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RURAL ECONOMY: THE CASE OF SMALLHOLDER MIXED
FARMERS IN THE SEMI-ARID ZONE OF MALI**

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Introduction

1. Contrary to the widely held view that rural households are unisectoral in their production, the typical household in the semi-arid zone of Mali derives its income from cropping and livestock activities as well as from such off-farm sources as migration remittances, crafts and non-agricultural labour earnings. This paper estimates the relative shares of crop, livestock and non-farm income sources in total cash incomes of sample smallholder producers in the semi-arid zone of Mali. It also attempts to understand the mechanisms and motives of cash income transfers from one sector to the other.
2. The paper begins by describing the study area and the farming system of the sample, followed by an estimation of cash earnings from various sources in the 1987/88 farming season. It then describes the various mechanisms by which earnings generated from a sector are transferred to other sectors in the rural economy. The paper ends with conclusions and policy implications based on the findings of the study. An appendix at the end of the paper describes the methodology used to collect data for the analysis.

Study area

3. The study was conducted in the Banamba zone of Mali, located west of the Niger River and about 150 km north of Bamako, the capital of Mali. The zone is typically semi-arid, lying within the isohyets of 600 and 800 mm of annual rainfall, and has approximately 120 plant-growth days on average. It experiences a short rainy season between June and September, followed by a long dry period from October to May.

The farming system

4. The zone is characterized by mixed crop-livestock production systems where the principal crops are millet, sorghum, cowpeas and groundnuts. Livestock kept include cattle, sheep and goats as well as donkeys and poultry. Table 1 summarizes the cropping patterns, farm implements and livestock ownership or holding of an average household in the study area. The averages are computed over 35 households regularly monitored by a multidisciplinary research team from the Malian Projet Sectoriel (Ly, Bartholomew, and Sissoko, 1987).

Table 1. Cropping patterns, farm implements and livestock ownership among smallholder households in the semi-arid zone of Mali, 1988/89

<u>I. Cropping pattern</u>	<u>Crop area (ha)</u>	<u>% of total</u>
a) Cereal crops in pure stands		
- millet	1.13	8.28
- sorghum	0.23	1.68
- maize	0.99	7.18
b) Cereal/Leguminous associations		
- millet/cowpea/groundnut	7.35	53.85
- sorghum/cowpea/groundnut	1.16	8.50
- millet/sweet potatoes	1.20	8.79
- sorghum/peas/calabash	0.25	1.83
c) Other crops		
- groundnuts in pure stands	0.98	7.18
- water melon	0.10	0.65
- peas in pure stands	0.26	1.90
Total all crops	14.00	100
<u>II. Agricultural implements</u>	<u>Average number/family</u>	
- animal drawn plough	2	
- multiple purpose weeder	1	
- planter	0	
- animal-drawn cart	1	
<u>III. Livestock</u>	<u>Average number/family</u>	
- oxen	3	
- other cattle	21	
- sheep and goats	34	
- donkey	1	

Source: Ly et al (1987)

5. Of the total crop area about 10% is planted to millet and sorghum in pure stands, and 72% to mixed crops including crop/leguminous associations as well as sweet potatoes, bambara nuts (peas) and calabash. On average a household owns two animal-

animal-drawn ploughs, a weeder and a cart as farm implements, and 24 head of cattle, including 3 oxen and about 34 small ruminants. Each family consists of an average of 15 members 7 of which may be considered agriculturally active i.e. capable of providing agricultural labour.

Net value of farm production

6. The total value of crop and livestock production (sales and on-farm consumption), less the variable costs of production for the average household in the sample was estimated at 491596 CFA (285 CFA = US\$1) per family over the 1987/88 cropping season (Table 2). Crops and livestock represented 59% and 41% of total farm value respectively. Grain crops, which were predominantly millet and groundnuts, contributed about 76% of the total value of crop production, while crop residues and non-grain crops contributed 15% and 9% respectively.
7. Livestock value was primarily derived from milk production (from both cows and small ruminants) and live sales of smallstock. These represented respectively 39% and 36% of the total value of livestock production. Cattle sales accounted for the remaining 25%.

