

Full Length Research Paper

Factors influencing smallholder farmers' decisions to participate in livestock markets in Namibia

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Across the world, sustained integration of smallholder farmers into commercial agriculture has empowered resource poor smallholder farmers to diversify their livelihoods into non-farm enterprises. The new enterprises have crystallized into socioeconomic development hubs. Associated with the growth of the agricultural sector in developed nations has been the development of highly market-integrated agribusinesses manned by few commercial farmers. However, developing nations have been committing a significant proportion of their budgets to smallholder agriculture development though the level of market participation by the smallholder farmers remains small. Limited research has been conducted to isolate the main factors blocking smallholder farmers' decisions from participating in commercial livestock market. The objective of this paper was to investigate the factors that influence the smallholder livestock farmers' decisions to participate in commercial livestock markets. A factor analysis model was used to isolate the main factors affect smallholder livestock farmers' market participation in Okakarara constituency of the Otjozondjupa region in Namibia. Principal factors isolated were production and marketing dynamics, transaction costs, human capital, state of marketing infrastructure and level of business orientation of the smallholder livestock farmer.

Key words: Principal component analysis, smallholder farmers, market participation, livestock, commercial markets, Namibia.

INTRODUCTION

Sustainable market integration of resource poor smallholder farmers in developing nations can be a strategy for them to meaningfully benefit from market-oriented production (Romer, 1993, 1994; Edwards, 1998; Xinshen et al., 2007). Economic history literature shows a positive correlation between agriculture sector growth and national economic diversification in developed

nations. The agriculture sector's growth was harnessed to spearhead agro based enterprises that then produced raw materials needed by industries as well as providing affordable food for the ever increasing urbanite population (Rios et al., 2008; Sadoulet and de Janvry, 1995).

However, Africa is yet to experience sustained

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smallholder farmers' market integration despite the sector having made significant gains in production (De Beer and Swanepoel, 2001; Gasper, 1996; Xinshen et al., 2007). This is despite that in Africa agriculture provides food requirements to approximately 70% of the population and contributes around 35% of the Gross Domestic Product (GDP) for most countries. The sector generates up to 13% of the total export earnings and is responsible for 66% of the intra-regional trade (World Bank, 2007; Xinshen et al., 2007; Byerlee et al., 2005; Louw et al., 2008; Louw, 2007). Vink and Sandrey (2006) established that in the southern Africa region, social return on investment is more positive in agriculture compared to other sectors. Within that background, resource poor smallholder farmers' market integration could spearhead economic growth as was also established by Louw et al. (2008), Louw (2007), Roetter et al. (2007), Hillborn (2010), Mendelsohn (2006) and Sherbourne (2010).

Some of the benefits from market integration of smallholder farmers include reduced cost of agricultural products and strengthening of the backwards and forwards economic linkages between farm and non-farm production systems (Louw, 2007; Mendelsohn, 2006; Sherbourne, 2010). These benefits may also be realised in Namibia where market integration of smallholder farmers remains very low (de Bruyn et al., 2001; Jauch, 2004; Uvanga and Dempers, 2006; Namibian Agronomic Board, 2009; Sherbourne, 2010). In Namibia, commercial livestock markets remains dominated by a small number of commercial farmers who contribute 69% of the total national agricultural output (Republic of Namibia, 2004; Sherbourne, 2010). This is despite the fact that approximately 62% of the national livestock herd is being owned by smallholder farmers (Schade et al., 2000; Sherbourne, 2010).

Lack of market integration of smallholder livestock farmers is blamed on a number of possible reasons. In the Eastern Cape Province of South Africa it was found that lack of marketing facilities imposed serious market access constraints (Musimwa et al., 2008). Some of the other challenges include poor infrastructure, lack of transport, dearth of market information, insufficient expertise on grades and standards and poor organizational support. There are some perceptions that smallholder livestock farmers' participation in the beef markets is insignificant because they see cattle as a form of non-monetary asset (Schade et al., 2000; Shiimi, 2010; Ortmann and King, 2010). Some smallholder livestock farmers are not forthcoming to participate in livestock markets as they have misgivings in the prices offered at these marketing channels (Schade et al., 2000; Shiimi, 2010; Ortmann and King, 2010). The stringent quarantine requirements are perceived to be responsible for lowering body weight in livestock, hence lowering ultimate sale price (Schade et al., 2000; Shiimi, 2010; Ortmann and King, 2010).

