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An Alternative to Cooperative Marketing System in the Southern Communal Area of Namibia: Are Farmers Willing To Pay?

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Abstract
This study investigated an alternative method to improve livestock marketing position amongst communal farmers in the Southern Communal Area (SCA) of Namibia. The investigation includes determining the willingness to pay for the establishment of an alternative market entity and the economic feasibility of such entity. The farmers' decision was modelled using a logistic probability model while the investment decision was estimated considering uncertainty and its probability distribution. According to the result, on average, there is a probability of 87.91% that farmers' will pay for a business entity with the future prospect of being a shareholder. The study found that the proposed business entity could generate between N$1.6 to N$3.2 million income annually. The study found livestock farmers in the SCA of Namibia to be mindful of running their enterprise as a business unit. Therefore, a good policy directive is needed for the implementation of the proposed agribusiness entity in Namibia.
EconLit: (C01, C10, C30, D22, D80, D82 & E03)
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1. INTRODUCTION

In the light of poor market access, institutional and infrastructural constraints, cooperative management system remains an important strategy for increased smallholder participation in dynamic markets. This is because it provides services such as (a) increased capacity and bargaining power, (b) access to new markets and marketing channels, (c) access to credit and support programmes, (d) access to better technical and market information, (e) more opportunities for exchanging experiences, and (f) greater access to training programmes (Santacoloma, Rottgen and Tartanac, 2009). In spite of these benefits, it is surprising that livestock cooperative systems do not function well in Namibia due to lack of patronage, especially amongst the smallholder farmers. This has been a major concern to policy makers, major stakeholders and farmer unions.

Investigations into the cooperative system and farmers' participation in the Namibia livestock sector show that there is a general reluctance by farmers to join cooperative as a result of lack of trust and alleged non-transparency in the cooperative governance system **(Mbai, Uchezuba and Laubscher, 2015).** According to **Mbai *et al*., (2015),** there is a 29.50% probability that farmers are willing to join livestock cooperative. Taking adequate cognisance of this situation has prompted a rethink among policy makers and stakeholders in the livestock sector to seek an alternative method that will enhance increased benefit from livestock enterprise by the communal farmers.

Consequently, the development of a business entity was proposed by the Namibian National Farmers' Union (NNFU), subject to approval by the Namibian government hence, the commissioning of this study. The nature of the proposal is as follows; initially, the entity will be registered as a cooperative, funded by members through their value and volume of participation, at a later stage; it will be transformed into an Investor-Oriented Firm (IOF) (public liability company), whereby livestock farmers will buy shares in the company with communal farmers as the majority shareholders. The idea is laudable, but whether it will be workable or sustainable in practice is not known with certainty. It is assumed that farmers will embrace this opportunity through increased willingness to pay for the services, however, greater uncertain lies in the optimal number of membership to be recruited, the capability to generate potential future income based on membership strength and the magnitude of the risk involved since the investment decision is undertaken under risk and uncertainty.

Therefore, the main objective of the study is to investigate an alternative to cooperative marketing system in the southern communal area of Namibia. In order to achieve this, the study determine, (a) the probability that the farmers' will be willing to pay (WTP) subscription fees, (b) the uncertainty (risk) involved and (c) the capability of the proposed entity to generate potential future income based on the estimated WTP. The focus of the study is on Cattle, Fat-tailed Sheep and Goat livestock enterprises in the Southern region comprising: Kunene South, Otjozondjupa, Omaheke, Erongo, Hardap and Karas. The Southern region was chosen for this study because of the outbreak of Foot and Mouth Disease (FMD) in the Northern region during the study period.

The rest of the paper is organized as follows: Next, a review of livestock cooperatives and business

enterprises is made. Then the method used in the study is described, followed by the description of the data and the model specification. Empirical results are presented and lastly closing remarks are given in the concluding section.

2. A NEED FOR A MORE VIABLE COMMUNAL LIVESTOCK ENTERPRISE

The establishment of a strong viable communal livestock marketing entity is an efficient and effective way to promote the development of the rural economy that make up the majority of the population and thus it cannot be viewed as one too many. This is because few livestock marketing firms are owned by the communal farmers. A few operational livestock small-scale cooperatives are; the Rehoboth Cooperative, Waterberg Farmers' Cooperative, Pamwe Farmers' Cooperative, Aminius Cooperative, Ohorongo Cooperative, Okangoho Farmers' Cooperative, Omangeti Farmers' Cooperative and Helena Farmers' Cooperative. None of these cooperatives are fully registered; they are often rural and operate provisionally on a small scale. The larger livestock cooperatives that offer auction services to farmers are Agra retail group, Namboer, Karoo Oche, Blaauberg and Windhoek livestock auctioneers. These are the major stakeholders in the livestock auction market. Most of them are vertically integrated with large market shares.

