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AN ASSESSMENT OF THE LINKS BETWEEN LIVESTOCK OWNERSHIP AND AREA CULTIVATED

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ABSTRACT. In this endeavour, an attempt was made to see if there is some kind of relationship between:

(i) the number of cattle owned and area cultivated,
(ii) sales of cattle due to drought vis-a-vis area cultivated prior to the drought, and
(iii) the degree of participation in other secondary occupations in relation to area brought under cultivation.

The study was based on the responses of 389 households who were resettled in Gambela and Metekel from parts of the drought-prone regions (Shewa, Wello, Gojjam and Tigray) following the 1984/85 drought.

The results showed that the number of cattle owned has only some degree of bearing on area cultivated (r = 0.040); those peasants with relatively smaller area of cultivated land tended to sell relatively more of their cattle (as high as 31.6%); and the degree of participation in other activities witnessed no general pattern but proved to be more important for those peasants who cultivated less than 1.5 hectares (28%).

1. INTRODUCTION

The Northern and Central Highlands of Ethiopia are regions of ancient agricultural settlements and government seats of the country. The land is extensively degraded for both economic and demographic reasons. The soil has exhausted its fertility; agricultural productivity is far below the subsistence level; crop failures and famine are common; environmental degradation must have begun many generations ago; and the present is only a manifestation of a long historical process [1], [4, pp. 23-25], [6], [14], [16, pp. 76-101]. Famine is the result of an archaic production and distribution system [2].

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Some researchers argue that the main factor responsible for famine is lack of productive resources like sufficient cultivable land and oxen, and that drought only exacerbates an already pathetic situation [7, p. 18], [14, p. 206]. Mesfin Woldemariam stipulates that lack of draught power, scarcity of cultivable land in the Northern and Central Highlands, and shortage of labour in other parts of the country reinforce each other to reduce agricultural output [16, p. 73]. This study is a modest attempt to look into some issues related to agricultural production in the drought-hit regions prior to the 1984/85 drought.

Research along this line has been of interest in subsistence economies for two reasons [18]. The first is that of immediate concern to understand peasant behavior, motivation and problems. The second is economic growth and development in the face of fast population growth and a low pace of industrialization. Subsistence agriculture and peasant behavior is a complex and interdisciplinary area of study; and the research area is vast [20, [21]. This study does not claim to be complete and conclusive.

This study is limited to area of cultivation vis-a-vis livestock ownership and other sideline activities. In the poor countries, crop production is mainly for family consumption and not for sale. In addition farmers keep livestock for various reasons, amongst which draught power and emergency needs stand out as extremely important [8, pp. 395-400, 404]. Farmers may also engage themselves in other activities to gain additional income [21, p. 394] such as trade, craftsmanship and hired labour. The creation of such opportunities should therefore be one aspect of rural development strategy.

II. THEME OF THE STUDY

The problematics to be investigated in this paper are based on the following hypotheses:

a) Some studies indicate that the size of livestock holding, rather than work oxen, has a significant bearing on the size of area cultivated for cropping, not so difficult a matter to discern on logical grounds [11, pp. 5-6]. That is, crop and livestock production are rather "complementary and not competing" in the Ethiopian setting. The basis of the argument is that a larger number of cattle entails a larger number of farm oxen and hence greater opportunity to bring more land under cultivation.

This study was inspired on the grounds that the reverse may also hold. That is to say, more cattle normally demand more grazing land and this may compete with land available for crop cultivation. Furthermore, it is hard to believe that agricultural output can significantly increase if more farm oxen could be made available to peasants simply because there is hardly any unutilized land for crop growing in this part of the country.

b) Following a dry season, food grains fall short and as a result peasants may sell part or all of their livestock to acquire the cash needed for the purchase of grain [11, p. 1]. It is generally believed that peasants first convert into cash their sheep and goats and only take their cattle, oxen in particular, to the market as a last resort. This is so because the sale of cattle adversely affects their future livelihood, recovery becomes even more difficult, and their pathetic situation is exacerbated [15].

