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COMMUNAL LIVESTOCK HUSBANDRY PRACTICES AND THEIR IMPACT ON MARKET PARTICIPATION: a case study from Zambezi region in Namibia

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Abstract

This paper examines the factors determining adoption of improved livestock management practices by communal livestock farmers in Zambezi region, of Namibia. Data was collected from 86 communal livestock farmers who are participating in a Farmer Support Project (FSP) funded by GIZ. Descriptive statistics and multi-logistic regression model were used to analyze the data. Of the respondents 48% had secondary education, with 35% having herd sizes ranging between 11 to 30 cattle composed of cows (34%), heifers (22%) and oxen (26%). Multi-logistic regression model analysis showed that the probability of adopting better livestock management technologies increased with education, financial assistance, farmer advice in animal health, and total number of cattle owned by a farmer. The conclusion that was made is that in order to increase adoption of improved technologies, efforts should be made to enhance access of farmers to education, financial assistance, and training in animal management practices.

Keywords: adoption, livestock management practices, multi-logistic regression model, socio-economic factors, weaners, communal areas, productivity

1. Introduction

It is estimated that 600 million people worldwide keep livestock of which 75% live in rural areas (Kruger and Lammerts-Imbuwa, 2008). Majority of the farmers about 52.30% own less than ten cattle, 35 % had herd size between 11 and 30, followed by 13 % whose herd was more than 71 cattle. The demand for livestock products has been increasing due to the increase in consumers' incomes, their purchasing power and technological advancement opening up new market opportunities for smallholder livestock producers in communal areas (Bahta and Bauer, 2007). The increasing demand for livestock products presents opportunities for the reduction of poverty among rural households in areas with good potential in livestock production (Kruger and Lammerts-Imbuwa, 2008). This is because the smallholder farmers will be integrated into the market and financial systems.

Cattle production in Namibia is the main agricultural production subsector in the country of which the value of production is annually estimated at N$900 million, and of which approximately 44.4% comes from weaner exports (Meat Board of Namibia, 2007). Livestock play a vital role in the livelihoods of many people in Namibia by providing economic and nutritional benefits (Teweldemedhin and Conroy, 2010). In Namibia about 70% of the Namibian population in rural areas depends on agriculture of which livestock is the major source of livelihood (World Bank (WB) 2011). According to Namibia Statistics Agency (NSA 2015) more than 50% of the households in the Zambezi region own livestock that contributes significantly to households in terms of food and cash as well as for ploughing, transport and as a form of store of wealth (Ashley, 2003). Kruger and Lammerts-Imbuwa (2008) noted that whereas more than 60% of the cattle in Namibia are found in the communal areas, with 44% found in the Northern Communal Areas (NCA), their participation in the formal livestock market is very minimal. Kruger and Lammerts-Imbuwa (2008) argue that the off-take rate of cattle through formal markets in NCAs, remain low at 2% compared to about an estimated 20% off-take for the rest of the country. The

livestock production system in Zambezi region just like in most communal areas is mainly based on pastoralism and agro-pastoralism as the majority of households are subsistence farmers. This production system influences the production objectives of livestock owners which ultimately are more diverse than in commercial livestock production. The livestock production function is satisfied by herd maximisation rather than maximising off-take and profit (Sweet, 1997).

To shift the production function more towards maximization of off-take and profit among NCA farmers, government and stakeholders such as GIZ have introduced a raft of initiatives for improving the performance of the sector. Some of the interventions are research on livestock breeding, rangeland management, livestock infrastructure provision and provision of extension services. The Directorate of Extension is mandated to provide agriculture extension services in the form of advisory, information communication, and training services aimed at empowering farmers, encouraging the adoption of improved agricultural and related income generating technologies and practices which will improve livestock production (MWAF (National Agriculture Policy), 2015). The golden thread running through the initiatives is the need to increase and sustain the levels of livestock sector's productivity taking into consideration Namibia's fragile ecosystem.