Amongst all, Agra business arm is the largest private livestock marketing corporate. Other agro-marketing firms are the state-owned enterprises such as the Namibian Agronomic Board (NAB), the Agri-business Development Agency (AgriBusDev), the Agro-marketing and Trade Agency (AMTA), and the MeatCo. The NAB is the official marketing agency for controlled grains such as wheat, maize and pearl millet (Mahangu). The AgriBusDev facilitates agribusiness development and its operation is currently limited to the Green Scheme Project. AMTA is a special agency of the Ministry of Agriculture, Water and Forestry. Its role is to coordinate and manage the marketing and trading of agricultural produce. Currently, AMTA's activities are focussed on fresh fruit, vegetables, and grains with collaboration with Fresh Produce Business Hubs (FPBH), the National Strategic Food Reserves (NSFR) and the Farm and Facility Inspectorate Unit (FFIU). Meatco is the dominant national livestock corporation with 70% share (Sherbourne, 2013/14). It is the largest meat processor and operates five abattoirs in Windhoek, Okahandja, Katima Mulilo, Rundu and Oshakati with the later on a lease agreement. Other meat processors are Brukarros Meat Processors, Farmers Meat Market from Mariental, owned by Hartlief, Nature Namibian Meat Producers, and Witvlei Meat. These are the major export merchants for Namibian meat to the outside world.

According to Meat Board (2012), there are three specialised export abattoirs for cattle in Namibia. Two belong to the MeatCo, one in Windhoek and one in Okahandja. The third one is the Witvlei abattoir, which was re-opened a few years ago. Furthermore, a meat deboning and processing facility is operated in Windhoek by the Hartlief Corporation Ltd. Most sheep are marketed to export abattoirs. There are four sheep export abattoirs in Namibia with a combined capacity of 1.3 million head per year. These include MeatCo in Windhoek, Farmers Meat Market (Hartlief) in Mariental, Aranos Abattoir (Natural Namibian Meat Processors) and Brukkaros Meat Processors in Keetmanshoop. The export of live goats for the ceremonial markets in South Africa forms the main share in the live exports of small livestock and only a few goats are slaughtered locally. It can be seen from the available auction and processors of livestock enterprises discussed above that there is a need for an enterprise that will specifically target the communal livestock sector to increase their participation in the value adding process.

3. MATERIALS AND METHODS

3.1 Sample and sampling

Information was gathered from the farmers in the study area by means of a survey. The survey was preceded by consultation with stakeholders, farmer associations and traditional councillors who assisted with the enumeration process. A semi-structured questionnaire containing both open and closed-ended questions was used to gather information from farmers. The questionnaire was first pre-tested on selected farmers and later modified to include additional opinions. The farmers were randomly sampled. The questionnaire includes amongst others, a question regarding farmers' willingness to pay an annual subscription fee to which they were given monetary options to choose.

A total of three hundred and forty respondents were interviewed in the survey. The number of sample per region varies. The variation is a reflection of many factors such as population density, larger livestock density and greater livestock activities. A total of 109 farmers were sampled in Otjozondjupa, Omaheke (96), Kunene South & Erongo (50), Hardap (51) and Karas (34). Because of small sample size and close proximity, data from two regions, Kunene Southern and Erongo were merged.

3.2 Model specification

3.2.1 The logistic model

A probabilistic outcome model was fit to determine farmers' willingness to pay any of the monetary alternatives; N$50, N$100, N$200, N$300, N$400 and N$500 as an annual subscription fee for the proposed livestock agri-

business entity. The response variable named WTPBE is a dichotomous variable taking the value one if a farmer is willing to pay any of the given annual subscriptions, zero otherwise. This variable is an example of a binary decision outcome whereby the code 1 represents a positive outcome indicating that an event occurred, whereas, zero is a negative outcome whereby an event did not occur. The aim is to estimate the relationship between WTPBE and a set of independent variables namely; farmer experience (Continuous variable), gender (male = 1, female = 0), age (Continuous variable), farmer's indebtedness (whether farmer has a loan = 1, 0 otherwise), education (which includes, no education = 1, 0 otherwise, secondary education = 1, 0 otherwise and tertiary education = 1, 0 otherwise) and lastly, a set of regional dummies comprising; one for a region, zero otherwise.