Table 2. Average net values of crop and livestock production for sample producers in the semi-arid zone of Mali, 1987/88

Sector	Sub-sector	Average net value (CFA/ha)	% of Total
Crop			
	Grains	220439	45
	Crop residues	42966	9
	Non-grain	26756	5
	Sub-total	290161	59
Livestock			
	Milk (cow and smallstock)	78959	16
	Live smallstock sales	72710	15
	Live cattle sales	49766	10
	Sub-total	201435	41
Total crop and livestock		491596	100

Sources of cash income (farm and non-farm)

8. Table 3 presents a summary of cash income sources and their relative contributions to total cash incomes of households in the sample during the 1987/88 cropping year. Only 20% of total cash income was obtained from crop production, an indication that crop production was used primarily for subsistence. Livestock on the other hand, were a major source accounting for 71% of total cash income. Non-farm sources, including remittances, contributed only 9% of total household cash income.

Table 3. Sources of cash income for sample producers in the semi-arid zone of Mali, 1987/88

Sector	Sub-sector	Net cash income (CFA/hh)	% of Total
Crops	Grains	30861	14.9
	Crops residues	6877	3.3
	Non-grain	3745	1.8
	Sub-total crops	41483	20
Livestock	Live small ruminants sales	603070	30.6
	Sheep fattening net income	3460	1.5
	Sub-total small ruminants	66530	32.1
	Live cattle sales	56835	27.5
	Cattle fattening net income	8117	3.9
	Cow milk sales	14675	7.6
Sub-total cattle	79627	39	
Sub-total livestock	146157	71.1	
Non-farm	Gardening	80	0.0
	Gathering (wood, shea butter etc.)	3842	2.0
	Artisanal (arts, crafts, weaving)	2880	1.4
	Remittances	11730	5.5
	Sub-total non-farm	18532	8.9
Total cash income, all sources		206172	100

9. Using the above figures and the data from Table 2, we can calculate that cash income from crop farming represented 14% of the net value of crop production while that generated by livestock sales represented 73% of the net value of livestock production. The corresponding figure for the overall share of marketed output (i.e. both crops and livestock) in the total value of farm production is 38%. These figures show that the market integration of livestock production by the sample households in semi-arid Mali is very high, contrary to widely held views that smallholders are subsistence-oriented.
10. Considering cash income from crop farming alone, grain sales accounted for 74% while crop residues and non-grain crop sales represented 17% and 9% respectively. For livestock, small ruminant sales represented 43% of total livestock cash income, while sales of live cattle and cow milk accounted for 39% and 10% respectively. The remaining 8% came from cattle and sheep fattening activities.

Food crop acquisition and disposal patterns

11. Groundnuts were the most important cash crop grown. About 50% of the sample households sold some quantity of groundnuts during the year. One in every three groundnut selling households sold groundnuts soon after harvest (i.e. between October and January), while about 20% did so in the inter-season between harvest and the next cropping season.
12. Sorghum and millet, the staple food crops in the area, were rarely sold for cash (only 12% of the households in the sample sold them for cash). They were usually traded on a non-cash basis such as in-kind payments for harvesting and threshing labour. Non-producing households in particular build up substantial grain reserves through this type of transfers. Table 4 shows in percentage terms a typical farm household's acquisition and disposal pattern of food crops during the 1987/88 cropping season.
13. The bulk of the total stock of food crops (90%) was obtained from a farm household's own production, while 8% was added from purchases during the pre-planting season presumably when the initial stock from own production has been depleted. Transfers into the stock accounted for only 2% of the total. In respect of disposals, 75% of the total consisted of home consumption while 14% was transferred out and 11% sold for cash.

Table 4. Food crop acquisition and disposal patterns of an average farm household in the semi-arid zone of Mali, 1987/88

<u>Sources</u>	<u>Acquisitions</u>	<u>Main period of transaction</u>
	<u>%</u>	
Own production	90	Post-harvest
Purchases	8	Pre-planting
Transfers (gifts and payments in kind received)	2	Post-harvest
	<u>Disposals</u>	
Home consumption	75	Year-round
Sales	11	Post-harvest
Transfers (gifts and payments in kind given out)	14	Post-harvest

Sale patterns of livestock

14. Sheep and goats were sold throughout the year with the volume of sales varying in opposite direction to the seasonal availability of food grain from farmers' own production. For example, during the period immediately following harvest (October to January), only 15% of the total sales was made. During the inter-season (February to May), a period when food grains were reasonably available, 32% of total small ruminant sales was made, while during the most critical period of food shortage (June to September), 53% of the sales was recorded. Cattle sales followed a similar pattern. In this case also most sales were made between June and September but cattle prices were also at their peak during this period.
15. During the survey year, which was a normal one with a normal harvest, 37% and 19% of the sample households sold smallstock and cattle respectively. In poor crop years these percentage figures are likely to be higher. Livestock, particularly smallstock, generally serve as an important insurance mechanism through which smallholder mixed farmers readily liquidate these assets in poor crop years to obtain cash for food grain purchases.

