

**Management information sources and communication strategies for  
commercially oriented smallholder beef cattle producers in Limpopo Province,  
South Africa**

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## **Abstract**

A survey was conducted to identify management information sources and communication channels used by commercially oriented smallholder beef cattle producers (n=62) in Limpopo province, South Africa. A total of 62 commercially oriented smallholder farmers under the Limpopo Industrial Development Corporation (IDC)-Nguni cattle project were interviewed using a structured questionnaire to collect data. Descriptive statistics were used to analyse data on farmers' demographic and farm characteristics, sources of information and communication channels used. A multinomial logistic regression (MNL) model was used to evaluate factors that influenced farmers' choices of information sources and communications channels used. Findings show that government extension (53% of the respondents) and other farmers (30%) were the major sources of management information for the farmers. Based on the logistic regression results, the decision to choose government extension as the main source of information was mainly influenced by respondents' gender ( $p=0.001$ ) and access to training ( $p=0.023$ ). Communication was mainly through farm-to-farm visits (56%) and the use of mobile phones (30%). Based on current findings, the infusion of modern information communication technologies such as mobile phone-based innovations with the existing government extension service could further strengthen the capacity of farmers to share information amongst themselves as well as providing feedback to extension agents. Furthermore, it is essential to take cognizance of farmers' socio-economic factors when identifying and characterising their management information sources and communication strategies.

**Key words:** Information sources, commercially oriented, smallholder cattle producers, communication, extension

## **Introduction**

Livestock production remains central to the livelihoods of people in developing countries, especially the resource-poor (Moyo and Swanepoel, 2010). Livestock are an important asset, serving as a source of food, income, insurance for credit and key security net during disastrous times (Sikhweni and Hassan, 2013; Ndoro et al., 2014; Bettencourt et al., 2015). In countries like South Africa, livestock contribute nearly 50% of the total value of agricultural output, with cattle farming being the largest sub-sector with a share of 26.2% [Department of Agriculture Forestry and Fisheries (DAFF), 2017]. Contribution from this sector can be further enhanced if livestock, typically cattle from the smallholder sector, are brought into the formal economy (IDC, 2016).

South Africa's smallholder sector accounts for a substantial proportion (40%) of the country's total cattle population (13.4 million; DAFF, 2017). The sector comprises the subsistence and commercially oriented farmers, formerly "emerging" farmers (Khapayi and Celliers, 2016). Commercially oriented farmers were created through the government's agrarian reform and developmental support programmes and are currently transitioning to operate at a commercial scale (Mabaya et al., 2011). Government's support programmes were adopted to redress the historic land imbalance that was created by Apartheid policies and bridging the gap between white commercial and black subsistence farmers (Kloppers and Piennar, 2014). The Apartheid policies allowed agricultural land to be owned by the minority white population while the majority black population was forced to occupy less productive land (Kloppers and Piennar, 2014). The Limpopo Industrial Development Corporation (IDC) Nguni cattle project is one of the initiatives started to foster the commercialisation of previously disadvantaged black smallholder farmers in the rural areas of South Africa. The project is being implemented under the Limpopo IDC-Nguni Cattle Development Trust which was founded in 2006. The trust is a tripartite development-orientated partnership formed by IDC which provides funding, the Limpopo Department of Agriculture (LDA) and the University of Limpopo (UL) which offers extension and research support services, respectively. According to DAFFnews (2016), besides developing capacity of previously disadvantaged black smallholder farmers, the project also aims at improving cattle production in the rural areas through reintroduction of the indigenous Nguni cattle bloodlines into cattle farming communities

Despite the support for commercially oriented smallholder farmers, there is growing evidence that these farmers continue to be weighed down by low productivity and poor access to markets (IDC, 2016; Moyo and Swanepoel, 2010). This is due to several management constraints including, drought, stock theft, feed shortages, diseases and parasites and lack of markets and financial resources (Mapiye et al., 2009; Khapayi and Celliers, 2016; Mapiye et al., 2018). Apart from these, low productivity could be due to lack of livestock farming information facilities and inadequate access to appropriate extension information by the farmers (Brhane et al., 2017; Mbanda-Obura et al., 2017, Moyo and Salawu, 2018). This is because, lack of appropriate information impairs the farmers' management ability and hence responses to challenges and opportunities (Mittal and Mehar, 2013; Mbanda-Obura et al., 2017).

