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ESTIMATING RELATIVE MAGNITUDES OF COMPONENTS OF FARM PRODUCTION IN SEMI-SUBSISTENCE FARMING : THE CASE OF KAVANGO

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Output from the non-formal, traditional or semi-subsistence sector is usually estimated on the basis-marketed production only. It is therefore often underestimated in national statistics and information on the relative importance of different sources of farm-household production is either not attempted or is unreliable. This paper provides an estimation of the magnitude and relative contribution of different production and consumption components for different farm-household types in Kavango. Some of the practical and conceptual issues involved are discussed, as well as the implications of the results obtained for development planning.

INTRODUCTION

Production in semi-subsistence farming is composed not only of production of crop and livestock products for sale and for consumption. It includes also earnings from non-farm activities, as well as the accumulation of productive assets such as cattle. Quantification of these production elements are normally captured separately in specific surveys, such as: crop production (Central Statistics Bureau (1997), household income and expenditure surveys (Central Statistics Bureau (1996), livestock censuses (Directorate of Veterinary Services (1997), Social Sciences Division (1994). Alternatively qualitative studies indicate the variation in sources of household income (Kavango Farming Systems Research and Extension, 1997), but do not provide information on the relative magnitudes of different elements production at the household level.

For development planning it is important to know not only the sources of household production, but to have a clear idea of the relative importance of market versus own consumption, crop versus livestock production, non-farm versus farm production. In this paper data from a farm management survey of Kavango (FMS, 1996) are analysed to provide an indication of absolute levels of household consumption and production and the relative shares of non-market versus market and farm versus non farm sources of consumption and production.

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FARMING AND HOUSEHOLD LIVELIHOODS IN KAVANGO

Farm-household in Kavango operate on traditional tenure. Cropland is allocated for use by individual households, who continue to have the right to use the land area as long as they continue to cultivate there. Non allocated land is available for use by the community for grazing, collection of fuelwood, thatching grass and so on. Most of the allocated crop land lies within a 5-10 km strip along the Kavango river. Inland areas, where water is available have also been settled, but village concentration is much higher along the river than inland.

Seasonal rainfall (November to April) averages 500mm (Rundu 50 year average). However, this is highly variable in space and time. A mixed farming system is practised. Cattle are used for land preparation and transport, as well as for consumption and sale. Goats and chickens are also commonly kept. Millet is the major crop, since it performs relatively well under prolonged dry spells, as is common. Some maize is planted in good rainfall seasons. Yields are low, averaging 270kg/ha and ranging from 420kg/ha to 120 kg/ha on average for the seasons 1992/3-1997/8 (Early Warning and Food Information System 1992-1998).

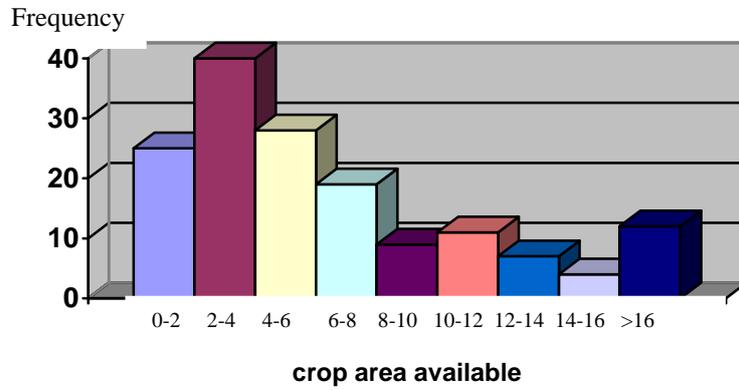
Households utilise a range of sources of livelihood. Livestock and crops are both consumed. Fishing and hunting and gathering wild fruits complement farming in the provision of own food supply. Cash is generated from crop and livestock sales as well as from non-farm sources. These latter include beer making, wages and remittances and pensions.

The major productive resources controlled by households are land, cattle and family labour. The distribution of these resources across households is highly skewed (Figure 1). Moreover there is a positive correlation between ownership of one resource and another. For example the ownership of oxen is positively related to the area of land cultivated. The area of land cultivated is also positively correlated to the number of adults (farm workers) living in the household.

