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FACTORS INFLUENCING ADOPTION OF LIVESTOCK INSURANCE BY COMMERCIAL DAIRY FARMERS IN THREE ZOBATAT OF ERITREA

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Abstract

A sample survey of 74 commercial dairy farmers was conducted between November 2002 and February 2003 in three Zobatat (zones) of Eritrea to identify factors that affect the adoption of livestock insurance. The results of a logit model indicate that formal education of the farmer and the farmer's awareness of livestock insurance increase the probability of insurance adoption, whereas farming experience, poor location and use of alternative risk management strategies, such as off-farm investments and farm enterprise diversification, reduce the probability of livestock insurance adoption. Further insight into the factors influencing farmers' adoption of livestock insurance may assist policy makers and the National Insurance Corporation of Eritrea in their future plans. Results of this study have some policy implications, such as the need for a variable rather than fixed insurance premium, improving the know-how of farmers concerning risk assessment, improving Zobatat' infrastructure and a need of a thorough study to be conducted on the demand for agricultural insurance in Eritrea.

1. INTRODUCTION

Eritrea is situated in northeastern Africa, and administratively it is divided into six zones referred to as Zoba (plural Zobatat). The total area of the country is 121 320 square kilometers, and the population is estimated at about 4.45 million with a growth rate of 2.57% per year (CIA, 2004). The Eritrean economy is based on subsistence farming with 80% of the population engaged in farming and herding. In 1999 the agricultural sector employed an estimated 78% of the economically active population. The sector contributes about 16% of the national Gross Domestic Product (Rake, 2002). Although livestock production is prominent in the lowlands of Eritrea, it is carried out on a subsistence and traditional way with limited marketing of beef and raw milk in local markets.

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The relatively modern dairy farms are largely located in the highlands of Eritrea where land is scarce due to population pressure. Animal disease is a severe problem faced by commercial dairy farmers. Problems that are associated with traditional livestock farming (poor management and housing) were further aggravated by the border war with Ethiopia and repeated drought.

Since independence in 1993, the government of Eritrea has been attempting to build up the nation's economy by directly investing in all sectors of the economy. The National Insurance Corporation of Eritrea (NICE), which was established after independence, is a state-owned financial institution³ that offers a range of insurance products, such as insurance against motor vehicle and fire damage, accidents (e.g. burglary, personal accident, workmen's compensation, all risks, goods in transit, liability), livestock losses, medical costs and death (NICE, 2004).

As far as agriculture is concerned, NICE currently focuses on providing livestock insurance, although it plans to provide insurance cover for more farm enterprises in future, particularly horticulture and poultry. NICE established livestock insurance with a subsidized premium amounting to 4% of the value of a cow (NICE, undated). Despite the efforts and good intentions of NICE, only a limited number of dairy farmers in Eritrea (4.4% at the time of the study) have used its services (Mobae, 2002). This study aims to identify the main factors that affect livestock insurance adoption by commercial dairy farmers in Eritrea. The low uptake of insurance may be due to a number of factors, such as lack of information on the insurance scheme, a low level of farmer education, poor rural infrastructure (making communication difficult and limiting access to insurance), affordability, degree of farmers' risk aversion and diversification of farm enterprises.

Since no research on this topic has yet been conducted in Eritrea, the results of this study may assist policy makers and particularly NICE in their understanding of factors influencing livestock insurance, and inform NICE's plans to provide additional agricultural insurance coverage. The study may also promote further research on the feasibility of the livestock insurance policy in the context of Eritrean agriculture. The main objectives of this paper, therefore, are to examine factors that influence livestock insurance adoption by commercial dairy farmers in Eritrea and to draw some policy implications from the results.

³ *There are plans to privatise NICE in 2004 (Shaebia, 2004).*

The paper is organized as follows. The next section deals with the theory of insurance. In section 3 the livestock insurance policy of NICE is briefly discussed, while the study sample and characteristics of respondents are dealt with in section 4. The model and hypothesized variables are presented in sections 5 and 6 respectively. After discussing the results of the study in section 7, the final section presents some conclusions and policy implications of the results.