According to the specification of the response variable, WTPBE, a qualitative dichotomous regression analysis was applied assuming utility maximization assumption. Within a utility maximization framework, farmers are faced with alternatives in which they have to make decisions. The alternative, in this case, is to decide how much to pay to sustain a proposed business entity to which they wish to obtain some form of benefits or utility. Therefore, their decision is made based on the alternative that gives maximum utility. The probability of making the correct decision is presented as a dichotomous model in this study. According to (Cameron and Trivedi, 2005:459), a model of dichotomous nature has mutually exclusive outcomes. It is either that an outcome is observed or not observed, therefore, the aim is to determine the probability (p) of the occurrence of one outcome rather than the alternative that occurs with a probability of ($1-p$). Suppose y represent the outcome variable, an outcome is observed for $(y=1)$ with probability p or not observed $(y=0)$ with probability ($1-p$). According to the specification of the discrete model, the nature of the observed data dictates the special treatment of a binary dependent variable model (Greene, 2012:724). The interest is to model a positive outcome of p as a function of a set of covariates, x. The probability mass function for the observed outcome, y is $p^{y}(1-p)^{1-y}$, with $E(y)=p$ and Var $(y)=p(1-p)$ (Cameron and Trivedi, 2005:460). The conditional probability takes the form:

$$p_i \equiv (\Pr(y_i = 1 \mid x) = F(x_i'\beta) \quad \text{..... (1)}$$

Or simply:

$$Logit\ (PX) = \alpha + \sum \beta_i x_i + \mu_i \quad \text{..... (2)}$$

Where,

$$(PX) = \frac{1}{1+e^{-(\alpha+\sum \beta_i x_i)}} \quad \text{..... (3)}$$

Where x is a vector of regressors, α, β_i are vectors of unknown parameters to be estimated, μ_i is a random disturbance term. The set of parameters β_i reflects the impact of changes in x on the probability of y (Greene 2003:665). It represents the change in the log odds that will result from a one unit change in x while other variables in the model remain constant (Kleinbaum and Klein 2010:21). Another interpretation of logistics coefficients is in terms of odds ratio obtained by exponentiation of the log odds. The odds ratio represents the number of times or percentage points the outcome variable will change given a one unit change in x. The function $F(.)$ is the cumulative distribution function which ensures that $0 \le p \le 1$ is satisfied (Cameron and Trivedi, 2010:460). This specification was applied to the data described above using logistic binary outcome model. This type of model is simple to estimate and easy to interpret compared to other binary options such as probit. Nevertheless, any of the two models will produce similar outcome. However, it is observed that irrespective of the fact that their assumption about error variance differ[1] (Long and Freese, 2001), their result do not differ greatly (Greene, 2003:667; Gujarati, 2009:571; Cameron and Trivedi, 2010:472).

In estimating the probability of an outcome as shown in equation (1) to (3), it should be noted that the probability p_i is non-linearly related to β and x, therefore, ordinary least square (OLS) estimator cannot be used to estimate the parameters. As a result, the logit model is evaluated through an iteration process by using a non-linear maximum likelihood estimation technique. The likelihood function for a logit model is:

$$\ln L = \sum_{i \in s} \omega_i \ln F(x_i\beta) + \sum_{i \notin s} \omega_i \ln\{1 - F(x_i\beta)\} \quad \text{..... (4)}$$

Where s is a set of all observations i, such that $y_i \neq 0$. $F(z) = e^{z}/(1+e^{z})$, ω_i is an optional weight (Stata, 2014). The model was estimated assuming heteroscedastic error variance with STATA 13 *vce*

[1]The probit model assumes error variance of 1 for a standard normal distribution whereas, it is $\pi^2/3$ for a logistic distribution

(robust) option. Robust standard errors were calculated instead of the usual standard error. Using the logistic model equation (3), the following model was specified.

$$\ln(p_i/1-p_i) = \beta_0 + \beta_1 Age + \beta_2 Gender + \beta_3 Farm\exp + \beta_4 Credit + \beta_5 Hardap + \beta_6 Karas + \beta_7 Kserongo + \beta_8 Omaheke + \beta_9 Sec + \beta_{10} Tert + \beta_{11} N\$50 + \beta_{12} N\$100 + \beta_{13} N\$200 + \beta_{14} N\$300 + \beta_{15} N\$400 + \beta_{16} N\$500 + \mu_t \quad (5)$$

Farmers' personal characteristic such as AGE, EXPERIENCE, and their level of EDUCATION were expected to positively influence the decision to pay, hence their inclusion. Three levels of education dummies were considered; SECONDARY, TERTIARY and a base category, NO EDUCATION. Regional effects were captured by including four regional dummies excluding the reference category OTJOZONDJUPA. Five monetary alternatives mentioned previously were also included in the model as shown in equation (5).