There has been mixed results in terms of the success of the interventions and the adoption of the introduced farming practices. Generally, low rates of adoption of cattle management practices such as winter supplementary feeding, effective control of internal and external parasites, culling and selection have been observed by stakeholders in the livestock sector among which is GIZ (Nowers et al,. 2013). One of the interventions being implemented is the Farmers Support Programme (FSP) technically and financially supported by the Federal Republic of Germany through the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and co-funded by the AgriBank of Namibia in partnership with the Namibia Agricultural Union (NAU), the Namibia Emerging Commercial Farmers' Union (NECFU) and the Namibia National Farmers' Union (NNFU). The initiative's goal is supporting farmers to improve rangeland and grazing, adoption of better livestock husbandry practices, infrastructure development and market participation. The initiative started in 2011 and so far 400 beneficiary in the NCA, which including Zambezi region have been supported. The paper examines factors influencing adoption of the newly introduced livestock management practices and their adoption rate in Linyati, Sibbinda and Judea Lyaboloma constituencies in Zambezi region.

2. MATERIALS AND METHODS

The study employed the quantitative research design in which a multi-stage sampling procedure was used starting with establishing the total population in the constituencies from which a quota sampling procedure was used to select the respondents. The quota system was based on the proportion of the total population of farmers participating in Farmers Support Programme (FSP) project within the study area which led to the selection of 86 beneficiaries. The populations for the study were all the household heads in the study area who are involved in decision making on livestock farming and production. A structured questionnaire was designed and administered to the household heads involved in livestock production.

2.1 Data collection and analysis

Data were collected using questionnaires that were administered through face-to-face interview by the researcher. After the data was collected it was then coded. Descriptive statistics were used to determine situational analysis of the livestock management practices in Zambezi region. To examine factors influencing adoption of the newly introduced livestock management practices a multi-logistic regression model was used. The following data was used to attain the objective: Education, gender, Farming experience, Training, Support received, Access to credit, Human capital, Costs of inputs, Number of cattle owned.

Table 1: Explanatory variables used in the multi-logistic regression model

Variable	Descriptive and measurement	Type of variable	Expected β sign
Farming experience	Actual number of years in livestock farming	Continuous	+/-
Education	Education level of household head	Category	+/-
Training received	Livestock related training received	Continuous	+/-
Farm size	Total farm size owned by household head in hectares	Continuous	+/-
Gender of household head	Gender of household head, male or female. It was expected to give a positive influence on adoption, male farmers expected to have high adoption rate than female	Category	+/-
Age of farmer	Actual years.	Continuous	+/-
Household size	Number of household members.	Continuous	+/-
Labor	Actual number of household members able to render labor.	Continuous	+/-
Livestock number	Actual number of livestock owned. It was expected that those with high number of livestock will adopt new and improved techniques.	Continuous	+/-
Support received & training	Types of extension services received.	Continuous	+/-
Access to credit	Availability of financial services ready to lender monetary services	Category	+/-
Total cattle sales	Actual cattle sales	Continuous	+/-

2.2 Multi-logistic regression model specification

Ý0= β1+β2X+β3X+β4X+ β5X+ β6X β7X β8X + β9X + β10X + µi

Adoption (y) = β1+β2 (education) + β3 (gender) + β4 (farming experience) + β5 (support received) +β6 (training) + β7 (access to credit) + β8 (cattle sales) + β9 (number of cattle) + β10 (gender of household head) + µi

The multi-logistic regression model econometric approach is characterized by a set of n binary dependent variables yi such that: (Green, 2000)

Y i = 1 if x βi + εi > 0 , or

= 0 if xβi + εi ≤ 0, i = 1,2,K, n ,

where X is a vector of explanatory variables, β1,β2,… ,βn are the parameters of the vectors, and random error terms ε1,ε2,..,εn are distributed as multivariate normal distribution with zero means, unitary variance and an n×n contemporaneous correlation matrix R =[ρij] with density φ(ε1,ε2,..,εn;R), (Green, 2000).

The multi-logistic regression model was applied as simultaneous model with the set of explanatory variables on different adaptation measure, which allows the unobserved and unmeasured factors (error terms) to be freely correlated (Lin, Jensen & Yen, (2005); Green, (2000); Golob & Regan (2002).

