

Livestock for Household Food Security- A Case Study of Small-Scale Mixed Farmers in Semi-Arid Nyakach, Kenya

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Abstract

This paper considers both direct and indirect contributions of livestock to food security in semi-arid parts of Nyakach. Livestock production is a major component of the agricultural economy of developing countries and goes well beyond direct food production. Sales of livestock and their products provide direct cash income to small-scale farmers. Livestock are the source of income for many farmers and have a critical role in the agricultural intensification process through provision of labor on farm, fuel and manure. Livestock ownership also contributes toward farming and economic stability through food production. The meaning of food security has evolved since the first World Food Conference of 1974. It is now generally accepted that it relates to access by all people at all times to enough food for an active healthy life (Reuntlinger, 1985; World Bank, 1986; FAO, 1989). At household level, food security is equated with sufficiency of household entitlements that include food production resources, income available for purchases, gift and assistance sufficient to meet the aggregate needs of all household members. Various constraints are faced by small-scale farmers to achieving full potential of livestock sub-sector. However, livestock contribute to food security through increased output of livestock and non-livestock products and by employment and income generation that may assure access to food.

Key words: Livestock Production; Household Food Security; Small-Scale Mixed Farmers; Semi-Arid Lands; Nyakach

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Introduction

The animal sub-sector serves as the major source of protein of high biological value needed to ensure optimum human health. Livestock industry contributes about 5% to the Gross Domestic product of the Kenyan economy. The extensive management systems for producing these animals are common in the study area. Despite the vast array of animal resources, the prices of milk, meat and eggs keep increasing, thus placing these products out of reach of the average Kenyan. The daily consumption of animal protein in Kenya averages 7g per adult person as compared with 35g recommended for proper growth, health and survival. It is obvious that there is poor growth in animal protein production. Economically semi-arid Nyakach is endowed with various resources, livestock being one of them. Livestock production is practiced in over 90% of households making it a major economic and social activity for the community. Livestock production plays a direct role in food poverty alleviation and at the same time contributing economically towards Kenya's economic growth and development. The most active stakeholders of livestock sub-sector are the small-scale farmers. This is due to the fact that the farmers get daily supplies of food from it. This is so even during times when crop production fails. The farmers keep a variety of livestock so as to spread risk of one species failing to provide enough food for the household. The species kept are the indigenous because they are resistant to environmental stresses such as droughts when rains fail to come, floods when too much rain falls and high temperatures of the semi-arid agro-ecological zone. If food security is defined as "...access to enough food for an active healthy life" livestock can make a major contribution. Achieving food security in this case is largely determined by an assumption of minimum nutritional need (Chen and Kates, 1994). An adequate quantity of balanced and nutritious food is a primary indicator of quality of life, human welfare and development. Animals are an important source of food, particularly of high quality protein, minerals, vitamins and micronutrients. The value of dietary animal protein is in excess of its proportion in diets because it contains essential amino acids that are deficient in cereals. Eating even a small amount of animal products corrects amino acid deficiencies in cereal-based human diets, permitting more of the total protein to be utilized because animal proteins are more digestible and metabolized more efficiently than plant proteins (Winrock, 1992, De Boer *et al.*, 1994). Animal products are a source of disposable income for many small farmers in developing countries. In fact, livestock are often the most important cash crop in many small holder mixed farming systems. Disposable income is important for purchase of agricultural inputs and other family needs. Increased livestock production in developing countries in general and the study area specifically have added to food security in several ways. First, many small-scale farmers have had direct access to more food of livestock origin. Second, increased production have kept livestock product prices down and allowed low income groups access to such food. These food producers have gained in the face of lower prices because

livestock products are both price and income elastic, so lower prices have increased demand, total production and farm revenue. Third, increased domestic production will reduce imports and save foreign exchange which can then be diverted to productive investment and indirectly contribute to food security.