Given such differences in the ownership of productive resources, it is to be expected that the both absolute production and consumption levels as well as the relative balance between sources of livelihood will vary considerably across households. For example it may be assumed that households with large cattle herds obtain a higher proportion of their consumption and production

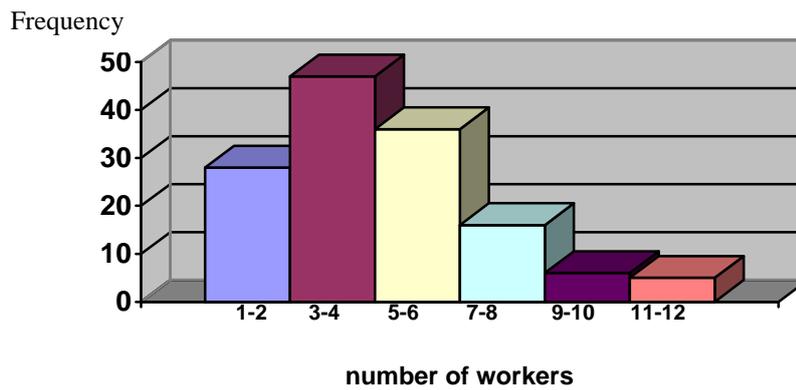
from livestock compared with those with fewer cattle, who will rely more on crop production for their livelihoods.

1a - Distribution of crop land



Distribution of productive resources between households

1b - Distribution of family farm workers



Consumption and Production Patterns by Cattle Ownership

1c - Distribution of Cattle Owned

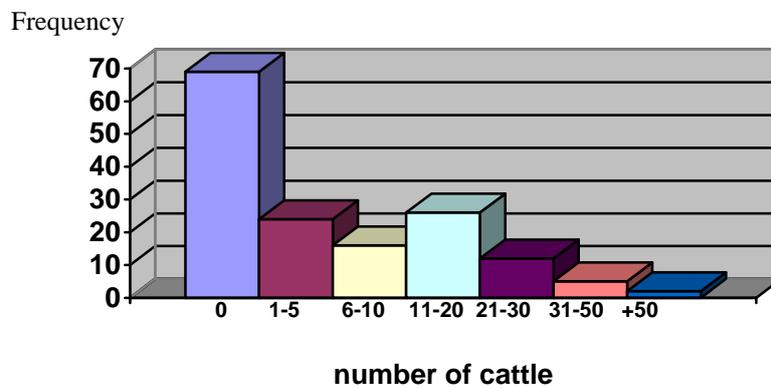


Figure 1: Distribution of resources

In this section data from the Kavango farm management survey (FMS, 1996) are analysed to examine consumption and production levels and patterns of three groups of households. The first group are those without cattle. They constitute 44% of households in Kavango. The second group are those owning between 1-10 head of cattle (26%). The final group are those owning 11 head of cattle and above (30%).

The results of the analysis are presented in Figure 2.

Consumption (Figure 2a)

Consumption is defined as consumption of own produced crop and livestock products plus cash expenditures. These are summarised for the three cattle ownership groups in Figure 2a.

Own consumption of livestock products is a combination of values of livestock consumed and changes in inventories. Thus if no livestock products are consumed, but herd inventory value increases, this is treated as a consumption gain. On the other hand if livestock products are consumed and this results in a decline in herd inventory values of equal magnitude to the consumption, this is treated as zero consumption gain. If herd inventory values decline by a greater magnitude than consumption, this is a consumption loss. In this last case a consumption loss may be compensated for by a cash income gain.

Figure 2a indicates that net own livestock consumption gains are small relative to the other consumption categories of cash expenditures and crops. However (unsurprisingly) own consumption gains from livestock are larger absolutely as well as relatively in-groups owning more cattle.

Groups owning more cattle have higher absolute levels of consumption of own produced crops. This is because crop production is directly related to area planted and households with higher number of cattle plant larger areas. However the relative contribution of own consumption of crops to total consumption remains the same between groups (about one third).

The absolute levels of cash expenditures increases for cattle owning groups with larger herds. However the proportional contribution of cash expenditures to total consumption is smaller for those households owning cattle (50%) compared with those owning no cattle (72%).