3.2.2 The probability, expected income and uncertainty specification

This section investigates the feasibility of a proposed investment decision to establish a business entity that will represent the livestock communal farmers in order to enhance their profitability through greater participation in the value chain process, integration and collective bargaining. To determine the economic feasibility of a future project, several factors are usually considered. Of importance is the (a) disposition of the project to sustainably generate the potential projected stream of cash flows and expected income, (b) the determination of the Net Present Value (NPV) of the future investment and (c) the risk involved in the decision to engage in financial or economic investment. The feasibility of a future investment project can be objectively or subjectively determined (McGuigan, Moyer and Harris, 2002 and Samuelson and Marks, 2012). Objectively, feasibility can be achieved by drawing statistics from similar projects or it can be based on the outcomes of a similar project(s). On the other hand, subjective deductions can be made by assuming that the decision outcome to establish a new project follows a probability distribution. The latter approach was followed in determining the feasibility of forming a livestock agri-business entity in this study. The approach is similar to that adopted by Zyl, Kirstein, Coetzee, and Blignaut (2013) and McGuigan, Moyer and Harris (2002).

An objective determination of the probability for the feasibility analysis was obtained from the results of the willingness to pay regression analysis discussed previously. Recall that the farmers were asked to choose amongst various monetary alternatives (N$50, N$100, N$200, N$300, N$400, and N$500) to show their willingness to commit resources to the establishment of an agri-business entity. Their responses were converted to percentage shares and were used to construct a probability distribution for the economic feasibility assessment. The number of respondents for each of the alternatives is 146 for the N$50 alternative, 86 for the N$100 alternative, and 33 for the N$200 alternative. Others are 9 for the N$300 alternative, 7 for the N$400 alternative and 15 for the N$500 alternative. The number of respondents who said they will pay zero amounts is 44. The probability of the first alternative, N$50 is 0.43; others are N$100 (0.25), N$200 (0.10), N$300 (0.03), N$400 (0.02), N$500 (0.04) and the N$0 (0.13). The potential cash flow (PCF) represents the product of the farmers' membership scenario (assigned arbitrarily) and the WTP alternatives. This is calculated as shown in equation (6).

$$Pcf = \sum_{j=1}^{n} w_j m_i \quad (6)$$

Where pcf is the potential cash flow outcome, w_j is the WTP alternative for the jth case, m_i is the membership scenario with n possible outcomes. According to Samuelson and Marks (2012), the ability of the project to generate the expected income is determined as follows. Suppose the project has n possible monetary outcomes, $v_1, v_2, \ldots\ldots\ldots\ldots v_n$, which is predicted to occur with a probability of $p_1, p_2, \ldots\ldots\ldots\ldots p_n$. The expected future income is determined as follows.

$$E(e) = p_1 v_1 + p_2 v_2 + \ldots\ldots\ldots p_n v_n \quad (7)$$

The monetary outcomes $v_1, v_2, \ldots\ldots\ldots\ldots v_n$, are the pcf estimated in equation (6). Considering that the investment is not risk-free, uncertainty (risk) is measured by estimating; (a) the deviation of expected income from the actual income, using the standard deviation (STDEV) method, and (b) the coefficient of variation (CV). The standard deviation is the measure of dispersion from the mean. It is calculated as the square root of the weighted average square deviations of the individual outcomes from the mean.

$$\sigma = \sum_{j=1}^{n} (pcf_j - \bar{e}_j)^2 p_j \quad (8)$$

where $pcf, \bar{e}, and\ p$ are as explained above. The coefficient of variation (CV) is the ratio of σ to the expected value $\bar{e}$ as, $CV = \sigma/\bar{e}$. Equations, (6 to 8) were used to determine the expected income of the future project,

the probability of the sustainable generation of future net income and the projected risk involved.

4. EMPIRICAL RESULTS AND DISCUSSIONS

4.1 Willingness to pay for a business entity

During the survey, farmers were asked to select one amongst five alternative options [N$50, N$100, N$200, N$300, N$400, and N$500] which they would pay per annum as members of the proposed business entity. About 43% indicated they will pay N$50, 25% would pay N$100 while 10% wants to pay N$200 per annum. Those who are willing to pay N$300, N$400 and N$500 make up 3%, 2% and 4% respectively. About 13% of the farmers are not willing to pay any amount of money. Using logistic regression such as equation 2, farmers' WTP was estimated as shown in equation 5. The parameter estimates for the farmers' WTP are shown in Table 1. The coefficients measure the expected change in the log odds for a one unit change in the regressor, given that other variables in the model remain constant. The sign of the coefficients indicates the direction of the influence of the regressors on the logit. A positive sign indicates positive outcome whereas, a negative sign shows a negative outcome.

