Evaluation of the Bull Scheme: An Open Nucleus Breeding System in the communal livestock farming areas of Namibia

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ABSTRACT

The communal farmers in Namibia have been unsatisfied with the low prices received from the meat slaughter companies due to low carcass weight when selling their cattle. As a result, the Government prioritised increased quality livestock production through the implementation of the Bull Scheme in which breeding materials namely improved indigenous bulls (e.g Sanga) and exotic breeds were given to improve frame size. This study, therefore, assessed the impact of the "Bull Scheme" on the beneficiary farmers' livelihoods made through the provision of breeding male animals with a prime focus on the herds of the beneficiaries. A questionnaire-based cross-sectional survey was conducted on 105 beneficiaries and data was analysed using SPSS version 25.0. There was an overall increase in the herd/flock of beneficiaries comparing the number of animals before and after Scheme participation with an increase of 131%, 147%, and 67% for the bull recipients, ram recipients, and buck recipients respectively. There was also an increase in the number of cattle sold after the scheme by 43%, for the bull recipients (t(83) = -2.445, p=0.017), while incomes were reported to have increased. Regardless of initial training upon receiving the breeding males, farmers did not adjust their management practices upon the introduction of new breeding animals. Most beneficiaries indicated that they faced several challenges of expensive feed supplements, long-distance travelled in search of grazing and water which predisposed the scheme breeding males to poor conditions and even death of the animal. There is a need to train beneficiaries on record keeping and proper management as well as the goals of the project prior to project implementation.

Keywords: Beef production, beneficiary farmers, breeding males, challenges, farmer's perceptions, Namibia

RÉSUMÉ

Les éleveurs communautaires de Namibie sont insatisfaits des prix bas reçus des entreprises d'abattage de viande en raison du faible poids des carcasses lors de la vente de leurs bovins. Par conséquent, le gouvernement a donné la priorité à une production de bétail de qualité accrue grâce à la mise en œuvre du programme Bull, dans lequel des matériaux de reproduction, notamment des taureaux indigènes améliorés (par exemple, Sanga) et des races exotiques, ont été fournis pour améliorer la taille des animaux. Cette étude a donc évalué l'impact du "programme Bull" sur les moyens de subsistance des agriculteurs bénéficiaires grâce à la fourniture d'animaux mâles reproducteurs, en mettant l'accent sur les troupeaux des bénéficiaires. Une enquête transversale basée sur des questionnaires a été menée auprès de 105 bénéficiaires et les données ont été analysées à l'aide de la version 25.0 de SPSS. On a constaté une augmentation globale du troupeau des bénéficiaires en comparant le nombre

d'animaux avant et après la participation au programme, avec une augmentation de 131 %, 147 % et 67 % pour les bénéficiaires de taureaux, de béliers et de boucs respectivement. On a également constaté une augmentation du nombre de bovins vendus après la mise en place du programme de 43 % pour les bénéficiaires de taureaux (t(83) = -2,445, p=0,017), tandis que les revenus auraient augmenté. Indépendamment de la formation initiale reçue lors de la réception des animaux reproducteurs, les agriculteurs n'ont pas ajusté leurs pratiques de gestion à l'introduction de nouveaux animaux reproducteurs. La plupart des bénéficiaires ont indiqué qu'ils rencontraient plusieurs défis liés au coût élevé des suppléments alimentaires, aux longs déplacements à la recherche de pâturages et d'eau, ce qui exposait les animaux reproducteurs du programme à des conditions précaires et même à la mort des animaux. Il est nécessaire de former les bénéficiaires à la tenue de registres et à une gestion appropriée, ainsi qu'aux objectifs du projet avant sa mise en œuvre.

Mots clés : Production de viande bovine, agriculteurs bénéficiaires, animaux reproducteurs, défis, perceptions des agriculteurs, Namibie

INTRODUCTION

The livestock sector is the single largest agricultural contributor to the Gross Domestic Product (GDP) of Namibia. The country has about 2.2 million cattle, 1.8 million goats, 2.5 million sheep, and a few pigs which all contribute 76% to the overall agricultural output value (Namibia Livestock Census, 2011; NDP4, 2012). About 80% of beef and mutton production is exported to South Africa and Europe which on average contributes between 10-15 % to the national income (Kruger and Lammerts-Imbuwa, 2008; Namibia Meat Board Report, 2011) depending on the amount of rainfall in a particular year. Amongst others, Government set priorities to increase livestock production, and development of the livestock sector particularly communal farming in the country (NDP4, 2012). The Ministry of Agriculture, Water and Land Reform (MAWLR) implemented the Bull Scheme program during the 2007/2008 financial year in which a total of 166 breeding males were distributed to communal livestock farmers; being 104 bulls, 36 goats, and 26 sheep. Similar programs were implemented earlier by the MeatBoard of Namibia (2003-2005), and later by GOPA (2010-2014).

The Bull Scheme in this study refers to the provision of livestock breeding materials directly to communal farmers. The communal farmers in Namibia have been unsatisfied with the low prices received at the meat slaughter companies due to low carcass weights when selling their cattle. As a result, the government prioritised increasing livestock production and the quality of animals through the implementation of the Bull Scheme. The breeding materials which were given were improved indigenous bulls (e.g. Sanga) and some exotic breeds to improve frame size. The main goal of the Bull Scheme project was to provide livestock breeding material to communal farmers thereby improving the productivity, and food security, creating and generating income through selling high-quality livestock; training farmers in various livestock management; strengthen the contact and relationship between the extension and farmers and encourage record-keeping of farm information. Breeding males distributed were bulls, rams, bucks, and a few boars, however, this study focuses on only the impact of the bulls, rams, and bucks. The most popular beef cattle breeds which were distributed to communal farmers through the Bull Scheme were; Brahman, Bonsmara, Simmentaler, Afrikaner, and the improved Sanga. The scheme was monitored by the extension officers and animal health technicians in the region. About 20% of total breeding males bred at government breeding stations were allocated annually to the communal farmers through the scheme.