3. RESULTS AND DISCUSSION

3.1 Socio-economic characteristics of the respondents

Of the 86 sampled respondents 76% and 24% were male and female households respectively. With respect to the respondents' age those above 60 years old were 38% and dominated the sample followed by those who were

between 31-45 years who were 29% and between 46 and 60 years old respectively and lastly those group age less than 30 years represent smaller portion about 4%. In terms of educational attainment, 48% had Secondary education, 28% Primary education with 15% having tertiary education and the remaining 9% having no formal education. Education level of a farmer has implication on information collection and adoption of better farm management. Those with higher level of formal education are more likely to adopt better livestock husbandry practices such as provision of supplement feeds, licks, and vaccinating, observing recommended stocking rates and take livestock farming as a business compared to the less educated as was also noted by Musemwa *et al*., (2008) and Kasale (2013).

Table 2: Social characteristics of the respondents

Characteristic	**Category**	**%**
Gender	Male	76
	Female	24
Total		100%
Age of respondent	Less than -30 years	4
	31-45 years	29
	46-60 years	29
	> 60 years	38
Total		100%
Education level	No school	9
	Primary	28
	Secondary	48
	Tertiary	15
Total		100%
Household size	0-5	27
	6-10	65
	>11	8
Total		100%

Education increases the ability of the farmers to use resources efficiently to improve productivity (Musaba, 2010). Chagwiza *et al* (2007) also found that farmers who had a secondary and higher level of education have more access to information about marketing and price, therefore were able to make better informed decisions about marketing channels.

From the results what can be deduced is that the adoption rate of the introduced agricultural technologies by communal farmers in Zambezi region is subdued. In study 54.7% of the respondents adopted some of the technologies with 16.3% of the respondents having adopted below average of the technologies, while only 29.1% adopted above average. As it can be observed in figure 1 and figure 2, adoption rate of various advanced agricultural techniques is low.

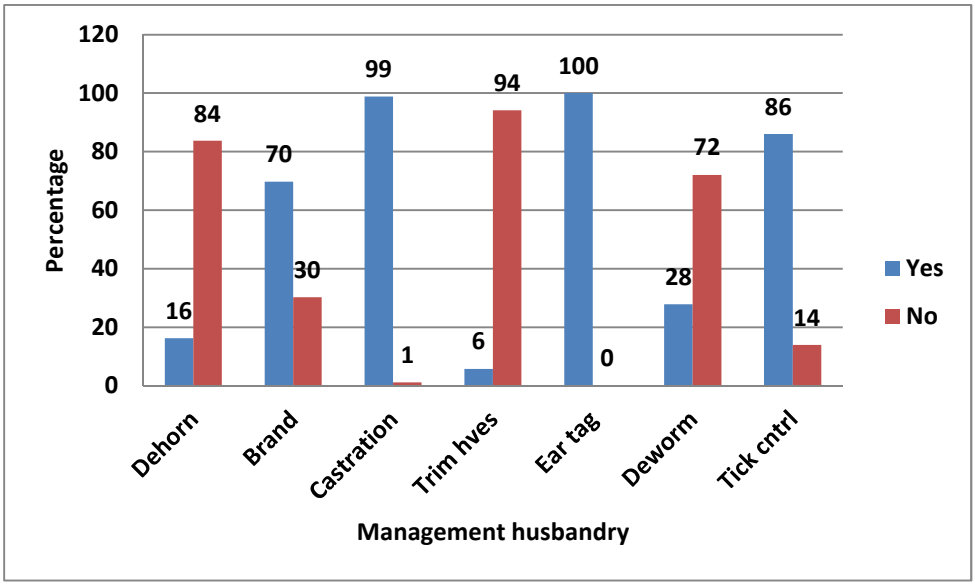

Figure 1: Animal management husbandry by surveyed cattle farmers

3.2 Rangeland management

The results show that very little effort is put towards rangeland management. As can be observed from figure 2, 83% and 71% of the respondents do not practice rangeland restoration neither do they adjust their herd sizes in respond to pasture availability and rangeland conditions respectively. A well-managed rangeland will increase animal production and profit, whilst improving rangeland productivity. Poorly managed rangeland will result in range degradation and poor cattle production. The results from the study implies that farmers are not well looking after the rangeland, and this will negatively affect the quality of cattle, thus affecting the industry and cattle marketing negatively.

