The Journal of Social Sciences Research
ISSN(e): 2411-9458, ISSN(p): 2413-6670
Vol. 6, Issue. 1, pp: 50-60, 2020
URL: https://arpgweb.com/journal/journal/7
DOI: https://doi.org/10.32861/jssr.61.50.60

Academic Research Publishing Group

Original Research Open Access

Constraints in Livestock Development Programmes, Experiences from the Kaonafatso ya Dikgomo (KyD) Scheme in KwaZulu-Natal Province, South Africa

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Abstract

The study identified constraints faced in a livestock development programme and their determinants. The study utilised a questionnaire, administered purposively on farmer field days in November, 2017, through a cross sectional survey of KyD scheme participants from KwaZulu-Natal Province, South Africa, with a purposive sample of 164 respondents from 3 locations. The data was analysed through descriptive statistics, Likert scale and binary logistic regression. The results show that the constraints faced include lack of sense of ownership, information, extension commitment and lack of leadership. Furthermore, lack of sense of ownership was determined by access to veterinary services, experience in rearing cattle, land tenure and the decision maker. Determinants of commitment of extension worker constraint were gender of household-head as well as the decision maker, whilst for lack of information were monthly off-farm income, land tenure, decision maker as well as source of income. Conclusions reached include overreliance on scheme services, and complexities in decision making having bearing on the constraints faced in the KyD scheme. The study recommends incorporating indigenous knowledge systems which have tier effect of increasing access to services, farmer's participation and decision making, also taking advantage of the relationships with extension services to enhance effective information dissemination.

Keywords: Livestock development programme; Kaonafatso ya dikgomo; Scheme; Constraints.

1. Introduction

Increasing urbanization, affluence and population growth will grow worldwide demand of livestock for nutrition and food security by 70% in the year 2050. This is over and above the traction, manure, asset saving and fiber they provide to small holder farmers and the rural poor (Darith *et al.*, 2017). Livestock production forms a major component of the Sub Saharan Africa (SSA) smallholder portfolio contributing to poverty reduction (Jodlowski *et al.*, 2016; Klapwijk *et al.*, 2014; Rawlins *et al.*, 2014). In South Africa, livestock keeping is regarded as a tradition, with most of the country's natural resources suitable for livestock production (Coetzee *et al.*, 2005; Meissner *et al.*, 2013).

To unlock livestock production's contribution towards poverty alleviation and improve rural poor household welfare, there necessitates livestock development strategies mainly relating to production, marketing and use. South Africa has spent a large budgetary amount in the endeavour to implement agricultural development, with inadequate evidence showing that they have been successful (Aliber and Hall, 2012; Khapayi and Celliers, 2016). According to Jodlowski *et al.* (2016), livestock development has an impact on the food economy, and through multiplier enhances food security of surrounding rural communities. Livestock development is an avenue through which assets could be enhanced for poverty reduction (Johnson *et al.*, 2016). Livestock development has been limited by lack of adequate experience and knowledge, limited support services, inefficient input/output marketing system, poor input supply system and other socio-economic and technical considerations. Furthermore, the programmes are expensive, have long gestation period, and require strong and continuous commitment and collaboration from stakeholders at all levels (Tegegne *et al.*, 2010). However, due to various constraints, level of livestock productivity in South Africa has not been satisfactory.

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StatsSA (2016), identifies that there has been a 19.12% and 9.72% decline in the number of households engaged in agriculture and livestock production in South Africa respectively. The sector contributes 47% to the country's agricultural GDP, accounting for 500 000 employees and 2 125 000 dependants in red meat production. Furthermore, two thirds of the estimated 3 million smallholder farmers own livestock, with an estimated 10-12 million dependants (Meissner *et al.*, 2013). Exclusive cattle rearing in South Africa was carried out by 79 992 households in 2016, a 46.67% reduction from the 2011 levels, with however a 15.94% increase in the number of households with mixed livestock (StatsSA, 2016). In terms of cattle numbers, households owning less than 10 cattle reduced by 15.03% between 2011 and 2016, with an increase of 36.32% and 32.44% of household owning between 11 and 100 as well as over 100 cattle, respectively.