Nonetheless, Namibia has a competitive advantage in

beef markets and enjoys an export quota to the European Union (EU market, which accounts for 40% of the country' beef exports under the European Union and African Caribbean and Pacific trade agreement (Sherbourne, 2010, 2009; Republic of Namibia, 2004). The country has put in place policies and programmes to support the smallholder livestock farmers' market participation in line with Namibia's vision 2030. The smallholder agriculture's crystallization into agro-industries can spur domestic and export markets growth (Louw et al., 2008).

This paper's specific objective was to investigate the main factors influencing market participation by smallholder livestock farmers using a case study in Okakarara constituency of Namibia. An understanding of such factors may help in informing policy interventions needed to enhance market participation by smallholder livestock farmers.

DATA AND ANALYSIS MODEL USED

The study was conducted in Okakarara constituency in the Otjozondjupa region of central Namibia, which is the largest region in the country (Figure 1). Between 1991 and 2001 the region's population was just 7.4% of the Namibian population (Republic of Namibia, 2006). Farmers in the Okakarara constituency are primarily subsistence livestock farmers mainly farming with cattle, sheep and goats under extensive grazing conditions. These livestock are marketed through auctions or permit systems organized by farmers' associations and to a lesser extent by farmers' cooperatives. Private livestock marketing also takes place whereby the farmers sell their livestock to abattoirs and private buyers.

A sample of 50 respondents was randomly selected to participate in the case study. Although a larger sample size would be most preferred, it was believed that in such an exploratory case study that sample size will generate enough data on the major factors influencing market participation. It was felt that the results will open way for further investigations where issues of representativity will be addressed. Prior to the interviews, farmers were notified about the purpose of the study and agreement was reached on when the study will commence. The idea was to secure their willingness to freely participate in the study.

Data was analyzed using the SPSS software where firstly simple descriptive statistics was performed before factor analysis was done to isolate the principle factors influencing market participation. The model was chosen on its ability to reduce the multidimensional problems inherent in the data set as was also used in various other studies by Grootaert (1999), Nyangena (2005), Sabatini (2006), Katungi (2006) and Zuwarimwe and Kirsten (2010). The model was used to isolate the variance co-variance structure of the factors influencing smallholder livestock market participation. The model reduced the data set to a few linear combinations to offer more opportunities for deeper interpretation. The premises is that within the dataset it is possible to account for the variability of most p components by looking at a smaller number k of the principal components that have as much information as in the original variables.

Algebraically, principal components are particular linear combinations of the random p variables $X_1, X_2, X_3, \dots, X_p$. These principal components are those uncorrelated linear combinations $X_1, X_2, X_3, \dots, X_p$ whose variances are as large as possible. The