Livestock farming information for the smallholder farmers (subsistence and commercially oriented) in general can be accessed from different sources (Mital and Mehar, 2013; Brhane et al., 2017) and disseminated using various channels (Angello, 2015). Adetayo and Eunice (2013) and Sebeho (2019) mentioned that smallholder farmers in developing countries largely depend on public extension services for livestock farming

information. Along with public extension, farmers also acquire information from other farmers, friends, relatives (Mbanda-Obura et al., 2017) and information communication technology (ICT) based sources such as internet, mobile phone, television and radio (Mittal and Mehar, 2013; Motiang and Webb, 2015) and print media (Mtega et al., 2016). However, it has become difficult for the smallholder farmers to continuously rely on the public extension system (Moyo and Salawu, 2018). The underlying concern is that public extension systems especially from developing countries besides being extension agent based have generally become weak (Mittal and Mehar, 2013) and this is largely attributed to lack of resources, inefficiencies and bureaucratic processes (Adetayo and Eunice, 2013). Therefore, Brhane et al. (2017) expressed the importance of devising modalities that could help improve efficiency of extension for it to be more responsive to farmers' needs. In fact, it is principally to that end that the growth and use of modern ICT-based agricultural extension services by farmers since the year 2000 came into effect (Mittal and Mehar, 2013). The ICTs could strengthen the agricultural extension services and dissemination of information, and enable farmers to be constantly connected to various sources of information and communication pathways. The current sources of information and communication channels specifically for the commercially oriented smallholder farmers in South Africa are, however, little-known as studies have concentrated on the smallholder sector as a whole. The objective of the current study was, therefore, to identify and analyse the information sources and communication channels used by farmers in Limpopo Province, South Africa. This may assist decision makers in identifying appropriate strategies that can be used to enhance such sources and communications channels used by these smallholder farmers transitioning to the commercial level.

## **Materials and Methods**

### *Study area*

The study was conducted in Limpopo Province (GPS coordinates 23.4013° S, 29.4179° E), South Africa. It focused on 14 local municipalities where the Limpopo-IDC Nguni cattle farmers are located. Limpopo province is characterised by average temperatures rising to 27°C in summer and 20°C in winter. Average annual rainfall ranges from a minimum of 300 mm to a maximum of 600 mm [Limpopo Department of Agriculture (LDA), 2016] which falls mostly during summer. It is one of the poorest provinces in South Africa characterised by high unemployment, poverty, illiteracy and many rural farmers producing at the subsistence level (Statistics South Africa, 2016). Water is the most limiting resource for agricultural production, and cattle farming is a key livelihood source for the majority farmers in the province.

### *Farmer selection*

Target population for the study comprised all the commercially oriented smallholder beef cattle farmers who benefited from the Limpopo IDC-Nguni cattle project. The project had a total of 62 beneficiaries since its inception in 2006 and these are all the farmers who participated in the study (census approach). As of year 2016, about eleven new beneficiaries were recruited following loan reimbursements from previous beneficiaries and these new farmers were not included in the current study. Table 1 shows the number of farmers who participated in the study and the districts and local municipalities where they are located.

**Table 1:** The distribution of Limpopo IDC-Nguni cattle farmers across the province

District Municipality	Local Municipality	Number of farmers
Capricorn	Aganang	3
	Blouberg	3
	Lepelle-Nkumpi	1
	Molemule	9
	Polokwane	10
Greater Sekhukhune	Elias Motsoaledi	3
	Ephraim Mogale	1
	Fetak Gomo/Greater Tubatse	2
Waterberg	Lephalale	3
	Mogalakwena	13
	Mookgophong/Modemolle	10
	Bela-Bela	1
Mopani	Maruleng	1
Vhembe	Makhado local	3
TOTAL		62

### *Data collection*

Primary data were collected through face-to-face interviews with farmers (Stellenbosch University Human ethical clearance: SU-HSD-000505). Pre-tested structured questionnaires were used to collect data from the respondents. The questionnaire comprised of both closed and open ended questions. All open ended questions were coded to necessitate data analysis. Data collection was conducted between August and September of 2016. Trained enumerators administered the questionnaires in local languages (Sipedi and Tshivenda) and captured responses in English. Data on the commercially oriented smallholder farmers' demographic information, farm characteristics, and major sources of farming information and communication pathways used were recorded.

