Risk Management in Smallholder Cattle Farming: A Hypothetical Insurance Approach in Western Kenya

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Abstract

Smallholder cattle farming is an important livelihood strategy in most developing countries like Kenya. However, tropical diseases in Africa often wipe out these valuable assets. This paper focuses on mitigation of cattle disease risks through a hypothetical insurance scheme. The study is based on data from a survey conducted on a purposive sample of 300 smallholder cattle farmers in Kakamega and Siaya districts of Western Kenya. Descriptive measures and a regression model were used in the analysis. Results of the study showed that most farmers (91.3%) were willing to participate in the cattle insurance scheme. Also, the farmers observed that the scheme would enable them to increase their herd sizes and change their breed composition. The farmer's mean Willingness To Pay (WTP) for the scheme would be determined by their gender, income, cultural norms, cattle breed and economic value/price of the animal kept. This paper recommends establishment of a formal cattle insurance scheme; and economic empowerment of both male and female farmers to encourage adoption of the scheme, as well as educating the farmers on how to integrate the scheme within their cultural norms to ensure it's sustainability.

Key words: Cattle, smallholder livelihoods, disease risks, insurance.

1. Introduction

1.1 Background

Livestock especially cattle, goats, sheep and chicken are kept for food production, traction, hides, manure, risk diversification and as alternatives to formal financing in

most African smallholder production systems (Marstrand *et al*., 2004). In Western Kenya, indigenous zebu cattle are used for dowry payment and bullfighting contests, besides the production purposes (Otieno, 2005). Indeed, Kristjanson *et al*., (2004) observed that among the *Luo* and *Luhya* communities in Western Kenya, the ability to purchase or keep cattle was regarded as a major step in the transition from poverty to wealth creation.

Despite the contribution of livestock to household livelihoods, Barret (2005) observed that pastoralists in East Africa's Arid and Semi-Arid Lands (ASAL) regularly suffer climatic shocks, price volatility and weak marketing infrastructure that lead to massive herd die-offs and loss of scarce wealth. The presence of cattle diseases also constitutes a costly constraint towards the improvement and expansion of the cattle industry in Kenya (KARI, 2003). Cattle diseases cause enormous losses ranging from cattle deaths, production and productivity losses, treatment costs, reduction of market opportunities due to notifiable diseases and threats to human health due to food-borne diseases. The most important cattle diseases in Kenya include East Coast Fever (ECF), Anthrax, Foot and Mouth Disease (FMD), Anaplasmosis, Mastitis, Lumpy Skin Disease (LSD) and Helminthosis (IFAD, 2004).

A risk can be considered as the likelihood of occurrence of shocks and stresses, while vulnerability is the susceptibility of households or individuals to specific events. The degree of vulnerability to shocks and stresses varies among farmers depending on their location, asset status and social networks. Farmers manage risks through a continuous adaptive process, whereby decisions are made based on perceptions of the external environment, resources and the farmers' own attitudes and preferences (IFAD, 2004). In

the risk management process, farmers consider and respond to a combination of external and internal factors, such as market access and the resources available to the farm household. Resource-poor farmers have less capacity to manage risks. Farmers as individuals also differ in their goals and attitudes towards risk. Furthermore, changes in risk preference affect the optimal farm enterprise combinations (Nyikal and Kosura, 2005). The risk management process involves choosing among alternatives that have uncertain outcomes and varying levels of expected returns. Strategies for managing risks can be categorized into two groups (MAFF, 2001):

i. Business diversification – use of mixed enterprise farming to reduce the risks associated with production of a single commodity.
ii. Sharing risks with others – forward contracts, futures and options contracts, insurance and revenue and income stabilization schemes.

The choice of risk management decisions and practices follows five steps: Farmers acquire knowledge of their own context, risk identification, risk analysis, risk assessment and selection of the most suitable option for avoiding, preventing or managing the risks (Hardakar *et al.*, 1997).

This paper addresses the management of cattle disease risk as a critical policy issue for sustainable smallholder livestock development. As noted by IFAD (2004), for disease risk management, it is not only the farmers' perceptions of the disease risk that are important, but also their perception of potential additional risks associated with available disease control strategies. Slingerland *et al.*, (2000) suggest the use of community grain banks to offset shocks in livestock production. However, grain banks only stabilize cereal prices but do not guarantee livestock continuity when the shocks are over.