Consumption, Income & Production per Household

Figure 2a

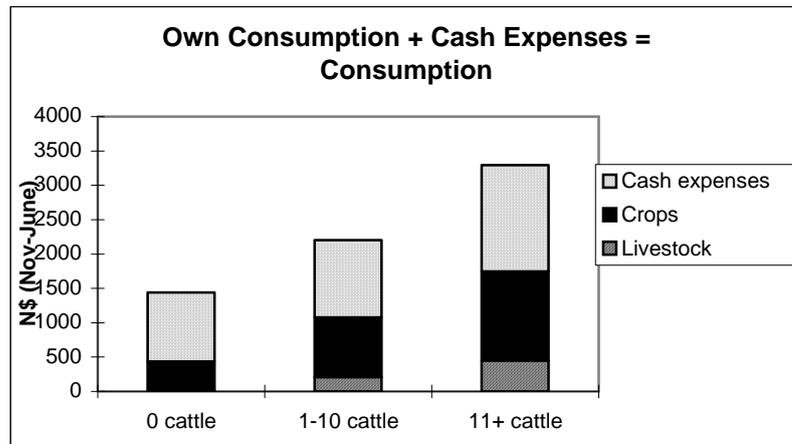


Figure 2b

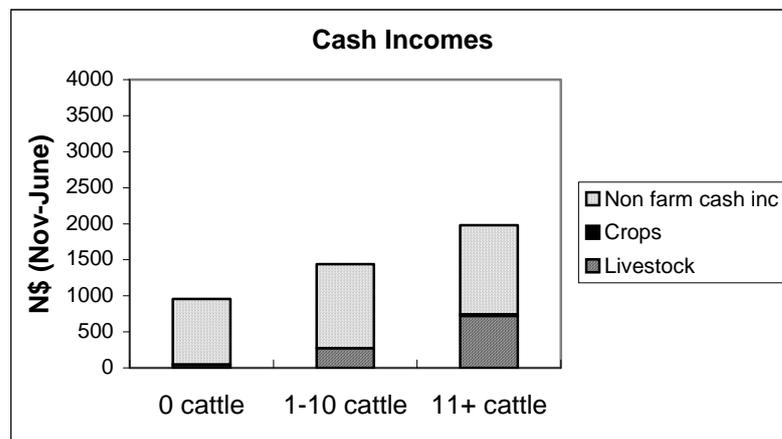
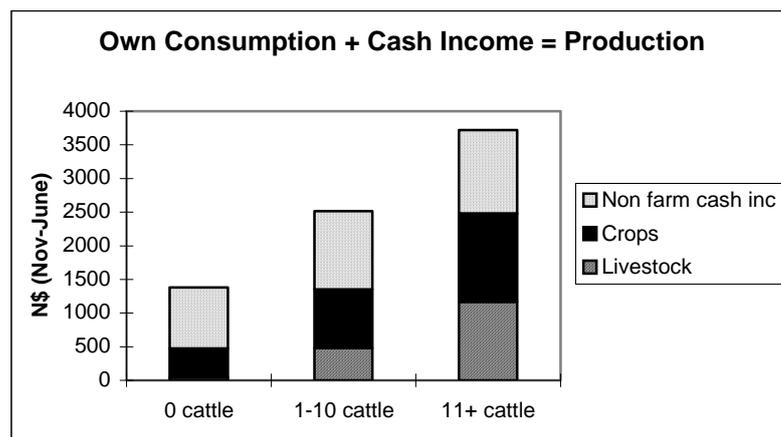


Figure 2c



Households without cattle have a relatively higher need for cash to meet their consumption requirements than do households who own cattle.

The major sources of this cash income are discussed in the next section.

Cash incomes (Figure 2b)

Effectively there are only two major sources of cash income: livestock and non-farm cash income. Crops are not a source of cash income for most households, even those with many cattle, cultivating 10 hectares or more.

This means that for households with no cattle, virtually all cash needs must come from non-farm sources. As cattle herds increase there is an increase in both absolute and relative amounts of cash income derived from sales of livestock and livestock products. While for households with no cattle, 95% of their cash income comes from non-farm sources, for the largest cattle owning group, only 63% of cash incomes is from non-farm sources.

