Hani municipality had more cattle than Amatole and Alfred Nzo. Amongst the cattle, the breeding females make up the largest proportion of the herd (Table 4).

Table 4

Average herd size and composition

Herd Composition	***Municipality***		
	Amatole	**Chris Hani**	**Alfred Nzo**
Calves	2.1 ± 3.3 (21%)	2.7 ± 3.9 (20%)	1.6 ± 2.5 (16%)
Steers	1.2 ± 2.0 (13%)	1.5 ± 3.5 (11%)	1.2 ± 2.6 (12%)
Heifers	1.7 ± 2.5 (18%)	3.0 ± 3.9 (22%)	1.5 ± 2.0 (15%)
Cows	3.5 ± 4.1 (36%)	4.3 ± 5.4 (32%)	4.0 ± 3.7 (40%)
Oxen	0.8 ± 1.7 (8%)	1.4 ± 1.7 (10%)	1.2 ± 1.9 (12%)
Bulls	0.4 ± 1.2 (4%)	0.7 ± 1.1 (5%)	0.5 ± 1.4 (5%)
Average herd size	9.7 ± 10.0	13.5 ± 12.2	9.9 ± 9.5

(%) Proportion to total municipality herd size

3.3 Reasons for keeping cattle

The principal reason why rural households keep cattle is for sales in all the sampled municipalities (Table 5). Income generated from cattle sales is used to finance household requirements, such as food, school fees, agricultural activities, and enterprises. An interesting observation is that respondents in Amatole and Alfred Nzo do not regard cattle draught power as important for keeping cattle, while the opposite is true for Chris Hani. Keeping cattle for milk consumption is more important than keeping them for meat consumption.

Table 5: Reasons for keeping cattle as ranked by respondents

	Rank (mean rank)[a]		
Reason	**Amatole** (n=110)	**Chris Hani** (n=41)	**Alfred Nzo** (n=32)
Meat	5 (3.45)	7 (3.28)	4 (3.33)
Milk	3 (2.51)	3 (2.38)	2 (2.72)
Draught power	6 (3.55)	2 (2.23)	8 (4.42)
Manure	4 (3.06)	6 (3.17)	7 (4.16)
Skin	9 (4.79)	9 (4.92)	9 (5.20)
Sales	1 (2.09)	1 (2.17)	1 (1.84)
Status	7 (4.40)	4 (2.75)	3 (3.25)
Dowry	8 (4.50)	8 (3.83)	5 (3.67)
Ceremonies	2 (2.47)	5 (3.15)	6 (4.04)

[a] The lower the rank of a reason, the greater is its importance.

3.4 Gender participation in cattle marketing activities

Adult males dominated all cattle marketing-related activities in all municipalities, as shown in Table 6. Male youths and hired labor participated in cattle production activities more than adult females, except in purchasing, slaughtering, and selling. Chris Hani had the highest number of the interviewees having reached at least primary education. Female youths are minimally involved in all cattle marketing-related activities in the three sampled municipalities. In the selling, purchasing, and slaughtering of cattle, no females were involved in all the three sampled municipalities.

Table 6: Participation (%) of different gender groups in cattle production

Activity	**Municipality**														
	Amatole (n=110)					**Chris Hani (n=42)**					**Alfred Nzo (n=31)**				
	Adults		**Youths**			**Adults**		**Youths**			**Adults**		**Youths**		
	M	**F**	**M**	**F**	**HL**	**M**	**F**	**M**	**F**	**HL**	**M**	**F**	**M**	**F**	**HL**
Purchasing	82	18	0	0	0	78	19	3	0	0	69	27	4	0	0
Slaughtering	83	12	4	0	1	73	15	6	0	6	64	25	7	0	4
Selling	87	12	0	0	1	67	30	3	0	0	67	33	0	0	0

