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FOOD CONSUMPTION OF SMALLHOLDERS IN SUB-SAHARAN AFRICA: DO LIVESTOCK REALLY HELP?

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ABSTRACT¹

Many smallholder farms in sub-Saharan Africa are characterised by the integration of crops and livestock. Livestock improve household food consumption; especially where crop production suffers due to worsening agro-climates. Livestock contribute to food consumption directly as food, and indirectly as an input to crop production and a source of income. For example, studies in the highlands of Ethiopia showed that the sale of livestock and livestock products can account for as high as 87% of household cash income, which in turn is spent primarily on food. The fulfilment of a household's food consumption preferences is a prerequisite to its attainment of food security.

This paper presents the preliminary results of an analysis of the linkages between livestock holdings, household characteristics, and food consumption of smallholders in the highlands of Ethiopia – a region with a long history of crop-livestock integration on the household farm and where women play a dual role as farmers and home caretakers. A proportionate stratified random sample of 107 households was selected. Results showed that households with more oxen also have more livestock. Female heads and illiterate heads were most numerous in households with no ox. This indicates that households with lower livestock holdings, primarily those with female or illiterate heads, may be more vulnerable to food insecurity. The amount of food consumed is not significantly different among the oxen ownership groups. Nonetheless, the sources of food, i.e. own production or purchased, may indicate the household's ability to be self-sufficient and to purchase preferred foods.

1. Introduction

Smallholder farmers in sub-Saharan Africa, in general, are susceptible to food insecurity. The availability of and access to food is constantly threatened by unreliable or unfavourable agro-climates and is hampered by serious technical, institutional, and logistical constraints common in developing countries. Rapid population growth rates further endanger their food security problem.

The United Nations defines food security as the sustainable availability of and access to food needed to maintain a healthy life. Food availability and access is achieved through a combination of production, purchasing power, and a network of social relations. For a household to be food secure, the food consumed by the household must be satisfactory in

¹ This paper was based on a study using an econometric approach to analyse causal relationships between household socio-economic variables including income, women's time, and social network to determine the impacts of crop-livestock integration on household food consumption and the implications to food security.

terms of quantity, quality, safety, and cultural acceptance. The household's subjective conditions for having enough to eat must be satisfied (Sanjur, 1982; Von Braun *et al.*, 1992; Sansoucy *et al.*, 1995; Maxwell, D., 1996; Maxwell, S., 1996; Chung *et al.*, 1997; Narayan and Pritchett, 1997). Therefore, fulfilment of the household's food consumption preferences is a pre-requisite to its attainment of food security.

2. The contribution of livestock to food availability and access

Over the last decade, sub-Saharan Africa exhibited the world's highest average population growth rate of 3.2% per annum. Agricultural production, meanwhile, grew at an average annual rate of only 2.5%, resulting in a decline of agricultural output per capita. To break out of this Malthusian trap, agricultural innovations and strategies focused on improving crop production. Livestock output was largely ignored. Livestock, however, can provide up to 35% of gross domestic agricultural production when its traction and manure contributions are recognised in addition to its commodity outputs of meat, eggs, dairy products, and hides. Meat, eggs and dairy products contribute to food availability and income while hides add to cash sales. As inputs to crop production, livestock traction and manure increase the availability of food crops, with the surplus augmenting cash and non-cash income. Furthermore, livestock manure processed into dung cakes is an important source of cooking fuel. In addition livestock function as near-cash assets or savings, allowing the purchase of food during production shortfalls. Livestock, therefore, contribute to both the availability and the access of food.

3. The role of women in household food consumption

Empirical studies have shown that two sets of activities — men's labour and women's labour — comprise the smallholder economy (FAO, 1987; Quisumbing, 1995). While women were shown to be equally efficient farm managers as men, women in sub-Saharan Africa contribute from half to three-fourths of the labour required to produce food for the home. Women's income has also been shown to have a significantly higher positive effect on food consumption than men's income. These labour and income contributions of women are substantial, in spite of the biological restrictions on them due to reproduction and cultural demands for domestic chores (Tibajuka and Feldstein, 1990; Nindi, 1992; Dejene, 1994; Quisumbing *et al.*, 1995).

4. The Highlands of Ethiopia as a case study

Ethiopia is one of most chronically food insecure countries in the world. Food consumption is quite low, with the average caloric intake at only 72% of the recommended dietary allowance. The highlands of Ethiopia are also characterised by an integrated crop-livestock farming system where high population densities constrain livestock output. Nonetheless, studies have shown that the sale of livestock and livestock products in the Ethiopian highlands can account for as high as 87% of total household cash income (Gryseels *et al.*, 1988). Moreover, Ethiopian culture dictates that only males plough. Sporadic political unrest, however, has led to many men leaving the farm because of conscription, while women become household heads. The highlands of Ethiopia, with its long history of crop-livestock integration on the household farm, and where women play dual roles as farmers and home caretakers was, therefore, used as a case study. This paper presents the preliminary results of an analysis of the linkages between livestock holdings, household characteristics, and food consumption of integrated crop-livestock smallholders. Implications to food security are then

drawn from these preliminary findings.