In the endeavour to enhance productivity and growth in the smallholder sector, support through government and non-governmental institutions has been availed through various development projects and programmes (Taruvinga *et al.*, 2017). However, smallholder farmers have been unable to take advantage of these developments (Chikazunga and Paradza, 2012; Khapayi and Celliers, 2016). Livestock development programmes have been identified as an avenue to circumvent the depressed number of farmers and productivity in smallholder production. DAFF (2011), identified that the smallholder farmer development programme in South Africa was premised upon support in the development of markets; infrastructure; access to finance, information, knowledge and training; planning and implementation of farming practices; and sustainable resource utilisation. Notwithstanding the role of livestock in rural South Africa in terms of food, income and wealth generation, the government adopted the Kaonfatso ya Dikgomo (KyD) scheme, with the objectives of meeting the needs of new resource-poor farmer entrants into farming (ARC, 2008). "Kaonafatso ya Dikgomo" is of the local Sepedi dialect, meaning "cattle betterment". The scheme was initiated as far back as 2000, but however the earliest recorded number of farmers engaged with the programme was in 2008 with 916 farmers in Limpopo, 178 in Mpumalanga and 160 in North West Provinces, with a total herd population of 23 260 cattle (ARC, 2008; Burrow *et al.*, 2008; Nengovhela, 2003). In 2008, 29 farmers in the KyD scheme went on further to join the National Beef Recording and Improvement (NBRI) scheme, enabling them access to more accurate decision making tools in improving and managing herd productivity. This figure improved to 140 farmers in 2010, with a further 247 farmers being trained in beef production through the KyD-Beef Profit Partnership in Eastern Cape, Limpopo and Mpumalanga Provinces as well as other areas (ARC, 2010). In 2013, the KyD scheme farmer participants had risen to 4 075, a 225% increase from the 2003 level, owning an estimated 60 000 cattle, more than double that of 2003 ARC (2013). By 2014, the number of KyD scheme participants had increased by 49.08% with current estimates in 2017 standing at 8404 farmers, also registered on the Integrated Registration Genetic Information System (INTERGIS)-a national animal improvement database (ARC, 2014;2015;2017).

The KyD scheme is an information and technology dissemination programme integrating scientific research into smallholder livestock production systems (ARC, 2015). The scheme aims to develop rural communities through accelerating smallholder farmers into mainstream livestock industries (ARC, 2013;2017). The farmers are assisted with training in performance enhancement and animal recording, increased productivity and income, practical application and exchange of animal data. The farmers have been empowered through ensuring good animal husbandry practices (animal recording and performance testing) (ARC, 2010). This has enhanced their confidence, especially in selling part of their herd, with a four-fold increase in the number of animals sent to the market, realising off-take rates of 20% in 2010, however decreasing to 16% in 2015 (ARC, 2010;2015). This was at par with commercial enterprises, and way above the 5% off-take rates characterising smallholder emerging farmers. This was partly due to the higher market participation and prices the farmers fetched, which were equivalent to commercial farmers as well as being twice the value to their pre-joining the scheme. This was mainly based on access to market information, where farmers in the scheme tend to charge a two-fold higher price for the animals when availed with correct market information (ARC, 2013). According to ARC (2010), the wealth of farmers increased 8 fold.

The Agricultural Research Council (ARC) through the KyD scheme also partners with extension officers in supporting farmers, trained through initiatives such as training in veterinary health work in collaboration with the Meat Industries Trust. This has been instrumental in maintaining the momentum and sustainability of the programme (ARC, 2011;2015). In partnering with departments of agriculture, the KyD scheme has successfully executed cattle auction sales in rural South Africa, culminating in increased demand for these auctions and sales activities. This has been enhanced by awareness about the significance of livestock income generation as well as entrepreneurship, with some farmers diversifying and vertically integrating into feedlotting and abattoring, easing barriers to market entry. Services in terms of reducing stock-theft through provision of livestock identification cataloguing (a biobank), monitoring and assessing information on effectively managing vegetation resources (rangelands) and feeding strategies have been some of the benefits of the KyD scheme (ARC, 2017).

In as much as the KyD scheme has been shown to improve animal husbandry, off-take, income and livelihood, there has been very little study directed towards the programme. To the authors' knowledge, there has been no study that has been directed at the constraints faced in participating in the KyD programme. Further still, no study has been identified that addresses the determinants of such constraints. Taruvinga *et al.* (2017) acknowledges that a large number of projects and programmes in South Africa struggle due to a number of constraints, chiefly due to neglect in socio-economic characteristics, culture, ethics, poor management and planning as well as lack of commitment. The objective of the study is thus to identify constraints faced in the KyD scheme and their determinants.

1.1. Constraints in Livestock Development Programmes

There has been limited literature concerning constraints faced in livestock development programmes relative to constraints in livestock production itself. Various constraints in livestock production have centred upon technical, organizational, infrastructural and policy (Tegegne *et al.*, 2010). The DoA (2006) partitioned constraints into equitable access and participation, competitiveness and profitability as well as sustainable resource management. Ayu *et al.* (2002) grouped the into sociological and cultural, land, programme entry, input availability and transport costs, whereas (Gelan, 2017) grouped the constraints into weak extension services, environment, adoption of new technology and institutional, limited collaboration and weak extension delivery system. According to Tegegne *et al.* (2010) technical constraints in livestock pertain to husbandry practices concerning undernutrition and malnutrition, high disease prevalence, low genetic potential of productive traits, poor management and weak market infrastructure.

In Eastern Cape Province, South Africa, Mapiye *et al.* (2009) found factors such as feed shortages, disease and parasites, poor extension, poor breeding, lack of skills, poor infrastructure, inadequate veterinary services and marketing services. Marketing and policy constraints limit access to and availability of some important technologies and access to inputs, mostly limited by lack of infrastructure (roads, markets) and high transportation costs. There also exist inefficiencies among input suppliers and poor logistic arrangements, inadequate cooperatives and stronger associations which can lobby for better prices and other producer incentives (Gelan, 2017). The constraints can be addressed through improved technological applications, efficient and effective input supply system, better management options, access to knowledge and credit which are required on the supply side. The development of market infrastructure and market institutions is also very important for inducing efficiency and incentives for market participants along the value chain (Tegegne *et al.*, 2010). Remedies to equitable access and participation involved factors such as partnerships, mentorship, economic empowerment, land reform, support services (structural, financial and market access). Competitiveness and profitability constraints could be addressed through addressing factors such as inputs (labour, costs, capital), efficiency of production, markets (domestic markets, import/exports, supply chain performance), enabling policy environment (food safety, animal health, land tenure) and risk management (environment, pests and diseases, crime and unstable prices) (DoA, 2006).

