Uganda Journal of Agricultural Sciences, 2004, 9, 31-37 ISSN 1026-0919

The socio-economic dimensions of smallholder livestock management in Kenya and its effects on competitiveness of crop-livestock systems

E A. Ouma, G. A. Obare and S. J. Staal[1]

Department of Agricultural Economics, Egerton University, P.O. Box 536, 20107 Njoro, Kenya
[1]International Livestock Research Institute, P. O. Box 30709, 00100 Nairobi, Kenya

Abstract

This paper uses data from a survey of two hundred and fifty cattle keeping households in three cattle keeping systems; intensive, semi–intensive and extensive systems, to assess the contribution of non–market benefits of cattle to the competitiveness and survival of smallholder cattle systems in Kenya, from an agricultural development perspective. These benefits of cattle keeping are of special importance in developing countries, where livestock are closely linked to the social lives of farmers and livestock assume finance and insurance roles for households, since financial markets function poorly and opportunities for risk management through formal insurance are generally absent. A complete budget analysis of the cattle enterprise is undertaken to estimate the contribution of non-market benefits to the competitiveness of the smallholder cattle production systems. The results indicate that up to 50-70 percent of the benefits realized from the smallholder cattle systems are non-cash. Further analyses indicate that smallholder cattle production systems are relatively competitive and efficient in utilization of household production factors, when non-market benefits are taken into consideration. This is especially so for extensive systems which are non-market oriented. The importance of non-market roles of cattle in evaluations of smallholder cattle production systems since this will have a bearing on any policy related interventions whose target is households that are wholly or partially dependent on the livestock economy.

Keywords: Cattle enterprise, non-market benefits, smallholder cattle production systems

Introduction

Analyses of cattle systems, production patterns and producer decisions more often focus on market variables, resulting in possible inconsistent results. Emphasis on market variables results in divergent perspectives on livestock productivity between policy analysts and livestock keepers, since the latter view the cattle enterprise in totality, based on their circumstances. This divergence may hamper appropriate policy formulation. The non-market functions are often ignored since they are difficult to value, yet they may contribute to a better understanding of existing livestock production systems and producer decisions.

Generally, productivity of systems is measured according to a single criterion; milk production for dairy animals and beef output for beef animals. However, smallholder cattle farmers in developing countries have multiple goals for their cattle enterprise. The roles that cattle play in these systems are manifold. Apart from meat and milk production, livestock are closely linked to the social and cultural lives of millions of resource-poor farmers for whom animal ownership ensures varying degrees of sustainable farming and economic stability. These values vary from society to society and largely determine the strategies, interventions, and demand and development opportunities for livestock. Livestock acts as security assets influencing access to informal credits and loans. They are also considered a common means of demonstrating wealth, cementing relationships through bride price payments and as social links, important in crises.

In many smallholder systems in developing countries, manure is considered as important as milk, meat or draught power. Romney *et al*. (1994), quote a study in Zimbabwe which recorded that farmers reduced grazing time by keeping cattle penned longer in order to collect more manure even though this meant a reduced feed intake thereby adversely affecting production. In the Kenyan highlands, use of organic fertilizers particularly livestock manure has been on the increase among the smallholder farmers due to its substitutability for inorganic fertilizer as the cost of the latter rises due to market distortions, resulting from physical constraints such as roads infrastructure (Omamo *et al*, 2002;

Obare, 2000). In Kenya, researchers found that the value of manure produced in a small dairy farm may be approximately 30% of the value of milk produced. This value is captured on-farm through the increased value of crop production, resulting from manure application to crops on-farm (Lekasi *et al.*, 1998). Large scale dairy producers on the other hand, may have great difficulty capturing this value since quantities of manure produced may be so great that the issue becomes that of disposal rather than use (Staal, 2002).

Livestock assets feature as living "savings" for future planned expected needs and perform financing roles in a context where banking is not developed or households are not fully integrated into credit markets, they also perform insurance roles because the capital invested in the herd forms a guarantee for meeting future unexpected requirements. Financing involves conversion of part of the herd into disposable income (and vice versa) to enable households meet lumpy expenditure needs, such as school fees payment. Insurance involves the maintenance of a capital stock embodied in livestock as a guarantee for offsetting shortfalls in earnings and unforeseen expenses in the future.