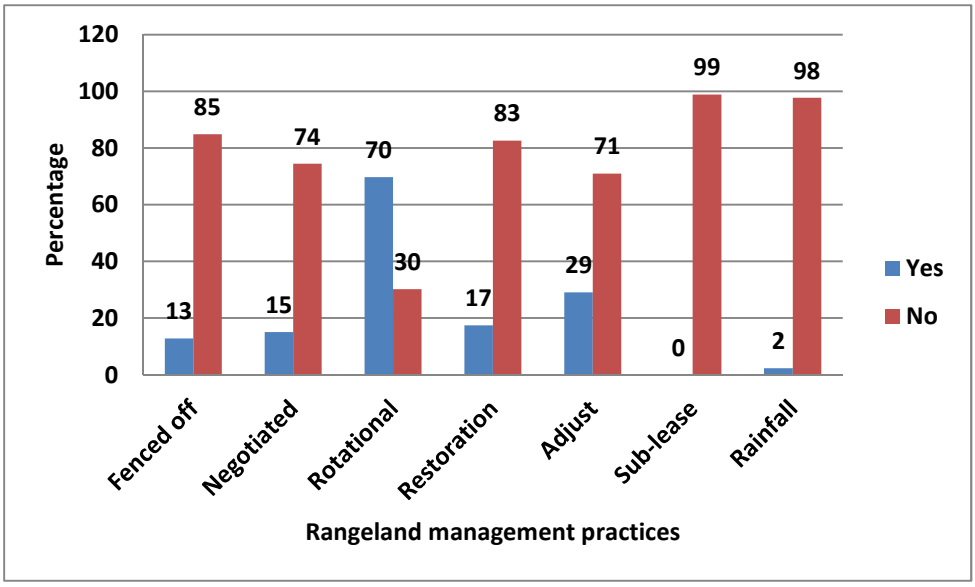

Figure 2: Rangeland Management

3.3 Livestock management husbandry practices

All farmers surveyed (100%) indicated not to practice breeding season. They attributed this to the constraints of communal farming systems and open grazing system in NCA. The open grazing system makes breeding seasoning almost impossible as cattle roam and mate freely with other herds during grazing (Chata, pers com,

2015). This is in agreement with Tavirimirwa (2012) who also indicated that communal cattle farmers in rural Zimbabwe experienced interbreeding between different herds as farmers made no attempt to control mating, which makes breeding seasoning none existing. According to Tavirimirwa (2012) this is attributed to the open grazing system in the rural communal areas.

More than 95% indicated that they do not to provide lick with 98% not providing supplementary feeding to their cattle. Apart from state financed FMD vaccine program, 87% do not vaccinate their cattle against various common diseases compared to only 13% who systematically vaccinate their herd against common diseases annually.

Communal cattle are rarely supplemented with commercial feeds or improved legume fodder resulting which explains poor livestock productivity (Tavirimirwa *et al* 2012; Ngongoni *et al*., 2007). Since livestock feed is a challenge communal cattle have less feed hence the poor body condition and low weight gains and a higher predisposition of the animals to endoparasites (Mashoko *et al* 2007) especially during the dry season. Due to scarcity of feed and water communal animals in the research area have to move much further away from the homesteads which further contribute to poor body condition as was also established by Kasale (2013). Masikati (2010) and Maburutse *et al* (2012) concluded that cattle due to longer distances of 14km and 10km cattle have to travel to water points in Nkayi and Simbi respectively in Zimbabwe the cattle loose body condition, thus collecting low market value at abattoirs. Provision of licks, feeds and vaccination plays an important role in beef cattle industry.

The results imply that farmers are not implementing cattle improving management practices, therefore their cattle are not meeting the standards required by the formal markets. This negatively affects the marketing prospects of cattle for beef in the region.