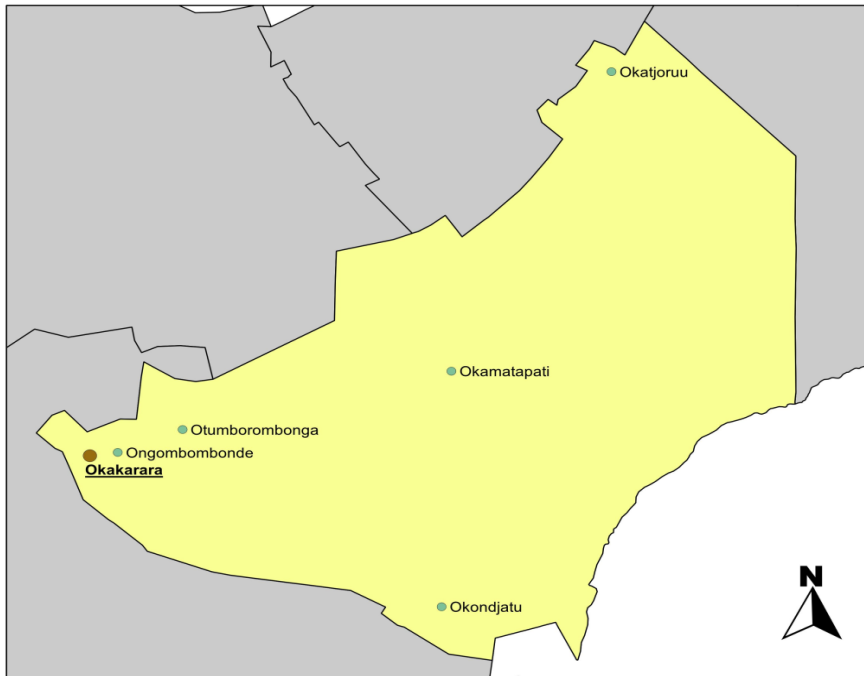


Figure 1. Location of the study area. Source: Own computation.

first principal component = the linear combination a' that maximises $Var(a'X)$ subject to $a'a=1$. The i th principal component = linear combination $a_i'X$ that maximises $Var(a_i'X)$ subject to $a_i'a_i=1$ and $Cov(a_i'X, a_k'X)=0$ for k being smaller than i .

The critical statistics of the PCA are the loadings or vectors $a = (a_1, a_2, \dots, a_p)$ associated with each principal component and its associated eigenvalue or variance. Whereas the pattern of the eigenvectors for a principal component aids in interpreting the principal component, the eigenvalues provide an indication of how well they account for the variability in the dataset for their relative sizes are indicative of the relative contribution of the variable to the variance of the principal component. The transaction cost theory was used to model the dynamics of smallholder livestock farmers' decisions to participate in livestock markets. High transaction costs leads to low levels of participation in livestock markets. Consequently, smallholder livestock farmers will only sell their livestock to market systems where they get less than the value of their livestock (Martins et al., 2010). The assumption is that resource poor smallholder livestock farmers' market entry becomes a risky undertaking hence they stick to tried and tested production systems. As Barrett (2007) would also argue, market participation is a function as much as it is a cause of development. The major source of transaction costs faced by resource poor smallholder livestock farmers is movement of products to the markets (Makhura, 2001; Hardt, 2009). Those farmers with high levels of human capital are better placed to gather and synthesize information about livestock marketing (Makhura, 2001).

RESULTS AND DISCUSSION

Market options for smallholder livestock farmers

Most respondents preferred private sales marketing

options followed by auctions with selling to butcheries and abattoirs being the least preferred option. A majority of the respondents between 20 to 49 years preferred to market their animals through auctions and private sales. On the other hand a majority of respondents 50 years old and above preferred to use butcheries and abattoirs as shown in Table 1. The understanding of such marketing options needs to be looked at in the light of the volumes sold and the reason for the sale. If the sale is to meet short term financial needs the farmers are more likely to go for the private buyers who may as well be local hence no need for transport to the market. The bigger picture could also be clearer if the gender and pricing signals from each option were put into the equation. What can be distilled from the results is that preferred options are not indicative of an increase in market participation as was also noted in the recent studies by Shiimi (2010) and Ortmann and King (2010).

Farmers with access to extension services are better informed when making decisions on farming activities. From the results more male farmers (80%) have access to extension compared to only 20% of the female farmers. This may explain why more male farmers were using all marketing channels unlike female farmers. In terms of power to negotiate the price of livestock more female respondents (52.4%) compared to 47.6% of the male respondents had power to negotiate livestock prices. More male respondents (63.9%) indicated that transport to the market is a challenge compared to 36.1% female farmers. Results shows that more male farmers

Table 1. Market options by age of the respondents.

Age	Auction	Private	Butcheries	Abattoirs
20-29	4	4	0	0
30-39	2	5	0	0
40-49	1	6	1	0
50-59	7	12	2	2
60-69	6	9	2	2
70+	1	3	0	0
Total	21	39	5	4

Table 2. Marketing channels and challenges.