These benefits of livestock keeping are of special importance in developing countries, where financial markets function poorly and opportunities for risk management through formal insurance are generally absent (Moll *et al*, 2001). Alternative forms of financing such as credit are limited and inaccessible especially for small-scale producers. The difference in the credit conditions faced by small and large scale farmers is the existence of a fixed cost of each lending and borrowing transaction, which is invariant with respect to the loan size. This makes it rather costly for small borrowers due to the larger transaction costs of small loans or in some cases an increased interest rate. The absence or ill functioning of markets for finance and insurance in developing countries, especially in rural areas, has been widely documented by for example, Binswanger and Rosenzweig (1986). Though these socio–economic functions of livestock are often acknowledged, livestock policies nevertheless emphasise on physical production since the socio-economic (non-market) functions are difficult to value.

As noted in Moll *et al.* (2001), this emphasis on physical production results in divergent perspectives on livestock productivity between policy analysts and livestock keepers. The divergent perspectives hamper the formulation of effective livestock policies that take into account both policy makers and livestock keepers' viewpoints. For instance, smallholder cattle production systems especially the traditional systems comprising extensive grazing may be assumed inefficient and low productive by policy analysts due to low milk or meat production compared to large scale systems. However, a key to smallholder competitiveness is their ability to capture non-market benefits, though not well measured to date. Livestock keepers in smallholder systems may be less concerned with productivity in the sense of physical production only and are willing to keep "low productive" animals in the herd. The objective of this paper is to assess the contribution of non–market functions of cattle to the competitiveness and survival of smallholder cattle production systems. This is aimed at contributing to a better understanding of "appropriate" public and private policies taking into consideration livestock keepers' perspectives while benefiting producers, technical staff, researchers and policy makers.

Data Sources

The data used come from a cross-sectional household level survey conducted on a sample of two hundred and fifty smallholder cattle keeping households in Kisii and Rachuonyo districts, using questionnaire interviews in the year 2002. The sampled households were randomly selected from nine sub-locations of Masaba and Suneka divisions in Kisii district and eight sub-locations of Kasipul, Kabondo and West Karachuonyo divisions in Rachuonyo district. Secondary data has also been used in some cases to complement the primary data. Extensive, semi-intensive and intensive systems of cattle keeping are practiced in the study sites of Kisii and Rachuonyo districts. The distinction between extensive and intensive agriculture refers to the amount and type of productive factors used in a given agroclimate (McIntire *et al.*, 1992). In the extensive systems, more land and less labour are used per unit of output.

Livestock mainly rely on grazing on natural pasture in common grazing grounds and are predominantly local zebus characterised with low milk production. There is little use of purchased inputs and land sizes are also relatively large. An important feature in this system includes the use of cattle for draught power. In the intensive cattle production system, crops and livestock are closely integrated, with some crop residues being fed to cattle and manure from livestock being used to fertilise agricultural plots. This system is mainly found in the Kenya highlands where high population growth has resulted in reduction in land–holding sizes. Cattle are confined in one place where they are stall – fed with fodder and crop residues. Manufactured feeds are widely used especially at milking. The semi–intensive system is characterised by a lower human population density compared to the intensive systems, the dairy animals rely mainly on grazing which is usually supplemented with cultivated fodder in a cut and carry system of feeding. The breeds are the same as those in the intensive systems though with a higher local zebu content.

Study Area

The two districts where the survey was done are in western Kenya. Kisii district is mostly hilly with a highland equatorial climate and an altitude of 900-1,800 metres above sea level. It receives an average annual rainfall of over 1500mm, which is usually highly reliable (MOARD, 2000a). The high altitude has enabled the growth of tea and pyrethrum in areas lying above 1,000 metres above sea level while at lower altitudes, coffee, sugar – cane and bananas are grown. Most parts of the district have red volcanic soils (Nitosols) which are deep and rich in organic matter. Farming is the main economic activity undertaken in the district. The high and reliable rainfall coupled with moderate temperatures and good soils is suitable for growing both food and cash crops. Over 70 percent of farmers in the district are cattle keepers with an average herd size of 3-4 upgraded dairy breeds on farm holdings of 0.2 to 1.8 ha of land. Semi–intensive and intensive system of cattle keeping is common in the district.