But such peasant reaction may not always hold because the justifications implicitly assume that there is a flexible market outlet in an essentially subsistence production system. Another theme of this study is therefore to assess the behavioral relationship between area cultivated prior to the drought (1984) and the subsequent sale of cattle in general.

c) Common sense imparts that if less livestock ownership tallies with less cropping area, then the relatively poor peasants may tend to engage themselves more in other supportive non-agricultural activities like trade and craftsmanship in order to maintain their survival. However, in the Ethiopian rural setting such skills are usually acquired from parents and/or some initial investment is required to go into such economic activities. Opportunities may not be open to all peasants who desire to pursue such supplementary activities. In view of this consideration, a third item of interest in this undertaking is to assess the degree of participation in other secondary occupations vis-a-vis cultivated land size.

III. METHOD OF STUDY

This study utilizes material compiled by the Institute of Development Research (IDR), at the potential settlement[1] sites of Gambella and Metekel (1985). The questionnaire focussed on, *inter alia*, farming experience of the settlers at their original homes. The settlers came from parts of the country that constitute the core of an extensively degraded and harsh environment [14]. The survey covered about 1164 household heads of which only 389 were considered for the purpose of this study (See map, Appendix II). The rest were left out for one or a combination of the following reasons:

- if one or some of the variables relevant for the purpose of this study have not been answered;

- the *enset*-growing settlers from Kembata-Hadiya were left out on the grounds that they had a different agricultural practice;

- others were excluded because they furnished exaggerated figures on cropping area. Some research findings have shown that three hectares is at the upper end of the scale [10, 14, 17]. The study

therefore did not consider peasants who reported to have cultivated 3 hectares and above. The main theme of the study, that is, whether crop production and cattle production compete over the use of cultivable land, can only be justified if some degree of constraint on land availability is assumed.

The selected respondents were classified into four groups according to cultivated area as shown in Table 1.

Table 1
Number of Households by Cultivated Area

Group	Cultivated Area (in hectares)	No.of Households	Average Cultivated Area (in hectares)
1	0 - 1.50	96	0.98
2	1.50 - 2.00	97	1.58
3	2.00 - 2.50	103	2.07
4	2.50 - 3.00	93	2.54
Total	0 - 3.00	389	1.79

Note: Upper limits of the class intervals are not included in a group.

Though the number of respondents seem to be sufficiently large, the reported figures on farm area did not show much variation. The 389 household heads supplied altogether eleven different figures on farm area, each figure occurring a large number of times. Also the frequencies at which the figures occurred exhibited significant differences. In view of this consideration, the best that could be done was to categorize the data as in the above so that we could obtain more or less comparable numbers of observations in each class.

IV. RESULTS AND ANALYSIS

The results of the problematics posed are presented and discussed below, and the correlation coefficient between the variables selected for the purpose of this study are provided in Appendix I.

4.1 Results

a) The average figures on livestock ownership in each group were as shown in Table 2.

Table 2
Average Cultivated Area and Average Number of Livestock Owned

Group	Average Cultivated Area (in hectares)	Average No. of of Cattle Owned	Average No. of Sheep and Goats Owned
1	0.98	8.49	7.95
2	1.58	8.44	8.08
3	2.07	9.93	8.09
4	2.54	10.48	8.34

These figures seem to indicate that there is a general rising tendency though not proportionately in the size of area cultivated as the number of cattle ownership increases ($r = 0.040$). As similar studies have shown cattle production is roughly associated with the provisions of draught power [9, 10, 11, 12]. But the results also seem to suggest that less area cultivated does not always coincide with fewer number of cattle as groups one and two register. The reason for cultivating less area of land is not fully explained by lack of draught power.

On the other hand, no apparent relationship appears to exist between the number of goats and sheep owned and area cultivated ($r = -0.005$). This may be so because sheep and goats are mainly produced for the market and own consumption and that they have very little to do with crop production.

b) The average number of cattle and goats-sheep sold following the 1984 drought are provided in Tables 3 and 4.

Table 3
Average Number of Cattle Sold

Group	Average No. of Cattle Owned	Average No. of Cattle Sold	No. of Cattle Sold Expressed as Percentage of No. of Cattle Owned
1	8.49	2.68	31.6%
2	8.44	2.63	31.2%
3	9.93	2.08	21.0%
4	10.48	2.30	21.8%

Table 3 above roughly suggests that groups with relatively low cultivated areas tend to sell relatively more of their cattle than upper groups indicating that lower groups are more vulnerable to disaffect their future livelihood. Even in absolute number, the trend is downward excepting in group 4. That is to say, upper groups may have had some surplus of grains to sustain them relatively longer. But in general terms even the destitute farmers sold less than 50% of their cattle. In the Ethiopian context, the peasant household in the Northern and Central Highlands of Ethiopia is essentially a subsistence producer and hence cannot easily interact with the wider national economy [14, p. 202], [6, p. 58]. There may therefore have been massive deaths of cattle or mass

killing of animals for consumption purposes. The former stands out as the most widespread phenomenon [16, pp. 59-62]. The logic is that as the peasant's future recovery[2] heavily depends on his cattle he prefers to keep them for future use in production. In expectation of a brighter future, he loses both his cattle and his own life [16, pp. 59-62].