5. Data collection

Primary data was collected from smallholders approximately 145 kilometres north-east of Addis Ababa where elevations average 2800 meters above sea level². Average annual rainfall is 963 mm and average annual temperature is 12.8 degrees Celsius (Gryseels *et al.*, 1988). Agriculture is primarily rain-fed with gravitational irrigation systems providing back up. Soils are of the vertisol type. The Amhara ethnic group, of Orthodox Christian religion, predominates in the area. Households are monogamous with one or two other relatives living with the nuclear family.

Case studies were first conducted intensively for seven months on ten households to probe deeper into household behaviour and farming practices. A census of 709 households followed the case studies to obtain data on demographics, livestock holdings, and gender-disaggregated responsibilities. From this, Bakelo-Dimbaro, with 425 households, was identified as the feasible study site. Finally, a proportionate stratified random sample of 107 households in Bakelo-Dimbaro was chosen.

The stratification variables used were oxen ownership and dependency ratio. First, the population of 425 households was stratified by oxen ownership – (1) no ox owned, (2) one ox owned and (3) two or more oxen owned. Then each oxen stratum was stratified by dependency ratio³ – (a) zero dependency, (b) from zero to 25%, and (c) greater than 25%. Stratifying by oxen ownership and dependency ratio was expected to enhance the representation of other important variables related to food consumption. Households owning no ox are most disadvantaged in terms of ploughing. Usually, they are unable to cultivate. They resort, instead, to providing sharecropping labour for which they receive no more than half of the harvest. Households with one ox, on the other hand, could participate in an oxen-sharing arrangement, called *mekenajo*⁴. With *mekenajo*, the household is able to cultivate its own land but not in a very timely manner. Finally, households who own at least two oxen are able to plough their land in the timeliest manner. With regard to dependency ratio, households who have no dependants are expected to have the highest production per capita. Thus, households with a zero dependency ratio were classified as one stratum. The remaining households were divided into two groups as evenly as possible. The cut-off was at a 25% dependency ratio.⁵

² The nearest town is Debre Berhan with a population of approximately 22,000 (Gryseels *et al.*, 1988).

³ Dependency ratio was defined as the proportion of non-working household members in the household.

⁴ Under *mekenajo*, a household with one ox forms a partnership with another household who also owns one ox (in very rare cases when a household owns three oxen, the third ox may be made available for *mekenajo*). These households take turns in borrowing each other's ox to be used for the *maresha*, the wooden plow requiring an oxen-pair.

⁵ There was no conceptual reason, *ex-ante*, for the 25% dependency ratio cut-off. However it was preferred, for policy purposes, to divide the households with positive dependency ratios into two groups.

The number of sample households in each stratum is shown in Table 1. It can be observed that the sample households are almost equally distributed in each stratum.

Table 1: Number of sample households in each stratum, Bakelo-Dimbaro, 1997

Dependency Ratio	Zero Ox Owned	One Ox Owned	Two or more Oxen Owned	TOTAL
Zero	17	12	15	44
Zero to 25%	5	10	17	32
Greater than 25%	10	10	11	31
TOTAL	32	32	43	107

5.1 Household characteristics

Overall, the average household size in Bakelo-Dimbaro is 4.5 adult equivalent units (AEU) with an average dependency ratio of 18%. The average age of the household head is 51 years. Female-headed households make up 19% of the total sample. About two-thirds of all households have a man who ploughs. The proportion of households with a literate head is quite low at 35%. In general, it takes approximately two hours and forty-five minutes to walk from the homestead to the market.

Table 2 shows the specific household characteristics per oxen ownership group.

Table 2: Household characteristics by oxen ownership group, Bakelo-Dimbaro, 1997

Household Characteristics	Zero Ox Owned	One Ox Owned	Two or more Oxen Owned
Average household size (AEU)*	2.9	4.6	5.6
Average dependency ratio (%)	21	17	15
Average age of head (years)	51	51	52
Proportion of female-headed households (%)*	44	6	9
Proportion of households with a man who ploughs (%)*	50	78	77
Proportion of households with a literate head (%)*	22	44	40
Distance of homestead to the market (hours of walking)	2.6	2.9	2.7

* Significantly different among the three oxen ownership groups at 5%⁶

⁶ Due to the small number of observations in each oxen ownership group, nonparametric statistics were used to test between-group differences. For categorical variables, the chi-square statistic was used. For continuous variables, the Kruskal-Wallis statistic was used.

Household characteristics that are significantly different among the oxen ownership groups are household size, presence of a man who ploughs, as well as gender and literacy of the household head. Table 2 also shows that households with no ox have a notably high proportion of women as heads. Further examination of this particular group showed that most of these female heads are widowed or divorced women who do not have a man who ploughs in the household.

Households with no ox also have the largest proportion of illiterate heads. Since some households obtain an ox on credit from the government or non-governmental organisations, this implies that the household head's literacy may contribute to his or her ability to obtain credit.