Rachuonyo district can be divided into two main relief regions; the lakeshore lowlands and the upland plateau. The lakeshore lowlands comprise a narrow stretch bordering Lake Victoria and covering mostly the north - western parts of the district. The upland plateau starts at 1,220 metres above sea level (MOARD, 2000b). The district is characterised by a variety of soils, the dominant of which are alluvial, loamy and sandy soils. On the lakeshore lowlands, alluvial, sandy and loamy soils are found, and are favourable for growth of cotton, sunflower, maize, beans, green grams and cowpeas. The district has an inland equatorial climate, which is modified by the effect of altitude and the proximity to Lake Victoria, making local temperatures comparatively low. Livestock production is a major economic activity in the district complementing crop production. The predominant type of livestock kept includes zebu cattle, sheep, goats, poultry, donkeys and dairy cattle. Zebu cattle are common in the lowland arid zones of the district where there is enough grazing land and are the major sources of income as most families meet their financial obligations from the annual sale of these animals. Farmers keep an average of 5-6 zebu cattle, on about 2.2 ha of land.

Analytical Techniques

A complete budget analysis for the cattle enterprise is undertaken to determine the contribution of non-market benefits to the competitiveness of the smallholder cattle production systems. The benefits include both market as well as non-market benefits and result from utilisation of the household's production factors. Profitability of an enterprise is one indicator for assessing competitiveness of the enterprise. For an enterprise to be competitive, it should at least earn normal profits. Normal profits are realized when the enterprise generates enough shillings to exactly pay the best alternative return to the investment (operator's labour, management, and equity capital). An enterprise earning above normal profits can be considered worthwhile and competitive relative to other enterprises since the returns to the factors of production (labour, management, and equity capital) are greater than their opportunity costs. These profits above the normal profit are regarded as economic profits. Non-market benefits from cattle comprise the value of manure used on-farm, the value of draught power used on-farm, the function of cattle as security against contingencies and the function of cattle as a means of financing periodic expenditures. Socio-economic roles of cattle (financing and insurance) account for approximately 20% of the animal's total value across the three systems. This was estimated using contingent valuation method (CVM) and a tobit model, see Ouma *et al* (2003) for details on the estimation. An estimation of quantity of manure produced was done following Lekasi (2000) whose study in the Kenya highlands indicate that a ruminant produces 0.8 % faecal Dry Matter of its bodyweight per day. Draught power is valued based on the average use of bulls/oxen and the price paid for ploughing.

Results

A summary of the results of the budget for the cattle production systems is presented in Table 1, showing the various cost and income parameters. The income parameters consist of net recurrent cash income, income in kind and non-market socio-economic benefits of cattle. The net recurrent cash income increases as the level of intensification rises, due to a shift to a more market oriented production as the level of intensification rises. The recurrent cash income is important as it offers income used to meet regular household expenses. The recurrent income in kind comprises non-marketed recurrent production that is consumed, exchanged or invested. It includes manure, milk consumed by the household, draught power and value of calves born on-farm.

The contribution of each income category to total income is presented in Figure 1. Much of the benefits realized from the smallholder systems are non-cash. The non-cash contribution forms a substantial 77, 52 and 45 percent of the total returns to the cattle enterprise compared to the cash contribution of 23, 48 and 55 percent in the extensive, semi-intensive and intensive systems respectively. The high non-cash contribution results from the predominant use of cattle for draught power in the extensive system and use of manure in the intensive and semi-intensive systems. The socio-economic roles of cattle contribute 21 percent of total returns in extensive systems compared to 17 and 16 percent in semi-intensive and intensive systems respectively. The high non-cash contributions in smallholder systems indicate that these systems tend to be more stable in the face of market risks compared to large scale systems since most of their returns are not observed through market tranactions.

Table 1: Average annual income parameters (US$) per household for a typical herd, by cattle production systems

	Extensive (n=132)	*Semi – intensive (n=111)*	*Intensive (n=12)*
Herd size (animals)	5.6	3.0	3.7
Milk revenue	104.0	358.8	668.7
Less: Recurrent purchased inputs	35.4	153.0	367.2
Less: Hired labour	11.3	15.4	66.6
Net recurrent cash income	***57.3***	***190.4***	***234.9***
Annual income from sale of animals	***75.3***	***97.9***	***137.8***
Milk consumed at home	98.5	230.6	233.3
Draught power	251.8	31.5	0.0
Manure	61.0	28.0	30.5
Herd increase (births)	18.7	28.8	70.8
Less: Milk given away	6.9	34.3	35.4
Less: Annual fixed costs	106.8	79.1	94.2
Recurrent income in kind	***316.3***	***205.5***	***205***
Non-market socio-economic benefits			
Bulls	43.6	6.8	5.1
Immature males	6.7	6.8	7.8
Cows	50.6	58.2	54.3
Heifers	17.7	25.4	37.1
Male calves	1.4	2.1	
Female calves	1.7	2.7	3.2
Non-market socio-economic benefits	***121.7***	***101.9***	***107.4***
Total net annual income	***570.6***	***595.7***	***685.1***
Factors of production[1]	673.0	578.9	698.2
Value of assets	610.4	544.5	737.5
Return on assets[2]	93.5%	109%	92.9%