Cattle then are an important source of cash, in contrast to crops, which are not.

Production (Figure 2c)

Crops are however an important source of production, contributing about one third of overall production. *Indeed crops retain the same importance as a source of overall production regardless of cattle herd size.*

From Figure 2c it is apparent that production from both crops and livestock become more important in terms of overall production as herd sizes increase. The contribution to overall production by non-farm cash sources is one third for households with 11 cattle or more, it is half for households with herds of 1-10 head and it is two thirds for non cattle owning households.

Households with no cattle are under stronger pressure to seek non-farm production opportunities than households with cattle.

ELEMENTS OF CASH NEEDS AND SOURCES

It has been seen that "households without cattle have a relatively higher need for cash to meet their consumption needs than do households who own cattle". In the following two sections we look closer at the cash needs and sources of cash income for different cattle owning groups.

CASH EXPENDITURE PATTERNS

Table 1: Priority sources of income - by rank and % of total cash income per household

| | No cattle | | 1-10 cattle | | 11+ cattle | |
|------------|-----------|----|-------------|----|------------|----|
| | rank | % | rank | % | rank | % |
| Maize meal | 1 | 39 | 1 | 43 | 1 | 45 |
| Other food | 2 | 30 | 2 | 19 | 3 | 14 |
| Power hire | 3 | 17 | 3 | 12 | 2 | 16 |
| School | 5 | 3 | 5 | 5 | 4 | 11 |

The major cash need for all households is for the purchase of maize meal. Maize meal and other food account for 69% of cash expenditure for no-cattle households, for 62% of expenditure for households with 1-10 cattle and for 59% of expenditure for large herd owners.

Households with no cattle also spend a higher proportion of cash expenses on hiring power sources (especially for ploughing) than other household groups. Households with large cattle herds seem to devote a relatively high proportion of their expenses to schooling.

SOURCES OF CASH INCOME

Table 2 shows that the priority sources of income are different for different cattle ownership groups. For those with no cattle, beer brewing is the major cash source², followed by wages/remittances and pensions.

Table 2: Priority sources of income - by rank and % of total income per household

| | No cattle | | 1-10 cattle | | 11+ cattle | |
|-----------------------|-----------|----|-------------|----|------------|----|
| | Rank | % | Rank | % | Rank | % |
| Livestock sales | 8 | 4 | 2 | 19 | 1 | 36 |
| Beer making | 1 | 23 | 4 | 4 | 4 | 8 |
| Wages and remittances | 3 | 21 | 1 | 30 | 2 | 35 |
| Pensions | 2 | 23 | 3 | 11 | 3 | 9 |

² One non cattle owner with particularly large earnings from brewing has been left out of the analysis.

For those owning cattle, wages and remittances are major cash income sources. For large herd owners, cash from livestock sales are equally important.

Pensions come in the first 3 for all groups. However they are more important for non-cattle owning households than those having cattle.

DISCUSSION

The farm management survey attempted to provide a comprehensive set of data on farm household consumption and production. At the outset it was recognised that evens this survey would have to be partial. It was difficult to quantify production and consumption resulting from hunting and gathering activities. Only information on persons and time spent in these activities was collected. Another major omission was the failure to account for bartering transactions between households. The first questionnaire did include a section to capture these transactions, but it became too complicated to administer in a comprehensive survey instrument.

Even with the transactions recorded, the distinction between consumption and production is not always obvious in subsistence households. A case in point is the treatment of livestock. Increases in livestock values, through births and weight gains represent production even if nothing is consumed or sold. Thus inventory records on additions and reductions in different classes of animals are needed to measure production, as well as records of consumption and sales of livestock products.

Despite the data shortcomings and conceptual issues, it has been possible to provide an indication of the relative magnitudes of different components of production and consumption for different Kavango households. As hypothesised, both absolute and relative magnitudes of production and consumption components differ according to households resource base. However, an important result is the finding that cropping represents a fixed and relatively high proportion (33%) of household production for all household types in Kavango. Livestock production however clearly becomes more important the more cattle that is owned, but still remains less than that of crop production even for the group owning most cattle. On grounds of both equity and impact on household welfare, development planners should concentrate on support to crop production, even though little is marketed compared with livestock.