## Statistical Analysis

All the data were analysed using SAS 9.4 [Statistical Analysis System (SAS) Institute Inc., Cary, NC, USA]. Summaries for farmers' demographic and farm characteristics, sources of information and communication channels data were computed using PROC FREQ procedure of SAS. A multinomial logistic regression (MNL) model was used to analyse how the demographic and farm characteristics influenced the likelihood of respondents to choose the main source of information and mode of communication. The multinomial logistic model has been used in many of the studies dealing with choice; other case examples include the choice of animal breeds (Murage and Ilatsia, 2010), determining the choice of marketing channels (Martey et al., 2012) and sources of information and communication pathways (Mbanda-Obura et al., 2017). The model for the factors influencing the choice of the main information source was given as follows:

$$\text{Prob}(Y_j = i) = P_{ji} = \frac{\exp(X_j\beta_i)}{\sum \exp(X_j\beta_k)} \text{ where } 0 < P_{ji} < 1 \quad (1) \quad (\text{Greene, 2003})$$

Equation 1 is linearized into (2):

$$\text{Prob}(Y_j = i) = P_{ji} (\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots \dots \beta_k X_k) \quad (2)$$

Where :

$Y_j$  = probability that the respondent  $j$  chooses an information source  $i$

$\text{Prob}(Y_j = i)$  Information source  $i$  with three response levels 1 = government extension service, 2 = other farmers and 3 = other sources.

Variables such as farmer's age, education level, formal training, gender, marital status, title deeds and farm size were expected to have influenced the farmers' choices of information sources. However, due to specification problems not all of the factors were included in the model.

By fitting the variables, the residual model for sources of information was specified as:

$$\text{InfoSource} = \beta_0 + \beta_1 \text{Age}_i + \beta_2 \text{Educ}_i + \beta_3 \text{FormTrain}_i + \beta_4 \text{Gend}_i + \beta_5 \text{MStat}_i + \beta_6 \text{TTDeed}_i + \beta_7 \text{FamSize}_i \quad (3)$$

Where;

$\text{InfoSource}$  = the preferred source of information;

$\text{Age}$  = respondent's age (1= old and 0= young);

$\text{Educ}$  = respondent's education level (1= educated and 0= not educated)

$\text{FormTrain}$  = formal training access of the respondents (1= access to training and 0= no access to training);

$\text{Gend}$  = sex of the respondent (1= male, 0= female);

$\text{MStat}$  = marital status of the respondent (1= married and 0= not married);

*TTDeed* = access to title deeds by the respondent and (1= had title deeds and 0= no title deeds);

*FamSize*= size of farm owned by the respondent [1= large farm (>1500ha) and 0= small farm (< 1500ha)].

Respondents were asked to identify one major source of beef cattle farming information and the method of communication preferred. According to Mittal and Mehar (2013), it could be difficult to find a single source providing farmers with all the information needed. Therefore, the assumption of mutually exclusiveness on information sources and channels of communication preferred was considered in the regression. The model for the choice of information source assessed the influence of various explanatory variables on the odds of two sources of information with reference to the base category. Since there were three response levels, one was treated as the referent level/base category (other sources) and two models were fit: 1) government extension and 2) other farmers. Therefore, models for government extension relative to other sources and other farmers relative to other sources were estimated in the analysis of maximum likelihood estimates.

## **Results**

### *Farmers' demographic and farm characteristics*

The study results indicate that the respondents were predominantly males (87%). The age of respondents ranged from 31 to 78 with an average of 56 years. The majority of the respondents (64%) were middle aged (between 46 and 65) while young (youth) farmers (<45) constituted 15% of the population. Almost half (47%) of the respondents had tertiary qualifications with 30% and 21% having secondary and primary education respectively. The overall mean household size for the sample was 6 and the majority (55%) had household sizes ranging between 3 and 12 members. Over 60% of farmers were practising cattle farming on leased land, while 23% and 16% were farming on communal and privately-owned farms, respectively. Some of the communally-owned land was being farmed under Community Property Associations (CPAs).