Table 4 demonstrates the sales of sheep and goats as a result of the drought.

Table 4
Average Number of Sheep and Goats Sold

Group Owned	Average No. of Sheep & Goats Owned	Average No. of Sheep & Goats Sold	No. of Sheep and Goats Sold Expressed as a Percentage of No. of Sheep & Goats
1	7.95	2.36	29.7%
2	8.08	3.26	40.3%
3	8.09	1.83	22.6%
4	8.34	2.77	33.2%

Table 4 shows that there is no clear behavioral pattern regarding the sales of sheep and goats. Peasant households in Groups 1 and 3 tend to sell relatively less of their sheep and goat stock than those in groups two and four. This points to the fact that the decision of peasant households is governed by a number of variables and one needs to go beneath these figures to really grasp the factors responsible for their actions.

c) The degree of participation in non-agricultural activities amongst the household heads in the various groups is shown in Table 5.

Table 5
Percentage of Households Engaged in Other Occupation

Group	Cultivated Area	Percentage Engaged in Secondary Occupations
1	0 - 1.50	28%
2	1.50 - 2.00	10%
3	2.00 - 2.50	17%
4	2.50 - 3.00	19%

A relatively higher number of peasant household heads in Group 1 are engaged in trade, craftsmanship, etc. as compared to all other groups. As they cultivate less area of land, they seem to participate more in other secondary activities to support themselves. This may be as a matter of available extra time and need.

The level of participation is minimum in Group 2. One possible explanation is perhaps the cultivation of more land with more or less the same number of work oxen as compared to peasants in Group 1 which may limit the time available for extra activities (See also Table 2). But at times of drought they are disposed to sell a larger proportion of their sheep-goat stock than all other groups, a not unlikely reflection of the fact that they have less cash at hand than peasants in Group 1 (See also Table 3 and 4).

The relatively better off groups, i.e. three and four, also register better access to other secondary occupations than peasants in Group 2. Since they have larger numbers of work oxen, they may get their land ploughed by other poor peasants under various forms of rental and borrowing arrangements [11, p. 3], thus enabling them to undertake other

activities. This indicates that the time factor may not have been a constraint as in Group 2. On the other hand, the participation is of lesser degree in comparison to peasants in Group 1 who seem to suffer land shortage.

4.2 Analysis

The hypothesis that livestock ownership positively affects the size of area cultivated appears to hold in very general terms (i.e. low correlation coefficient). In light of the various reports on livestock holding in the Northern and Central Highlands of Ethiopia, ILCA's recommendation that "livestock development will prove an important vehicle for overcoming the food crisis in Ethiopia" appears to be appropriate [10, p. 6]. In Gojjam, Shewa and Wello it has been estimated that the average ox-holding is respectively 1.42, 1.05 and 1.11 [17, Ch. 3]. The surveys in all the three regions confirm that well above 50 percent of the peasant households have one ox or none. ILCA's field reports [9, 10] also claim that 50 percent of the farmers around Debre Berhan have less than two oxen; those peasants with two or more oxen cultivate 32 percent more land than those with no oxen; and nearly 30 percent of the land is kept fallow mainly for dearth of draught power. The same general trend is also reported for Debre-Zeit area.

Another socio-economic survey [23, p. 12] also showed that 20 percent of the sample peasant households were unable to bring part of their land under cultivation for lack of ploughing oxen. The authors also argue that there has been a general reduction in the number of livestock between 1978 and 1983 on account of the drought [23, pp. 25-26]. It is not therefore difficult to judge the seriousness of the problem of draught power in the drought-prone parts of the country.

However, ILCA's proposed strategy seems to single out the lack of work oxen and improved inputs as the two most important impediments

for increasing crop yields [11, p. 3]. The results of the IDR survey on which this study is based on the other hand tally with another study [17, p. 73] that the scarcity of cultivable land also stands out as one of the major problems. Let us witness the table below.