Aspect	Male (%)	Female (%)
Auctioning	76.2	23.8
Private sale	61.5	38.5
Butcheries	100	0
Abattoirs	100	0
Access to extension	80	20
Have training on farming	62.5	37.5
Full time farmers	65	35
Membership to association	63.6	36.4
Power to negotiate price	47.6	52.4
Use of brokers to sell cattle	80	20
Lack of information	53.1	46.9
Plan where to sell	52.6	47.4
Access to processing facilities	66.7	33.3
Transport is a problem	63.9	33.1
Grazing is a problem	75	25
Water is a problem	80	20

are members to associations compared to female farmers (Table 2).

However, while the above results are consistent with findings by Schade et al. (2000); Shimii (2010) and Ortmann and King (2010), there is need to identify the principal factors influencing market participation. For that reason the Principal Component Analysis (PCA) was adopted to isolate the principal factors.

Principal factors affecting market participation

The seven principal factors that were isolated cumulatively explained 73.3% of the variance in terms of market participation. The first principal component accounted for 22.05%, the second one 11.73%, the third one 10.62%, the fourth one 8.70%, the fifth accounting for 8.27%, the sixth one accounting for 7.01% with the seventh one accounting for 4.91% of the sample variance respectively (Table 3).

Production and marketing related transaction costs

This component has high loading factors from conditions of grazing and availability of water services, and marketing through abattoirs, marketing through butcheries and using brokers. This component accounted for 22.05% of the variability amongst the respondents. This means that grazing, watering facilities and information about the abattoirs, butcheries and livestock brokers will lead to a 22.05% improvement in market participation by the smallholder livestock farmers. Improving grazing and watering facilities are critical for livestock farming as these will lead to better livestock quality but they are associated with a cost to be borne by an individual farmer. With better livestock quality, smallholder livestock farmers become more confident to participate in the livestock markets. This could also explain why commercial livestock farmers with their better grazing and watering facilities are participating more in the livestock markets as compared to smallholder

Table 3. Shows the loading factors for each component.

Loading factors	Component						
	1	2	3	4	5	6	7
Selling through Auction	0.551	0.547	-0.108	-0.247	0.257	0.015	-0.264
Selling to Private buyers	-0.060	-0.658	0.075	0.121	-0.528	-0.015	0.334
Selling to Butcheries	0.769	-0.233	-0.231	0.042	-0.157	-0.361	-0.040
Selling to abattoirs	0.847	-0.159	-0.147	0.047	-0.158	-0.272	-0.065
Power to negotiate during selling livestock	0.482	-0.198	0.466	-0.290	-0.118	0.084	-0.203
Use of brokers	0.716	0.020	0.082	-0.149	-0.084	0.157	-0.091
Weight the livestock before selling	-0.081	0.632	-0.095	0.589	0.112	-0.069	0.050
Have access to Information	0.209	-0.383	0.203	0.001	0.354	0.493	0.233
Plan the marketing of the livestock	0.565	0.020	0.488	0.190	-0.025	-0.069	0.311
Have access to marketing facilities	-0.159	0.472	0.586	0.039	-0.424	0.017	0.072
Have access to processing facilities	-0.029	0.299	0.204	-0.696	-0.012	0.019	0.189
Transport being a challenge in the area	-0.373	0.104	0.264	0.324	0.392	0.278	0.031
Mode of transport to take livestock to market	0.088	-0.448	0.028	0.434	0.520	-0.091	-0.086
When to sell the livestock	-0.135	0.015	0.710	0.193	0.176	-0.276	-0.276
Why selling the livestock	0.138	0.083	-0.339	-0.180	0.436	-0.219	0.614
Access to extension services	0.309	0.555	-0.493	0.068	-0.140	0.284	0.042
Production as a challenge	-0.258	-0.137	-0.266	-0.058	0.154	-0.606	-0.181
Diseases	0.159	-0.064	-0.372	0.464	-0.418	0.380	-0.143
Predators	0.318	-0.386	-0.175	-0.264	0.320	0.422	-0.253
Water	0.816	0.220	0.230	0.082	0.187	-0.051	0.063
Grazing	0.858	0.086	0.123	0.330	0.045	-0.016	0.116

livestock farmers from communal areas. The grazing and watering facilities' significance have been long established as the cause of unending battles between various communal farming communities.