M=males**, F=**females and **HL=** Hired labour

Marketing channels

In Chris Hani and Alfred Nzo, the majority of the respondents (58 and 53%, respectively) sell their cattle through auctions, while in Amatole; only 16% use this channel (Table 7). The most preferred marketing channel in all the sampled municipalities is auction. Less than 11% of the respondents in the Amatole, Chris Hani, and Alfred Nzo sell their cattle to speculators. They indicated that they are satisfied with the use of this channel because the buyers just pay on spot. Less than 6% of the farmers in the three municipalities used abattoirs as a marketing channel. The mean distance over which the beneficiaries of the Nguni Cattle project sell cattle is 15, 4, and 6 km for Amatole, Chris Hani and Alfred Nzo, respectively. Market distance significantly varied across municipalities ($p>0.05$).

Table 7: Marketing channels used by farmers in the Eastern Cape Province of South Africa

Marketing channel	*Amatole*		*Chris Hani*		*Alfred Nzo*	
	Actual	**Preferred**	**Actual**	**Preferred** %	**Actual**	**Preferred**
	%	%	%		%	%
Auction	18	35	58	49	41	53
Private Sales	43	12	26	24	50	0
Abattoirs	6	16	0	0	6	0
Butchery	4	6	0	0	0	0
Speculators	10	0	11	5	10	0
Both auction and private sales	20	33	5	22	4	47

Cattle prices and market off-take rates

The off-take rate in Amatole was 12%, while in Chris Hani, it was 9% and in Alfred Nzo, it 16%. Chris Hani had the highest mean cattle price of R 4 061 closely followed by Amatole which has a mean cattle price of R 3 897 Alfred Nzo has the least mean price of R 3 305. Prices of cattle range between 1,500 and 7,000 in Amatole, 1,800 and 7,000 in Chris Hani, and 1,500 and 5,000 in Alfred Nzo.

Market opportunities and constraints to Nguni cattle marketing

Table 8 shows that buyers and friends provide minimal market information in all the sampled areas. In Amatole (80%) and Chris Hani (56%) the majority of households do not have access to market information. From those who had access to market information, the majority of them acquired the information from neighbors.

Table 8: Sources of market information

	Amatole	Chris Hani	Alfred Nzo
Friends	2.73	0	3.13
Neighbours	14.54	53.85	40.63
Buyers	2.73	0	0
Do not have	80	46.15	56.24

Table 9 summarizes the opportunities as perceived by the respondents in the various municipalities.

Table 9: Farmers' views on market opportunities for Nguni cattle

Opportunity	***Municipality (%)***			***Total***
	Amatole %	**Chris Hani** %	**Alfred Nzo** %	***%***
High price for hides	21	25	22	26
High price for cattle	9	55	3	23
Existence of competitive buyers	27	5	34	22
High market off-take	10	5	13	9
None	33	10	28	24

The four most important opportunities, namely, high price for hides (26%), high price for beef (23%), existence of competitive buyers (22%) and high market off-take rate (9%) are all directly concerned with Nguni cattle marketing. In contrast to these, 24% of the respondents do not see any opportunity in indigenous cattle marketing. Market availability, transport availability, body condition of cattle, information access, and gender of household head, as shown in Table 10 affect cattle sales significantly.

Table 10: Constraints to Nguni cattle marketing

Analysis of maximum likelihood estimates				
Parameter	**Estimate**	**Error**	**Chi-Square**	**P-value**
Intercept	14.5488	4.9590	8.6071	0.0033
Sex	4.7246	2.0549	5.2865	0.0215
Age	-1.3229	0.7723	2.9339	0.0867
Education	1.2223	0.8806	1.9268	0.1651
Household size	0.00248	0.1216	0.0004	0.9837
Herd size	0.00133	0.0606	0.0005	0.9824
Information access	-7.2121	2.2111	10.6390	0.0011
Market price	0.0465	0.5126	0.0082	0.9276
Market distance	-0.3879	0.6506	0.3556	0.5510
Market availability	2.8836	1.3306	4.6965	0.0302
Transport availability	4.2060	1.4369	8.5683	0.0034
Transport affordability	1.8118	1.2262	2.1831	0.1395
Method of payment	0.2698	1.1086	0.0593	0.8077
Body condition	-5.0995	1.6142	9.9805	0.0016

Lack of information access reduced cattle sales. The presences of markets that farmers like in or near their communities facilitate cattle sales. Smallholder farmers sell more cattle as transport become more available. The probability of

smallholder farmers selling their cattle decreases as the body condition of cattle increases. As the household head changes from being male to being female, the probability of selling cattle increases.