The result in Table 1 shows that age positively and significantly influences the log odds of the farmers' willingness to pay for a business entity. This implies older livestock farmers are more likely to pay for a business entity than younger ones. Farmers nearing retirement seem to have increased need for an investment they can rely on during retirement than younger adventurous ones. The odds are 5.6% that older farmers are more likely to pay than younger ones. In terms of regional effects, the odds of getting a farmer who is willing to pay will not exceed 2.4% if they are from Hardap, 4.4% if they are from Karas and 11% if they are from Omaheke.

Farmers with secondary and tertiary education are more willing to pay than those without secondary and tertiary education. The more educated they are, the more the likelihood that they would pay. According **to Mbai *et al* (2015),** farmer's age had a negative impact on the willingness to participate in cooperative but in this study positive influence of age points to the fact that farmers' prefer shareholding business entity than cooperative and this has greatly influenced their decision in this study.

The study further determines how much the farmers will pay by using five Namibian dollars denominated alternative options described above. The results show that there is a positive and significant relationship between the monetary categories and farmers' WTP. The odds of getting a farmer who will pay any of the listed money categories increases by 17.24% for those who chose to pay N$50 and 45.04% for those who chose N$100. Others are 47.51%, 70.28% and 78.36% for those who chose N$200, N$300 and N$500 respectively.

The diagnostic tests for the estimated coefficients are shown in the lower panel of Table 1. The first row shows the chi-square statistics for the Wald test of the joint statistical significance of the estimated coefficients. The null hypothesis of the test is that the coefficients of the estimated model are all zero. The null hypothesis is rejected at one per cent level of significance, signifying that at least, one of the regressors is different from zero. The test of joint statistical significance for the proportional odds ratio test is a Likelihood ratio (LR) test which is similar to Wald test. The null hypothesis of zero coefficients is rejected as in the Wald test. The McFadden's (1974) pseudo R^2 is estimated as an additional measure of goodness of fit of the model. It is not equivalent to the R^2 obtained in linear ordinary least square models but mimics it. The pseudo R^2 value of 0.4224 calculated for the model is high, an indication of goodness of model fit. In addition to the pseudo R^2, a model classification test showed that 91.74% of the model was correctly classified.

4.2 Marginal effects of regressors on the farmers' willingness to pay

The parameters of the marginal effects for the WTP logistic model are shown in Table 2. The result shows that though age influences WTP, its average marginal effects are minimal (0.04%). Marginal effects do not increase beyond 23.15% if farmers are from Hardap, 19.35% if they are from Karas and 13.69% if they are from Omaheke. At least on average, farmers with secondary education are 33.14% more likely to pay than those without secondary education. Overall, there is an increased marginal effect for all monetary categories with N$200 having the highest marginal effect compared to other options.

4.3 Predicted probabilities of the farmers' willingness to pay

The predicted probabilities for farmers WTP is given in Table 3. According to the results, on average, the estimated probability that farmers are willing to pay is 87.91%. There is no significant difference compared to the sample frequency of WTP which is 87.65. In logit or probit models, sample frequency supposed to be equal to the predicted probability, if they differ significantly; it is a sign of model misspecification. Therefore, the Hosmer-Lemeshow misspecification or goodness of fit test was carried out. The null hypothesis of the test is that the sample frequency equals the predicted frequency; rejection of null signifies lack of fit or misspecification. The test is chi-square distributed with degrees of freedom equal the number of number of variables. The chi-square statistics for the test is 1.21, whereas, the p-value is 0.5449. The null hypothesis was not rejected, evidence that the model has good fit.

Probabilities were also evaluated at sample representative value. The result in Table 4 shows that the older and experienced male farmers with secondary education from all the selected regions are more likely to pay

than the young and inexperienced male farmers with secondary education. Older and more experienced farmers tend to have more need to diversify and hedge for future income than younger and inexperienced ones. As explained previously, the result suggests that there is a greater need for old and experienced farmers to be more conscious about securing future income for retirement purposes than younger adventurous farmers.