Meuwisen *et al.*, (2001) noted that livestock insurance schemes are relevant strategies in managing disease risks. But, none of the previous studies has attempted to design an insurance scheme for risk management in cattle. This study fills the existing gap by using a hypothetical insurance scheme to address cattle disease risks in Western Kenya.

1.2 Rationale for the study

Smallholder cattle farming is a major source of livelihood for over 75% of the poor people in Sub-Saharan Africa (SSA) – Otieno (2005). Management of cattle disease risks would enable sustainable livestock production and contribute to poverty reduction (SRA, 2005).

1.3 Objectives of the study

The main purpose of this study is to analyze farmers' willingness to manage disease risks through participation in a cattle insurance scheme. The specific objectives include:

i. To investigate the vulnerability of different cattle breeds to disease risks;
ii. To analyze smallholder farmers' willingness to pay for cattle insurance; and
iii. To determine factors that influence farmers' willingness to participate in cattle insurance scheme.

2. Methodology

2.1 Study sites

The study uses secondary data from literature review and primary data. The primary data was obtained through a household survey conducted in Ukwala and Karemo divisions in Siaya district, and Shinyalu and Ikolomani divisions in Kakamega district of Western Kenya. The study sites were chosen on the basis of existence of a high population of indigenous zebu cattle, high incidence of tropical cattle diseases and high

household poverty levels (Kristjanson *et al*., 2004). Siaya district has close to 122,500 zebu (40% of which are in Ukwala division, 25% in Karemo, and the rest in five other administrative divisions) and approximately 2,100 crosses/exotic cattle (15% in Ukwala and 8.5% in Karemo), while Kakamega district has about 127,500 zebu (30% in Shinyalu, 15% in Ikolomani and the rest in five other divisions) and almost 28,600 crosses/exotic cattle (20% in Shinyalu and 19% in Ikolomani). In the most recent national census of 1999, the human population densities in Siaya and Kakamega districts were estimated at 316 persons per km^2 and 433 persons per km^2 respectively. The national poverty indices show that over 61% of people in both districts live below US$1 per day (CBS, 2003).

Both sites have agropastoral farming systems. Kakamega district has adequate bimodal rainfall, average household land size is 4 acres, main crops grown include tea, sugarcane, maize and beans, and there is moderate tick challenge and ECF infection rates. In Siaya district, rainfall is bimodal but unreliable, average household land size is about 6 acres, main crops grown are cotton, sugarcane, maize, beans, and there is high tick challenge and ECF infection rates higher than the 65% incidence estimated in Central Kenya by Kanyari and Kagira (2000). Although close to 95% of smallholder farmers in both sites have attempted to apply tick control measures such as spraying and feeding in non-infested pastures at some time, none of them consistently observes the required control measures due to lack of money, poor information/knowledge, low safety and efficacy of existing prevention measures (IFAD, 2004).

2.2 Sampling

A total sample of 300 smallholder cattle farmers was interviewed. The sample comprised 75 farmers purposively selected on the basis of cattle population in each of the four divisions covered. The sampling frame considered was smallholder cattle farmers in the divisions and the main units of analysis were households.

2.3 Data collection

Both primary and secondary data were collected in June 2004. Primary data was obtained through structured interviews and Focus Group Discussions (FGDs) using questionnaires in a household survey. Primary data focused on vulnerability of different cattle breeds to disease risks, farmers' Willingness To Pay (WTP) for a hypothetical cattle insurance scheme (Slingerland *et al.,* 2000), how the WTP varied with the farmers' socio-economic characteristics, as well as how the introduction of a cattle insurance scheme would affect farmers' cattle breed composition. The vulnerability of various cattle breeds to disease risks was assessed by comparing their frequency of sickness (tick-borne diseases), veterinary costs and lost output during sickness or eventual deaths (summation of all lost output – cost of milk, meat plus whole animal if it dies).