2. THEORY OF INSURANCE

Alfred Manes (cited by Jarvie and Nieuwoudt, 1988:11) defines insurance as *"... the elimination of the uncertain risk of loss for the individual through the combination of a large number of similarly exposed individuals who each contribute ... premium payments sufficient to make good the loss caused to any one individual"*. Thus, the idea behind insurance is that of risk pooling, which involves combining the risks faced by a large number of individuals who contribute through premium payments to a common fund that is used to cover the losses incurred by any individual in the pool (Hardaker *et al*, 1997). Insurance, in general, can provide protection against adverse economic losses experienced by individuals and firms, and caused by natural phenomena such as fire, hail and floods. The decision to buy insurance against risk in agriculture should be an economic one. In making that decision, two factors are critical: 1) How much loss can the manager (farmer) withstand without insurance? 2) What are the trade-offs between insurance costs and potential losses? (Casavant and Infanger, 1984). Therefore, insurance is more attractive to risk-averse farmers and in situations where risks warrant paying a premium significantly higher than the expected loss without insurance (Hardaker *et al*, 1997). However, in some countries government subsidises premiums, making the purchase of insurance more attractive (Eidman, 1990).

In a study of insurance there are two basic issues that affect both the insurer and insured, namely asymmetric information and systemic risk. Asymmetric information relates to the problem that the insurer and the insured may not have the same information as regards the probability of losses occurring. The problem could arise due to either adverse selection or moral hazard. Adverse selection occurs if those more at risk purchase more insurance than others, without the insurer being aware of this. "As a result, the insurer's expected indemnity outlays exceed total premium income, and, in the long run, the insurance operation loses money" (Nieuwoudt, 2000:277). Miranda (1991) points out that the insurer's effort to avoid these losses by raising premiums only results in a smaller and more adversely selected pool of participants. A common tool that insurance companies use to minimize adverse selection is to

ask the insured to disclose any factors that may lead to above-normal risk (European Commission, 2001). Moral hazard, which also arises from asymmetric information, refers to an individual's change in behaviour after having taken out an insurance policy in a way that increases the probability of receiving an indemnity payment (Miranda and Glauber, 1997). Moral hazard problems occur because the insured can take actions that cannot be observed by the insurer but which affect the probability of losses (Nelson and Loehman, 1987). Asymmetric information problems (particularly adverse selection and moral hazard) are a major cause of market failure in crop insurance (Nieuwoudt, 2000).

Systemic risk refers to a situation where a large number of people suffer a loss at the same time. It arises mainly from the impact of extensive unfavourable weather events, such as drought or extreme temperatures, over a large geographic area. These events result in a significant correlation among individual farm-level yields. As a consequence, many people make a claim at the same time, with the result that the premium paid into a pool is not sufficient to cover the loss incurred, thereby threatening the solvency of the insurance pool (Nieuwoudt, 2000). One possible reason why NICE is not planning to promote crop insurance is due to the high probability of systemic risk that crop farmers in Eritrea face as a result of unfavourable weather conditions.

3. LIVESTOCK INSURANCE POLICY OF NICE

As indicated in the Introduction, NICE provides insurance cover for many risk areas. However, with regard to agriculture it presently focuses on livestock insurance only. With a subsidized premium of 4% of a cow's value, NICE established livestock insurance with the intention of expanding its coverage to the rest of the agricultural sector, primarily horticulture and poultry.

The scope of cover of NICE's livestock insurance policy is limited to 75% of the sum insured. It indemnifies the insured in respect of death to the insured animal(s) (due to accidents, illness, diseases and epidemics) during the period of insurance at the location specified in the master schedule or loss due to permanent total disability suffered by the animal during the period of insurance. Emergency slaughter of the animal(s) as a result of accident, illness, diseases or epidemics is also included if it is based on the advice of a qualified veterinary surgeon. Animals to be insured must be healthy, well nourished, disease free and between six months and ten years of age. This policy does not cover loss due to injury, death or liability directly or indirectly caused by

disease arising out of external parasites, theft, clandestine sale, pollution, war and invasion (NICE, undated).

4. STUDY SAMPLE AND RESPONDENTS' CHARACTERISTICS

Data for this study were collected from three Zibatat of Eritrea, namely Ma'akel, Debub and Gash-Barka, between November 2002 and February 2003. Seventy-four commercial dairy farmers that were considered in this study are part of a total sample of 186 commercial farmers that were interviewed (Mohammed, 2004). Twenty-four of the dairy farmers were purposefully included in the sample, as they had adopted livestock insurance. This was done to facilitate the analysis of factors influencing adoption of livestock insurance. The remaining 162 farmers were randomly selected. A summary of the sampling fractions of the main study is presented in Appendix A. Characteristics of the sample of farmers are presented in Appendix B.