4.4 Feasibility of establishing a business entity

The results of the feasibility assessment are shown in **Appendix Table A1**. The first column represents the willingness to pay categories from which farmers chose the amount they will pay. The second column is the farmers' response to the alternatives. The third column represents the projected number of financial members for the proposed entity. Using the WTP figures in column one and the membership roll in column two, the potential net cash flow of the project was calculated as shown in equation 7 (See column 4). With this information, the expected value of each decision alternative was calculated using equation 8 (See column 6). The expected value is the weighted average of the possible repeated outcomes. The total annual expected income of the proposed entity given a membership of 5,000 and the probability distribution implied by the farmers' response in column 2 is N$522,059. This is the amount the entity can generate per annum if it would recruit 5,000 members given the WTP alternatives. Applying different membership scenarios this value increased to N$3,654,412 as membership increased from 5,000 to 35,000. This is an indication that income generation is directly related to the number of members recruited given that the farmers can pay any amount ranging from N$50 to N$500.

The variability of the potential future income or the risk involved in the investment decisions was determined using standard deviation (STDEV) and coefficient of variation (CV) methods. The aim is to determine the degree of variability of the estimated future income given that risk increases the possibility that the actual returns will differ from the expected income. Using STDEV method, the variability (risk) in the estimated income of N$522,059 is N$576,397 (column 7), representing a deviation of 10.41%. This implies that the expected income of the future investment will vary from the realized income by 10.41%. The expected income and the STDEV are calculated for other alternative membership rolls such as 10,000, 15,000, 20,000, 25,000, 30,000 and 35,000. The results indicate a constant STDEV of 10.41% across the alternatives. The estimated coefficient of variation (CV) representing the risk per Namibian dollar of the projected net cash flow for all the alternatives is N$ 1.10 (column 8). This implies that for every Namibian dollar of expected value, the result will vary by N$1.10.

4.5 Sensitivity analysis

The study further performed a sensitivity analysis with the expected annual member subscription fee of N$200. Recall that N$200 was found to have a more marginal effect on willingness to pay than any other monetary alternative presented to the farmers (Table 2). Three sets of outcome scenarios were undertaken. By assuming the most **pessimistic** member enrolment number of 1,000, a **realistic** outcome of 10,000 and an **optimistic** scenario of 30,000, the potential and expected incomes were calculated. The results are shown in Table 5. The expected income would be N$1,654,118 if annual member subscription fee is projected at N$200 for the membership enrolment scenarios of 1,000, 10,000 and 30,000. It is N$3,276,471 for scenarios 5,000, 20,000 and 50,000. Using the STDEV method, the variability (risk) increased, resulting in an estimated income of N$2,370,781 for the first set of scenarios and N$3,682,235 for the second set. The two sets of scenarios represent 43% and 12% changes respectively. This implies that the expected income of the future investment for the two sets of scenarios will vary from the realized income by 43% and 12% respectively. The estimated risk per Namibian dollar of the projected income is N$1.43 and N$1.12 respectively for the two sets of scenarios. This implies that for every Namibian dollar of expected value, the result fluctuates by N$1.43 and N$1.12 respectively. Comparing the results obtained in Tables 5 and A1, it can be seen that the expected income increases as the number of member enrolment increases but variability (risk) decreases as the number of enrolment increases. This implies that member enrolment has a strong influence on the feasibility of the proposed investment project.

5. CONCLUSION

Based on the observed inactive role played by most cooperatives in the livestock sector, coupled with the *lukewarm* attitude of farmers' towards the cooperative system, the establishment of a business entity was proposed. The aim is to stimulate the market institution by strengthening the bargaining power of the communal sector through the engagement of an agri-business entity albeit, uncertainty that farmers may not be willing to pay for such services.

This study investigated farmers' willingness to pay an annual subscription fee for the establishment of a livestock business entity. The result shows that on average, the estimated probability that farmers are willing to pay is 87.91%. This probability is higher compared to the probability to join a cooperative estimated in Mbai *et. al.,* (2015). This is because farmers anticipate a better wellbeing from a shareholding business entity than a cooperative. A scenario was developed using probability distribution implied by the WTP alternatives selected by the farmers. The aim was to determine the best membership scenario that leads to the highest potential expected annual income for the proposed business entity. The result shows that potential future income increases as the

number of membership increases. This implies that the financial strength of the proposed enterprise lies in the number of members recruited. Using the alternative with the highest possible marginal effects on the WTP (ie, N$200), the study found that the entity could generate between N$1.6 to N$3.2 million income annually.

The findings in this study highlight a general desire by farmers for a profitable agribusiness venture. The establishment of a shareholding business entity guarantees future income, as such farmers were found to be more willing compared to the findings in Mbai *et.al,* (2015), where farmers showed reluctance to join a cooperative. In this regards, this study found livestock farmers in the SCA of Namibia to be mindful of running their enterprise as a business unit. It will serve as a guide towards planning of the proposed business entity given that the estimate of the number and possible potential for income generation has been derived in this study. Policy directives are needed for the implementation of the proposed agribusiness entity.