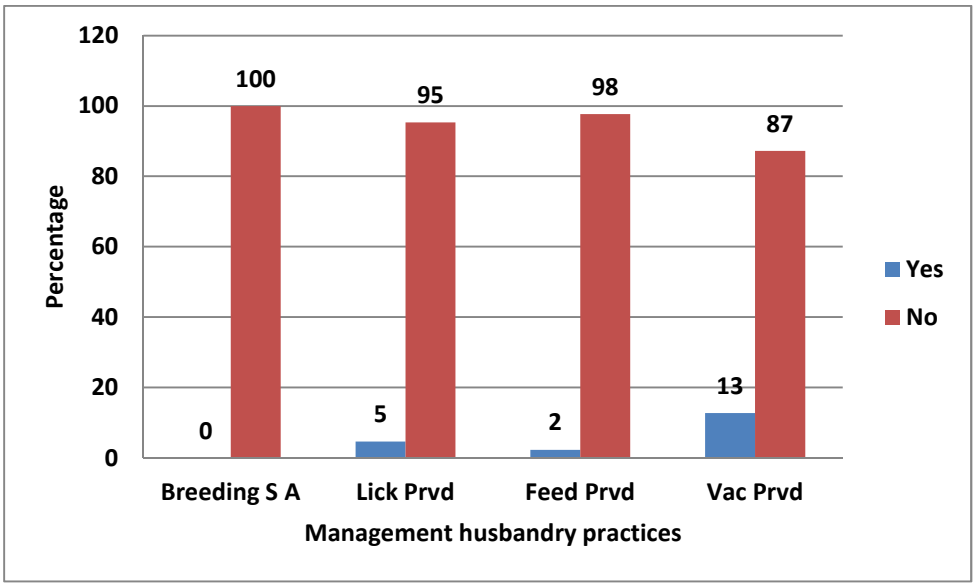

Figure 3: Livestock management husbandry practices

3.4 Factors affecting adoption of improved livestock management technologies

Table 3 indicates the results from the multi-logistic regression model where the determinant of adoption of advanced agricultural technologies by farmers in Zambezi region is considered to be the dependent variable.

Table 3: factors affecting adoption of improved livestock management technologies

Parameter Estimates							
L.MGT.PRAC[a]		B	Std. Error	Wald	df	Sig.	Exp(B)
AVERAGE	Intercept	19.281	8.015	5.787	1	.016	
	AGE	2.423	1.851	1.713	1	.191	11.278
	HHS	.314	.922	.116	1	.733	.730
	EXP	1.131	.835	1.835	1	.176	3.100
	No_Sales	1.040	1.129	.848	1	.357	2.828
	No_cattle	1.454	.769	3.571	1	.049	4.280
	GENDER	.703	1.183	.353	1	.552	2.021
	EDT	1.368	.810	2.854	1	.091	3.929
	FARM_ADV	.382	2.016	.036	1	.850	1.465
	Finance_Ass	.193	.865	.050	1	.823	.824
	No_Adj_Range_Land	1.915	1.345	2.029	1	.154	6.788
ABOVE	Intercept	22.756	9.585	5.637	1	.018	
	AGE	2.290	2.189	1.095	1	.295	9.879
	HHS	.226	1.168	.037	1	.846	1.254
	EXP	.028	1.012	.001	1	.978	.972
	No_Sales	1.813	1.211	2.240	1	.134	6.130
	No_cattle	2.169	.853	6.463	1	.011	8.747
	GENDER	.853	1.418	.362	1	.548	2.347
	EDT	1.997	.949	4.424	1	.035	7.368
	FARM_ADV	3.319	2.334	2.022	1	.155	27.634
	Finance_Ass	1.433	1.060	1.830	1	.176	4.193
	No_Adj_Range_Land	2.776	1.469	3.571	1	.059	16.061

In this multi-logistic regression analysis, it estimated the model compared to "below average" as reference point; as indicated in Table 3, the model classification predication estimated at 56%, 76% and 63% for below average, average and above average respectively.

When average livestock management practice compared, number of cattle and restoration found to be significant at 5%; whereas education only found significant at 10% only. However, intercept found to be significant at 5% with bigger estimated coefficient. This implying that the multi-logistic estimate for number of sales increase within the categories of average "livestock management practice" one unit compared below average category that will lead to increase in the management practice by 1.45 unit. This shows clearly number of cattle to introduce better management practice could be an incentive, however, it would have range land management distortion with number increment without proper animal husbandry practice.

The multi-logistic estimate that education found to be one parameter average categorized farmers managed to be better from the category of below average group; however, it was found only significant at 10%; however, this implying that one unit increase in education with this category would eventually lead to increase the adoption rate by 1.35 unit.