The approach that was used in the scheme follows that of the open nucleus-breeding scheme (ONBS). Cunningham (1980) described an open nucleus-breeding scheme as a good strategy for genetic improvement in the absence of artificial insemination (AI) and record-keeping. ONBS is also the most appropriate for a subsistence production system. The breeding strategy used in this study follows that of an ONBS consisting

of a three-tier pyramidal structure comprising the nucleus herd, commercial herd, and village herds. In this case, the nucleus herds were the livestock breeding research stations or farms, which produced a small number of best quality sires, on-farm tested, and were then distributed at a subsidized price to the owners of communal herds.

The Scheme was monitored by the agricultural extension officers together with animal health officers stationed in the regions by visiting the village herds. The monitoring process was carried out to assess both the adaptability and performance of the bulls. However, there is almost no performance recording of livestock in communal farming and therefore it has been difficult to determine the performance of crossbreds (Marius *et al*., 2012, Marius *et al*., 2021). However, the Namibia Livestock Identification and Trace-back System (NAMLITS) was therefore implemented by MAWLR to trace animals and control animal diseases in the fulfilment of the requirement of meat exports. Lack of animal performance recording has been known for a long to affect genetic improvement programs with negative results in the communal areas of most developing countries (Kahi *et al*., 2003; Roessler *et al*., 2008). Tada *et al*. (2012) reported that the absence of performance records, particularly of the indigenous communal breeds can lead to the undefined breeding season and uncontrolled mating. The consequences of uncontrolled mating are well documented and include, among others; the production of un-uniform animals, the presence of undesirable and genetic defects, and inbreeding depression (Scholtz *et al*., 2008; Scholtz and Theunissen, 2010).

Crossbreeding has been reported to ensure rapid genetic progress with desired traits hence complimentarily of traits and exploit heterosis in animal performance (Imbayarwo-Chikosi, 2009). In as much as crossbreeding improves frame size and breed vigour, it may lead to the loss of indigenous animal genetic resources. The conservation of adapted indigenous cattle breeds in vivo such as breeding research stations, in vitro for example conservation of genetic material in liquid nitrogen, is supported by FAO (Wollny, 2003; FAO, 2007). In Namibia, cross-breeding with exotic breeds is common in communal livestock farming (Marius *et al*., 2012). The adaptability of breeds becomes very important, especially in marginal semi-arid lands where grazing is limited and also with long, dry, and hot conditions which affect mostly exotic breeds but is suitable for indigenous breeds.

Introducing bulls to the communal areas help in introducing new genetic material. However, in recent studies, developing countries have been losing many indigenous livestock breeds as a result of farmers' preference for exotic breeds that are perceived to be more productive. In Botswana, the study by Nsoso and Morake (1999) did not recommend cross-breeding practice under the traditional farming system because of the unavailability of fences which leads to uncontrolled breeding. In Zambia, efforts to improve the productivity of indigenous cattle through crossbreeding with high-performing exotic breeds did not work very well because there was no provision of a continuous supply of the exotic breeds to the communal farmers (Simbaya, 2005).

To inform future projects, programming, and other interventions, it is imperative to assess the bull scheme in terms of its implementation (what worked and what did not work), outcomes, and impact on the beneficiaries' livelihoods. The study further assesses whether the project achieved its objectives or fell sort based on the outcomes. This study, therefore, sought to evaluate the impact of the bull scheme project on the beneficiaries.

MATERIALS AND METHOD
Study area. The Scheme distributed breeding male animals to communal areas within the 13 regions (excluding the Khomas region) (Figure 1) and villages were irrelevant to the list. The areas fall under ecological zones defined as arid to semi-arid and desert to coastal along the Atlantic Ocean. In general, rainfall is highly variable, from less than 20mm in the western coastal zones to 700 mm north-east of the Zambezi strip (Mendelssohn, 2006). Temperature ranges between 3 and 39° C, indicating high temperature, high evaporation, and surface runoff, while groundwater recharge is

very minimal (Mendelssohn, 2006). Furthermore, the country, of late experienced frequent droughts coupled with temporal and spatial unequal rainfall distribution. The livestock production system is characterised mainly by extensive grazing across the country with sheep and goats dominating the southern part of the country, while cattle and crops are in wetter areas mainly the north-central and north-east.

Sampling and data collection. The 'Bull Scheme' in this study refers to the provision of livestock breeding materials directly to communal farmers in all the regions of Namibia excluding Khomas region. The Scheme was implemented by MAWLR from 2007 to 2014. A total of 166 breeding males were distributed to communal livestock farmers; being 104 bulls, 36 goats, and 26 sheep.

A purposive sampling design was used in the study because only beneficiaries were allowed to participate in the survey using the beneficiaries list.