Marshall and Ejlersten (2011), in a study of improvement of animals through breeding, identified that some of the constraints pertained to lack of knowledge, capital, breeding animals, information and high mortalities. This was exacerbated by weak extension services where service delivery is compromised through transport problems affecting supervision, support and monitoring field activities. There are high staff turnover and lack of succession plan and insufficient capacity, with extension officers being reluctant to live and work in remote areas (Gelan, 2017). Furthermore, insufficient forage for livestock, poor livestock housing and land shortages were some of the constraints identified (Lukuyu *et al.*, 2015). Ouma *et al.* (2014) identified market related constraints which pertain to limited market opportunities, lack of market information, especially on input and output prices for different market outlets and location; lack of capacity (resources) in live-weight estimation (buyers take advantage of this). Further constraints include expensive and poor quality inputs; and unavailability of outlets supplying inputs within localities (Ouma *et al.*, 2014). This is a cause and also effect of poor production and marketing management, exacerbated by lack of both physical and institutional infrastructure and unwillingness in adopting improved husbandry practices (Coetzee *et al.*, 2005; ECRDA, 2015).

Darith *et al.* (2017), attribute some of the constraints to low educational levels of farmers, erratic market prices, local breed with low productivity, indigenous knowledge systems which dominate the subsector. Furthermore, there exists lack of resources such as grasses, stock feed, and water. Gender based constraints pertain to overshadowing of women premised on lesser educational levels and knowledge resulting in less self-confidence and discomfort especially in addressing men; involvement with childcare, disregarding other activities; cultural temporal differences, restricting women to certain activities at certain times of the day; cultural domestic prescriptions for women; reluctance of men to expose women to alien gender norms and outside negative stereotypes; and taboos of women travel. This heavily skewed decision making between spouses affects the allocation of resources (Anderson *et al.*, 2017).

In the one cow per family programme in Rwanda, Klapwijk *et al.* (2014) identified that for the programme to succeed, access to fodder and cowshed constraints need to be addressed, as well as land being a pre-requisite to be part of the programme. Ntuli and Oladel (2013), identified constraints pertaining to marketing, financial and production in broiler production in Limpopo Province, South Africa. The determinants of marketing constraints pertained to age, religion, frequency of extension contact, type of extension agent and housing type. Financial constraints were mainly determined by marital status, religion, type of extension agent and number of years in broiler farming, whereas determinants of production constraints were labour sources and number of years in broiler farming Ntuli and Oladel (2013). Roets *et al.* (2004), highlighted that challenges in designing a goat improvement programme in the Eastern Cape Province, South Africa, mainly centred on low level of organization, lack of appropriate infrastructure, skills, numbers and ownership of livestock. In Botswana, Oladele (2011) identified that significant determinants in a livestock identification and trace back system pertained to age (most farmers were conservative and void of introducing innovations), educational level (a significant indicator of social change, effective in adopting and practicing innovations), farming experience, source of information, herd composition, attitude towards the programme and time taken to crushes (infrastructure).

There is a fair amount of literature on the constraints faced by smallholder livestock producers (Agholor, 2013; DoA, 2006; Gelan, 2017; Khapayi and Celliers, 2016; Lukuyu *et al.*, 2015; Macleod *et al.*, 2008; Ouma *et al.*, 2014; Tegegne *et al.*, 2010). However, it tends to concentrate on livestock rearing independent of being part of a development programme. Limited literature tries to factor in constraints faced by livestock keepers in a development

programme (Klapwijk *et al.*, 2014; Marshall and Ejlersten, 2011). However, these also suffer the same limitation of availing constraints in the livestock husbandry irrespective of the constraints faced by the programme itself. There also exists a limitation on studies relating to the determinants of the constraints in livestock development programmes (Ntuli and Oladel, 2013; Oladele, 2011; Roets *et al.*, 2004). The current study digresses from this limitation and focuses on the constraints faced in a livestock development programme and their determinants, taking a case of the KyD scheme in South Africa.

2. Material and Method

The study made use of data collected from KyD scheme participants in KwaZulu Natal Province, South Africa. The data was collected in November, 2017, during KyD scheme farmer field days, purposively from 164 respondents in Godlwayo, Aitona and Uitval. The cross-sectional survey utilised a questionnaire as a data collection tool, with ethical considerations pertaining to anonymity, refusal to participate and confidentiality being taken into consideration (Ethical Certificate: University of Fort Hare, MUS281SNGA01). Statistical Package for Social Scientist (SPSS) version 23 was utilised to analyse the data through descriptive statistics, Likert scale and a binary logistic regression.

