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AN ANALYSIS OF SMALLHOLDERS' PRODUCTION
AND MARKETING PATTERNS FOR COARSE
GRAINS IN SOUTHERN MALI, 1985-88

by

Victoire D'Agostino, Josué Dioné and John Staatz

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I. INTRODUCTION

During the 1980s, there were many calls to increase food prices in Africa in an effort to stimulate agricultural production and raise rural incomes. It was generally argued that most of the poor in Africa were farmers, and hence raising the price of basic staples, the major product of these farmers, would increase rural incomes as well as stimulate production. The degree to which such a price policy will be successful in reaching its objectives depends critically on (a) the elasticity of supply with respect to price, i.e., the capacity of farmers to expand production in response to higher prices and (b) the degree to which the majority of farmers are net sellers of these staples. This paper presents results from analysis based on three years of data on the production and marketing of coarse grains (millet, sorghum and maize) by a sample of smallholders in southern Mali to address these issues. The analysis highlights: (a) the differential impact of price policy on net sellers and net buyers of grain in rural areas, (b) the central role that rural grain markets play in helping assure the household food security of the large number of farm households that are net buyers of grain, (c) the interactions among farm-level technologies and rural institutions in determining the supply response to higher prices, (d) the role of cash crops in influencing grain production and sales, and (e) the impact of non-agricultural policies, such as tax policy, on household grain production and sales behavior. Because the data cover three very different rainfall years, the analysis also illustrates how farm households in Mali adapt their commercial behavior as production and market conditions change.

II. THE DATA

The analysis is based on data collected from November 1985 to October 1988 from a sample of 190 randomly selected farm households in the grainbelt areas of the CMDT and OHV zones of southern Mali. This period includes the 1985/86 and 1986/87 cropping seasons, which were characterized by relatively abundant rainfall, as well as the 1987/88 season, in which rainfall was mediocre. The data include annual production estimates of millet, sorghum and maize, as well as monthly volumes of coarse grain sales and purchases made by individual farmers during the three-year period. The data were collected under the CESA-MSU Food Security Project¹. A preliminary analysis of production and marketing patterns using the first two years of data has already been undertaken (Dioné, 1989; D'Agostino, 1988; Dioné, 1987).

Both the CMDT and OHV are comprised of northern areas, where rainfall ranges between 550 and 750 mm, and southern areas, where annual rainfall averages between 1150 and 1450 mm. Consequently, both zones are suitable for cultivation of the same rainfed food and cash crops, including millet, sorghum, maize, cowpeas, cotton and groundnuts (Dioné, 1989). Despite their ecological similarities, the CMDT and OHV differ greatly in the importance of cash-crop production in gross crop income: cash crops (cotton and groundnuts) represented 38% of gross crop income in the CMDT and only 14% in the OHV (Dioné, 1989). Cotton alone constitutes 36% of gross crop income in the CMDT compared to 8% in OHV in 1985/86. With eight times the cotton area and eleven times the average cotton production per farm, the CMDT is clearly the more important cotton-producing zone. The development of cotton production in the CMDT has been closely linked with the expansion of agricultural credit, input and output markets, infrastructure, and farmer training and education. Overall, gross crop income per farm household was 128% higher in the CMDT than in the OHV in 1985/86 (Dioné, 1989).

¹For background on the CESA-MSU Food Security Project and the sampling procedures used, see Dioné, 1989.

III. ANALYSIS OF FARM-LEVEL GRAIN PRODUCTION

Table 1 provides a three-year view of coarse grain production among the 190 farm households participating in the CESA-MSU study. For the total sample, coarse grain production per capita increased by 35% from 1985 to 1986 and decreased by 25% from 1986 to 1987. Per capita production for the entire sample exceeded consumption requirements by 20% in 1985, by 62% in 1986 and by 21% in 1987.² However, only between half and two-thirds of the sample, depending on the year, had a marketed surplus beyond consumption requirements.