The research design comprised a quantitative and qualitative approach in a questionnaire to capture qualitative and quantitative information. Data were collected using a structured questionnaire administered through face-to-face interviews with the Scheme beneficiaries. The data were collected between October 2013 and February 2014. The sampling frame consisted of all beneficiaries, however, the target sample size was 50% of beneficiaries (83) since homogeneity of the target population was assumed. A total of a hundred and five (105) respondents were interviewed representing 63% of all beneficiaries. Some of the questions that were asked in the questionnaire included: the number of animals before and after the scheme, number of livestock sold before and after the scheme, improvement in income after the scheme, improvement in weight of livestock sold after the scheme, fate of the breeding males and beneficiaries' perception of the scheme among others.
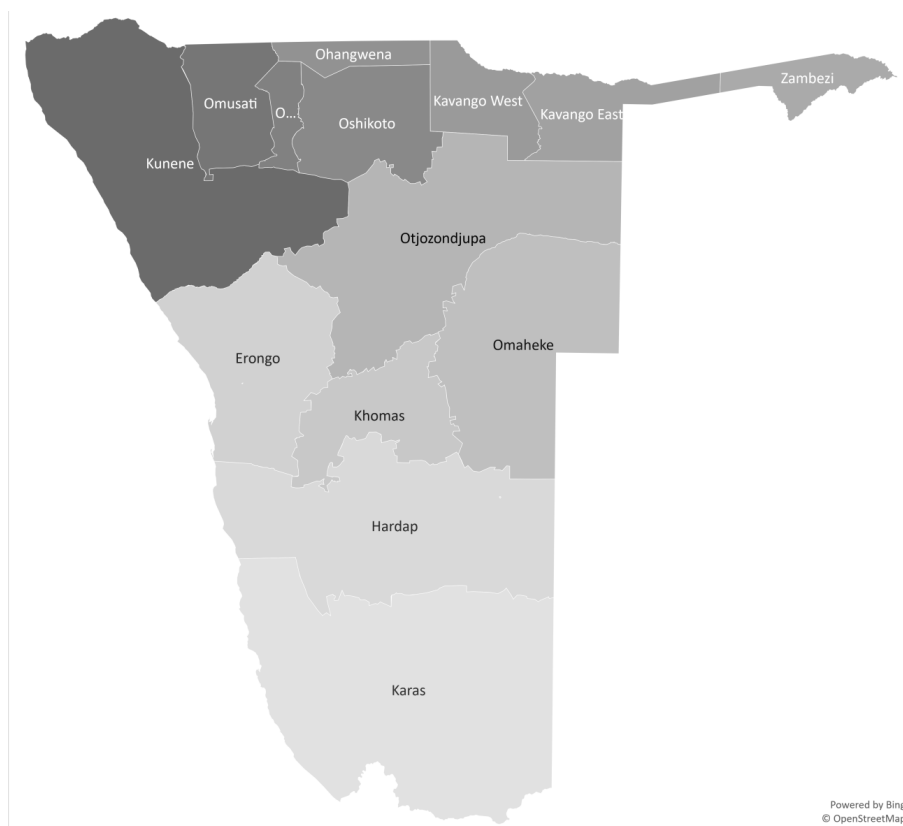

Figure 1. The map of Namibia showing the fourteen (14) regions

In addition, the approach used for assessment was based on Radhakrishna's (2001) model for evaluating agricultural and extension projects. The model posits three evaluation questions relating to (i) problem diagnosis and objectives that address the problem, (ii) the desired situation, and (iii) what the project actually achieved. This model framework guided the approach of this study.

Data analyses. Data were analysed using descriptive statistics (frequencies, means), graphical techniques (graphs), and a paired sample T-test to compare the number of animals kept and sold before and after the scheme using SPSS version 25 for Windows.

RESULTS

The demographic information of the beneficiaries in the Scheme is shown in Table 1. Data were collected and the percentage of beneficiaries with breeding males, on sex, age, marital status, level of education, and sources of income. Out of the 105 beneficiaries interviewed, 78.1 % received a bull, 12.4 % a buck, and 9.5 % a ram for breeding purposes. Most of the beneficiaries interviewed were married (71.4 %), males (84.8 %) aged 60 and above (38.1 %), who had at least a secondary education (39 %), and very few with no education background (16.2 %). Beneficiaries that were interviewed were mostly those whose incomes were drawn from farming (41%), however, 24.8 % indicated that they were permanently employed while others were pensioners (15.2 %). The majority of beneficiaries interviewed also had farm income between N$ 5001-10 000 (23.8 %) and N$ 50001-100 000 (21.9 %) per year, whereas, 31.4 % earned income from non-farm businesses and 21 % of farmers had no information on their farm incomes.

Table 1. Demographic information of the beneficiaries in the Scheme

Variable		Total (%)
Breeding male	Bull	82 (78.1)
	Ram	10 (9.5)
	Buck	13 (12.4)
Sex	Female	16 (15.2)
	Male	89 (84.8)
Age (years)	20-30	4 (3.8)
	31-40	9 (8.6)
	41-50	14 (13.3)
	51-60	35 (33.3)
	61+	40 (38.1)
	Do not know	3 (2.9)
Marital status	Single	23 (21.9)
	Married	75 (71.4)
	Widow/er	6 (5.7)
	No answer	1 (1.0)
Level of Education	Primary(grade 0-7)	29 (27.6)
	Secondary (grade 8-12)	41 (39.0)
	Tertiary(college and university)	18 (17.1)
	No education/Literacy	17 (16.2)
Major source of income	Farming	43 (41.0)
	Permanent employment	26 (24.8)