[1]Includes imputed value of family labour, capital in stock and rental value of land under pasture. Imputed value of family labour is the wage rate in alternative enterprises. This was found to be KSh 100 ($1.28) per manday. The land rental value is on average KSh 1411 ($18.1) in Kisii district.

[2] Calculated as (total net annual income/value of assets)*100

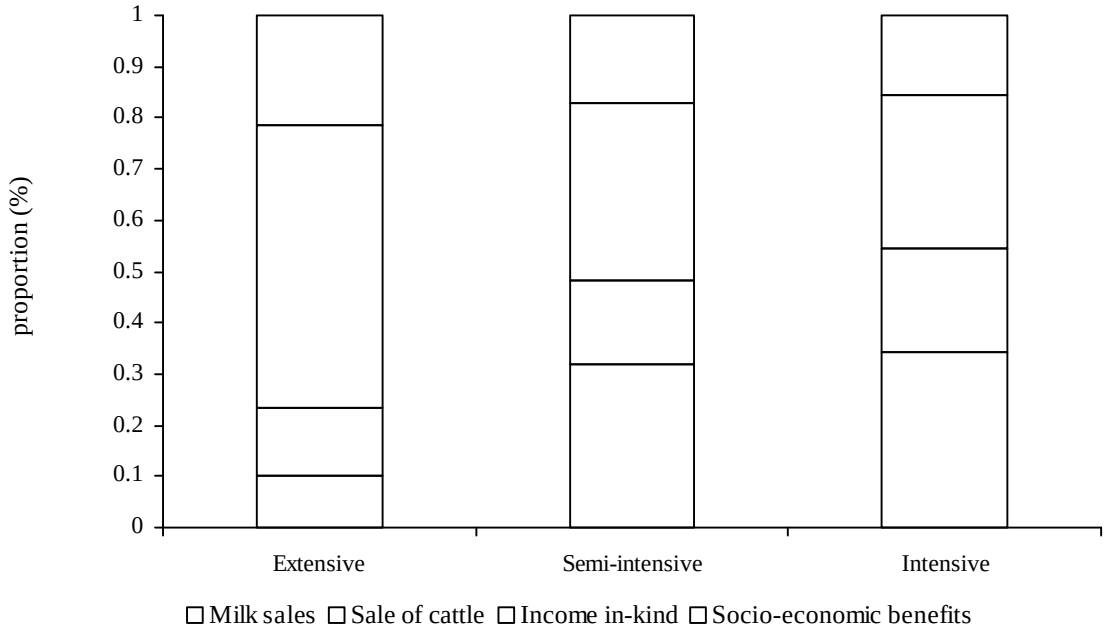

Figure 1. Contribution of various income categories to total returns from cattle enterprise, by production systems