The data on the characteristics of sample dairy farmers (Appendix B) indicate that 61% of dairy farms are under individual ownership, 35% under family partnership and 4.1% belong to associations. About 68% of the sample dairy farmers had primary school education, 24% had secondary school education and only 8% completed technical school. About 40% of sample farmers had less than 15 years of working experience and 60% had over 16 years of farming experience. About 92% of the sample dairy farmers were between 51 to 70 years of age. Dairy farmers have the highest turnover (gross income), indicating relatively greater liquidity compared to other farmers. Sample dairy farmers and crop farmers, as compared to horticulture and poultry farmers, are relatively older, less educated and more experienced.

5. MODEL

In explaining a dichotomous dependent variable (Y_i), where one represents insured and zero not insured, different regression methods can be used (e.g. discriminant analysis, linear probability model, logit and probit). The assumption of multivariate normality that discriminant analysis is based on limits its use as the assumption may be violated. The most important criticism for using the linear probability model is that the marginal probability is assumed to be constant. Although it is not expected that different results will be obtained using a logit or probit model, a logit model is used to examine factors affecting livestock insurance participation in Eritrea due to disproportionate incidence of insurance in the sample (24 insured and 50 not insured). A logit model is also generally preferred to the probit model due to its simpler mathematical structure. The logit model is based on the cumulative

distribution function and yields results that are not sensitive to the distribution of sample attributes when estimated by maximum likelihood. If the aim is to examine which variables are significant in explaining a dependent dummy variable using the logit model, disproportionate sampling is not a problem as it only affects the constant term and not the estimated slope coefficients (Maddala, 1992). The mathematical form of the model used in this study is:

$$\ln (p_i/(1-p_i)) = \beta_0 + \sum_{j=1}^k \beta_j X_{ij} \quad (1)$$

where p_i is the probability of the i th farmer being insured and X_k the k th explanatory variable. The dependent variable, $\ln (p_i/(1-p_i))$, in equation (1) is the log-odds ratio in favour of purchasing livestock insurance (Gujarati, 1995).

6. CONSIDERATION OF MODEL VARIABLES

Livestock insurance in Eritrea was basically established with a subsidized premium to help farmers better manage risk. Despite the intention, only a few farmers have so far adopted insurance cover for their livestock. This may be due to a number of factors, such as a lack of information on, or awareness of, the insurance scheme, a low level of education among farmers, poor rural infrastructure (making communication difficult and limiting access to insurance), affordability, degree of farmers' risk aversion and diversification of farm enterprises. These and other factors that could influence the adoption of insurance by dairy farmers are discussed in this section.

Results of a correlation analysis of the initially considered variables indicated high collinearity between some variables, namely farmers' age (AGE) and years of experience (YRS), and farm size in hectares (FSZ) and farm turnover (TURN). The correlation coefficient of the former was 0.670, significant at the 1% level, indicating a potential multicollinearity problem. To remedy this problem, a common factor (a weighted representation of the original variables), experience index (EXP), was extracted using principal component analysis. EXP⁴ has an eigenvalue of 1.670 and explains 83.5% of the variation in the data. Similarly, using principal component analysis, a size index (SIZE⁵) was extracted from TURN and FSZ since the correlation coefficient of these variables was 0.779 (significant at the 1% level). SIZE, with an eigenvalue of 1.779, explains 88.9% of the variation in the data. The definitions of the most important variables expected to influence the adoption of dairy livestock

⁴ EXP = 0.914 (AGEs) + 0.914 (YRSs), where s = standardized variate.

⁵ SIZE = 0.943 (TURNs) + 0.943 (FSZs), where s = standardized variate.

insurance are presented in Table 1. Measures of the impact of moral hazard on the provision of insurance were not considered as government, at the time of the study, offered and subsidized the insurance scheme.