	Pensioner	16 (15.2)
	Other business	7 (6.7)
	Farming and permanent employment	3 (2.9)
	Farming and pensioner	6 (5.7)
	Farming and other business	1 (1.0)
	Pension and other business	2 (1.9)
	No answer	1 (1.0)
Farm grouped income/ year	500-1000	12 (11.4)
(N$)	1001-5000	14 (13.3)
	5001-10000	25 (23.8)
	50001-100000	23 (21.9)
	50001-100000	12 (11.4)
	100000+	3 (2.9)
	No answer	16 (15.2)
Non-farm grouped in-come/year(N$)	500-1000	3 (2.9)
	1001-5000	11 (10.5)
	5001-10000	33 (31.4)
	50001-100000	16 (15.2)
	50001-100000	12 (11.4)
	100000+	8 (7.6)
	No answer	22 (21.0)

1 USD = N$ 14.67, the number in brackets represents the percentage

Performance progress in the Scheme. Table 2 shows the performance progress in the Scheme from October 2008 to February 2014. The mean number of persons per household with a bull, ram, or buck were (10±7), (10±7), and (8±7) respectively. The results indicated a lot of variability in farm income per year of N$24045±43315, N$23500±29640, and N$8462±13611 for the bull, ram, and buck respectively. The non-farm income per year of N$50123±148890, 25840±32940, and N$8117±12803 for the bull, ram, and buck respectively. Beneficiaries reported an increase in the mean number of herd/flock in the scheme of bull (7±14 to 10±19) and ram (14±15 to 13±14) which is an increase of 115% and the bull and ram were kept in the herd for 3 years on average. Herd sizes before and after the scheme were significantly different with t(83)=-.847, p=0.000, flock size for those that received rams and bucks were significantly different with t(9)=-3.202, p=0.011 and t(12)=-2.829, p=0.015 respectively (Table 3). The number of animals sold by recipients of bulls slightly increased from 7.2±13.65 to 10.2±18.66, t(83)=-2.445, p=0.017 which represents approximately 11.8% increase in the number of livestock sold, while there was no significant difference for those that received a ram or a buck.

Table 2. Performance progress in the scheme from October 2008 to February 2014

	Bull (N=84)		Ram (N=10)		Buck (N=13)	
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
Age of beneficiary (years)	55	18	49	18	54	13
Household size	10	7	10	7	8	7
Farm income from live-stock per year (N$)	24045	43315	23500	29640	8462	13611
Non-farm income/sala-ry/wage per year (N$)	50123	148890	25840	32940	8117	12803
Total number of Herd/ Flock before scheme	35	71	19	19	33	38
Total number of Herd/ Flock after Scheme	81	105	47	20	55	48
Number of years of bull/ram/buck spent in the herd/flock	4	3	2	2	3	2
Number of animals sold per year before the scheme started	7	14	14	15	9	9
Number of animals sold per year as a member of the scheme	10	19	13	14	9	9

There was a significant difference in the herd size of farmers who received a bull before the scheme (34.9 ± 71.13) and the herd size after joining the scheme for at least five years (80.9±105.15), t(83)=-4.847, p= 0.000, while the flock size of farmers that received a ram and those who received a buck were significantly different before joining the scheme (19.1±18.96) and after joining the scheme 46.7±20.16, t(9)=-3.202, p=0.011 and 32.8±38.12 before and 55.5±47.7, t(12)=-2.829, p= 0.015, respectively. In addition, the number of cattle sold before joining the scheme was significantly different (7.2±13.65) from the number of cattle sold at least five years after the farmer had joined the scheme (10.2±18.66), t(83), =-2.445, p=0.017, while there was no significant difference in the number of goats and sheep sold for those who received a ram or a buck (Tables 3).

Table 3. Descriptive statistics and paired samples t-test statistics for the total number of livestock owned and sold before and after joining the scheme

	Breeding animal received	Number of animals	N	Mean	Std. dev	Std. Error Mean	t	df	Sig. (2-tailed)
Number of animals kept	Bull	Total herd size before the scheme	84	34.9	71.13	7.76	-4.847	83	0.000
		Total herd size after the scheme	84	80.9	105.15	11.47			
	Ram	Total flock size before the scheme	10	19.1	18.96	6.00	-3.202	9	0.011
		Total flock size after the scheme	10	46.7	20.16	6.37			
	Buck	Total flock size before the scheme	13	32.8	38.12	10.57	-2.829	12	0.015
		Total flock size after the scheme	13	55.5	47.54	13.18			
Number of animals sold	Bull	Total number of cattle sold before the scheme	84	7.2	13.65	1.49	-2.445	83	0.017
		Total number of animals sold after the scheme	84	10.2	18.66	2.04			
	Ram	Total number sheep sold before the scheme	10	13.5	14.62	4.62	0.044	9	0.966
		Total number of the sheep sold after the scheme	10	13.3	13.90	4.39			
	Buck	Total number of goats sold before the scheme	13	8.6	8.54	2.37	-0.113	12	0.912
		Total number of goats after the scheme	13	8.8	8.61	2.39			

Figure 2 shows the proportion of Scheme breeding males which were still available and those that were no longer available in the scheme. Beneficiaries were asked to indicate whether the Scheme bull, ram, or buck was still available in the herd/flock. The results showed that 46 % of bulls, 60 % of rams, and 39 % of bucks given by the Scheme were still available at the time of the survey.