### *Information sources used by commercially oriented smallholder beef cattle farmers in Limpopo Province*

Overall, all the farmers sought information when making beef cattle management decisions. Government extension services was the most used source of management information (53%). However, about 80% of the respondents expressed dissatisfaction with the system especially regarding irregular farm visits, and poor visibility of the government extension agents. About 30% sourced information from other farmers while 17% relied on other sources such as private extension, buyers, input dealers and media.

### *Factors influencing farmers' choices of the information sources*

The results of the regression model presented in Table 2 show factors that influenced farmers' choice of the main source of information. Compared to old farmers, young farmers tended to rely on government extension ( $p=0.06$ ) as main source of information relative other sources. Old as opposed to young farmers, however, relied on other farmers ( $p=0.019$ ) as main source of information relative other sources. Respondents that had access to formal training were more likely to use government extension ( $p=0.026$ ) and other farmers ( $p=0.004$ ) as the main sources of information relative to other sources. Also, with reference to other sources, males compared to females were more likely to use the government extension ( $p=0.001$ ) and other farmers ( $p=0.001$ ) for information.

**Table 2** Multinomial logistic regression estimates for the factors influencing the choice of beef cattle farming information sources

Variable	Government extension		Other farmers	
	Coefficient	Significance	Coefficient	Significance
Education	-6.7803	0.9796	-6.6475	0.9800
Age	0.8712	0.0608	1.0844	0.0185*
Training	0.8823	0.0258*	1.1170	0.0044*
Farm size	-0.0599	0.8540	-0.0459	0.8869
Gender	1.3610	0.0013*	1.5054	0.0003*

Note: \*Statistically significant at 5% level ( $p<0.05$ ), Base category= 'other sources'

### *Communication channels used by commercially oriented smallholder beef cattle farmers in Limpopo Province*

Almost all respondents (95%) were involved in the sharing of beef cattle management information. Most of them had tertiary education (47%) with nearly two thirds being between the ages of 46 and 65 years. The majority (63%) of the farmers shared their extension messages with fellow farmers. About a third of the respondents shared their information with government extension officers while 4% preferred to communicate with other stakeholders such as cattle buyers and veterinary personnel. Apart from that, findings show that farm-to-farm visits or travel and tell (farmers visiting each other to share management experiences) (56% of the respondents) and mobile phones (41%) were the common channels for communication used by the farmers. Methods such as group meetings, internet and print resources were used by 2%, 1% and 1%, respectively.



### *Factors influencing farmers' choices of information sharing channels*

The choices of information communication channels used by farmers were influenced by demographic factors (Table 3). Old compared to young farmers were likely to use farm-to-farm ( $p=0.004$ ) as well as mobile phones ( $p=0.013$ ) relative to 'other channels' of communication (Table 3). In comparison to the reference communication channel, respondents with access to formal training were more likely to use farm-to-farm ( $p=0.002$ ) and mobile phones ( $p=0.011$ ) compared to those without access to training. Gender influenced ( $p=0.001$ ) the choice of communication channel with males as opposed to females having a higher likelihood of using farm-to-farm relative to 'other channels'. Compared to females, males tended ( $p=0.006$ ) use mobile phones relative to 'other channels'.

**Table 3** Multinomial logistic regression estimates for the factors influencing the choice of communication channels

Variable	Travel and Tell		Mobile phone	
	Estimate ( $\beta$ )	Significance	Estimate ( $\beta$ )	Significance
Age	1.1547	0.0043*	1.1547	0.0126**
Training	1.2173	0.0019*	1.0007	0.0111*
Farm size	0.0675	0.8294	0.1284	0.6831
Gender	1.6509	0.0001*	1.4857	0.0614
Marital status	0.4511	0.1428	0.0067	0.9823

Note: \*Statistically significant at 5% level ( $p<0.05$ ), Base category= other channels