Literature Review

In small scale crop-livestock systems in the Ethiopian highlands livestock accounted for 34-87 per cent of total cash income from crops and livestock. Crops are more often a subsistence enterprise. The livestock share in cash income was higher in those villages where total cash income was higher indicating that increased cash income came primarily from livestock (Gryseels, 1988; Asamenew, 1991; Omiti, 1995). In semi-arid Mali, livestock contributed 78 per cent of cash income from crops and livestock on small holder mixed farms (Debrah and Sissoko, 1990). In both Ethiopia and Mali, a major part of livestock cash income was spent on food and medicines. In some crop-livestock systems, such as in semi-arid areas of Botswana, self-sufficiency in food crop production may not be a major goal. Most food crops may be purchased by income generated by livestock. In many societies, women have a specific family responsibility of household food provision and ownership of livestock and access to livestock products for sale helps them in this function. In southern Nigeria 41 one per cent of 5460 sales of small ruminants in four village markets over a period of 14 months were by women. Although both male and female sellers sold primarily for cash needs (55 per cent of sales), cash needs for buying food and clothing were a more prominent reason for sale by women (Jabbar, 1995). Livestock give increased economic stability to farm households, acting as a cash buffer (small stock), a capital reserve (large animals) and as a hedge against inflation. In mixed farming systems, livestock reduce the risk through diversification of production and income sources and there is therefore a much greater ability to deal with seasonal crop failures and other natural calamities. Livestock represent liquid assets which can be realized at any time, adding further stability to the family production and economic systems. At farm level, draught animal ownership patterns have implications for food production and security. There are positive correlations between draught animals and cereal crop production (Gryseels, 1988; Omiti, 1995). In many developing countries ownership is skewed. Many small and marginal farmers own none or an inadequate number of traction animals (BBS, 1986; Gryseels, 1988; Asamenew, 1991). Crop production of these farmers suffers due to late planting, poor quality tillage, use of low value crops needing less tillage and an inability to cultivate all available land. These problems may be aggravated after natural calamities such as flood or drought due to death or poor health of animals and increased draught animal prices (Jabbar, 1990)

Methodology

The Study Area

This study focuses on semi-arid agro-ecological zones of Nyakach in Kisumu County, Kenya. The area has witnessed gradual food insecurity over the last three decades but this phenomenon has recently intensified due to, poverty, rapid population increase, overgrazing, over-cropping and coupled with serious deforestation on the upper catchments and flooding on the Kano plain. This negative trend has to be reversed if the region has to attain food security for its residents in future. 65.0 percent of the residents of the study area are food insecure. The major causes of food insecurity are poverty, declining soil fertility due to overuse leading to low agricultural production and poor natural resource management. The semi-arid Nyakach spreads across two Agro-ecological zones, LM3 and LM4. These are Low, warm and dry zones that receive inherently erratic and unreliable rainfall that varies from as low as 150mm during the short rains to 700mm during the long rains. Mean annual rainfall is 600mm, and sometimes lower. LM3 is the Lower Midland Cotton Zone, which is warm, with annual average precipitation of 50-60% of potential evapotranspiration. LM4 is the Marginal Cotton Zone, which is warm and transitional with annual average precipitation of 40-50% of evapotranspiration. Agricultural harvests are irregular though majority of the population depend on agriculture for subsistence. It exhibits low organic matter levels, high rates of potential evapotranspiration and periodic droughts. These conditions have discouraged crop production in the area. However, grazing is satisfactory in this semi-arid environment and farmers have resorted to keeping diverse assemblage of animals in their homesteads. This has encouraged livestock production hence food security. The soils in this area are undergoing intensive crop production as a result of high and rapidly growing rural population and development of agricultural markets, cultivation has spread into delicate landscape niches, such as wetlands, with poorer and more vulnerable soils. Human settlement competes for use of agricultural land. External farm inputs are often less available, more costly and less profitable to the small-scale farmers in this marginal environment.

Study Design

The design used in data collection was survey where respondents were asked questions, through the use of questionnaires and in-depth interviews on agricultural land-use practices and their effects on small-scale agriculture. The study adopted cross-sectional survey research design. The survey design was the most appropriate for this study since it sought to establish the relationship between small-scale farmers' animal farming practices on household food security in the semi-arid Nyakach. The study used the cross-sectional method because information was collected from the population at a single point in time. Thus, data for the study was collected for a period of one year from September 2013 to August 2014.

Sampling Procedures

Data for this study was collected from the semi-arid agro-ecological zones of Nyakach District. These are areas that fall under agro-ecological Zones LM3 and LM4. This study area receives mean annual rainfall of 585.6 mm. It is characterized by small-scale mixed farming. The main sampling procedures used in the study were purposive and simple random sampling. Purposive sampling was used in selecting the key informants in the study area who included the district agriculture officer, agricultural extension officer, World Vision Kenya (WVK) officers working in the study area, VI-Agroforestry officers that have been working with the farmers on agroforestry practices and officials of local community-based organizations. The small scale farmers/key informants gave information on small-scale livestock practices in the study area, types of livestock kept and the effect of these practices on household food security. Simple random sampling was used in selecting small-scale farmer respondents. Data was collected by administering a structured questionnaire to 180 selected small-scale farmers. The questionnaire was designed to obtain information on bio-data, general household information like the food security status, the number and type of livestock kept, herding and breeding practices and purpose of keeping livestock.