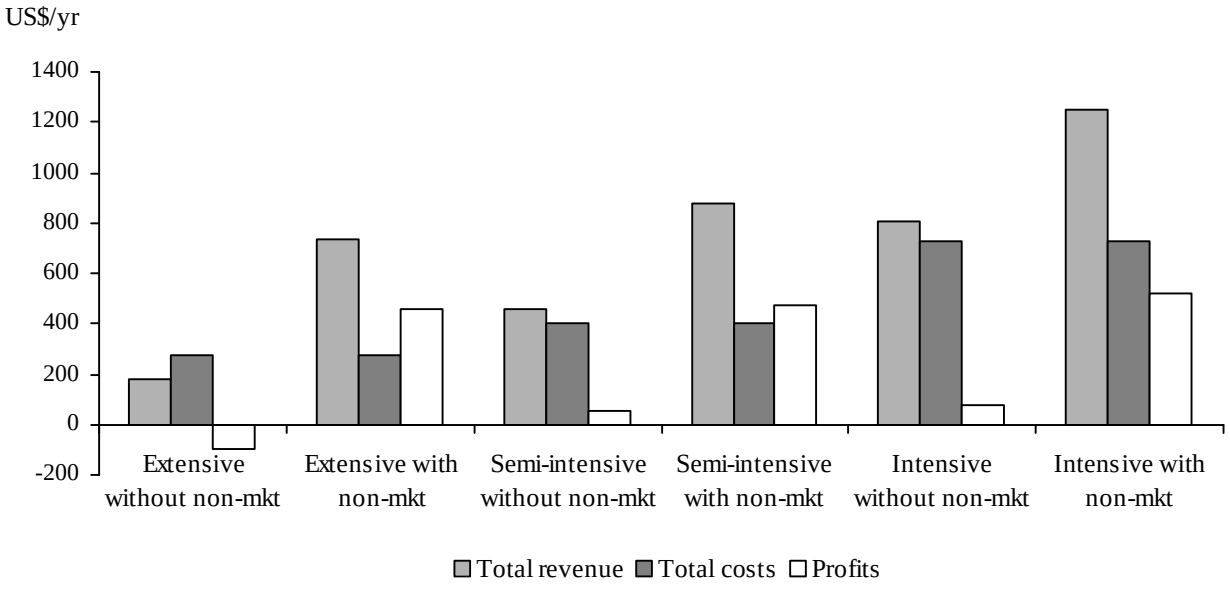

Figure 2. Comparison of revenue, costs and profit with and without non-market benefits

A comparison of revenue, costs and profit with and without non-market benefits is presented in Figure 2. The results show that with inclusion of both market and non-market benefits, above normal profits are realised in all the three systems with the highest returns realised in the intensive systems and lowest in the extensive system. However, when only cash benefits are taken into consideration, the extensive system would be deemed unprofitable and uncompetitive since it yields negative returns. This indicates that the smallholder cattle enterprise is competitive relative to other alternative enterprises when both market and non-market benefits are taken into consideration. These non-market benefits play a crucial role to the survival of these systems.

Profit *per se* may not be the best measure of how efficiently the factors of production have been utilized. The best measure of efficiency is that which recognizes the returns per unit of input. Since capital has been identified as one of the constraints to increased agricultural production in the area (Orodho, 1999), the return per dollar of capital[1] tied up in the enterprise is calculated. This is to help in assessing whether it is worth investing in such enterprise as capital has an opportunity cost. Results in Table 1 indicate that the return to capital is considerably high, about 94, 109 and 93 percent in the extensive, semi – intensive and intensive systems respectively. This is higher than the interest rate of 12 percent charged on loans by Savings and Credit Cooperative societies (SACCO's). This suggests that there is efficient utilization of the resources when market and non – market benefits are taken into consideration. The capital invested generates enough benefits to payback for the investment and earn profits.

Conclusions and Policy Implications

Non-market benefits of cattle are crucial to the survival and competitiveness or profitability of smallholder cattle production systems. They play a significant role in meeting household needs, more so for resource poor farmers, especially women who do not have alternative avenues to meet these needs. From this study various conclusions can be drawn and lessons learnt. Firstly, the benefits of livestock in a livestock production system outweigh costs when non-market parameters are considered in the cost-benefit analyses, and that the rate of return to livestock capital investment is higher than those obtainable from cash in a form of savings that is investable in formal or non-formal financial institutions. Consequently, non-market parameters should be incorporated in evaluating the economic importance of livestock to households engaged in livestock production since this will have a bearing of any policy related interventions whose target is households that are wholly or partially dependent on the livestock economy. Otherwise, unless better, viable and attractive alternatives and substitutes are available, the production systems as they are currently constituted will remain a permanent feature in agriculture that is characterised wholly or partially by the livestock economy.

Secondly, contingency upon climatic conditions, risk insurance and recurrent expenditures are important determinants of the type of livestock system that farm households are engaged in. The social roles that livestock play are also important although there are bound to be variations across communities. Appreciation of these roles is necessary if any policy geared towards change in the structure of the systems is to succeed.

Thirdly, improved integration of livestock keeping households into the market would possibly reduce non-market roles of livestock. However, this will entail deliberate efforts geared towards the development of livestock and livestock product markets. With well functioning and regionally integrated markets the role of cattle as insurance against risk and that of financing unexpected expenditures will decline. This is because functioning markets provide signals for investment decisions. They also provide opportunities for long term planning. Otherwise, with limited or constrained market opportunities livestock keepers are rational decision makers because livestock is profitable when non-markets benefits are considered and also because the market environment dictates that livestock provide services that are not provided by the market.