Another parameter compared average and below average was restoration found to be significant at 5%; since those who indicated not implementing restoration was 83% compared to those who do restore was 17%. The multi-logistic regression estimated negatively that mean should the number of those do not implement restoration reduced by one unit; will eventually lead to increase the "livestock management practice" by 3 units compared to below average category. As indicated intercept in other word other factors which are not captured in this study found to be very elastic and negatively related and also significant at 5%.

4 Conclusions and recommendations

4.1 Situational analysis of the livestock management practices in the study area

Livestock sector in Namibia has a tremendous potential to contribute to much needed income growth in rural

areas. Small-scale cattle sector in northern communal areas of Namibia, Zambezi region included has not achieved its full potential due various factors including, amongst others, poor infrastructure, poor livestock management practices, low off- take rates, insufficient training and specialist advice and markets information, inadequate of institutional support, poor markets access, high transaction costs and so on. This is evidenced by the fact that 90% of the respondents still have not yet embraced fully the importance of agricultural technologies such as dehorning, rangeland management, deworming, and provision of licks, supplementary feeds and breeding seasoning. While livestock population figures are sufficient to meet formal cattle market demands with proper husbandry practices, off-take remains very low as only 1.5% of all the cattle owned were sold through the formal markets. The other conclusion to be made is that there is a strong tendency by farmers to sale mostly old cattle which is in contradiction to the requirements of the formal markets which prefers heifers and young steers. These findings have implications for a successful cattle rearing and the livestock market in the region. The low number of farmers practicing advanced agricultural technologies is a concern that should be addressed by stakeholders in order to arrest the situation. Therefore, the study recommends training on livestock management should be intensified and as well as setting up micro lending for livestock farmers. The study further recommends infrastructure development; invest more in infrastructure development and capacity building of local institutions to manage the infrastructure. Farmer exchange programs should be carried out, by exposing farmers to other local communal farmers who have fully implemented the new technologies and are successfully farming and making profit from cattle enterprise in order for lesser adopters to see the importance of adoption of the advanced technologies.

In order to increase off-take rate, the study recommends that communal farmers should be educated about risks involved in keeping large stock, such as loses caused by diseases outbreaks and drought. Farmers should be educated about the relationship between cattle age and prices offered by formal markets, so that they change their tendency of mostly selling old cattle. Furthermore farmers should be educated to view cattle farming as an enterprise, rather than form of wealth store and status in society.

4.2 Factors affecting adoption of improved livestock management technologies

The study results have shown that various factors are influencing adoption of newly introduced agricultural technologies. Educational level, financial assistance, total cattle owned and farming advice affected adoption rate of the introduced technology. Education attained and total numbers of cattle owned by the farmer were highly significant at 95% confident level in adopting livestock management practices. The rest of factors were significant at 90% confident level. The study reviewed an average adoption of improved livestock management, which represented 50% of the respondents. This could imply that low level of education coupled by lack of training is hampering sustainable livestock production as well as size of livestock sold.

The study therefore recommends that CLDP project and The Government through the Ministry of Agriculture, Extension Services to educate and train more farmers with secondary and tertiary education about advanced technologies and their advantages, and then use farmer to farmer training approach to trickle the knowledge down to other farmers, who in this case would be below average adopters. Financial assistance was a significant factor at 95% confident level; therefore, the study recommends that tailor-made loans/grants should be availed to the communal farmers. In term of agricultural advice, the study recommends that extension and veterinary services should be strengthened by ensuring that extension officers are well distributed and well equipped with necessary resources, which will enable them to increase their coverage in terms of the numbers of farmers they reach. Extension officers should give timely and professional advice on overall management practices by been subject specialists. The study further recommends that in order to increase number of sales by farmers, incentives should be paid to farmers who sale cattle at rightful age and quantity as the formal market requires, this should encourage communal farmers to sale more, and generate income in order to offset costs involved in adoption of new technologies.

References

Ashley, C. & Lafranchi, C. (2003). Livelihood strategies of rural households in Caprivi: Implications for conservancies and natural resource management. DEA Research Discussion Paper Number 20. Windhoek, Namibia

Bahta, S.T. Bauer, S. (2007). Analysis of the Determinants of Market Participation within the South African 206.