DISCUSSION

The old aged dominates the agricultural sector. This, therefore, is a challenge to the government as participation of youths in agriculture is vital as they are the farmers of the future. The observation, that nearly 50% of the heads of households had no formal education, could be explained by the lack of schools in rural areas. The lack of access to education was designed, by apartheid, to ensure that the majority of the indigenous population of South Africa would not receive adequate skills. This would perpetuate poverty and force them to be employed in menial jobs (particularly in commercial farms and mines). The poor level of education is now adversely hindering agricultural productivity in the rural communities (Mapiye et al., 2007). Fortunately, the problem of household heads having never attended school is likely to diminish quite significantly over the years as access to education is improving significantly in rural areas (Nkhori, 2004). Many of the existing household heads are elderly and the youths are increasingly having access to formal education, and are likely to be more productive and more readily to accept, initiate, and manage development projects (Mapiye et al., 2009). Identifying and developing marketing options, including adding value to products, becomes easier.

The observed large mean household size across all the municipalities conforms to the sizes reported in many rural communities in Southern Africa (Chimonyo et al., 1999; Mapiye et al., 2009). The large household sizes could suggest that the required labor for cattle production and marketing is available in abundance. The large household sizes, however, increase competition and pressure for food within the household (Musemwa et al., 2007). More than 80% of the farmers in the three sampled municipalities did not have access to credit facilities. Finance is essential during the production process for the purchase of stock, drugs and supplements, and during the marketing process for transport and during value adding processes (Hobbs, 1997; Strauss Commission, 1996). It is, therefore, worrisome to see poor access to credit in the surveyed municipalities, and undoubtedly this shows that interventions are needed in this regard. The lack of access to credits could be due to lack of collateral security. Lending institutions tend to shy away from giving credits to small-scale farmers, as the transaction costs are high, as also acknowledged by the Strauss Commission (Strauss Commission, 1996).

The involvement of women in many household chores, such as caring for children, could explain their minimal participation in cattle production and marketing. Amongst the cattle kept, the breeding females make up the largest proportion of the herd as they are an inflation-free and a high interest form of banking for poor resource farmers. Cattle give birth and make the herd grow (Mapiye et al., 2009). Keeping cattle for milk consumption is more important than keeping them for meat consumption in the entire sampled municipalities as meat is a terminal product. The finding that off-take rates were low in the municipalities where the cattle prices were high was unexpected. Such a pattern could indicate the different reasons, times as well as markets where the farmers sell their cattle, as reported in literature (Coetzee et al., 2004).

Market availability affected cattle sales. These results agree with those of Nkhori (2004) and Hobbs (1997). As markets become more available and accessible to farmers, the more they would offer farmers with competitive prices. Good prices are a likely result in the farmers willing to sell since rational people want good offers, which will, in turn, increase

cattle sales. As expected, the results suggest that those households that had access to markets are likely to sale more cattle than those that had little or no access to markets. The presence of markets that farmers, like in or near their communities, facilitates cattle sales. Similar findings have been reported in other parts of South Africa (Nkhori, 2004; Montshwe, 2006; Musemwa et al., 2007). Lack of markets also increases transactional costs which, in turn, reduce the probability of farmers selling their cattle (Staal, Delgado & Nicholson, 1997). Identifying markets is, therefore, likely to have a positive impact on the marketing of the introduced Nguni cattle.