5.2 Livestock holdings

Households in Bakelo-Dimbaro invest in livestock as capital and as near-cash assets or savings. Cattle are held as a capital stock and used as inputs to crop production. A pair of oxen is used for ploughing with the maresha. Bulls, cows, and calves are used for threshing. Lactating cows, however, are often kept free from traction work. Sheep, goats, and poultry are held as liquid assets or savings that can be sold to meet emergency cash needs or traded during lean seasons. They are also sold in town during major holidays to take advantage of the high prices created by the tight demand. Donkeys and mules are used to transport goods to and from the market and to carry the harvest from the farm plots to the homestead. Horses are used as human transport.

Table 3 shows the average number of livestock owned by oxen ownership group.

Table 3: Average number of livestock by oxen ownership group, Bakelo-Dimbaro, 1997

Livestock	Zero Ox Owned	One Ox Owned	Two or more Oxen Owned
Cattle*	0.7	2.0	3.1
Sheep and goats*	2.3	5.8	9.5
Donkeys, mules, and horses*	0.4	1.2	2.1
Poultry*	1.2	2.7	3.8

* Significantly different among the three oxen ownership groups at 5%.

In all livestock categories, there are significant differences in holdings among the three oxen ownership groups with households owning more oxen also owning more livestock. This indicates that vulnerability to food insecurity due to low livestock holdings is greatest among households who do not have an ox.

5.3. Food consumption

The typical diet in Bakelo-Dimbaro is heavily based on cereals and pulses⁷. Barley (*Hordeum vulgare*) and wheat (*Triticum dicoccum*) are the most common cereals consumed while the primary pulses consumed are horsebeans (*Vicia faba*) and lentils (*Lens esculenta*). Meat, eggs and dairy products are favoured foods but are consumed only on special occasions such as festive holidays, weddings, and funerals. The meats eaten are mutton, beef, and on some occasions, goat. Pork is not eaten because of religious practices. The dairy products consumed are cow's milk, butter, cottage cheese, and yoghurt. The consumption of fruits, vegetables and root crops is minimal.

Table 4 shows the average daily per capita food consumption of cereals, pulses, and dairy products by oxen ownership group⁸.

Table 4: Average daily per capita food consumption by oxen ownership group, Bakelo-Dimbaro, 1997

Food Item	Zero Ox Owned	One Ox Owned	Two or more Oxen Owned
Cereals			
Total consumption of cereals (grams)	774	846	896
From own production (%)	60	58	45
From cash purchases (%)	40	42	55
Pulses			
Total consumption of pulses (grams)	353	204	187
From own production (%)	43	41	54
From cash purchases (%)	57	59	46
Dairy Products			
Total consumption of dairy products from own production ⁹ (grams)	210	115	171
In the form of milk (%)	95	84	94
In the form of butter (%)	5	16	6

The average daily per capita consumption of cereals, pulses, and dairy products is not statistically different among the three oxen ownership groups. Households with two or more oxen, however, consume slightly more cereals from purchases than from own production. This may indicate that they are in a better position to obtain preferred cereals from the market such as teff (*Eragrostis teff*)¹⁰. On the other hand, these same households consume more pulses from own production rather than from purchases indicating that they may be more self-sufficient in pulse production.

The consumption of dairy products among the three oxen ownership groups is unexpected, however. Households with no ox and owning the least livestock consume the highest amount

⁷ *Injera* is the staple food in Ethiopia. It is a thin, sour, porous pancake about 40-50 centimeters in diameter. Farmers in Bakelo-Dimbaro generally eat barley *injera* with a side of powdered pepper or a spiced sauce made of pulses.

⁸ Table 4 reflects only one seven-day period between two major holidays (Ethiopian New Year and *Meskel*, an Orthodox Christian holiday). Data collection on food consumption was completed later.

⁹ Only milk and butter were consumed during the seven-day period, none of which was purchased.

¹⁰ Teff is the preferred cereal for making *injera*, but the agro-climate of Bakelo-Dimbaro is not suitable for its cultivation.

per capita of dairy products from own production¹¹. Although the amount of dairy products produced is unknown, this may indicate that households with no ox prefer to consume rather than sell their home-produced dairy products.

It should be noted that the results shown on Table 4 reflect only one seven-day period between two festive Ethiopian holidays characterised by the preparation of plentiful food. The importance of this holiday season for everybody may explain why there is no significant difference in food consumption among the three oxen ownership groups.

6. Conclusions and implications to household food security

The preliminary results shown in this paper indicate that the number of livestock can be a reliable indicator of a smallholder household's food security. Households with female or illiterate heads appear disadvantaged in terms of owning livestock, including oxen. This may hinder their ability to produce sufficient crops and livestock products for the home. Although the amount of food consumed is not significantly different among the three oxen ownership groups, the sources of food, i.e. own production or purchased, may indicate the household's ability to be self-sufficient and to buy preferred foods. In sum, ownership of more livestock as farm inputs may lead to greater food consumed out of own production while ownership of livestock as a direct food source and as a source of cash may lead to greater consumption of more preferred foods.

¹¹ Further breakdown of cattle holdings show that this group also has the lowest average number of cows.

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