As suggested by Dioné, one major factor explaining differences in coarse grain production is the institutional environment. During all three years, coarse grain production per farm, per worker, and per capita was consistently higher in the CMDT than in OHV, although this difference was the most marked in the most favorable production year, 1986. In all three years, the CMDT zone's production per capita exceeded annual consumption requirements: by 50% in 1985, by 109% in 1986 and by 44% in 1987. In contrast, during the three-year period, the OHV zone was only able to meet between 61% and 78% of its food grain needs. Differing per worker production levels for the two zones explains, in part, why the ability to meet consumption needs varies so much between these zones. The CMDT's coarse grain production per worker levels on average were double those of the OHV. The proportion of households with a marketable surplus also differed between the two zones: in the CMDT the proportion totaled 67-87% depending on the year, compared with 24-27% in the OHV. These figures, however, do not take into account social obligations that necessitate gifts of coarse grains and therefore reduce the actual amount of coarse grain available for sale.³

Differences in the natural environment of production also contribute to differences in coarse grain production levels. The strongest difference between production per worker in the northern and southern subzones occurred in 1985 (49% higher in the south), and the lowest in 1986 (18% higher in the south).

Ownership of farm equipment, particularly animal traction equipment, also greatly affected household grain production levels. Per-worker coarse grain production for equipped farms exceeded that of non-equipped farms by between 47% and 50%. The proportion of equipped farmers with a potential marketable surplus varied between 64% and 84% depending on the year, while that for non-equipped farms ranged from 25% to 48%. Equipment levels vary strongly by region. In the southern and northern subzones of the CMDT, equipped farms represent 40% and 52%, respectively, of the total farm population of the survey villages. In contrast, in southern and northern OHV, equipped farms are only 15% and 17%, respectively, of the total farm population of the survey villages.

IV. ANALYSIS OF GROSS SALES OF GRAIN

Table 2 provides a view of aggregate trends in gross sales of coarse grains over the three-year study period. About 63% of sample farmers sold coarse grains in 1985/86, which was the first good year of production following a series of drought years.⁴ In the two subsequent years, the proportion of selling households dropped to 58% in 1986/87 and 53.4% in 1987/88. The stability in the number of selling households masks the complexity of farmers' sales decisions, which take into account changes in size of harvest, marketing decisions of the previous years, and the levels of on-farm stocks. Sales in 1985/86 were determined both by

²These figures were estimated using a grain consumption requirement of 188 kg per capita (Sundberg, 1988).

³Net coarse grain gifts accounted for 72% of net outflows of grain among households in the first two years of the study. Due to space limitations, this paper addresses only commercial transactions.

⁴In Mali, the marketing year runs from November, when the main harvest of millet and sorghum begins, to October of the following year.

the relatively good harvest and by farmers' need for cash to repay debts accumulated during the drought of the early 1980s. In 1986/87, coarse grain production reached even higher levels than in the previous year. However, slightly fewer farmers sold grain than in 1985/1986, reflecting a decision to allocate surplus production to re-building on-farm stocks during this second consecutive good harvest year. Although 1987/88 was characterized by a poor harvest relative to the two previous years, the number of market participants did not decline significantly. As discussed below, this constant level of market participation appears to reflect the need on the part of an important number of rural households to sell grain, regardless of depressed production levels.

However, while the percentage of farms selling grain did not vary widely during the three-year study period, average sales levels did. Average sales of coarse grains per farm increased from 228 kg in 1985/86 to 319 kg in the higher production year of 1986/87. In 1987/88, however, average sales per farm fell to 200 kg, a decline of 37%. Despite this fall in average sales per farm, the percentage of production sold in 1987/88 actually was slightly higher than the figure for the preceding two years, (8.2% compared to 7.8%) due to the fall in production levels resulting from inadequate rainfall in 1987/88.

This aggregate picture of the coarse grain marketing patterns suggests that certain aspects of the market, such as the proportion of households selling grain, the proportion of production sold and the market share of different grains, remain constant from year to year, despite large differences in rainfall patterns. The mechanism by which sample households appear to respond to changes in rainfall and production conditions is through the adjustment of the absolute amount of grain sold. While on balance certain marketing patterns appear constant, disaggregating the data reveals more dynamic responses among households.