The observation that farmers who had access to information were not likely to sell their cattle was also unexpected. In the current study, farmers who had information about market prices and trends tended to make rational and appropriate decisions. The information also strengthened their negotiating ability during transactions with buyers and, consequently, prevented possible exploitation by buyers (Coetzee et al., 2004). Access to information resulted in the farmers not completing deals with buyers who, in most cases, would be exploiting them. The failure to complete deals, consequently, reduces cattle sales.

More than 30% of the respondents preferred to sell their cattle through auctions of which most of the buyers at auctions are speculators and butcheries who would want to maximize profits (Barrett, Chabari, Bailey, Little & Coppock, 2003). As a result, as the farmers became informed about market prices, they would not sell their cattle if buyers offered prices lower than market rates. Farmers with access to information were aware of markets that provide high and attractive prices. The available markets were, however, far from the communities. Abattoirs, which provide attractive prices, have, unfortunately, high risks of having their cattle condemned. Pricing at abattoirs also prejudice small breeds with a compact body conformation, such as the Nguni. Unlike at auctions, abattoirs make farmers realise the value of hides, which is one of the main attributes of the beautiful skins from Nguni cattle. For example, the South African Antique Dealers Association (SAADA, 2005) has also cottoned onto the aesthetic beauty and quality of the Nguni skin. One opportunity was to use the skin to make decorated car seats for exported Mercedes Benz vehicles by Daimler-Chrysler. The main advantage of selling at auctions was that they do not consider the breed of the animal, except the body weight and body condition scores. In addition, farmers preferred to sell their cattle through auctions because transaction costs are minimal (Wollny, 2003).

Using the law of demand, the more the transport is available, the cheaper the cost of transporting the cattle and, therefore, the more the farmers can sell (Wollny, 2003). Cattle sales are high if transport costs are low as farmers will be able even to sell in far away markets as transactional costs are low. The increase in the probability of farmers to sell their produce as transport became more available agrees with Jacoby (2000) and conforms to theoretical expectation. In the current study, an increase in the condition of cattle decreased the probability of smallholder farmers selling their cattle. Such an unexpected negative relationship indicates that the farmers, in most cases, sell animals in poor condition (Musemwa et al., 2007). The better the condition of the cattle the more the farmer is attracted with his animals and the less the probability of him selling the cattle. Animals in poor condition are likely to be too old to keep in the herd.

As the household head changed from being male to being female, our findings showed an increase in the probability of selling cattle. Most women in the smallholder farming sector are not employed and, hence, have little, if any, source of income (Montshwe, 2006). Widows, for example, are forced to sell cattle to meet the household requirements. They

would not be prepared to have additional activities, such as cattle herding and taking cattle to auctions. Women, however, showed more interest in keeping indigenous female cattle than males. They highlighted that female indigenous cattle give birth and are resistant to parasites and drought as their male counterparts. They, however, indicated that they are less equipped to negotiate for good prices with buyers and would welcome the support of the development agencies and government for them to benefit fully from the indigenous cattle.

Distances that farmers travelled when selling their cattle varied across municipalities. In Amatole, active cattle markets (major towns in the municipality) are far away from the sampled communities, while the surveyed communities in Chris Hani and Alfred Nzo were close to major towns. Chris Hani municipality provided market infrastructure to smallholder farmers. In Amatole, on the other hand, marketing infrastructure was absent or in a poor state. For the Nguni projects to succeed, the distance to the market has to be reduced by bringing buyers closer to smallholder farmers (Montshwe, 2006).

The differences in the body condition of cattle across municipalities were expected. The municipalities had different soil types and received different amounts and patterns of rainfall. The agro-ecological zones were, thus, different. Alfred Nzo municipality had poor condition of grazing lands, low rainfall, snow and poor soils, relative to Amatole municipality. Besides body condition scores, cattle herd sizes were also different. Mean herd size for Chris Hani was markedly larger than for Alfred Nzo and Amatole. Chris Hani receives high rainfall and the vegetation is largely of the grassland types, with little bush encroachment, as was the case with Amatole. Alfred Nzo experiences extreme climatic conditions (particularly snow) and experiences high levels of stock theft (Musemwa et al., 2008). The thefts were related to the proximity of the municipality to the border with Lesotho.