On the other hand the marketing dynamics are equally important for the smallholder livestock farmers as each option has a cost associated with it. Farmers are more likely to orient their livestock production decisions to respond to market signals if they have confidence in the marketing infrastructure. There have been a lot of misgivings on the credibility of abattoirs and butcheries as farmers believe that the prices being offered are not commensurate to the quality of their livestock. Some even allege that Meatco short-change them in terms of the livestock prices. There are also some negative perceptions on the brokers who many accuse of working in collusion manner with the buyers to the disadvantage of the smallholder livestock farmers.

To enhance market participation by smallholder livestock farmers there is need to improve the quality of grazing and water facilities so as to improve the quality of their livestock. Maybe this could be incorporated in the current land resettlement programme so as to bring the state of the grazing and water infrastructure in the communal areas closer or at par with their commercial farming sector counterparts. With respect to marketing options information about the livestock markets should be

availed timely to all players. There is also a need to come up with programmes to govern the roles of all the various players in the livestock supply chain. Assumptions that can be made from the results are that if the above issues are looked into there is a 22.05% chance that smallholder livestock farmers will orient their decisions towards market signals. However this should be looked at as part of the bigger picture as there are other factors at play.

Livestock handling challenges

This component has high loading factors from weighing the animals before sale, marketing the animals through auctions, transport to take the animals to the market and access to extension services. This component cumulatively accounted for 11.73% of the variance between the respondents. The significance of transaction costs reduction need not be over emphasized in the livestock business as one has to know the true live weight of the animal so that even when negotiating the price there is a reference point. If one is not aware of the actual weight of the animal chances are that there will be suspicion that the buyer might short-change the seller. This calls for the farmer to be able to read and understand the weighing system so as to negotiate the right price. If the weighing system is not transparent

chances is that the smallholder farmers will not be obliged to participate in the livestock markets. This issue of weighing becomes even pertinent for smallholder livestock farmers to the North of the Veterinary Cordon Fence whose animals have to be quarantined before they can be marketed. Some of them have been complaining that during the 21 days quarantine their animals lose weight thus fetching very low at the market especially in the Kavango and Caprivi regions of Northern Namibia. This could be the reason why some would rather prefer other marketing options.

Auctioning of livestock also entails that some transaction costs have to be met. For instance livestock farmers should have adequate information about the auction dates and venues. They have to take the livestock there on time and in good health. This is also related with transport to take the livestock to auction centres. All these involve costs that have to be met and in cases where the farmers are not happy with the auction price and wish to take the livestock back they will have to incur more transport costs. In the worst case scenario the farmers will end up selling at a price they are not happy with for fear of losing more money on transportation. There are chances that some farmers will suspect foul play hence in future they are not so willing to participate in the auction of livestock. Those who have their own trucks are more likely to take their livestock to the markets when compared to those who have to hire transport. If the distance to the auction markets is long then some farmers who do not have their own transport are less likely to take their livestock there. Those with access to extension services are also better informed in terms of the various aspects of livestock auctioning. The role of extension to market participation is well documented in terms of improving quality and quantity as well as in terms of relevant information transmission.

Programmes that can be suggested to deal with the above issues include increasing the number of auctioning points so that farmers do not necessarily have to incur more expenses to sell their livestock. This could be done through assisting the farmers to construct and manage community based auction pens. The issue of information dissemination is also critical if farmers are to be well informed about the auctioning of livestock. This can be done through capacitating the existing extension workers and even having more training for livestock farmers on the livestock market supply chain. Just like in some crop farming ventures where smallholder farmers have been trained to form marketing cooperatives the same may be explored so as to deal with transportation challenges to take the livestock to the markets.

Human capital level of the farmer

Has the following loading factors, when to market the animals, having access to marketing facilities, ability to

put together a plan for livestock marketing and having power during negotiating the sale of the livestock. This component accounted for 10.6% of the variability amongst the respondents. The issue of human capital development and ability to engage in economic activities is well documented. Farming should be taken as a business by smallholder livestock farmers and this call for them to have skills to read market trends and be able to plan when to sell their livestock as well as putting together a marketing plan for their livestock. This is what most enterprises that thrive do otherwise without that skills capacity their level of market entry will remain low. With some skills and knowledge of the various aspects of the livestock supply chain the farmers are able to negotiate the prices of their livestock as they can engage in the negotiation of the price of their livestock.