Table 6
Average Number of Cattle Per Hectare

Group	Average Cultivated Area	Average No. of Cattle Owned	Average No. of Cattle per Hectare
1	0.98	8.49	8.66
2	1.58	8.44	5.34
3	2.07	9.93	4.80
4	2.54	10.48	4.13

Note: This is calculated from the figures given in Table 2.

The average number of cattle per hectare declines as we go from a lower group to a higher group (See last column). What are the possible interpretations of this pattern?

First of all, lower groups would have been able to cultivate larger area of land with the available draught power had it not been for scarcity of cultivable land. An integral ingredient of ILCA's development strategy ought therefore be the mitigation of land scarcity in the Northern and Central Highlands of Ethiopia. In other words, rural development policy in Ethiopia should entail far-reaching implications on population distribution and population control.

Secondly, cattle production may probably be a major means of supplementing income for lower groups such as selling the by-products

of cattle. One may even go further and contend that lower groups hire out draught animals to higher groups if the opportunity exists. It should be noted however that all these require further investigations and justifications.

The degree of participation in other secondary activities seems to be relatively stronger in the lower and upper most groups, i.e. 28% and 19% respectively. In the case of the former, it might be a matter of survival and in the latter case the situation requires further investigation. Still interesting in this finding is that peasants in Group 2 appear to participate least, only 10%, in other secondary occupations when compared with all other groups. Time and resources might have been the constraints as peasants in this group cultivate larger areas of land with more or less the same number of cattle in relation to farmers in Group 1.

Finally as peasants run out of food grains due to droughts and crop failures, they may sell out part of their livestock in exchange for grains [6, pp. 210-226]. These findings roughly indicate that peasants in lower groups are relatively more inclined to sell their cattle than peasants in upper groups. The sales of sheep and goats do not appear to have any systematic trend. But it seems that the level of participation in other secondary occupations has some bearing. For instance, those peasants in Group 2 put on the market relatively more of their sheep and goats in relation to peasants in Group 1 who seem to participate more in other activities.

VI. CONCLUDING REMARKS

At this closing juncture, some qualifying statements may be relevant. First of all, the reliability of the data is subject to some degree of reservations. We have worked with data obtained not through actual

observations and measurements at the place of origin but through interviews conducted at new settlement sites. The peasants were new arrivals and were exhausted from long distance travel and the concomitant discomforts may have led to "poor cooperation with the working team". Secondly, the enumerators were hastily drawn and sufficient training was not provided. Under such circumstances, at least some of the enumerators may not have correctly interpreted the questions to the peasants as intended by those who prepared the questionnaire. For example, a large proportion (about 66.6%) of the peasants reported to have cultivated more than three hectares, which may not be common in the regions covered by the study. This suggests that area cultivated was not correctly interpreted to the peasants. For some enumerators, it may have meant farm area in general, i.e., including fallow land; in other cases it may have included grazing land around the farm or even the compound. But this particular question was intended to know the actual area of land that was brought under cultivation in a normal year. Incidentally this is the precise reason for this writer to delete from the study the households who responded to have cultivated three hectares and above.

Secondly, it should be emphasized that area cultivated was tested against the total number of cattle owned and some tentative conclusions were made. The underlying assumption was that there is uniform proportion in the composition of cattle. This is doubtful and even unrealistic. For instance, small farmers may keep relatively more cows or more marketable animals than working oxen in order to diversify their sources of income.

Thirdly, the data were drawn from a large number of *awrajas* which have differences in the underlying factors such as the fertility of land and market outlet. The intensity of the problem may therefore vary. Ideally this type of study should at least try to separately treat each *Aawraja* [16, pp. 180]. In fact, even more serious is that our sample was pooled from

various regions and some of them may not have been adequately represented and the results may be biased toward some of them. In other words, the results may not be a representative of all. It would have been most appropriate to disaggregate the sample data by *Aawraja* in order to show the direction of bias if there is any or to show the places of origin of those households deleted from study for the reasons discussed in section III of the paper. The difficulty has been that this study was made on the basis of actual reports of the peasants on area cultivated before the data were entered into the computer. As the keys and the computer print-outs depict, the range classifications used in entering the data into the computer are not congruent with the groupings designed for the purpose of this study. Every effort was made to trace the raw data but in vain. The otherwise crucial suggestion of the referee could not therefore be incorporated into the paper.