Crop and livestock cash income transfers towards the satisfaction of household needs

16. In the rural economy, households easily generate cash through the sale of stored

harvests or animals to meet cash demands as they come. The main motives for which crop products were sold by the sample included food purchase, tax payments and to meet miscellaneous family expenditures. In 59% of the cases, the reasons for crop sales were attributed to the purchase of food grains, which the sample farmers did not produce themselves, and for the purchase of condiments. Tax payments were cited in 22% of the cases as reasons for the sale of crop products, and 2% for the purchase of animal feed. The proportion of crop cash income used for different purposes varies from product to product. For example, 60% of the cash income obtained from the sale of groundnuts, the important cash crop, was used to acquire rice and maize from the market.

17. As noted earlier, livestock activities provide the main source of cash incomes for smallholder households in the semi-arid zone of Mali. Livestock were sold for the same reasons as crop products but in addition, livestock sales generated cash to buy animal feed and to purchase other livestock. Livestock sales were also used for the payment of hired labour in both crop and livestock production as well as for the purchase or repair of farm equipment. Expenditures to meet miscellaneous family obligations constituted by far the most important reason for livestock sales. Such obligations include baptisms, religious festivals, circumcisions, medical treatments, travel, as well as the purchase of condiments and clothes. Table 5 summarizes the most important purposes of expenditure for which livestock were sold and the relative contributions of sales of the two livestock species in meeting household cash needs.
18. On average 43% of the cash generated by livestock sales went to meet miscellaneous household expenditures while 10% and 7% was spent on food grain and animal feed purchases respectively. Payment of taxes and purchase of livestock took closely similar shares as the latter two purposes of expenditure, 12% and 6% respectively. Overall, small ruminant and cattle sales contributed approximately equal amounts to the total cash generated to meet all expenditure purposes but showed different levels of contributions to expenditure for some specific purposes. For example, small ruminant sales contributed about 53% and 72% of the cash used to meet miscellaneous household expenditures and food grain purchases respectively. On the other hand, cattle sales contributed about 85% and 73% of the cash used to purchase animal feed and to re-invest in livestock respectively, and 61% for the payment of taxes. Small ruminant sales are probably made to meet frequent but relatively small cash needs (e.g. food grain purchases) while cattle sales are probably

made to meet lumpy expenditures which have to be made much less frequently (e.g. payment of taxes).

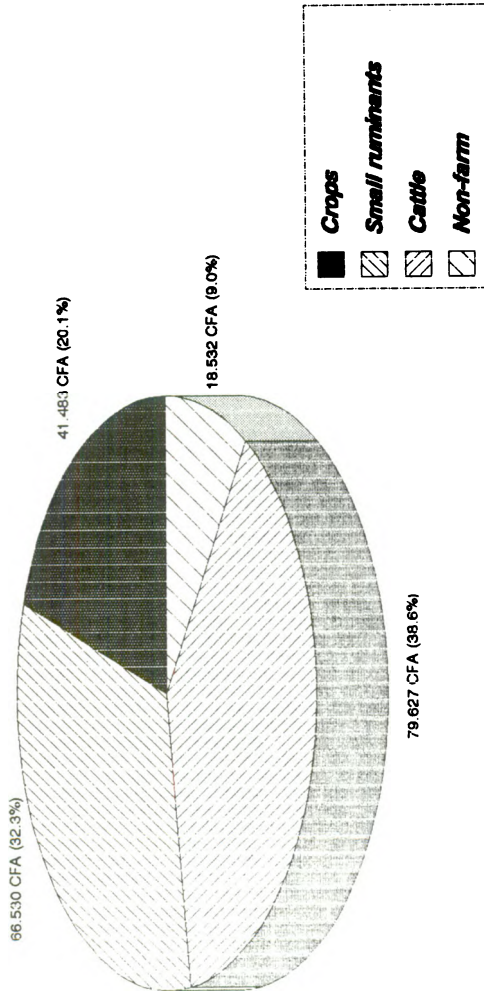
Table 5. The role of livestock in meeting various household expenditure needs of smallholder mixed farmers in the semi-arid zone of Mali