Table 1: Definition of variables expected to influence adoption of dairy livestock insurance, Eritrea

| Variable | Definition | Expected sign |
|----------|----------------------------------------------------------------------------------------------------|---------------|
| EDU | Formal education of the farmer (e.g. primary = 6 years, secondary = 12 years) | +/- |
| FAMS | Family size (number of family members who are dependent on the farm) | + |
| OFF | A dummy variable = 1 if a farmer has off-farm investments, 0 otherwise | - |
| DAR | Debt to asset ratio | + |
| DIVERS | Farm enterprise diversification: A dummy variable = 1 if a farm is diversified, 0 otherwise | -/+ |
| EXP | Years of farming experience (an index extracted from age of farmers (AGE) and farming years (YRS)) | - |
| SIZE | Farm size (an index extracted from farm size in hectares (FSZ) and farm turnover (TURN)) | + |
| INFO | A dummy variable = 1 if a farmer is aware of the importance of livestock insurance, 0 otherwise | + |
| LOCAT1 | A dummy variable = 1 for Zoba Debub, 0 otherwise | - |
| LOCAT2 | A dummy variable = 1 for Zoba Gash-Barka, 0 otherwise | - |

The expected sign for EDU could be positive or negative. Education may promote an understanding of the effects of risk and hence may increase the demand for insurance; on the other hand, increasing education levels are associated with an increase in transferable human capital, facilitating greater risk taking by individuals with lower risk aversion (Szipiro and Outreville, cited by Esho *et al*, 2003). FAMS is expected to have a positive sign; as the number of family members dependent on the farm increases the responsibility of the farmer to avoid potential losses increases and with it the demand for insurance. As farmers participate in off-farm investments as a risk management strategy, the probability of using insurance may decrease. Therefore, OFF is expected to have a negative sign. DAR is hypothesized to have a positive sign since it is expected that a farmer with a high debt-asset ratio may be required to secure part of the debt payments by adopting insurance.

Although DIVERS is an alternative risk management strategy, it does not necessarily mean that DIVERS and insurance always have a negative relationship. In a situation where one of the two tools (insurance or farm diversification) is not available, the other is used, but when both insurance and farm diversification are available, both could be considered by risk-averse farmers (Blank and McDonald, 1996). EXP is expected to have a negative impact on the likelihood of livestock insurance adoption because as farmers

get more farming experience, they become more aware of various risk management strategies, which lowers the probability of adopting insurance. SIZE is expected to have a positive sign, as wealthier farmers (usually with larger farms) may be more likely to purchase insurance to secure their asset.

INFO, which captures information or awareness about the importance of livestock insurance, is expected to have a positive sign since the probability of adopting may increase the more a farmer understands insurance. LOCAT1 and LOCAT2 are included in the model to determine whether a farm location (Zoba) has an impact on the insurance participation decision. The distance from Zoba Ma'akel, where the main insurance activities of NICE take place, and additional transaction costs due to poor infrastructure are expected to affect livestock insurance purchases negatively in the other two Zobatat. Location may also affect the ability of farmers to diversify farm enterprises due to climatic factors that prevent cropping.

Following these arguments, the following logit model was postulated:

$$\ln(p_i/(1-p_i)) = \beta_0 + \beta_1 \text{EDU}_i + \beta_2 \text{FAMS}_i + \beta_3 \text{OFF}_i + \beta_4 \text{DAR}_i + \beta_5 \text{DIVERS}_i + \beta_6 \text{EXP}_i + \beta_7 \text{SIZE}_i + \beta_8 \text{INFO}_i + \beta_9 \text{LOCAT1}_i + \beta_{10} \text{LOCAT2}_i \quad (2)$$

7. LOGIT MODEL RESULTS

Since the conventional R^2 measure of the goodness of fit is inappropriate when the dependent variable takes on only two values, the Chi-square test is used instead (Gujarati, 1995). The Chi-square, which tests the joint significance of the explanatory variables, is statistically significant at the 1% level of probability (Table 2). The estimated model correctly classified 91.9% of respondents. The success rates for predicting insured and non-insured respondents are 84.6% and 95.8%, respectively.

Except for the variable DAR (not significant) all coefficient estimates have signs that were initially hypothesized. The positive signs attached to the estimated coefficients of the variables EDU, FAMS, SIZE, and INFO indicate that the greater the values of these variables the higher the tendency for farmers to participate in livestock insurance. The negative signs of OFF, DAR, DIVERS, EXP, LOCAT1 and LOCAT2 indicate that the greater the value of these variables the lower the probability that the farmers will insure.