TABLES

Table 1 Parameter estimates for the farmers' Willingness to Pay (WTP)

Variables	Coefficient	z-statistics	P-value	Odds Ratio	z-statistics	P-value
Farming experiencer	-0.0237	-1.0600	0.2870	0.9765	-0.9800	0.3280
Gender	-0.5439	-0.8900	0.3740	0.5805	-1.0000	0.3190
Age	0.0558***	2.6700	0.0080	1.0573**	2.2500	0.0240
Loan	1.0851	1.3500	0.1780	2.9598	1.2800	0.2020
Hardap	-3.7335***	-3.9700	0.0000	0.0239***	-4.0300	0.0000
Karas	-3.1213***	-3.0600	0.0020	0.0441***	-3.3800	0.0010
Kunene South & Erongo	-0.8341	-0.6400	0.5220	0.4343	-0.6500	0.5130
Omaheke	-2.2078***	-3.7900	0.0000	0.1099***	-3.0800	0.0020
Secondary	5.3460***	4.3100	0.0000	209.771	0.0100	0.9930
Tertiary	13.3659***	8.2500	0.0000	637880	0.0100	0.9910
N$50	3.7652***	5.5900	0.0000	43.1724***	5.6600	0.0000
N$100	4.4479***	6.0300	0.0000	85.4504***	5.4200	0.0000
N$200	5.0719***	3.2800	0.0010	159.4751***	3.9300	0.0000
N$300	2.9287***	2.7400	0.0060	18.7028***	3.0500	0.0020
N$500	2.7590**	2.2800	0.0220	15.7836***	2.7500	0.0060
Constant	5.2185***	3.0200	0.0030	184.664	0.0100	0.9930
Diagnostic Tests:						
Wald / LR (χ^2)	251.84			105.62		
Probability > χ^2	0.000			0.000		
Pseudo R^2	0.4224			0.4224		
Log-Likelihood	-72.2124			-72.212426		
Number of observation	339			339		

Note: The signs ***, ** and * Signifies statistical significance at 1%, 5% and 10% levels respectively.

Table 2 Marginal effects of the explanatory variables on the farmers' willingness to (WTP)

Average marginal effects				Marginal effects at the mean		
Variables	Margin	Z-stat	P-value	Margin	Z-stat	P-value
Farmexpr	-0.0015	-1.0400	0.2980	-0.0007	-0.9600	0.3370
Gender	-0.0337	-0.8900	0.3710	-0.0161	-0.8800	0.3800
Age	0.0035**	2.4600	0.0140	0.0016	1.9000	0.0570
Loan	0.0673	1.3200	0.1870	0.0321	1.1900	0.2340
Hardap	-0.2315***	-3.6400	0.0000	-0.1103	-2.5500	0.0110
Karas	-0.1935***	-2.8900	0.0040	-0.0922	-2.3300	0.0200
Kserong	-0.0517	-0.6300	0.5310	-0.0246	-0.5700	0.5680
Omaheke	-0.1369***	-3.7200	0.0000	-0.0652	-2.6500	0.0080
Secondary	0.3314***	3.2900	0.0010	0.1580	1.9800	0.0480
Tertiary	0.8286***	5.0000	0.0000	0.3950	2.5500	0.0110
N$50	0.2334***	6.2600	0.0000	0.1113	2.9700	0.0030
N$100	0.2758***	6.0300	0.0000	0.1314	2.8300	0.0050
N$200	0.3144***	3.6600	0.0000	0.1499	3.4100	0.0010
N$300	0.1816***	3.0700	0.0020	0.0865	2.2600	0.0240
N$500	0.1710*	2.4100	0.0160	0.0815	1.9900	0.0460

Note: The signs ***, ** and * Signifies statistical significance at 1%, 5% and 10% levels respectively.

Table 3 Average predicted probabilities

Variables	Margin	Std.Error	Z-stat	P-value	[95% Conf. interval]	
Willingness to pay	0.8791***	0.0142	61.8000	0.0000	0.8512	0.9069

Note: The signs ***, ** and * Signifies statistical significance at 1%, 5% and 10% levels respectively.