The Likert scale was used in identifying the perceptions of the respondents towards the constraints identified whilst the binary logistic regression was used in identifying determinants of constraints in participating in the KyD scheme. A binary logistic regression predicts the probability of occurrence of a dependent variable based on independent variables (Gujarati, 1992). The logistic regression is presented as Gujarati (1992):

$$logit\ (P_i) = \ln\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_1 X_1 + \cdots + \beta_n X_n + \mu_t \quad (1)$$

where P_i= probability that the characteristic of interest is present; $1 - P_i$ = probability that the characteristic of interest in absent; $\beta = (\beta_1, \beta_2, \ldots \beta_n)$ = coefficients; $X = (X_1, X_2, \ldots, X_n)$ = independent variables; μ_t= error term. In the current study, P_i represented that a constraint was identified as affecting the respondent, whereas $1 - P_i$ the constraint did affect the respondent. The independent coefficient X referred to various socio-economic and institutional factors that affected whether the identified factor was a constraint or not, and are summarised in Table 1.

Table-1. Independent variables in the binary logistic regression model

Variable	Type of measurement
Years in the programme (*years*)	Continuous
Gender of household head	Categorical: 1=Male, 2=Female
Age of household head (*years*)	Ordinal: 1=<20, 2=20-29, 3=30-39,…, 7=>70
Marital status of household head	Categorical:1=Single, 2=Married, 3=Widowed, 4=Divorced
Total household size	Continuous
Highest educational qualification of household head	Categorical:1=None at all, 2=None but can read, 3=None but can write, 4=None, but can read and write, 5=Primary, 6=Secondary, 7=Tertiary
Employment status of household head	Categorical: 1=Unemployed, 2=Formally employed, 3=Self-employed, 4=Part time farmer, 5=Full time farmer
Monthly household farm income	Ordinal:1=<R500, 2=R500-R999, 3=R1000-R1999,…, 13=>R100 000
Monthly household off/non-farm income	Ordinal:1=<R500, 2=R500-R999, 3=R1000-R1999,…, 13=>R100 000
Source of income	Categorical: 1=Formal employment, 2=Informal employment, 3=Social grants, 4= Remittances, 5= Pension
How long have you been rearing cattle (*years*)	Ordinal: 1=0-4, 2=5-9, 3=10-14,…,6= More than 25 years
Number of cattle	Continuous:
Type of cattle enterprise	Categorical: 1=Communal, 2= Small scale commercial, 3= Large scale commercial
Land tenure	Categorical: 1=Communal, 2= Resettled, 3= Inherited, 4= Private, 5= Rented
Farming activities undertaken	Categorical: 1= Livestock only, 2= Livestock + crops, 3= Livestock + vegetable, 4= Livestock + crops + vegetables
Source of cattle	Categorical: 1= Purchased, 2= Inherited, 3= Borrowed, 4= Gifts, 5= Dowry
Decision maker	Categorical: 1= Household head, 2= Immediate whole family, 3= Relative (individual), 4= Extended family (group)
Training in rearing cattle	Dummy: 1=Yes, 2=Otherwise
Access to veterinary services	Dummy: 1=Yes, 2=Otherwise
Access to dip tank	Dummy:1=Yes, 2=Otherwise

3. Results and Discussion

3.1. Descriptive Results

Table 2 shows that on average, the respondents have been part of the KyD programme for 8 years, even though the maximum number was 18 years. Even though the programme was officially commissioned by the government in 2007, some of the respondents indicated that they were part of the programme as far back as 2000. There were more male respondents, aged between 40 and 50 years, married, with a household size of 7 and an average dependency ratio of 1.27. Most of the respondents had a primary education, unemployed with both farm income and non-farm income between R1000 and R2000 per month. Most respondents attained social grant non-farm income and have been rearing cattle for 10 to 15 years, with herd averaging 19 cattle. Most of the respondents utilised communal land rearing cattle as well as engaged in vegetable production. Most respondents inherited their cattle, with farm decisions being undertaken by the household head. Most respondents did not receive any training in livestock rearing but did however have access to veterinary services as well as a dip tank.

Table-2. Descriptive statistics

	Min	Max	Mean	Std. Deviation
Years joined in the program	1	18	8.03	5.041
Gender of household head	1	2	1.30	0.462
Age of household head	1	7	4.55	1.344
Marital status of household head	1	4	2.20	0.939
Total household size	1	30	6.58	4.365
Dependency ratio	0	8	1.27	1.249
Highest educational qualification of household head	1	7	4.75	1.868
Employment status of household head	1	5	1.96	1.374
Monthly household farm income	1	11	2.99	2.756
Monthly household off/non-farm income	1	11	3.16	2.593
Source of income	1	5	2.63	0.786
How long have you been rearing cattle	1	6	2.81	1.660
Number of cattle	1	109	18.96	17.778
Land tenure	1	5	1.70	1.087
Farming activities undertaken	1	4	2.95	1.153
Source of cattle	1	5	2.05	1.252
Decision maker	1	4	1.49	0.917
Training in rearing cattle	1	2	1.70	0.460
Access to veterinary services	1	2	1.25	0.434
Access to dip tank	1	2	1.05	0.228

Figure 1 shows that 27.3% of the respondents identified a lack of sense of ownership being a high constraint in the KyD programme. Twenty five percent identified that lack of information was a high constraint, whilst 22.4%, 21.1% and 19.9% highlighted that lack of technical knowledge, lack of market accessibility and lack of resources respectively were high constraints within the programme. Lack of leadership, lack of land and lack of extension commitment were identified by 19.3%, 18.6% and 15.5% respectively, as having high constraint within the KyD programme.