### **Discussion**

The results of the demographic attributes of the farmers were discussed in a companion paper by Mapiye et al. (2018). The findings that the majority of respondents used government extension as the main source of information was supported by the findings of Adetayo and Eunice (2013), Motiang and Webb (2015) and Brhane et al. (2017) who found that more than 75% of the respondents relied on government extension services. Heavy reliance on government extension services could be attributed to the general perception that information provided by the government is accurate and reliable (Kipkurgat, 2015; Sebeho, 2019). However, dissatisfaction expressed by most of the respondents against the government extension system conforms to the previous findings of Brhane et al. (2017) who reported medium (57%) to low (25%) satisfaction level by the farmers. High costs and lack of support resources (Adetayo and Eunice, 2013), high extension agent to farmer ratio and lack of expertise (Kipkurgat, 2015; Moyo and Salawu, 2018) could be some of the factors leading to dissatisfaction from other respondents.

The observation that respondents with access to formal training were likely to use government extension could be because formally trained farmers better understand the importance of consulting official sources of information. The result that males compared to females had a higher likelihood of using government extension conforms to previous findings by Mtega et al. (2016) and Mbanda-Obura et al. (2017). This could suggest that men are relatively endowed with resources and time to meet with extension agents for instance during leisure time after farm activities whereas while women would perhaps be conducting household chores and preparing meals during that time (Mtega et al., 2016). Therefore, for improved extension service provision, the government should increase extension manpower and its support resources with special emphasis on visiting female farmers as they have limited time to meet with extension agents. This should be complemented with strategies that allow farmers to create extension messages to suit their conditions and give feedback to the system (Sebeho, 2019).

The respondents' significant use of other farmers as a source of information is supported by findings by Mittal and Mehar (2013) and Mbanda-Obura et al. (2017) where above 40% of respondents ranked it as the most preferred source. A study by Motiang and Webb (2015) showed that nearly 50% of the livestock farmers relied on their peers for management information. This could be because as farmers operating within the same community, sourcing information among each other would be established based on expertise exhibited by known individuals and trust due to shared background (Kipkurgat, 2015, Morrison and Ramsey, 2018). The finding that old compared to young farmers had a higher likelihood of using fellow farmers as sources of information relative to other sources concurs with that of Mbanda-Obura et al. (2017). However, the result contradicts findings by Woosen et al. (2017) where older compared to young respondents were more likely to use extension services. The positive influence of age could be because older farmers are reluctant to explore new sources of information compared young farmers (Robinson-Pant, 2016A; Mbanda-Obura et al., 2017).

The observation that mass media-based sources were not preferred does not agree with previous findings by Motiang and Webb (2015) and Mtega et al. (2016) who found that radio and television were significant sources of information for the smallholder farmers. Also, a study by Isaya (2016) showed that over 50% of the women farmers used radio as a primary source of information. Failure by farmers to use mass media sources in the current study could be attributed to factors such as non-availability of support infrastructure, high costs of electronic gadgets and servicing fees (Brhane et al., 2017). In that regard, the introduction of strong public-private partnerships to enhance access to cattle farming information by commercially oriented smallholder beef cattle farmers through media-based sources could be vital. The use of ICT based information sources to complement the

initiative should be encouraged as previously mentioned by Angello (2015) and Brhane et al. (2017). The ICTs establish a linkage with conventional information sources hence helping in bridging the information gap (Mittal and Mehar, 2013).

Generally, the results showed that the respondents preferred interpersonal methods, which involved direct interactions when sharing extension messages. According to Mbanda-Obura et al. (2017), the farmer-to-farmer approach allows farmers to practically exchange ideas and adopt new innovations, particularly from experienced fellow farmers. This would propagate a system of common values and beliefs within emerging rural social information networks (Morrison and Ramsey, 2018) thereby promoting resilient agricultural knowledge systems. In studies conducted by Benard et al. (2014) and Angello (2015), the majority of the respondents preferred interpersonal methods such as farm-to-farm visits when sharing agricultural information.