Opportunities in Nguni cattle marketing significantly varied across municipalities ($p<0.05$). These findings conform to our *a priori* expectations that municipalities emerged from different administrations, which provided different support services to farmers. The differences in support, thus, could have lead to market opportunities. For example, Chris Hani District has a base in agriculture with limited agro-processing industries than Amatole (ECDC, 2003). These differences, therefore, result in variations in market opportunities with other municipalities.

Formation of small farmer groups and associations, which seems to have worked well in vegetable farming among smallholder cattle producers, could assist the beneficiaries of indigenous cattle when marketing their cattle. Formation of cattle marketing groups could lower transaction costs, increase access to information, and increase participation of smallholder farmers in formal markets. Retailers that specialize in selling organic foods should be targeted.

The market and bargaining power that a farmer can receive in a small group of between two to five farmers is obviously less than that from a larger group. By aggregating into larger associations such as inter-group associations, small farmers have the potential to achieve even greater economies of scale in accessing services, information, infrastructure and markets (Goetz, 1992; Musemwa et al., 2007). As far as transporting their cattle is concerned, costs can be easily cut if these groups use the same transport to the market. By transporting in bulk, they stand a better chance of getting good discounts from transport firms as compared to transporting as individuals and in small quantities. By pooling resources to invest in transport or processing operations, smallholder cattle farmers could become more active participants in the

marketing systems. They can buy their own truck and set up their own abattoir in their areas. Municipalities can also assist through building small abattoirs and providing farmers with transport. Furthermore, to achieve improved marketing efficiency, attention must be given to improvement of infrastructure and formulation of new and amendment of marketing policies as well as institutional reforms to ease constraints on market involvement.

Extension officers should also play an active role using the recent extension approach of participatory rural appraisal through discussing with farmers and empowering the farmers in identification of cattle marketing problems and solutions. Success of extension officers in livestock farming areas should be measured by the number and value of livestock sold. Improved extension can also result in higher productivity and output.

Capacity building and training programs for the farmers need to be developed. Smallholder farmers are frequently subject to high illiteracy (as observed in the current study). The training programs should be focused on visual aid materials and adequate illustration, and designed for adult learners who have extensive experience in keeping cattle. Training should also be directed at developing farmers' negotiating skills during the settlement of transactions and basic farm management tools, such as marketing, record keeping, and financial management. The decentralization of livestock markets and the wider dissemination of well updated information to the smallholder farmers by the government and other stakeholders involved in agriculture can improve smallholder farmers' access to formal cattle markets. The provision of market information will strengthen farmers' negotiating ability during transactions with individual speculators and consequently prevent the possible exploitation of farmers by better-informed buyers.

CONCLUSIONS

Smallholder indigenous cattle farmers experience various marketing constraints. The chief constraints identified were market unavailability, transport shortage, poor condition of cattle, and limited access to information. On the other hand, opportunities in indigenous cattle marketing exist in South Africa, but most of the smallholder farmers do not utilize these opportunities. Group marketing, decentralization of cattle information centers, and the involvement of communal farmers' in the dissemination of information plays a critical role in improving farmers' access to formal markets. For the profitability and sustainability of the Nguni outreach projects, the marketing of the indigenous cattle breeds have to be developed, with emphasis on developing organic products whose demand is currently much higher than the supply. The current shortage is causing the prices of organic products to be high, thereby making indigenous cattle production an attractive venture to smallholder farmers. Indigenous cattle production, due to their reliance on natural pastures, are environmentally-friendly and do not exacerbate the challenge of global warming and climate change.

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REFERENCES

Acocks, J.P.H. (1988). Veld Types of South Africa. 3rd Edition. Memoirs of the Botanical Survey of South Africa, Government Printer, Pretoria, 57, 1-146.