Infrastructural development needs to be considered so as to improve market access for the non – market oriented cattle systems. This would enhance the realisation of recurrent cash income, which is important in the daily sustenance of the rural households. Poor infrastructure reduces producer's margin as it results in high market transaction costs. One policy imperative is to develop the rural road infrastructure and establish slaughterhouses or processing factories closer to the livestock owners to provide quick markets to farmers. One way of achieving this is to invite the private sector to establish such factories and offer them incentives like tax rebates. In addition, livestock and livestock product market integration may also be promoted by removing institutions and policies impeding domestic trade such as removing the restriction of once a week livestock market days.

In general, consideration of the roles of cattle is relevant in formulation of effective livestock policies aimed at improving livelihoods of cattle keepers. It enables assessments closely from the viewpoint of the producers, as they consider proposed changes in the production system in the context of their circumstances. The alternative use of cattle for financing and insurance functions though useful, is associated with risks such as theft and deaths in case of animal disease. Therefore in the long run, there may be need to integrate these households into financial and insurance markets so as to improve their livelihoods.

Acknowledgement

Funding support by the Smallholder Dairy (R&D) Project (SDP) of the Kenya Ministry of Livestock and Fisheries, Kenya Agricultural Research Institute and International Livestock Research Institute, through the UK Department for International Development (DFID) is gratefully acknowledged. The views expressed are not necessarily those of the DFID.

References

Binswanger, H.P. and Rosenzweig, M.R., 1986. Behavioural and Material Determinants of Production Relations in Agriculture, *Journal of Development Studies*, 22, 503-539.

Lekasi, J.K., Tanner, J.C., Kimani, S.K. and Harris, P.J., 1998. Manure Management in the Kenya Highlands: Practices and Potential, pp. 1-35: The Henry Doubleday Research Association.

Lekasi, J.K., 2000. Manure Management in the Kenya Highlands: Collection, Storage and Utilisation to Enhance Fertiliser Quantity and Quality, Ph.D Thesis, Coventry University.

McIntire, J., Bourzat, D. and Pingali, P., 1992. *Crop - Livestock Interaction in Sub - Saharan Africa*, 1st edition, The International Bank for Reconstruction and Development, The World Bank.

Ministry of Agriculture and Rural Development, 2000a. Livestock Production Annual Report, Kisii district, Kenya.

Ministry of Agriculture and Rural Development, 2000b. Livestock Production Annual Report, Rachuonyo district, Kenya.

Moll, H.A.J., Staal, S.J. and Ibrahim, M.N.M., 2001. From Meat to Milk: Smallholders' Livelihoods and Markets, pp. 1-15. Paper Presented at 12th Symposium Tropical Animal Health and Production, "Dairy Development in the Tropics", University of Utrecht

Obare, G., 2000. The Effect of Road Infrastructure on Input Use and Farm Level Productivity in Nakuru district, Kenya. Ph.D Thesis, Egerton University, Njoro - Kenya.

Omamo, S.W., Williams, J.C., Obare, G.A. and Ndiwa, N.N., 2002. Soil Fertility Management on Small Farms in Africa: Evidence from Nakuru District, Kenya, *Food Policy* (27), 159-170.

Orodho, A.B., 1999. Grassland and Pasture Crops: Country Pasture/Forage Resource Profile-Kenya. Rome, Research Report of the Food and Agriculture Organisation.

Ouma, E., Obare, G. and Staal, S., 2002. Cattle as Assets: Assessment of non – Market Benefits of Cattle in Smallholder Crop – Livestock Systems, Contributed paper at the 25th International Conference of Agricultural Economists, August 16 – 22nd 2003, Durban, South Africa.

Romney, D.L., Thorne, P.J. and Thomas, D., 1994. Some Animal Related Factors Influencing the Cycling of Nitrogen in Mixed Farming Systems in Sub - Saharan Africa, *Agriculture, Ecosystems Environment*, 49, 163-172.

Staal, S.J., Baltenweck, I., Waithaka, M.M., deWolff, T. and Njoroge, L., 2002. Location and uptake: Integrated household and GIS analysis of technology adoption and land use, with application to smallholder dairy farms in Kenya, *Agricultural Economics*, 27, 295 - 315.