Beneficiaries gave various reasons for the fate of the Scheme animal (Figure 3) mainly death (24% of bull beneficiaries, 40% of ram beneficiaries, 46% of buck beneficiaries) or sold/culled (24% of bull beneficiaries and 15% of buck beneficiaries) or other fate (7% of bull beneficiaries).
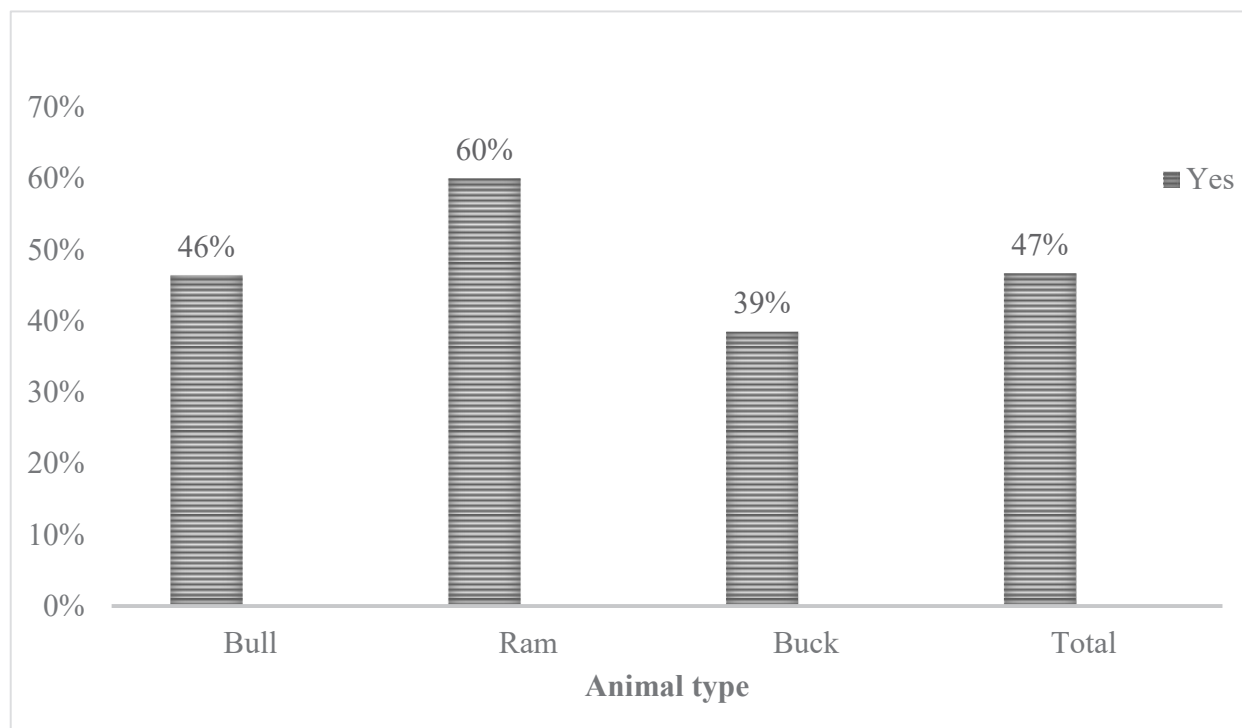
Figure 2. Proportion of breeding males of the Scheme which were available after at least five years from the start of the scheme
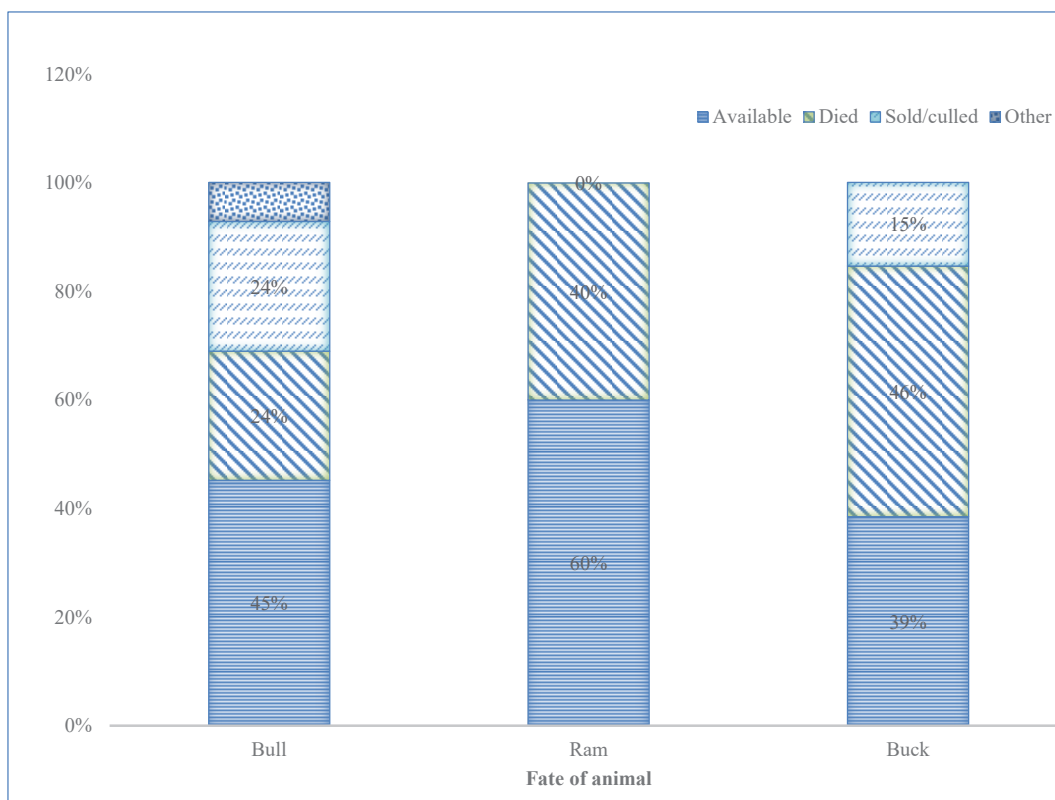

Figure 3. Fate of breeding animals given to farmers after five years (other in the figure represents animals castrated, lost or returned to the scheme)

In figure 4, animals that were sold after the scheme had improved weight and better price per animal. Farmers were asked if they were able to sell animals at a better price per weight per animal. Over 80% of beneficiaries indicated that they sold animals with better weight as compared to before the Scheme. The results further indicate that farm income improved over the period of five years of the scheme with an average of 53%. Respondents who received bulls (55%) had the most improvement in income while the ones who received bucks (46%) had the least improvement.