Anderson, S. (2003). Animal genetic resources and sustainable livelihoods. *Ecol. Econ*., 45(3), 331-339.

Ayalew, W., King, J.M., Bruns, B., & Rischkowsky, B. (2003). Economic evaluation of smallholder subsistence livestock production: lessons from an Ethiopian goat development program. *Ecol. Econ.*, 45, 473– 485.

Barrett, C.B., Chabari, F., Bailey, D., Little, P.D., & Coppock, D.L. (2003). Livestock pricing in the northern Kenyan rangelands. *Journal of African Economies*, 12(2), 127–155.

Bester, J., Matjuda, L.E., Rust, J.M., & Fourie, H.J. (2005). The Nguni: A Case Study. Community-Based Management of Animal Genetic Resources. Proceedings of the workshop held in Mbabane, Swaziland, May 7-11, 2001.

Chimonyo, M., Kusina, N.T., Hamudikuwanda, H., & Nyoni, O. (1999). A survey on land use and usage of cattle for draught in a smallholder farming area of Zimbabwe. *Journal of Applied Sciences for Southern Africa*, 5(2), 111-121.

Chimonyo, M., Kusina, N.T., Hamudikuwanda, H., Nyoni, O., & Ncube, I. (2000). Effects of dietary supplementation and work stress on ovarian activity in non-lactating Mashona cows in a smallholder farming area of Zimbabwe. *Animal Science*, 70(2), 317-323.

Collins-Luswet, E. (2000). Performance of Nguni, Afrikaner and Bonsmara cattle under drought conditions in North West province of Southern Africa. *South African Journal of Animal Science*, 30(1), 33-38.

Coetzee, L., Montshwe, B.D., & Jooste, A. (2004). The Marketing of Livestock on communal lands in the Eastern Cape Province: Constraints, Challenges and Implications for the Extension Services. *South African Journal of Agricultural Extension*, 34(1), 81-103.

David, N., Reardon, T., & Hopkins, R. (1995). Case studies of farmer organizations linking to dynamic markets in Southern Africa: The Fort Hare Farmers Group, South Africa. http://www.pfid.msu.edu/FormerOrganLinktoDynMrktsForeHare.pdf (accessed on February 7, 2008).

ECDC. (2003). ECDC Sector Profile: Dairy Opportunities. http://www.ecdc.co.za/sectors/sectors.asp?pageid=108 (accessed on June 4, 2008).

Goetz, S. (1992). A selectivity model of household food marketing behavior in Sub-Sahara Africa. *American Journal of Agricultural Economics*, 74(2), 444-452.

Gujarat, D.N. (2003). Basic Econometrics (4th Ed). McGraw Hill. New York

Hanotte, O., Bradley, D.G., Ochieng, J.W., Verjee, Y., Hill, E.W., & Rege, J.E.O. (2002). African pastoralism: genetic imprints of origins and migrations. *Science*, 296, 336– 339.

Hobbs, J. E. (1997). Measuring the importance of transactions costs in cattle marketing. *American Journal of Agricultural Economics*, 79(4), 1083-1095.

Hosmer, D.W., Lemeshow, S. (2000). Applied Logistic Regression (2nd Ed). Wiley-Interscience Publication, New York

ISRDS (2004). The Integrated Sustainable Rural Development Strategy, http://www.info.gov.za/otherdocs/2000/isrds.pdf (accessed on June 4, 2007).

Jacoby, H. (2000). Access to markets and the benefits of rural roads. *Economic Journal*, 110(465), 713-737.

Jooste, A., & Van Rooyen, C.J. (1996). Constraints to small farmer development in the red meat industry. Invited paper, Red Meat Producers Conference, Roodevallei, Pretoria, 27 March 1996.

Mapiye, C., Chimonyo, M., Muchenje, V., Dzama, K., Marufu, M.C., & Raats, J.G. (2007). Potential for value-addition of Nguni cattle products in the communal areas of South Africa: a review. *African Journal of Agricultural Research*, 2(10), 488-495.