The formal education level (EDU) has a positive coefficient estimate indicating that, *ceteris paribus*, the probability of purchasing livestock insurance increases as the level of formal education of the farmer increases. Esho *et al* (2003) used

education (completing secondary school) as a proxy for risk aversion following the argument by Outreville (cited by Esho *et al*, 2003) that improving cognition enables a better assessment of risk and hence an increased demand for insurance. Bullock *et al* (1994) found that education was negatively related to a farmer's willingness to take risk. In the study by Woodburn *et al* (1995), however, education was positively related to a farmer's willingness to take risk. Vandever (2001) also found that farmers with more education were less likely to buy insurance.

Table 2: Logit model results for dairy livestock insurance adoption in Eritrea, 2002/03 (n=74)

| Variable | Coefficient estimate | Standard error | t- statistic | Wald statistic | Significance level |
|------------------------------|------------------------------------|----------------|--------------|----------------|--------------------|
| EDU | 0.767 | 0.392 | 1.955* | 3.333 | .065 |
| FAMS | 0.193 | 0.330 | 0.586 | 0.452 | .356 |
| OFF | -4.336 | 1.661 | -2.611** | 6.536 | .014 |
| DAR | -0.039 | 0.147 | -0.265 | 0.241 | .652 |
| DIVERS | -2.540 | 1.235 | -2.056** | 5.321 | .041 |
| EXP | -1.637 | 0.654 | -2.503** | 6.023 | .020 |
| SIZE | 1.281 | 1.456 | 0.880 | 0.654 | .221 |
| INFO | 6.359 | 1.425 | 4.462*** | 9.560 | .001 |
| LOCAT1 | -4.152 | 3.225 | -1.287 | 1.484 | .184 |
| LOCAT2 | -1.425 | 0.428 | -3.330*** | 7.325 | .005 |
| Constant | -0.613 | 0.244 | -2.512 | 6.339 | .012 |
| Model Chi-square | 79.440*** on 10 degrees of freedom | | | | |
| Correct prediction (percent) | | | | | |
| Total | 91.9 | | | | |
| Insured | 84.6 | | | | |
| Non-insured | 95.8 | | | | |

Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels of probability, respectively.

Off-farm investment (OFF) (including investments in shops, trucks, buses, flour mills, and the import-export trade) has a negative coefficient estimate implying that the more farmers engage in off-farm investment the less the probability of purchasing livestock insurance. Off-farm investment thus seems to be a substitute method of risk management. Moscardi and De Janvry (1977), in their study of attitudes toward risk among peasants in Mexico, found that the higher the off-farm income the higher the capacity to assume risk in agricultural production. Mishra and Goodwin (1997) reported a positive correlation between off-farm employment and farm income variability, indicating that off-farm investment helps many farm households to diversify their income risks. Farm enterprise diversification (DIVERS) has a negative, statistically significant coefficient estimate indicating that diversified dairy farmers are less likely to purchase livestock insurance. Dairy farmers who are diversified may experience lower income variability than non-diversified

farmers because the income loss in one enterprise may be compensated for by a higher income in another enterprise. Jarvie and Nieuwoudt (1988) reported that use of other strategies, such as on-farm diversification and generating off-farm income, may reduce the use of insurance as a means of risk management. Blank and McDonald (1996) reported that more diversification is practised in the absence of insurance.

The experience index (EXP) is negatively related to the decision to purchase livestock insurance. It appears, therefore, that older and more experienced dairy farmers are less willing to purchase insurance. Farmers with such characteristics might have acquired enough knowledge through time to deal with income risk without insurance (e.g. by establishing feed reserves). Results of the studies by Jarvie and Nieuwoudt (1988) and Vandever (2001), however, indicate that younger farmers, or those with less experience, were less likely to buy insurance. Information or knowledge about insurance (INFO) is a highly significant variable. The positive coefficient suggests that the more information a farmer has about insurance the more likely he will use livestock insurance.

The negative estimated coefficient for LOCAT2 is significant at the 1% level. Farms in Zoba Gash-Barka are a long way from the main insurance office and relatively poor infrastructure increases transaction costs and thus lowers livestock insurance participation. Although LOCAT1 is not statistically significant, its absolute t-value is greater than one. The negative coefficient suggests that as the distance from Zoba Ma'akel towards Zoba Debub increases, the probability of adopting insurance by farmers in Zoba Debub decreases. The variables family size (FAMS), debt/asset ratio (DAR) and size index (SIZE) were not statistically significant.