Small-scale Livestock Sector, pp. 25-39 From <http://www.tropentag.de/2007/abstracts/full/ 422.pdf> (Retrieved on 16 November 2016).

Chagwiza, C. Musemwa, L. Sikuka, W. Fraser, G. Chimonyo, M. and Mzileni, N. (2007). Analysis of cattle marketing channels used by small-scale farmers in the Western Cape province of South Africa.

Golob T.F. and A.C. Regan. 2002. Trucking industry adoption of information technology: a multivariate discrete choice model. *Transportation Research Part C* 10*:* 2005-228.

Green, W.H., (2000). Econometric Analysis. International Edition, 4th edn., New York: Prentice Hall International Inc.

Kasale, F. (2013). Determination of nutritive values of browsable plants utilized by cattle during the dry season in Sibbinda constituency of Zambezi region Namibia. University of Namibia, Faculty of agriculture and natural resources, department of animal science.

Kruger, B., Lammerts-Imbuwa, L. (2008). Livestock Marketing in Namibia: Training Manual. Namibia National Farmers Union (NNFU).

Lin, C-T.J., K.L. Jensen, and S.T. Yen. 2005. Awareness of foodborne pathogens among US consumers. *Food Quality and Preference* 16: 401-412.

Maburutse, B. E., Mutibvu, T, Mbiriri, D. T and Kashangura, M. (2012). Communal livestock production in Simbe, Gokwe south district of Zimbabwe. Online J. Anim. Feed Res., 2:351-360. http://www.science-line.com/index/; http://www.ojafr.ir

Mashoko, E, Muchenje, V. Ndlovu, T,. Mapiye, C, Chimonyo, M. and Musemwa, L. (2007). Beef cattle production in a peri-urban area of Zimbabwe Journal of Sustainable Development in Africa 9:121-132.

Masikati, P. (2010). Improving the water productivity of integrated crop-livestock systems in the semi-arid tropics of Zimbabwe: an ex-ante analysis using simulation modelling.http://www.zef.de/fileadmin/webfiles/downloads/zefc_ecology_development/eds_78_masikati_text.pdf. Accessed on 22 June 2016

Ministry of Agriculture, Water and Forestry. (2015). National Agriculture Policy. Namibia Government

Musaba, E C (2010). Analysis of factors influencing adoption of cattle management technologies by communal farmers in Northern Namibia. Livestock Research for Rural Development.Volume 22, Article #104.Retrieved February 3, 2011, fromhtt://www.Irrd22/6/musa22104.htm.

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

Meat Board of Namibia. (2007).Annual Report. Windhoek, Namibia.

Namibia Statistics Agency (NSA). (2015). Namibia Census of Agriculture, 2013/2014. Communal Sector

Report, Namibia

Ngongoni, N. T., Mwale, M,. Mapiye, C. Moyo, M. T, Hamudikuwanda, H. and Titterton, M. (2007). Evaluation of cereal-legum intercropped forages for smallholder dairy production in Zimbabwe. Animal Traction Network for Eastern and Southern Africa (ATNESA). ACP-EU Technical Centre.Livestock Research for Rural Development.Vol 19 (09)

Nowers, C. B. Nobumba, L. M. & Welgemoed, J. (2013). Reproduction and production potential of communal cattle on sourveld in the Eastern Cape Province, South Africa. Applied Animal Husbandry & Rural Development. Volume 6. Stutterheim, 4930, South Africa.

Sweet, J. (1998). *Livestock Coping with Drought: Namibia Case Study*. Tsumeb: Northern Regions Livestock Development Project.

Tavirimirwa, B. Mwembe, R. Ngulube, B. Banana, N. Y. D. Nyamushamba, G. B. Ncube, S. & Nkomboni, D. (2013). Communal cattle production in Zimbabwe: A review. Department of Research and Specialist Services, Matopos Research Institute. Bulawayo, Zimbabwe.

Teweldemedhin, M. Y. & Conroy, A. B. (2010). The economic importance of draught oxen on small farms in Namibia's Eastern Caprivi Region, Afr. J. Agric. Res 5(9): 928-934

World Bank. 2011. *World Bank Indicators – Namibia*. Agricultural Production