Figure-1. Constraints in the Kaonafatso ya Dikgomo Scheme

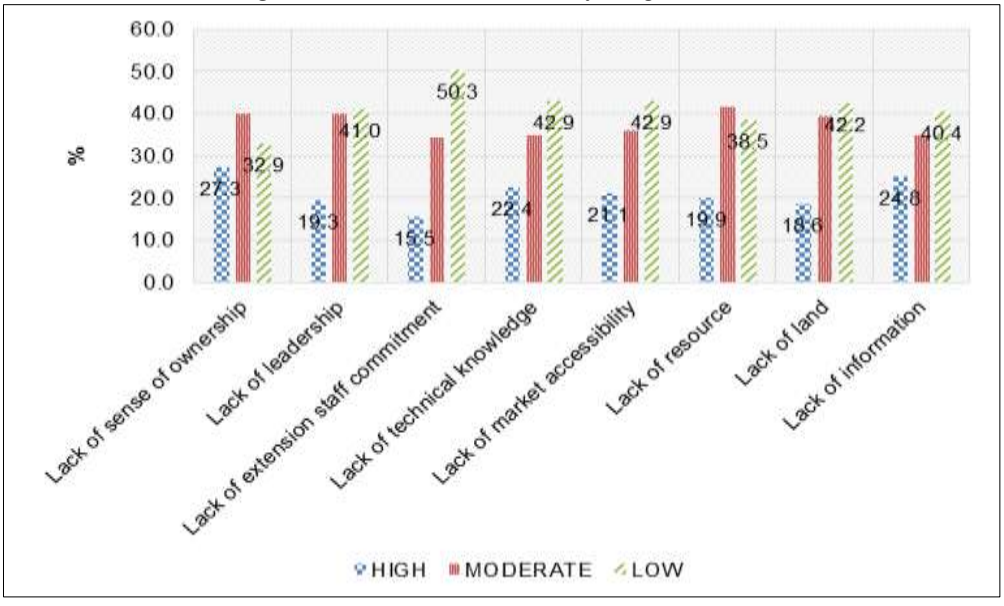

Table 3 shows that the 8 constraints identified were reliably measured by the 3-point Likert scale, with a Cronbach's Alpha more than 0.7. The Hotteling's T-squared test is significant at the $p < 0.05$ level, signifying a significant difference in the means of the Likert scores for each constraint. The mean scores (≈2) and the negative skewness show that the respondents were close to being neutral swaying towards low rating of the constraints in the KyD programme

Table-3. Constraints in the Kaonafatso ya Dikgomo Scheme

	Min	Max	Mean	Std. Deviation	Skewness	Kurtosis
Sense of ownership	1	3	2.06	0.777	-0.097	-1.330
Leadership	1	3	2.22	0.747	-0.378	-1.124
Commitment by extension staff	1	3	2.35	0.735	-0.653	-0.883
Technical knowledge	1	3	2.20	0.784	-0.379	-1.274
Market inaccessibility	1	3	2.22	0.772	-0.397	-1.219
Resources	1	3	2.19	0.743	-0.315	-1.131
Land	1	3	2.24	0.746	-0.414	-1.100
Information	1	3	2.16	0.795	-0.286	-1.361
Reliability test						
Cronbach's Alpha		0.885			Sig	
Hotelling's T-squared		26.567			0.001	
			Mean Square	F		
ANOVA with Tukey's Test for Nonadditivity	Between items		1.074	24.992	0.001	
	Nonadditivity residual		0.502	1.698	0.193	

3.2. Empirical Results

A binary logistic regression was performed in ascertaining determinants of the various constraints faced in the KyD scheme. Table 4 shows that from the model summary only 3 constraints were significantly identified relative to their determinants. Lack of ownership and information were significant at the $p < 0.05$ level with Nagelkerke values of 27.5% and 29.1% respectively. Wurzinger *et al.* (2011), advocate that programme ownership should be solely the premises of the community-level participants, whilst the research institutes should play an advisory role. Tsantopoulos *et al.* (2017), reinforce, adding that information problems reduces trust in innovations in livestock development. The lack of commitment by extension staff constraint was significant at the $p < 0.1$ level, with a Nagelkerke value of 29.7%. Ogola *et al.* (2010), found that lack of extension was a constraint in a goat breeding programme in Kenya. The other constraints i.e. lack of leadership, technical knowledge, market access, resources and land were insignificant, indicating that the variables utilised in the model did not adequately explain whether they were determinants or not.