8. CONCLUSIONS AND POLICY IMPLICATIONS

The empirical results of the logit analysis indicate that the demand for dairy livestock insurance in Eritrea is positively influenced by the level of formal education of a farmer. The greater the extent of information on, and awareness of, the importance of insurance, the greater the probability of insurance purchase. Alternative risk management strategies, such as off-farm investments and farm diversification, were negatively related with the likelihood of livestock insurance participation. Years of farming experience and location of farms in Zoba Gash-Barka, where poor infrastructure increases transaction costs, were also negatively related to the probability of livestock insurance purchase.

The positive coefficients for formal education (EDU) and information (INFO) imply the need for policy makers and insurers to design programmes to better educate farmers so that they can assess risk management tools and thereby increase their participation in insurance. Since the low level of education of many farmers in the study area may have negatively influenced the decision to purchase livestock insurance, NICE should intensify its advertising efforts and inform farmers in all Zibatat about their insurance products, taking into account the farmers' education level. Dairy farmers with alternative risk management strategies, such as off-farm investments and farm diversification, had a lower probability of participating in insurance implying the need to target dairy farmers with low off-farm income and those that are not diversified. NICE's plan to introduce horticulture insurance may encourage many diversified dairy farmers to adopt either dairy or horticulture insurance.

Although results suggest that young and inexperienced farmers have a greater probability of adopting insurance, it may not be economical for NICE to charge all farmers a fixed premium, as less risky farmers may be reluctant to pay the same premium rate as high-risk farmers. Also, NICE may not insure high-risk farmers (young and inexperienced farmers living in high-risk areas) unless they can charge a higher premium. Skees (1999) reported that subsidized insurance programmes favour those with highest risk and those in the highest risk regions. Therefore, a variable premium, as in all private insurance schemes, is recommended. Despite NICE's claims that it offers subsidized premiums, some farmers may feel that the premium payments are still too high. Therefore, further lowering premiums could be a motive for some farmers to adopt insurance.

The relatively low number of dairy farmers who have adopted insurance for their livestock may cast doubts on the feasibility of livestock insurance. Moreover, adoption of insurance by commercial dairy farmers may generally be low because it is a relatively low-risk enterprise that generates regular cash flows. Alternatively, NICE might contemplate poultry and horticulture insurance (crop insurance might have frequent systemic risk), since most poultry and horticulture farmer respondents have less farming experience and are younger than dairy farmers. The estimated negative coefficient of LOCAT2 suggests that the probability of adopting livestock insurance by farmers in Zoba Gash-Barka may increase if the infrastructure of this Zoba is improved or NICE's Zoba branches are authorized to provide full services at the Zoba level. Lastly, it is highly recommended that a thorough study be conducted and workshops be held that involve all stakeholders (farmers, Ministry of Agriculture staff, bankers, researchers, NICE) before additional insurance products are launched.

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APPENDIX A

Sampling fractions of Eritrean study (n=186)

| Enterprises | Zobatat | | | | | | | | | Total | | |
|--------------|---------|-----|------|-------|----|-------|------------|----|------|-------|-----|------|
| | Ma'akel | | | Debub | | | Gash-Barka | | | | | |
| | N* | n** | % | N | n | % | N | n | % | N | n | % |
| Poultry | 180 | 16 | 8.88 | 210 | 22 | 10.48 | 12 | 2 | 16.7 | 402 | 40 | 9.95 |
| Dairy | 300 | 23 | 7.66 | 320 | 40 | 12.5 | 62 | 11 | 17.7 | 682 | 74 | 10.9 |
| Horticulture | 26 | 2 | 7.69 | 58 | 5 | 8.62 | 305 | 24 | 7.87 | 389 | 31 | 7.97 |
| Crop | 12 | 1 | 8.33 | 60 | 5 | 8.33 | 420 | 35 | 8.33 | 492 | 41 | 8.33 |
| Total | 518 | 42 | 8.10 | 648 | 72 | 11.11 | 799 | 72 | 9.01 | 1965 | 186 | 9.47 |

* Represents the number of the total population.