The hypothetical cattle insurance scheme would compensate farmers almost the full value (80% – 100%) of their animals after verifying that the cause of their animals' death was not due to personal negligence or poor management. The scheme would sell membership tickets per animal at prices ranging from Kshs100 – 1000 (US$1=Kshs75) per ticket for a maximum of 5 years (useful productive period) in the life of an animal. Farmers were then asked whether they would join such scheme if it were made real and how much they would pay per ticket, as well as the cattle breeds and number of animals

that they would insure in such scheme. The hypothetical insurance scheme was explained to farmers in the survey through brief scenarios as follows:

'Imagine that you could receive compensation for high veterinary expenses or the death of your animal if you were to participate in a loss-reducing scheme that would work like this: when you buy an animal you can buy a ticket which will pay you back almost the full value of your animal should it get very sick or die. Such compensation would only be paid to you after verification that the cause of your animal's sickness or death is not due to your personal negligence or poor management. These tickets will be valid for one year and can be bought annually for five years. Would you be willing to buy such tickets if they were available?'

Farmers who expressed their willingness to participate in the scheme were asked to state the exact amount of money that they would pay for each ticket as follows: *'Now imagine you can buy a ticket for that animal that would pay you back up to 80% of the animal's value should it become sick or die. How much would you be willing to pay per year for the ticket/loss-reducing scheme?'*

The logic behind this hypothetical scenario was that a farmer who buys more tickets at high prices (close to Kshs1000 in this case) would be compensated a greater percentage of the animals' worth. The ticket price range used in the insurance scheme was obtained through FGDs with members of *Ilesi* women's pottery group in Kakamega that provide informal insurance. The secondary data was obtained by review of literature from relevant previous studies.

2.4 Data analysis

Both descriptive and quantitative methods were used to analyze data. Descriptive data was analyzed using frequency tables and percentages. WTP data on insurance was entered and analyzed in the Statistical Package for Social Scientists (SPSS) version 12.0 software using Ordinary Least Squares (OLS) regression. The mean WTP for the cattle insurance scheme was computed from the prices specified by the respondents, using the simple average method (Equation 1).

$$\text{Mean WTP} = \frac{\sum X_i}{N} \quad \text{---------- (1)}$$

where X_i = WTP for insurance scheme by the i^{th} respondent, N = total number of respondents willing to participate in the insurance scheme.

The main factors that determine farmers' WTP for the cattle insurance scheme were analyzed using the OLS model (Equation 2).

$$Y = \gamma_0+\gamma_1X_1+\gamma_2X_2+\gamma_3X_3+\gamma_4X_4+\gamma_5X_5+\omega \quad \text{---------- (2)}$$

where, Y = Amount of money a farmer would be willing to pay for each insurance ticket in Kenya shillings (Kshs), γ_0 = constant term, X_1 = gender of the farmer (0 = female, 1 = male), X_2 = Household's total monthly income (Kshs), X_3 = Amount of money a farmer is willing to spend on the next cattle that he/she wishes to buy (price or value of animal) in Kshs., X_4 = Farmer's ethnic group or tribe (0 = Luhya – 'Isukha/Idaho', 1 = Luo – 'Ugenya/Alego'), X_5 = Breed of cattle a farmer would buy next (0 = crossbreed/grade, 1 = Local zebu), ω = Error term which accounts for all random disturbances and omitted variables in the estimated model, , while γ_1, γ_2, γ_3, γ_4 and γ_5 are coefficients representing the marginal effects of the respective independent variables on the mean WTP. The

estimated coefficients were then subjected to tests of significance and consistency with the OLS properties.

3. Results and discussion

3.1 Gender and income levels

About 77% of the respondents were from male-headed households while the rest were from female-headed households. The total monthly incomes of the farm-households was extremely skewed; some 69.3% of the farmers earned below Kshs 5000 (Table 1).

Table 1: Total monthly household incomes

Income level (Kshs)	% of households
0 – 5000	69.3
5001 – 10000	26.3
10001 – 15000	2.7
15001 – 20000	0.4
Above 20001	1.3
Total	100.0

Source: Survey Data (2004).

3.2 Cattle breeds and vulnerability to disease risks

Most farmers in the study areas keep many male and female zebu compared to crosses and grade/exotic cattle (Table 2).

Table 2: Distribution of cattle breeds

Animal	Average	Minimum	Maximum
Male zebu	2	1	10
Female zebu	4	1	16
Male crosses	1	0	3
Female crosses	1	0	6
Male grade/exotic	0	0	1
Female grade/exotic	0	0	4

Source: Survey Data (2004).