Table 4 shows that determinants of whether ownership was a constraint were dependent upon access to veterinary service at the $p < 0.05$ level, the length of time a respondent was rearing cattle, land tenure and the decision maker at the $p < 0.1$ level. The results show that the limited access to veterinary service there was, there existed a 69% likelihood that ownership of the programme became a constraint. This implies that with limited access to veterinary services, the respondent's view that the KyD belongs to the government and they are not part of the decision making process, and in essence do not own the programme. Part of the programme emphasises on dipping and veterinary services (ARC, 2011;2015), thereby showing that farmers overly rely on it for such services. This is reflective at two ends: 1) The low resource endowments of the livestock farmers who are part of the programme with reduced access to veterinary services; and 2) the free-rider syndrome in smallholder areas (Georgiev, 2010; Iqbal and Daly, 2013; Tegegne *et al.*, 2010), where farmers rely on government and/or non-governmental organisations for intervention in veterinary services. The farmers openly reduce themselves to recipients of external techniques in animal husbandry due to lack of resources, un-intuitively relinquishing ownership and direction of the programme to research institutes and researchers.

Table 4 also shows that for every 5 year increase in the number of years a respondent was rearing cattle, there existed a 23.8% likelihood that ownership of the programme became a constraint. This implies that the more time a respondent was rearing cattle, the more they identify that ownership was a constraint. This reinforces the free-rider syndrome as the more experienced farmers have been receiving government support over the years and assume it a norm that they are entitled to it, through relinquishing ownership of the programme. More experienced farmers have also been exposed to more development initiatives, thereby become precarious about which programme they belong to. Furthermore, through experience in other programmes, these experienced farmers were exposed to the top-down approach in programme planning and implementation (Wurzinger *et al.*, 2011), and thus it became imbedded in them, and thus un-reluctantly relinquish ownership of the programme to the administers and designers of such programmes. Relationship complexities also increase as a farmer's experience in rearing cattle increases, having a bearing on the ownership within the programme between farmers themselves as well as with the programme administers and designers. A change in mind set is thus a requirement if such a situation is to be circumvented.

It is also shown that as land tenure shifts from communal through to private, there is a 1.7 chance that ownership will not be a constraint, whereas as the family decision maker shifts from household head to extended family, there exists a 60.2% chance that ownership of the programme becomes a constraint. As the farmers have more access to the land resource, the more they assume ownership of the programme. The DoA (2006) identify that equitable access is a constraint in the South African livestock sector. In Bali, Ayu *et al.* (2002) found that lack of land was a major constraint in participation in a livestock development programme, impeding expansion. Farmers that have access to land try by all means to make such programmes succeed as there in more chance of pro-longed exposure to that programme. Such farmers tend to actively participate and own the programme to ensure that it subsist for as long as possible. Decision making also tends to have a bearing on the decision to participate and be part of the programme, as well as roles played thereby influencing the ownership of that programme. This is particularly influenced by the complexities in decision making, less exhibited by the number of decision makers. In this instance, the more decision makers there are, the likelihood of conflict and delays in making decisions pertaining to be part of the programme, and the roles played therein.

Table-4. Determinants of constraints in the Kaonafatso ya Dikgomo (KyD) Scheme

	Owner ship	**Leader ship**	**Commitment by extension**	**Technical knowledge**	**Market access**	**Resource s**	**Land**	**Infor mation**
Years joined in the program	0.031 (0.522) 1.031	0.076 (0.164) 1.079	0.025 (0.678) 1.025	0.038 (0.453) 1.039	-0.029 (0.543) 0.971	-0.015 (0.758) 0.985	-0.028 (0.575) 0.972	-0.005 (0.919) 0.995
Gender of household head	0.330 (0.564) 1.390	0.469 (0.481) 1.599	1.430* (0.080) 4.179	0.481 (0.407) 1.618	0.192 (0.754) 1.212	1.138* (0.072) 3.119	0.847 (0.183) 2.333	-0.379 (0.515) 0.685
Age of household head	-0.116 (0.545) 0.890	0.300 (0.194) 1.349	0.345 (0.153) 1.412	0.238 (0.249) 1.269	0.040 (0.840) 1.041	-0.042 (0.839) 0.959	-0.274 (0.201) 0.760	-0.245 (0.240) 0.782
Marital status of household head	0.387 (0.229) 1.473	-0.091 (0.781) 0.913	-0.030 (0.936) 0.971	-0.214 (0.477) 0.807	0.632* (0.060) 1.881	0.008 (0.980) 1.008	-0.063 (0.844) 0.939	0.448 (0.178) 1.566
Total household size	-0.003 (0.960) 0.997	0.053 (0.424) 1.055	0.123 (0.189) 1.131	-0.002 (0.979) 0.998	-0.052 (0.340) 0.950	-0.029 (0.620) 0.971	0.105 (0.206) 1.111	-0.023 (0.717) 0.978
Highest educational qualification of household head	0.058 (0.670) 1.060	0.254* (0.096) 1.290	0.233 (0.165) 1.263	-0.009 (0.947) 0.991	-0.051 (0.724) 0.950	-0.003 (0.985) 0.997	0.075 (0.610) 1.078	-0.188 (0.195) 0.828
Employment status of household head	0.110 (0.590) 1.116	0.258 (0.301) 1.294	0.403 (0.161) 1.496	0.026 (0.907) 1.026	0.206 (0.387) 1.229	-0.148 (0.476) 0.863	0.093 (0.674) 1.097	0.133 (0.538) 1.143
Monthly household farm income	-0.067 (0.592) 0.935	0.078 (0.581) 1.081	-0.197 (0.158) 0.821	-0.209* (0.088) 0.812	0.090 (0.499) 1.094	-0.169 (0.178) 0.844	-0.092 (0.477) 0.912	-0.185 (0.157) 0.831
Monthly household off/non-farm income	0.030 (0.832) 1.031	0.014 (0.932) 1.014	-0.184 (0.272) 0.832	-0.403** (0.015) 1.496	0.043 (0.773) 1.044	0.278* (0.063) 1.321	0.297* (0.070) 1.346	0.397** (0.020) 1.488
Source of income	-0.0385 (0.295) 0.699	0.189 (0.664) 1.208	-0.740 (0.122) 0.477	0.590 (0.163) 1.803	-0.073 (0.851) 0.929	0.182 (0.631) 1.199	0.458 (0.297) 1.581	0.769* (0.069) 2.158
How long have you been rearing cattle	-0.271* (0.083) 0.762	-0.146 (0.422) 0.864	-0.110 (0.579) 0.896	-0.086 (0.617) 0.918	-0.134 (0.409) 0.875	-0.050 (0.759) 0.951	0.141 (0.408) 1.152	0.086 (0.608) 1.090
Number of cattle	-0.016 (0.354) 0.984	-0.014 (0.530) 0.987	0.0018 (0.526) 1.018	0.015 (0.423) 1.015	0.005 (0.784) 1.005	0.001 (0.955) 1.001	-0.006 (0.738) 0.994	0.016 (0.442) 1.016
Type of cattle enterprise	0.703 (0.121) 2,021	0.618 (0.258) 1.854	1.012 (0.108) 2.750	-0.151 (0.727) 0.860	0.405 (0.403) 1.500	-0.288 (0.479) 0.750	0.450 (0.368) 1.569	-0.426 (0.331) 0.653
Land tenure	0.504* (0.099) 1.655	0.597* (0.098) 1.817	0.598 (0.117) 1.819	0.334 (0.254) 1.396	-0.147 (0.613) 0.864	0.401 (0.162) 1.493	0.550* (0.088) 1.733	0.938*** (0.009) 2.554