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Appendix

A1. Significance tests of differences between groups

The table below indicates the probabilities of significant differences existing between cattle ownership groups in respect of own consumption, incomes and values of production. Where probability values are less than 0.1, it means that there is less than 10% probability that the differences observed between groups are not real differences due to the grouping and could have occurred by chance due to random variation in the data. The F statistic gives an indication of the probability of the differences between groups not being real. When the F statistic indicates a significant difference between the groups, the t statistic can be used to examine whether there is a significant difference between any two groups.

With survey data of this type, which are subject to high variations, it is usual to take probabilities of 10% or less as indicating that observed differences are due to the groupings used. On this basis then the following statements can be made.

| | N\$ per household | | | | | |
|-----------------------|-------------------|-------------|-------------|------------|------------|------------|
| | 0 cattle | 1-10 cattle | 11+cattle | F prob | t prob | t prob |
| | A | B | C | | A-B | B-C |
| CONSUMPTION | 1404 | 2203 | 3291 | .00 | .02 | .02 |
| cash expenses | 1005 | 1126 | 1549 | .21 | | |
| livestock utilisation | 91 | 248 | 595 | .00 | .00 | .00 |
| inventory changes | -86 | -41 | -145 | .86 | | |
| crops | 430 | 869 | 1296 | .00 | .00 | .01 |
| CASH INCOME | 956 | 1439 | 1981 | .02 | .06 | .12 |
| livestock | 38 | 273 | 721 | .00 | .00 | .00 |
| crops | 12 | 2 | 21 | .42 | | |
| non-farm | 906 | 1164 | 1239 | .57 | | |
| PRODUCTION | 1336 | 2517 | 3723 | .00 | .00 | .03 |
| livestock | 43 | 481 | 1169 | .00 | .00 | .01 |
| crops | 432 | 871 | 1314 | .00 | .00 | .01 |
| non-farm | 906 | 1164 | 1239 | .57 | | |

The value of own consumption per household differs significantly between groups. This is due to significantly larger values of own consumption of crops and livestock by households with no cattle compared to those with some cattle and also by households with smaller herds compared to those with larger herds.

Cash expenses and livestock inventory changes are not significantly different between groups.

Total cash incomes are significantly higher for cattle owners versus non-cattle owners. They are not significantly higher for owners of larger herds versus owners of smaller herds. Cash income from sales of livestock products are significantly higher for owners versus non owners as well as for large herd owners versus small herd owners. Cash incomes from other sources (crops and non-farm) are not significantly different between groups.

The significantly higher value of production for cattle owners versus non-owners and for larger herd owners versus smaller herd owners is due to differences in crop and livestock production. It is not due to differences in non-farm cash income, which is not significantly different between groups.

A2 Per capita analysis

The above analysis has been based on consumption and production per household. Since the number of household members tend to be larger for households with more cattle, it may be that consumption and production per household member are no different across cattle ownership groups.

To test this, the household consumption and production data were divided by the number of members in the household to give per capita measures. The results for the elements of consumption and production that were significantly different on a per household basis are presented in the table below.

| | N\$ per capita | | | |
|------------------------|----------------|-------------|------------|------------|
| | 0 cattle | 1-10 cattle | 11+ cattle | F prob |
| OWN CONSUMPTION | 186 | 241 | 303 | .04 |
| livestock utilisation | 12 | 24 | 62 | .00 |
| crops | 60 | 91 | 124 | .00 |
| CASH INCOME | 118 | 147 | 191 | .17 |
| livestock | 5 | 23 | 72 | .00 |
| non-farm cash | 112 | 118 | 117 | .98 |
| PRODUCTION | 173 | 268 | 345 | .00 |

When examined on a per capita basis the differences between groups is not so great as on a per household basis. Nevertheless production and consumption is significantly lower per capita in households with fewer than with more cattle.

On a per capita basis there is no significant difference in cash income between household groups. Non-farm cash incomes per capita are almost the same for all groups, although per capita cash income from the sale of livestock products is significantly higher for household with more cattle.

This analysis shows that households with no or few cattle do not consume and produce less because they have fewer members compared with households with large herds. The people in households with no or few cattle consume and produce less per person than their counterparts in households with large herds.