The Zebu cattle breed had the lowest vulnerability to disease risks in terms of the average sickness frequency, veterinary costs and output loss (Table 3).

Table 3: Vulnerability of different cattle breeds

Cattle breed	Average frequency of sickness	Average veterinary costs per treatment (Ksh)	Average output loss (Ksh)
Zebu	Twice annually	354	5,000
Crosses	Thrice annually	460	9,000
Grade/Exotic	Once monthly	1,205	20,000

Source: Survey Data (2004).

3.3 Cattle insurance scheme

Majority (91.3%) of the farmers were willing to participate in a cattle insurance scheme if it was established. The rest were unwilling due to their desire to shift from risky crop-livestock systems to '*less risky*' non-agricultural Small and Medium Enterprises (SMEs) such as bicycle transportation (*boda boda*). The farmers' mean WTP for the insurance scheme would be Kshs344 per year. Also, 71.3% of the farmers would increase their herds considerably if cattle insurance schemes are established. With an insurance

scheme, a higher proportion (67.0%) of the farmers who initially kept zebu cattle showed interest in keeping more crossbreeds (of zebus and exotic breeds), while the rest would maintain the zebu. The presence of insurance tickets would induce farmers to keep animals of higher average economic value (Kshs 14,500 per animal compared to the current Kshs8,000 per animal). Due to the high vulnerability of exotic cattle, more tickets would be bought to insure them compared to other breeds (Table 4).

Table 4: Farmers' insurance ticket preferences for different cattle breeds

Breed	Average number of tickets	Average number of animals	Average number of years of insurance
Zebu	3	3	4
Crossbreeds	3	2	4
Grade/exotic	4	2	4

Source: Survey Data (2004).

3.4 Determinants of farmers' mean WTP for cattle insurance scheme

All the independent variables included in the regression model were individually statistically significant in explaining variations in the mean WTP for cattle insurance scheme at 95% level of confidence (Table 5). Also, the significance of the F-statistic at $p = 0.0000$ shows that all the independent variables were jointly significant in explaining variations in the mean WTP for cattle insurance scheme. The WTP for the cattle insurance scheme was higher among male farmers compared to the females. This reflects the domination of most household investments by male people in African societies. Also, the value of cattle and household income showed a positive relationship with the WTP; more well off farmers had higher WTP for the cattle insurance scheme compared to the

extremely poor. The foregoing conforms to the finding by Kristjanson *et al.*, (2004) that in the process of transition from poverty in Western Kenya, purchase and maintenance of livestock especially cattle is associated with relatively wealthy families. The WTP for the insurance scheme was higher among the farmers who were buying cross/exotic breeds compared to the zebu. This shows the higher risk perception associated with the exotic/cross breeds and hence the need to insure it compared to the other breeds. The results also show a higher WTP for the insurance scheme among the *Luo* ethnic group in Siaya district, compared to the *Luhya* community in Kakamega district. This variation can be explained by the familiarity with informal forms of insurance schemes (such as pottery groups) and better agricultural zones (that support high value commercial enterprises such as dairy and tea), in Kakamega relative to Siaya district, besides their varied cultural norms.

Table 5: Estimation Results (OLS Regression)

Variable	Coefficient	Standard error	t- ratio
Gender	0.133	0.049	2.714*
Income	0.127	0.051	2.490*
Price	0.480	0.057	8.421*
Tribe	0.119	0.050	2.380*
Breed	-0.135	0.055	-2.455*

Adjusted R^2 = 0.374; n = 273; F = 33.535 (significant at p = 0.000). *Significant at 1%.

Source: Survey Data (2004).

Conclusions

Exotic cattle breeds were considered more vulnerable to disease risks than the indigenous zebu. Majority of farmers were willing to reduce the risks by participating in the cattle insurance scheme. Participation in the scheme would stimulate increases in herd sizes and enable farmers to keep more crossbreeds of zebu and exotic cattle. Gender, household incomes, breeds, value of cattle and cultural norms would influence the smallholder farmers' mean WTP for the insurance scheme.

Policy recommendations

A formal cattle insurance scheme should be established in order to urgently manage cattle disease risks. There is also need for economic empowerment of both male and female farmers to improve their WTP and adoption of the scheme. Sustainability of the scheme should be ensured by educating farmers to integrate its operation within their livelihood objectives and cultural norms.

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