The respondents who sold their livestock used mostly auctions and informal markets (figure 5). Most of the farmers who received rams (70%) and bucks (46.2%) sold through auctions while those who received bulls preferred the informal marketing channel (37%). There were very few farmers in the scheme who did not sell their livestock (12%).
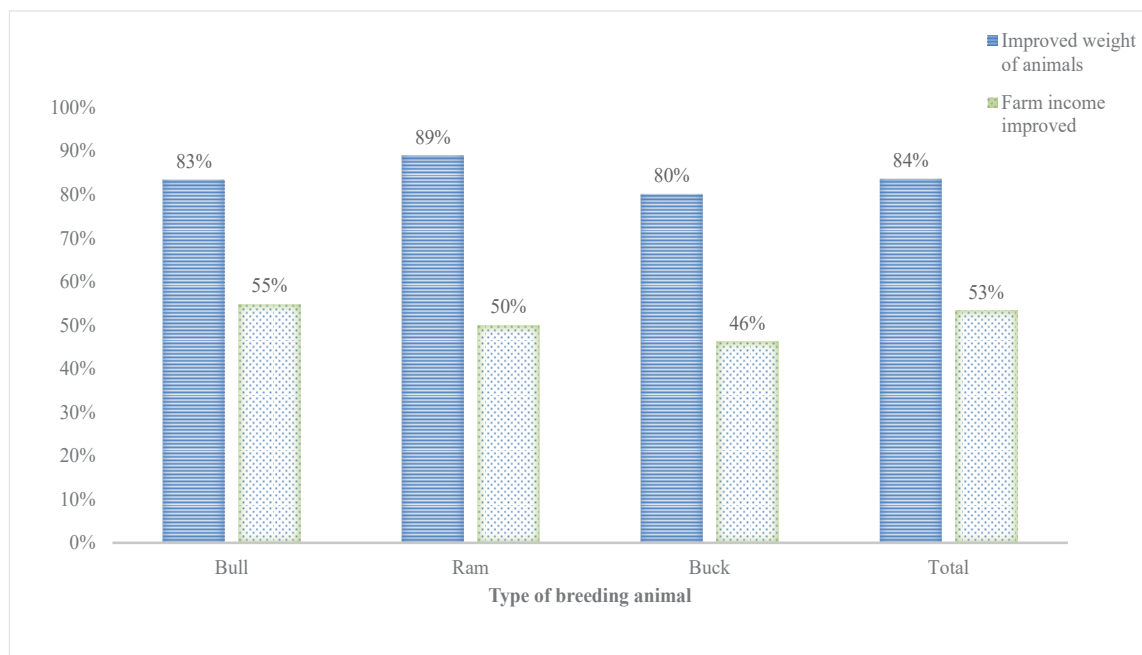
Figure 4. Improvement in weight of animals sold and improvement in income due to the scheme
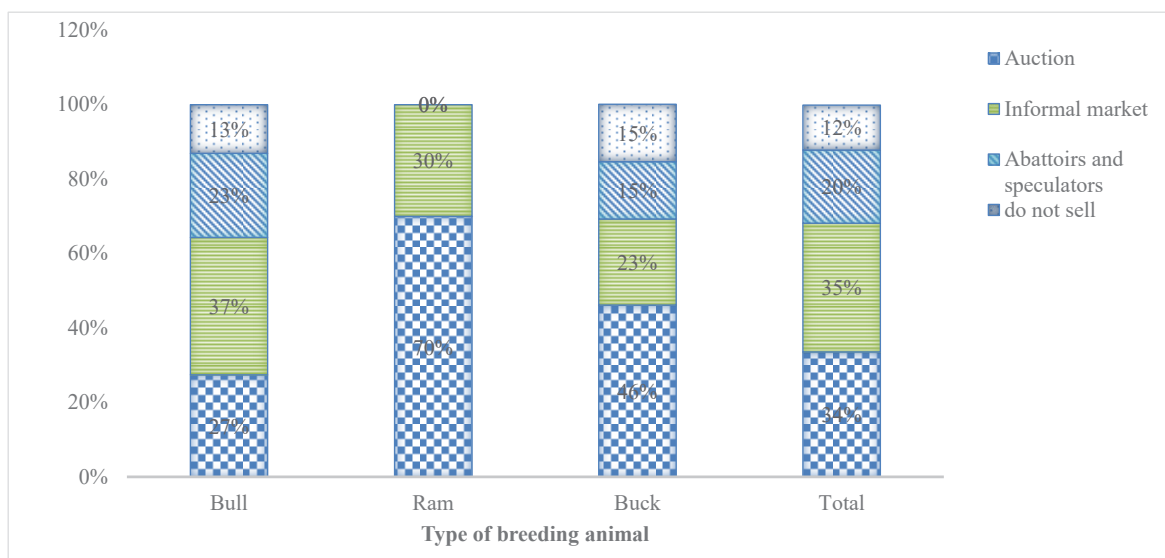
Figure 5. Marketing channel used by farmers of the scheme

Farmers' perceptions of the Scheme are shown in Table 4. About 28.6 % of farmers felt that the number of beneficiaries should be increased, followed by 27.6 % of beneficiaries who require more training in on-farm management. Other beneficiaries indicated that female breeding animals (15.2 %) should be added to the Scheme. There were a number of challenges that predisposed the herd improvement in the communal areas such as the frequent occurrence of drought that impacted negatively on fodder and grazing, poor farm management (i.e. disease control, feed supplementation, and record-keeping), lack of infrastructure i.e. fences, poor marketing channels and lack of transport to auction facilities.