Farming activities undertaken	0.199 (0.294) 1.220	-0.009 (0.969) 0.991	-0.236 (0.338) 0.790	-0.491** (0.024) 0.612	-0.134 (0.511) 0.874	-0.273 (0.195) 0.761	-0.269 (0.220) 0.764	-0.146 (0.474) 0.864
Source of cattle	0.012 (0.940) 1.012	-0.205 (0.262) 0.815	-0.111 (0.587) 0.895	-0.056 (0.753) 0.946	0.050 (0.781) 1.051	0.019 (0.919) 1.019	0.137 (0.523) 1.147	0.206 (0.261) 1.228
Decision maker	-0.507* (0.061) 0.602	-0.761** (0.009) 0.467	-0.638* (0.053) 0.528	-0.664** (0.014) 0.515	-0.343 (0.220) 0.709	-0.662** (0.017) 0.516	-0.692** (0.015) 0.501	-0.744** (0.007) 0.475
Training in rearing cattle	-0.325 (0.538) 0.722	-0.172 (0.777) 0.842	-0.357 (0.612) 0.700	-1.652** (0.018) 0.192	-0.498 (0.385) 0.608	-0.397 (0.500) 0.673	0.080 (0.891) 1.083	-0.843 (0.146) 0.430
Access to veterinary services	-1.172** (0.023) 0.310	0.328 (0.579) 1.389	-0.157 (0.812) 0.854	-0.245 (0.645) 0.782	-0.573 (0.282) 0.564	-0.819 (0.130) 0.441	-0.112 (0.853) 0.894	0.037 (0.946) 1.038
Access to dip tank	0.488 (0.658) 1.628	-1.379 (0.260) 0.252	-1.304 (0.318) 0.271	-0.059 (0.960) 0.942	0.461 (0.689) 1.585	0.451 (0.733) 1.570	-1.088 (0.355) 0.337	-1.722 (0.121) 0.179
Constant	2.148 (0.377) 8.565	-1.672 (0.574) 0.188	0.613 (0.847) 1.847	3.286 (0.211) 26.734	1.713 (0.509) 5.545	2.775 (0.299) 16.046	0.429 (0.874) 1.536	2.982 (0.242) 19.732
Model summary								
-2 Log likelihood	152.289	128.251	108.224	141.321	143.040	139.988	133.046	144.478
Nagelkerke	0.275	0.263	0.297	0.252	0.200	0.184	0.199	0.291
Sig.	0.043**	0.123	0.090*	0.119	0.399	0.541	0.461	0.029**
Sig. *0.1, **0.05, ***0.01								