Purpose of expenditure	Contribution of livestock sales to cash expenditure (%)		
	Average/ <u>Total</u>	- - - Of which - - - Small <u>Cattle</u> <u>ruminants</u>	
Miscellaneous family needs condiments, baptism, clothes, festivities, travel	43	53	47
Purchase of food grain	7	71	29
Payment of taxes	12	39	61
Payment of hired labour	2	40	60
Purchase of animal feed	10	15	85
Purchase of livestock	6	27	73
Purchase/repairs of farm equipment	1	100	0
Other	19	64	36
Total number of animals sold	235	203	32
Total cash income obtained (CFA)	2770290	1389290	1381000

Conclusions and policy implications

19. Figure 1 graphically summarizes the relative shares of the various farm and non-farm activities that constitute a smallholder mixed farmer's total cash income in the semi-arid zone of Mali. It shows that crops, smallstock, cattle and non-farm activities contribute 20%, 32%, 39% and 9% to total cash income respectively. Although based on a small sample of households that may be considered better endowed in resources than the average Sahelian smallholder mixed farmer, the results strongly suggest that smallholders consider opportunity costs across all sectors of the economy, both farm and non-farm, in their income generating activities.

Fig. 1 Relative shares of the different sources of cash income of smallholder mixed farmers in the semi-arid zone of Mali, 1987/88



20. In general, the smallholder mixed producers consumed most of their crop output and sold cash crops to purchase food grains they did not produce. They also used cash income from crop sales for the purchase of animal feed (see para 16). Livestock cash income supports the purchase of cereals in the critical food shortage periods of the year. They also are used for paying hired agricultural labour as well as for the repair of farm equipment. Livestock cash incomes are also re-invested in livestock activities such as purchase of more stock and animal feed. Non-farm income supports both crop and livestock activities in the rural economy.
21. Another finding of the study is that the sample households are involved in market activity either through cash sales or transfers to generate both income and food. This contrasts to the conventional view in policy discussions of rural households, particularly semi-arid livestock producers, as being generally subsistence-oriented and by implication largely insensitive to price incentives.
22. The implications for policy are that policy instruments that tend to emphasize unisectoral pathways to food self-sufficiency, such as proclaiming target grain production levels to which all resources are diverted, may no longer be effective. A household as seen from the results of the study can assure its food self-sufficiency by generating cash from other sectors to have access to food through the market. Rural households' access to input and output markets needs to be improved, and reasonable prices for the wide range of products from which they earn their living be assured.

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APPENDIX

Data Collection Methodology

1. A sample of 15 households, representative of households in the study area in family size, cropping pattern, farm implement ownership and livestock holding was selected for detailed monitoring in the 1987/88 cropping season. Data were collected by interviews, measurements and observations from January 1987 to February 1988. Information on agricultural activities including total cropped area, types of crops grown, agronomic practices, harvested yields, crop sales and on-farm consumption was collected. Data on family size and composition, labour availability and use in various farm and non-farm activities were also collected. Livestock data collected included stock holdings and their composition as well as the herd dynamics (births, deaths, purchases, gifts, slaughters and live sales). Information on off-farm activities such as constructions, trade, handicrafts (mat-making, basket weaving, etc.), fruit gathering and remittances were also collected.
2. The analysis was carried out in two steps. First, the value of crop harvests (sales and on-farm consumption) less the costs of all inputs used was computed. A similar analysis was done for livestock production. The contributions of crop and livestock production in the total value of farm production were then estimated. In the second step, only cash incomes were considered. The cash value of crop and livestock transactions as well as earnings from non-farm activities were computed and the relative contributions to the farmer's total cash income determined.
3. Supplementary information was collected on the volumes and numbers of agricultural and livestock products sold, the periods of and principal motivations for their sale and actual uses to which the cash incomes from the various sources were put. Similar information on purchases of agricultural and livestock products was collected. The information on sales and purchases and the periodicity of the transactions was used to describe the income transfer mechanisms across sectors in the rural economy.