Results and Discussion

At farm level, the importance of livestock as an income source and the actual sources of food vary across ecological zones and production systems, which in turn determines the species raised and the products and services generated. In this semi-arid agro-ecological zone, cash has been generated from sales of livestock products such as milk and eggs regularly, or periodically by selling live animals, skin, meat, hides, or from services such as cultivation and transport. Dairy produce is the most regular income generator, though the cows are the indigenous species that produce little amounts of milk per day. Dairy development has been shown to increase income; consumption and repayment capacity in this study area. Cattle here fulfill multiple roles in generating income and ensuring food security. In these remote villages 88 per cent of cows are dual purpose in that they both produce milk and draught services on the farm. Average milk yield of draught cows was about 68 per cent of non-draught ones, yet farmers used cows as they did not have enough cash to buy bullocks nor enough feed to maintain both bullocks and cows. Crop production of these farmers would suffer without using cows for draught because each household requires at least four cattle to draw the plough. About 86 per cent of households in the study area sold part or the entire milk yield to supplement income from crop and other off-farm sources of food and income. 57 percent of households sold all their milk indicating that a high value nutritious food was given up to meet other family needs.

Table 1: Land and Cattle Holdings and Milk Sales in Semi-Arid Nyakach District

Item	Representative Villages
Sample households	120
Average land holding (ha/household)	1.56
Number of cattle per household	
Bullocks	2.28
Cows	3.23
Young cattle	3.70
Total	9.21
% cows used for draught	88
Highest daily yield/cow (litre)	
Draught + milk cow	2.30
Milk cow	3.32
% households selling milk	
Entire milk yield	57
Part of the milk yield	29
Not selling milk	14

Source: Field Data, 2013

Manure

Nutrient recycling is an essential part of any strategy for food security and sustainable agriculture. Integration of livestock and crops allows for efficient recycling through use of crop residues and by-products as animal feeds and for animal manure as crop fertilizer. Cattle dung contains about 8 kg of nitrogen, 4 kg of phosphate and 16 kg of potash per tonne of dry matter (Ange, 1994). In addition, manure returns organic matter to the soil, helping to maintain its structure as well as its water retention and drainage capacities. This has resulted in improved soil fertility. Throughout the study area, manure is the primary source of plant nutrients for indigenous rainfed crops. Chemical fertilizers are expensive and not affordable to the farmer. Manure is important in this area because the vertisols are fragile and of low inherent fertility. Only a small fraction of crop land receives adequate manure, however, and availability in a given year depends on the livestock population and its species composition, location at manuring time, feed supply from range and crop land and efficiency of manure collection. Since crop and livestock production are not yet integrated on a wide scale, there is considerable loss of nutrients in the process of transfer from range-based livestock to crop fields. Nutrient flow may be further affected by drought-induced changes in livestock populations, species composition and animal mobility. For these reasons, it has been estimated that, in present production systems, animal manure is not adequate to sustain the current level of crop production in the semiarid areas because it requires a very high pasture area per unit of crop area (Fernandez-Rivera *et al.*, 1994; McIntire and Powell, 1994; Williams *et al.*, 1994). This is probably an interim problem because population pressure and market conditions will drive intensification in the future and crops and livestock will be more integrated. Loss of manure will then be minimized as it

becomes critical for sustaining soil productivity. It has also been suggested that efficiency of manure use can be increased by joint application of manure and fertilizer and manipulation of the relative amounts and times of application of manure (Brouwer and Powell, 1994; Murwira *et al.*, 1994).

Weed Control

Livestock, particularly sheep, are efficient in controlling weeds and thus help to increase crop production hence food security. The use of livestock on the ground cover under the tree canopy increases overall production and can save up to 40 per cent of the cost of weed control, lowering the cost of herbicides hence reducing by half the total cost of weed control and providing an additional income from meat production. Such systems also safeguard the environment and avoid chemical pollution while supplying additional organic material to the soil. (Chen *et al.*, 1988).

Dairy Production

The study area receives variable rainfall throughout the year, which contributes positively to forage regeneration and expansions. Hand spraying is the preferred method of tick control to most Dairy farmers. Natural breeding service contributes considerably to up-grading by complementing Artificial insemination services. The milk produced in 2013 increased by 62% compared to production in 2009. This was mainly due to increased animal population and production area. The region is milk deficit hence all milk produced by the farmers easily finds market. There is currently no co-operative society handling milk. Organized milk outlets are milk bars in the local shopping centers. This is a major source of income for the farmers. The accrued income is spent on purchasing food items that the farmers do not produce hence household food security.

Table 2: Milk Production and Revenue Estimates from Milk Sales in Semi-Arid Nyakach

Year	Indigenous cows (litres)	Exotic cows (litres)	Goats (litres)	Revenue (Kshs.)
2009	1.8 million	81,440	1,600	94.15 million
2010	1.69 million	1.83 million	14,475	1.77 million
2011	1 million	1.3 million	0.02 million	116 million
2012	1.78 million	1.98 million	0.067 million	191 million
2013	1,34 million	3.86 million	20,440	261 million

Source: Field data, 2013

Beef Production

The production of beef cattle is characterized by traditional systems that mainly rely on indigenous breeds whose overall productivity is generally low. Although productivity remains low the farmers have developed exceptional adaptive traits to utilize the poor roughage and tolerate endo-parasites and ecto-

parasites. Beef production serves the community as a source of investment and income to solving some astringent family financial and customary issues such as payment of school fee and other levies, providing family healthcare, purchasing food and clothing and payment of dowry. The family unit herd is usually large, normally more than six heads on average. Grazing is usually communal, breeding is uncontrolled and growth of the herd is slow.