Livestock marketing infrastructure

Has high loadings on the following factors; weighing the animal before sale, access to slaughtering and processing facilities and diseases as a problem for the cattle farming. This component accounted for 8.7% of the variability among the respondents. Generally for smallholder farmers to orient their production systems towards markets there is need for well functioning institutional and physical infrastructure that guarantee broad-based, low-cost access to competitive, well-functioning markets. There is need for transparent weighing machinery otherwise farmers lose confidence in the weighing and will not participate in the markets. Smallholder livestock farmers need to realize more value from their livestock so they need to have access to certain infrastructure such as slaughtering and processing facilities. The issue of disease control infrastructure need not be over emphasized in Namibia as smallholder livestock farmers in the north where the bulk of livestock is found always experience challenges when trying to market their livestock due to stringent disease control measures. Perhaps to improve market participation level of the smallholder livestock farmers there is a need to improve the infrastructure as well as institutional arrangements to guarantee broad-based, low-cost access to competitive, well-functioning markets. It could be through improving the self organization capacity of the farmers so that they can have a stronger voice in the market given that they are the majority and have the largest livestock numbers.

Accessibility of livestock marketing infrastructure

This component has high loadings on mode of transport used to take animals to the market, transport cost during marketing season and reasons for selling animals. It accounted for 8.3% of the variability amongst the

respondents. Farmers need access to transport so as to take their livestock to the markets at the right time and at reasonable costs if long term market participation is to be guaranteed. This is necessary if long term participation is to be assured otherwise they will not change their production decisions in a significant way. Thus there is a need to invest in transport infrastructure such as improved road network as well as perhaps government subsidized livestock transport to take the smallholder farmers' animals to the markets. Perhaps the other option could be increasing the livestock marketing points so that the farmers have easy access to them at lower prices. This is more likely to lead to changing the farmers' perceptions of the livestock farming.

Perception of the livestock marketing business environment

This component has high loadings on the following factors; level of production, marketing information and predators as a problem in the area. This accounted for 7% of the variability amongst the respondents. The perceived business viability generally induces or discourages entry by any rational entrepreneur. The same is true for livestock farming specifically by smallholder farmers who are operating in an environment where decisions are made from incomplete information. This will at the end of the day influence the level of production. If marketing information is incomplete farmers would rely on perceptions which might be wrong hence negatively level of market participation. To enhance change of decisions by smallholder towards livestock market signals there is need to improve levels of market information dissemination systems. Perhaps smallholder farmers' institutional arrangements strengthening and training may be aggressively addressed to induce the farmers to take advantage of livestock signals.

Production orientation of the smallholder livestock farmer

The component has high loadings from the following; reasons for selling the cattle, selling animals to private individuals, ability to formulate marketing plan. This accounted for 4.9% of the variability among the respondents. For any meaningful market participation by smallholder livestock farmers in developing countries to be realized among farming has to be taken as a business. This calls for a shift in reasons for selling livestock from merely meeting short term financial needs to fully fledged commercialization where clear marketing plans will be in place. This will also mean a change in market options from private options to more market linked options such as abattoirs and auctions where quality and volumes issues are dominant. Perhaps to training on

agribusiness supply chain could be aggressively implemented amongst smallholder farmers. This is because if the vision 2030 of Namibia is to be realized smallholder livestock farmers are to be highly integrated into the livestock markets.

Conclusions

This research has shown that participation in livestock markets by smallholder livestock farmers is influenced by a number of key factors: production and marketing dynamics, transaction costs, human capital, state of marketing infrastructure and level of business orientation of the smallholder livestock farmer. To improve market participation by smallholder livestock farmers, a responsive extension system is needed. The policy directions should focus on improving information flows, livestock marketing infrastructure and human capital development of the smallholder farmers. If these factors are addressed, more smallholder livestock farmers can participate in livestock markets.

Conflict of Interest

The authors have not declared any conflict of interest.

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