Table 4 Predicted probabilities for farmers' willingness to pay (WTP)

Sensitivity	Farm EXP	Gender	Age	Hardap	Karas	Kunene	South Erongo &	Omaheke	Secondary	Tertiary	Margin	Z-stat	P-value
Young & inexperience	10	1	25	1	0	0		0	1	0	0.6079	3.3200	0.0010
	10	1	25	0	1	0		0	1	0	0.7409	4.3800	0.0000
	10	1	25	0	0	1		0	1	0	0.9657	20.9300	0.0000
	10	1	25	0	0	0		1	1	0	0.8770	15.3200	0.0000
Old & experienced	35	1	62	1	0	0		0	1	0	0.8708	9.7800	0.0000
	35	1	62	0	1	0		0	1	0	0.9256	17.1900	0.0000
	35	1	62	0	0	1		0	1	0	0.9919	95.4600	0.0000
	35	1	62	0	0	0		1	1	0	0.9687	57.0700	0.0000

Note: The signs ***, ** and * Signifies statistical significance at 1%, 5% and 10% levels respectively.

Table 5: Sensitivity analysis of the economic feasibility of a business entity with N$ 200 annual subscription fee

WTP	Scenarios	Membership	Potential net cash flow (PNCF)	Probability[1]	Expected Income	Standard deviation	Risk per N$ projected net cash flow
(N$)		(Number)	(N$)		(N$)	N$	N$
200	Pessimistic	1,000	200,000	0.68	136,471		
	Realistic	10,000	2,000,000	0.10	194,118		
	Optimistic	30,000	6,000,000	0.22	1,323,529	2,370,781	
Total					1,654,118		1.43
200	Pessimistic	5,000	1,000,000	0.68	682,353		
	Realistic	20,000	4,000,000	0.10	388,235		
	Optimistic	50,000	10,000,000	0.22	2,205,882	3,682,235	
Total					3,276,471		1.12

[1] The probabilities 0.68 and 0.22 are the sums of probabilities above and below the N$200 alternative respectively.

Appendix A

Table A1: Economic feasibility of establishing a livestock business entity

WTP	Number of Respondents	Membership	Potential net cash flow	Probability	Expected Income	Standard deviation	Risk per N$ projected net cash flow
(N$)	(Number)	(Number)	(N$)	(Prob)	(N$)	(N$)	(N$)
50	146	5000	250000	0.43	107353	576397	1.10
100	86		500000	0.25	126471		
200	33		1000000	0.10	97059		
300	9		1500000	0.03	39706		
400	7		2000000	0.02	41176		
500	15		2500000	0.04	110294		
0	44		0	0.13	0		
Total	340			1.00	**522059**		
50	146	10000	500000	0.43	214706	1152795	1.10
100	86		1000000	0.25	252941		
200	33		2000000	0.10	194118		
300	9		3000000	0.03	79412		
400	7		4000000	0.02	82353		
500	15		5000000	0.04	220588		
0	44		0	0.13	0		
Total	340		0	1.00	**1044118**		
50	146	15000	750000	0.43	322059	1729192	1.10
100	86		1500000	0.25	379412		
200	33		3000000	0.10	291176		
300	9		4500000	0.03	119118		
400	7		6000000	0.02	123529		
500	15		7500000	0.04	330882		
0	44		0	0.13	0		
Total	340			1.00	**1566176**		
50	146	20000	1000000	0.43	429412	2305590	1.10
100	86		2000000	0.25	505882		
200	33		4000000	0.10	388235		
300	9		6000000	0.03	158824		
400	7		8000000	0.02	164706		
500	15		10000000	0.04	441176		
0	44		0	0.13	0		
Total	340			1.00	**2088235**		

Table A1 Continues

WTP	Number of Respondents	Membership	Potential net cash flow	Probability	Expected Income	Standard deviation	Risk per N$ projected net cash flow
(N$)	(Number)	(Number)	(N$)	(Prob)	(N$)	(N$)	(N$)
50	146		1250000	0.43	536765		
100	86		2500000	0.25	632353		
200	33		5000000	0.10	485294		
300	9	25000	7500000	0.03	198529	2881987	1.10
400	7		10000000	0.02	205882		
500	15		12500000	0.04	551471		
0	44		0	0.13	0		
Total	340			0.00	**2610294**		
50	146		1500000	0.43	644118		
100	86		3000000	0.25	758824		
200	33		6000000	0.10	582353		
300	9	30000	9000000	0.03	238235	3458385	1.10
400	7		12000000	0.02	247059		
500	15		15000000	0.04	661765		
0	44		0	0.13	0		
Total	340				**3132353**		
50	146		1750000	0.43	751471		
100	86		3500000	0.25	885294		
200	33		7000000	0.10	679412		
300	9	35000	10500000	0.03	277941	4034782	1.10
400	7		14000000	0.02	288235		
500	15		17500000	0.04	772059		
0	44		0	0.13	0		
Total	340			0.00	**3654412**		

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