Constraints and Opportunities Facing Livestock Farmers

The major constraints are: erratic weather patterns affecting both quality and quantity of feeds at any given time; Poor management of the existing developed fodder and shrubs; limited resources to be channeled towards pasture Improvement; high costs of commercial feed; fluctuating quality of commercial feeds; overstocking of local species of animals creating pressure on available natural Pastures; and high costs of farm inputs such as fertilizers and seeds. The findings of this study established that some microfinance organizations, NGOs, parastatals and banks operating in the study area are ready to offer credit to farmers, but on stringent conditions that most farmers cannot meet. Credit providers to livestock farmers are Agricultural Finance Corporation (AFC) with 4 beneficiaries and Equity Bank with 3 beneficiaries, which support dairy and poultry enterprises. AFC gives loans of between Ksh.200,000-500,000, while Equity Bank loans are between Ksh.100, 000-300,000. The K-Rep Bank has given loans to two farmers in support of poultry and dairy goat farming. The amount of loan it gave to the beneficiaries was between Ksh.100,000-150,000. In total, 9 farmers benefited from loans from various financial institutions. The impact of this credit is yet to be seen and felt. Linking farmers to microfinance institutions is critical in propelling the livestock industry towards commercialization. This should be done by extension officers from the relevant government body. Livestock fanners are waking up to the reality of acquiring loan to develop the livestock industry but this idea has not been put to reality, farmers say due to lack of exposure and the need to organize themselves into cooperatives, which they are yet to do. Livestock production extension services were found by this study, to be lacking. The study area is subdivided into seven administrative Locations, which form the extension units. However, not all these units have an Extension Officer as the case should be. This is due to shortage in personnel. The divisional subject matter specialist doubled as the Frontline Extension worker because the division did not have a Frontline Extension Officer. The effectiveness of extension services is compromised by the big ratio of staff to farmer. This meant that extension activities were no carried out as should have been. Farmers lacked trainings, farm visits, field demonstrations and field days. There are seven extension units in semi-arid Nyakach, but the extension workers are only two, against approximately 14,000 farmers. The staff: farmer ratio is, therefore 1: 7,000 (District Agricultural Office, 2013).

When the Ministry of Agriculture and Livestock Development was asked why farmers could not receive services as and when they should, the officer in charge cited the challenges they face as: Low levels of funding from the government; acute staff shortage; inadequate transport facilities that greatly hampered delivery of extension services to the farmers; high levels of poverty that affected technology adoption, and low farmer attendance during trainings. The officer, however, reported that the ministry tries its best and that he carried out a few trainings and field days. The mode of extension that the officer adopted had been mostly group approach although there was individual targeting as well. The major constraints faced by the service providers are low adoption rate and low funding by the government in the case of the Ministry providing the service. This study also established that there were inadequate livestock production programmes and projects. During the year 2013 there was no livestock related programme /projects implemented. Activities undertaken during the period of this study were facilitated through Government of Kenya and Nalep-Sida programme. This is a situation carried over from previous years. The broad objective of the programme is to promote a pluralistic, efficient, and functional demand- driven extension service. The specific objectives of the NALEP-SIDA program are to; increase effectiveness of pluralistic provision of extension service; institutionalize demand driven and farmer led extension service; facilitate commercialization of some agricultural extension services; increase participation of private sector in providing extension service; empower farmers take charge of extension service and to develop accountability mechanisms in delivering extension services.

Conclusions

Animal products are expected to contribute proportionally more to food supply and food security in the study area.

The contribution of animals to food security has not been adequately evaluated. Most food security studies generally underestimate livestock contributions since many important non-food outputs which are difficult to quantify in monetary terms are excluded from calculations. The role of animals in development programs is generally underrated, in spite of the increasing demand, especially in the developing countries, for animal products and services.

Improved efficiency of animal agriculture with its various commodities and service products is critical to achieving sustainable agricultural development and food security, particularly in low income food deficit households.

A prerequisite for sustainable development of animal agriculture is the development, testing under local conditions, and promotion of appropriate technologies that use local and affordable resources. Policies,

infrastructure and support services must be established to enable such technologies to succeed and reach small scale farmers.

Integrating livestock and crops increases short term benefits to and long term sustainability of food production, distribution and consumption.

Facilities and credit for small scale farmers should be emphasized, rather than major investments in institutions which are usually over equipped and only supportive to the large-scale farmers.

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