Determinants of whether commitment by extension was a constraint in the KyD programme included gender of household head and decision maker at the $p < 0.1$ level. Table 4 shows that there was a 4.18 likelihood that commitment by extension was not a constraint if the household head was female relative to male. This reflects the acceptance of extension services by the households based on gender, showing that females do not find it difficult and less of a constraint in relating to what extension officers prescribe. Furthermore, female are more engaged because of the utility they attach to agricultural production (Alkire *et al.*, 2013), thereby are more receptive to any intervention they deem will improve production. However, Ntuli and Oladel (2013) highlighted that the higher the extension contact in broiler production in Limpopo province, the enhanced the marketing constraint. Females have more contact with extension staff and fellow farmers due to their household based chores, grounding them to the house while their male counterparts are more enterprising moving further from the household. This enhances contact with extension officers, thereby making it a negligible constraint to female headed households. It is further shown that as the family decision maker shifts from household head to extended family, there exists a 52.8% chance that commitment by extension staff in the programme becomes a constraint. This is also reflected in the complexities of group decision making, where a head of household decision maker would not find extension commitment as a constraint because the single person is a point of reference and contact. A situation where there are possibilities of different points of contact and decision makers tends to distort the intended message as well as taking time, thereby assuming extension commitment a constraint.

Determinants of whether lack of information was a constraint was determined by monthly off-farm income, land tenure, and decision maker at the $p < 0.01$ level, whilst source of income was significant at the $p < 0.1$ level. As off-farm income increases, there exists a 1.44 chance that access to information does not become a constraint. Access to income tends to enhance access to Information and Communication Technology (ICT) improving access to information. In a disease control programme in Eastern Cape, South Africa, Masika *et al.* (1997) identified the attempt of the programme in shifting ownership to local communities and encountered challenges pertaining to information access and training. Ayu *et al.* (2002), also found lack of information limiting farmer access to livestock programmes. According to Tsantopoulos *et al.* (2017) if farmers mistrust the information they do not make investments in amendments and innovations reducing their participation in collective schemes. Contrarily however, there exists a 2.15 likelihood that access to information will not be a constraint when the source of income shifts from formal employment to social grants, remittances and pensions. This tends to down play the access to more income which enhances access to ICT. This might be due to socio-economic activity differences between those formally employed, informally employed, on social grants and pensioners. Formally employed respondents are likely

to spend most of their time away from the farm and engaged in their employment activities thereby not privy to any information related to the livestock development programme. Thereby access to information becomes a constraint relative to pensioners and social grant recipients who for the most parts are at home, being privy to any information and development in the programme. In that essence, lack of information will not be a constraint. Table 4 also shows that there is a 2.55 likelihood that access to information will not be a constraint when land tenure shifts from communal through to private. Land owners have an affinity to develop their land and production respectively. Tsantopoulos *et al.* (2017), highlights that effective information can be obtained through educational actions, workshops, information gatherings and it is more likely that private land owners would like to improve access to such information. They are adamant in accessing any information that pursues this cause. However, as decision maker shifts from household head to extended family, there is a 47.5% chance that access to information becomes a constraint. This is also explained by the complexities in decision making where the larger the decision making body, the larger the probability that there would be lack of information and misinformation.

4. Conclusion and Recommendation

The study explored the constraints faced in the Kaonafatso ya Dikgomo (KyD) scheme in South Africa. The study went on further to identify the determinants to such constraints. The study revealed that out of the 8 constraints identified, lack of ownership and information were highly rated. This was followed by lack of technical knowledge, market access, resources, leadership, land and commitment from extension staff. Overall, the respondents had a neutral-low rating of the constraints. Three of the constraints, namely lack of ownership, information and commitment of extension staff, were adequately modelled with the variables utilised in the binary logistic regressions. The lack of ownership constraint was determined by access to veterinary services, number of years a respondent was rearing cattle, land tenure and the decision maker. Determinants of commitment of extension worker constraint were gender of household as well as the decision maker, whilst for lack of information were monthly off-farm income, land tenure, decision maker as well source of income.

The respondents in the study area exhibited overreliance on the programme in term of veterinary services. This has impeded effective participation in decision making as they do not want to circumvent the status quo top-down decision making. Land ownership had a bearing on whether the respondents identified the programme belonging to them or was government imposed, with those owning land identifying with the programme. Furthermore, respondents with access to land have an affinity to information which improves their productivity, thereby reducing the lack of information constraint. The study highlighted that the more the complexities in decision making, the less the respondents identified with the programme, the reduced commitment by extension as well as lack of information. The commitment by extension constraint was less apparent to female respondents relative to male.

The study recommends the need to enhance training in the livestock programme to take advantage of the increased livestock demand outlook. Further training is required to induce change in mind set pertaining to livestock as a tradition impeding commercialisation. Women should also be empowered to further participate. This also requires social transformation in regarding livestock as a tradition, with decision precepts based upon males. There requires effective conscientization. The programme can take advantage of the existing relationships with the extension officers as well as the department of agriculture to enhance partnerships for effective service delivery. Ogola *et al.* (2010), advocates for effective extension training models be adopted for success of livestock development programmes. The lack of ownership constraint can be avoided through incorporating indigenous knowledge in veterinary services provided. This has tier effect of improving access to veterinary services and animal health, as well as enhancing participation and decision making of the participants. Confidence and ownership of the programme is therefore enhanced. The lack of information constraint requires effective extension, achieved through taking advantage of the relationship with governments departments. Other avenues which disseminate information about the programme can be pursued such as the electronic media to avoid lack of information.

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