** Represents the number of farmers in the sample.

APPENDIX B

Frequency of types of business arrangements (n=186)

| Business Arrangements | Number of respondents | | | | | Percentage |
|-----------------------|-----------------------|----------|----------|------------|-------|------------|
| | Horticulture | Poultry | Dairy | Field Crop | Total | |
| Individual Owner | 23 (74%) | 29 (72%) | 45 (61%) | 41 (100%) | 138 | 74.19 |
| Family Partnership | 6 (19%) | 9 (22%) | 26 (35%) | 0 (0%) | 41 | 22.04 |
| Association | 2 (6.5%) | 2 (5%) | 3 (4.1%) | 0 (0%) | 7 | 3.76 |
| Total | 31 | 40 | 74 | 41 | 186 | 100.00 |

Educational level (n=186)

| Formal Education | Number of respondents | | | | | Percentage |
|-----------------------------|-----------------------|------------|----------|------------|-------|------------|
| | Horticulture | Poultry | Dairy | Field Crop | Total | |
| Primary and Junior | 12 (39%) | 11 (27.5%) | 50 (68%) | 34 (83%) | 107 | 57.53 |
| Secondary | 15 (48%) | 19 (47.5%) | 18 (24%) | 7 (17%) | 59 | 31.72 |
| . | 2 (6.5%) | 6 (15%) | 6 (8.1%) | 0 (0%) | 14 | 7.53 |
| 2 years graduated (diploma) | 1 (3.2%) | 1 (2.5%) | 0 (0%) | 0 (0%) | 2 | 1.08 |
| 4 years graduated (degree) | 1 (3.2%) | 3 (7.5%) | 0 (0%) | 0 (0%) | 4 | 2.15 |
| | 31 | 40 | 74 | 41 | 186 | 100.00 |

Farming experience in years (n=186)

| Years | Number of respondents | | | | | Percentage |
|---------|-----------------------|------------|----------|------------|-------|------------|
| | Horticulture | Poultry | Dairy | Field Crop | Total | |
| 4 - 10 | 11 (35%) | 33 (82.5%) | 7 (9.5%) | 3 (7.3%) | 54 | 29.03 |
| 11 - 15 | 12 (39%) | 7 (17.5%) | 24 (32%) | 24 (59%) | 67 | 36.02 |
| 16 - 20 | 5 (16%) | 0 (0%) | 30 (41%) | 7 (17%) | 42 | 22.58 |
| 21 - 25 | 2 (6.5%) | 0 (0%) | 10 (14%) | 6 (15%) | 18 | 9.68 |
| > 25 | 1 (3.2%) | 0 (0%) | 3 (4.1%) | 1 (4.1%) | 5 | 2.69 |
| | 31 | 40 | 74 | 41 | 186 | 100.00 |

Age in years (n=186)

| Years | Number of respondents | | | | | Percentage |
|-------|-----------------------|----------|----------|------------|-------|------------|
| | Horticulture | Poultry | Dairy | Field Crop | Total | |
| 40-50 | 5 (16%) | 22 (55%) | 6 (8%) | 5 (12%) | 38 | 20.43 |
| 51-60 | 19 (61%) | 18 (45%) | 37 (50%) | 30 (73%) | 104 | 55.91 |
| 61-70 | 7 (23%) | 0 (0%) | 31 (42%) | 6 (15%) | 44 | 23.66 |
| | 31 | 40 | 74 | 41 | 186 | 100.00 |

Farm business turnover in thousands (Nakfa*) (n=186)

| Nakfa (1000) | Number of respondents | | | | | Percentage | Cumulative Percentage |
|-----------------|-----------------------|----------|----------|---------------|-------|------------|--------------------------|
| | Horticulture | Poultry | Dairy | Field Crop | Total | | |
| < 150 | 0 (0%) | 21 (52%) | 0 (0%) | 19 (46%) | 40 | 21.51 | 21.51 |
| 151 - 300 | 5 (16%) | 14 (35%) | 12 (16%) | 16 (39%) | 47 | 25.27 | 46.77 |
| 301 - 450 | 12 (39%) | 4 (10%) | 31 (42%) | 5 (12%) | 52 | 27.96 | 74.73 |
| 451 - 600 | 8 (26%) | 0 (0%) | 18 (24%) | 1 (2.4) | 27 | 14.52 | 89.25 |
| 601 - 750 | 2 (6.5%) | 0 (0%) | 10 (14%) | 0 (0%) | 12 | 6.45 | 95.70 |
| > 751 | 4 (1.3%) | 1 (2.5%) | 3 (4.1%) | 0 (0%) | 8 | 4.30 | 100.00 |
| | 31 | 40 | 74 | 41 | 186 | 100 | |

*The exchange rate at the time of the survey was 1US\$ = 14.5 Nakfa.