Figure 6 indicates the process flow application of the evaluation model proposed by Radhakrishna (2001). Overall, the analysis shows that most farmers had positive outcomes as shown by an increase in the herd size, increase in sales as well as income from livestock sales. This was achieved despite challenges faced with deaths of breeding males and limited change in record keeping. Poor record keeping also made it difficult to assess some of the indicators for evaluation as some records were non-existent.

Table 4. Farmers' perceptions of the Scheme

|	Frequency (%)			
	Bull(N=130)	Ram (N=12)	Buck (N=15)	Total
Increase number of beneficiaries	21 (19.6)			
	2 (1.9)	7 (6.5)	30 (28)	
Provide more breed types	10 (9.3)	1 (0.9)	0 (0.0)	11 (10.3)
Provide adapted bulls/rams/buck	8 (7.5)	0 (0)	1(0.9)	9 (8.4)
Provide female animals	10 (9.3)	3 (2.8)	3 (2.8)	16 (15)
Provide every 2 to 3 years	10 (9.3)	1 (0.9)	1 (0.9)	12 (11.2)
Provide tested bulls/rams/buck	3 (2.8)	0(0.0)	0 (0.0)	3 (2.8)
Provide training on management	27 (25.2)	1 (0.9)	1 (0.9)	29 (27.1)
Provide free marketing	1 (0.9)	1 (0.9)	0 (0.0)	2 (1.9)
Improve infrastructure	5 (4.7)	0 (0.0)	0 (0.0)	5 (4.7)
Provide transport for breeding animals	4 (3.7)	0 (0.0)	0 (0.0)	4 (3.7)
Provide feed supplements and subsidy on grazing	11 (10.3)	0 (0.0)	1 (0.9)	12 (11.2)
Increase frequency of visits	5 (4.7)	1 (0.9)	0 (0.0)	6 (5.6)
No problem with the scheme	9 (8.4)	1 (0.9)	1 (0.9)	11 (10.3)
Repeat/give beneficiaries again	4 (3.7)	1 (0.9)	0 (0.0)	5 (4.7)
Provide bull/ram/buck before the rains	2 (1.9)	0 (0.0)	0 (0.0)	2 (1.9)
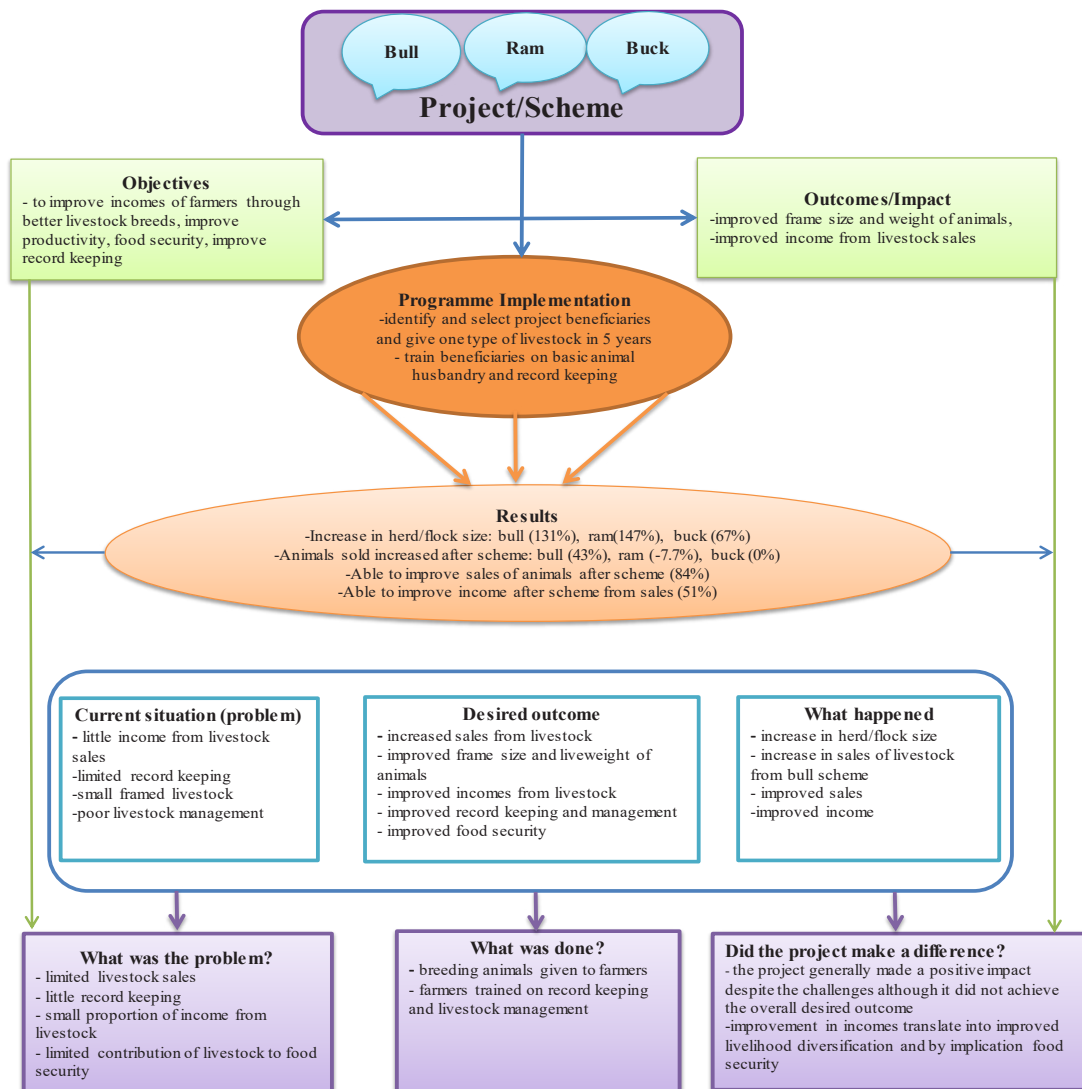
Figure 6. The evaluation results using the evaluation framework by Radhakrishna (2001) on the Scheme project