Finally, it is also unfortunate that we have left out other relevant variables, opportunities for seasonal migration and the degree of urban agglomeration which can have significant bearing on the issues raised in the report. Hence this study can only serve as a benchmark and inspiration for further inquiry and it does not pretend to be complete and conclusive. A more systematic study based on well planned fieldwork and a closer examination of these and other variables is called for.

NOTES

1. A policy instrument used by the Government to rehabilitate drought victims has been the resettlement of peasants in the less densely populated wester and south-western parts of the country. The resettlement effort is critically reviewed by Dessalegn [5].

2. The issue of rehabilitation and recovery is thoroughly discussed in McCann [15], Wood [22].

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Appendix I

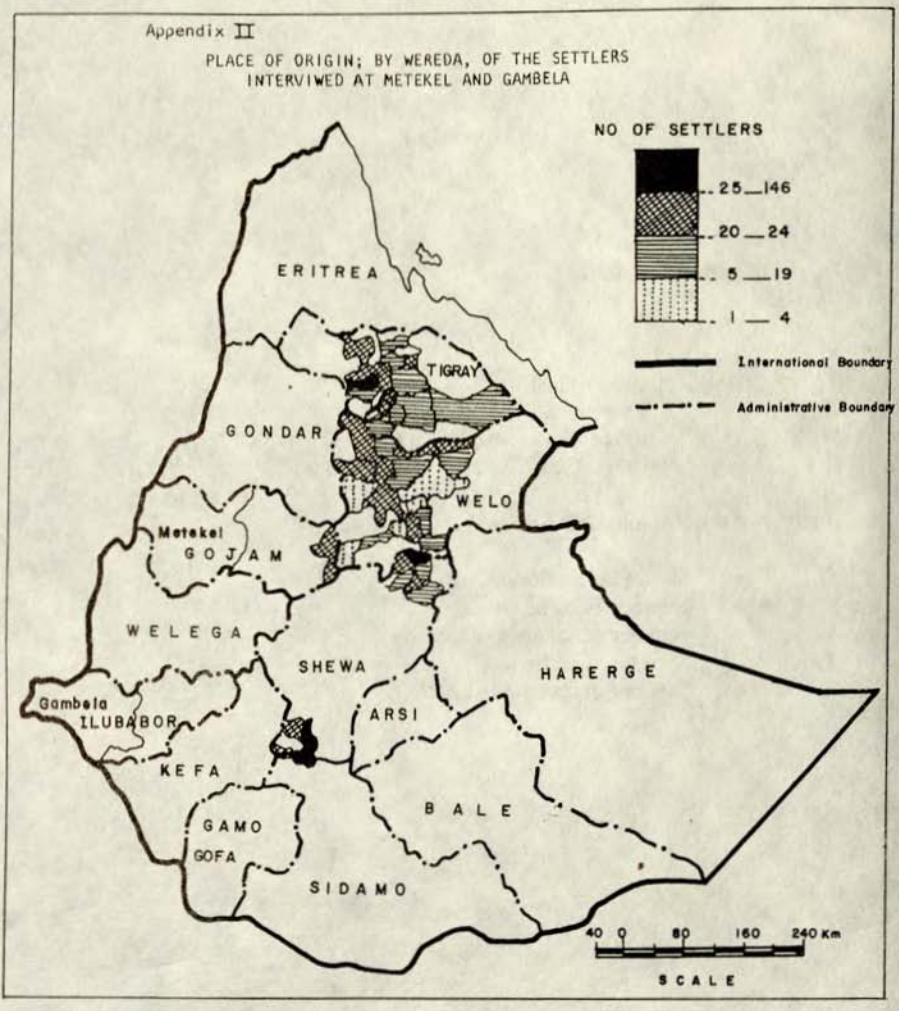
Pearson Correlation Matrix

	X	Y	Z	W	U
X	1.000				
Y	0.040	1.000			
Z	-0.005	0.304	1.000		
W	-0.054	0.517	0.075	1.000	
U	-0.004	0.204	0.468	0.269	1.00

Number of observations: 389 households

X = Size of area cultivated
Y = Number of cattle owned
Z = Number of sheep-goat owned
W = Number of cattle sold
U = Number of sheep-goat sold

Appendix II



Source: [13, Appendix]. See Reference