The finding that old farmers were more likely to use farm-to-farm visits relative to other channels suggests that they preferred interactive ways of sharing knowledge. Some of them could be too old to travel very long distances to attend meetings, demonstrations and field days hence preferred to visit close by farmers who could have managed to attend the gatherings to share experiences (Mbanda-Obura et al., 2017). Also, this could suggest that older farmers are endowed with time to visit other farms or resort places during leisure time after work and share information Mtega et al. (2016). On the other hand, young farmers prefer to explore new and advanced channels such as the use of social media platforms installed on their mobile phones to share and acquire information (Robinson-Pant, 2016). However, Kipkurgat (2015) argued that, despite information being readily available, the challenge is for them to get what suits their situation in a timely manner. This suggests the importance of supporting travel-and-tell methods with modern techniques such as the use of ICT based tools to foster knowledge sharing among commercially oriented smallholder farmers.

The observation that mobile phones were the second most important information-sharing channel confirms their popularity amongst commercially oriented smallholder farmers. In a previous study by Angello (2015) more than 90% of the respondents used phones to disseminate information. This could be due to the broadening mobile phone and communication infrastructure and the increasing quality of services offered by mobile network companies (Mittal and Mehar, 2013). Also, previous findings by Angello (2015) revealed that the use of mobile phones is quick and saves on time and costs of travelling for farmers. Digital Statistics South Africa (2017) reported that over 52% of the South African population (55.9 million) were utilising the internet with 21% of them accessing it through their mobile phones in 2016. Therefore, the role of digital methods of communication,

especially mobile phones amongst commercially oriented smallholder farmers should be further explored for sustainable use in sharing livestock farming information.

The report that old compared to young farmers had a higher likelihood of sharing information using mobile phones relative to other channels could be attributed to the fact that farmers become less mobile as they get older (Mbanda-Obura et al., 2017). Thus, instead of travelling long distances or exploring other forms of communication, they tend to use mobile phones which enable them to instantly convey and receive information (Angello, 2015), stimulate interaction and hence built social networks (Bukonya, 2015; Morrison and Ramsey, 2018). However, as suggested by Mittal and Mehar (2013) despite the use of mobile phones being important they cannot substitute other forms of sharing information such as face-to-face interactions.

The finding that formal training positively influenced the use of mobile phones as the main communication channel relative to other channels could be because it contributes to improved appreciation and skills on how to operate the gadgets (Bukonya, 2015; Mtega et al., 2016). The low level of skills was one of the challenges mentioned by Brhane et al. (2017) and Angello (2015) to have reduced the use of ICT tools in knowledge management amongst smallholder farmers. Therefore, provision of training programmes, user friendly tools and internet services in commercially oriented smallholder farming communities through formal and non-formal learning should be considered for improved communication (Robinson-Pant, 2016).

The reported use of internet and print media by a few respondents to share extension messages and broadcasting (radio and television) services as channels of communication could be because the use of such channels is associated with high running costs and lack of support infrastructure (Angello, 2015; Brhane et al., 2017). In addition, farmers are usually busy during the day hence may not have time to listen to the radio or watch television.

## **Conclusions and recommendations**

Results show that public extension and other farmers were the main sources of information for the farmers. The majority of the farmers shared the information with other farmers and preferred farm-to-farm visits and the use of mobile phones. The choices of information sources and communication channels were mainly influenced by respondents' age, gender and access to training. Overall, the study showed that commercially oriented smallholder farmers have similar information sources and communication channels with subsistence smallholder farmers. Despite commercially oriented smallholder farmers being better resourced and operating at a more advanced level than subsistence farmers, they are still being weighed down by lack of access to better information sources and technology-based communication strategies. This suggests the importance of devising new policies and

strategies to meet the specific information and communication needs of the commercially oriented smallholder farmers. This could be through the introduction of ICT-based information infrastructure and tailor-made tools such as smartphone and computer web-based information sharing platforms. These could have the capacity to mobilize the farmers to acquire, create and share livestock farming knowledge and information among themselves and with extension agents.

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### **Compliance with ethical standards**

Ethical clearance (SU-HSD-000505) for the current research was provided by Stellenbosch University Human Research (Humanities) Ethics Committee.

### **Conflict of interest**

Authors have declared that no competing interests exist.

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