DISCUSSION

The majority of the Scheme beneficiaries that were interviewed consisted of individuals aged 60 years and above. Most households were male-headed, retired elderly men, whose incomes were drawn from agricultural farming and needed to support large families. Chepape *et al.* (2011) and Togarepi *et al.* (2016) reported similar gender, and age groups, and that pensioners (older people) were more readily available for farming compared to young farmers.

Livestock was marketed using either the formal or informal marketing channels or both with auctions used the most by those who received small stock while those who received bulls preferred the informal markets. Similar findings were reported by Thomas *et al.* (2014) on marketing channels used by communal farmers. However, for cattle, it seems it was more lucrative to sell informally as higher prices are negotiable compared to formal markets that have fixed prices. There was an increase in the number of animals in the herds which may have resulted in improved incomes of farmers after the scheme participation. Although the livestock numbers increased by 115% after the scheme, the number of sales only increased by 11.8% which indicates that most farmers in

rural areas do not keep livestock for marketing purposes but for other reasons such as status and traditional and cultural reasons with sales only done when the need for cash arises. However, distance travelled to auction kraals, transport, poor market information, and the presence of the veterinary cordon fence were viewed as limiting to the success of livestock marketing in communal areas. These factors were also stated in the study of Marius *et al*. (2012) and Togarepi *et al*. (2016). Beneficiaries with sheep and goat breeding males indicated that it was difficult to notice an improvement in their flocks. Moreover, the results indicate a very high proportion of deaths (24%, 40%, 46%) among the breeding animals with bulls, rams and bucks respectively, which may indicate poor animal management practices and possibly effects of drought or disregard of the objectives of the scheme. The reason could be attributed to the lack of weight recording of animals at birth or weaning even at the market. Poor performance data recording and trait identification in communal livestock farming were also observed which concurs with the work of Roessler *et al*. (2008).

About 47.6 % of breeding males were still available at the time of the assessment; however, there was significant high demand for more breeding males as they were shared amongst the communities. Beneficiaries also indicated the need for training in farm management suggesting improvement in the Scheme regarding this aspect. Other concerns reported simply implied that the purpose of the Scheme and its implementation measures were not well understood (Table 4) by the beneficiaries. For example, beneficiaries were encouraged to remove or castrate existing breeding males in their herds, which was rarely the case. This caused fighting and injuries leading to ineffective breeding, death, or loss of the Scheme animals. Previous researchers working in communal livestock areas highlighted poor management practices and uncontrolled breeding (Nsoso and Morake (1999). In as much as trying to solve the problem of low carcass weights and improve prices, other problems may be introduced through crossbreeding for example loss of indigenous animal genetic resources.

CONCLUSIONS

The scheme was successful to an extent and had a positive impact on the farmers generally given that farmers could sell more animals at better prices than before the scheme and that herd size increased with better weight at weaning. Farmers who received rams and buck did not show improvement in numbers sold and this requires further investigation to ascertain the reasons for this. Overall, farmers that received bulls seemed to perform better in the scheme. Management practices improved to some extent, however, many farmers did not keep proper or sufficient records making it difficult to assess other parameters of the scheme. There remained some challenges that were alluded to by the beneficiaries such as adaptation of animals to the environment and inadequate feed/grazing that might have limited the success of the scheme. Despite the increase in herd and flock size that was achieved, there was a high death rate of the breeding animals especially among the rams and bucks given. In addition, schemes such as these have the potential to contribute to farm incomes and the diversification of livelihoods of communal farmers with proper planning, training, monitoring and evaluation of the schemes.

RECOMMENDATIONS

Many farmers want the "Bull scheme" to continue, however, stricter monitoring is required to enable the Scheme administrators to have all the information that is required through records. Reporting mechanisms need to be improved to have up-to-date information on the Scheme. There is also a need to carry out follow-up training to capacitate farmers not only on record-keeping but on marketing and business management principles for the farmers to appreciate their breeding stock as assets that have the potential to generate more income. Future schemes of similar nature will require extensive awareness and education campaigns to improve the potential for success and achievement of scheme goals. Regular monitoring and evaluation of schemes need to be done to ensure prompt response to problems such as high death rates among the breeding stock. This evaluation was the first since the Scheme was implemented, therefore future follow-up

interviews with beneficiaries are recommended. There is a need to do a cost-benefit analysis of the scheme before a similar scheme can be resumed.

STATEMENT OF NO-CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this paper.

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