Mapiye, C., Chimonyo, M., Dzama, K., Raats, J.G., & Mapekula, M. (2009). Opportunities for improving Nguni cattle production in the smallholder farming systems of South Africa. *Livestock Science*, 124, 196-204.

Marufu, M.C., Chimonyo, M., Dzama, K., & Mapiye, C. (2009). Sero-prevalence of tick-borne diseases in communal cattle reared on sweet and sour rangelands in a semi arid area of South Africa. *The Veterinary Journal*, 10.1016/j.tvjl.2009.02.014.

Montshwe, D.B. (2006). Factors affecting participation in mainstream cattle markets by smallholder cattle farmers in South Africa. MSc Thesis, University of Free State, RSA.

Muchenje, V., Dzama, K., Chimonyo, M., Raats, J.G., & Strydom, P.E. (2008). Meat quality of Nguni, Bonsmara and Aberdeen Angus steers raised on natural pasture in the Eastern Cape, South Africa. *Meat Science*, 79, 20-28.

Muchenje, V., Dzama, K., Chimonyo, M., Strydom, P.E., Hugo, A., & Raats, J.G. (2009). Cholesterol levels and fatty acid profiles of beef from three cattle breeds raised on natural pasture. *Journal of Food Composition and Analysis*, 22(4), 354-358.

Musemwa, L., Chagwiza, C., Sikuka, W., Fraser, G., Chimonyo, M., & Mzileni, N. (2007). Analysis of Cattle Marketing Channels Used by Smallholder Farmers in the Eastern Cape Province, South Africa. *Livestock Research for Rural Development*, 19(9), Article #131.

Musemwa, L., Mushunje, A., Chimonyo, M., Fraser, G., Mapiye, C., & Muchenje, V. (2008). Nguni cattle marketing constraints and opportunities in the communal areas of South Africa: Review. *African Journal of Agricultural Research*, 3(4), 239–245.

Nqeno, N. (2008). Reproductive performance of cows in sweet and sour veld types under communal production systems in the Eastern Cape Province of South Africa. MSc thesis. Department of Livestock and Pasture Sciences, University of Fort Hare, South Africa.

Nkhori, P.A. (2004). The impact of transaction costs on the choice of cattle markets in Mahalapye district, Botswana. MSc Dissertation, University of Pretoria, RSA.

Rege, J.E.O & Gibson, P.J. (2003). Animal genetic resources and economic development: issues in relation to economic valuation. *Ecol. Econ*., 45, 319–330.

SAADA. (2005). Beauty is Nguni skin deep. http://www.streetwires.co.za/pressroom1.htm (accessed on June 4, 2008).

Schoeman, S.J. (1989). Review: Recent research into the production potential of indigenous cattle with specific reference to Sanga. *South African Journal of Animal Science*, 19, 55-61.

Scholtz, M.M. 1988. Selection possibilities of hardy beef breeds in Africa: The Nguni example. Proceedings of the 3rd World Congress on sheep and beef cattle breeds, Paris, France, 2, 303-304.

Simianer, H., Reist-Marti, S.B., Gibson, J., Hanotte, O., & Rege, J.E.O. (2003). An approach to the optimal allocation of conservation funds to minimize loss of genetic diversity between livestock breeds. *Ecol. Econ*., 45, 377– 392.

Staal, S., Delgado, C., & Nicholson, C. (1997). Smallholder Dairying Under Transactions Costs in East Africa. *World Development*, 25(5), 779-794.

Strauss Commission. (1996). Final report of the commission of inquiry into the provision of rural financial services. Pretoria: Government Printer.

SPSS. (2006). SPSS AnswerNet. http://www.spss.com/tec/answer/ (accessed on June 4, 2008).

Wollny, C.B.A. (2003). The need to conserve farm animal genetic resources in Africa: should policy makers be concerned? *Ecol. Econ*., 45, 341– 351.

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