Table 2 - Coarse Grain Sales (1985/86 - 1987/88)

	1985/86	1986/87	1987/88
Percentage of farms with sales	63.3	58.0	57.5
Average sales per farm (kg)	228.0	319.0	184.0
Percentage of production sold	7.8	7.8	8.1
Millet as a percentage of sales	27.8	26.8	28.6
Sorghum as a percentage of sales	65.0	71.9	71.2
Maize as a percentage of sales	7.2	1.2	0.2
Percentage of millet production sold	4.2	5.1	5.3
Percentage of sorghum production sold	14.0	11.6	13.6
Percentage of maize production sold	4.5	0.9	0.1

SOURCE: CESA-MSU Food Security Project farm household surveys, 1985-87.

Table 3 disaggregates the data on coarse grain sales by institutional zone, agroclimatic subzone and level of animal traction equipment. Keeping in mind that production levels increased from 1985 to 1986 and then fell from 1986 to 1987, several observations are worth noting in this table. First, there are important differences in marketing patterns between the CMDT and OHV zone. In the CMDT, the percentage of households involved in the market held steady for the first two years of average to better-than-average production, and then fell when production levels fell in the third year. Thus, some households in the CMDT responded to poor coarse grain production levels in 1987/88 by getting out of the market altogether. In addition, the 46% increase in average sales per farm in the CMDT from 1985/86 to 1986/87 and then the 45% decline in these

sales from 1986/87 to 1987/88 suggests that CMDT farmers varied the absolute quantities of coarse grains sold in response to volatile coarse grain production levels. Overall, CMDT households were able to respond to production shortfalls by limiting their participation in the market and by reducing absolute levels of coarse grain sales. When production levels improved, the number of farmers participating in the market remained the same but the quantity of coarse grain sold increased. These findings suggest that there is a certain degree of flexible response among CMDT farmers that permits them to adjust to changing production conditions by altering their coarse grain marketing strategies. This flexibility is only possible because of the liquidity provided by cotton revenues. By serving as a dependable source of post-harvest cash necessary for tax payments and social obligations, cotton production permits farmers to be more discriminating in the timing of their coarse grain sales and the quantities sold. Because farmers who produce cotton in addition to coarse grains have immediate post-harvest cash from cotton, they can afford to wait for favorable market conditions (e.g., relatively high rainy-season prices) to sell their coarse grains, or, if the impending coarse grain harvest looks poor, they can opt not to sell at all.

TABLE 3. Coarse Grain Sales by Zone, Subzone and Level of Animal Traction Equipment, CMDT and OHV (1985/86 - 1987/88)

ZONES/SUBZONES EQUIPMENT LEVELS	PERCENTAGE OF FARMS WITH SALES			AVERAGE SALES PER FARM (kg)			SALES AS % OF PRODUCTION	
	1985/86	1986/87	1987/88	1985/86	1986/87	1987/88	(1985-87)	(1987/88)
SOUTH CMDT	73.7	67.4	60.7	438	665	320	12.0	10.2
NORTH CMDT	65.9	71.8	51.2	162	213	160	4.4	5.9
SOUTH OHV	50.3	19.3	47.4	52	46	55	2.5	3.6
NORTH OHV	50.9	49.2	49.3	119	119	180	9.1	13.2
TOTAL CMDT	69.8	69.6	55.9	299	437	239	8.3	8.2
TOTAL OHV	50.7	35.2	48.4	88	85	122	5.3	8.4
TOTAL SOUTH	66.1	51.8	56.4	313	465	235	10.4	8.9
TOTAL NORTH	60.7	63.9	50.5	147	181	167	5.1	7.4
TOTAL SAMPLE								
Equipped farms	79.9	78.0	60.1	423	595	329	8.7	8.2
Semi-equipped	60.9	51.7	68.6	146	201	177	6.2	8.7
Non equipped	46.4	41.5	28.8	86	121	71	7.6	7.4
All farms	63.3	58.0	53.4	228	319	200	7.8	8.2

SOURCE: CESA-MSU Food Security Project farm household surveys, 1985-87.

An entirely different impression emerges for the OHV. The percentage of households in the market decreased when production levels improved between 1985/86 and 1986/87. When production levels declined from 1986/87 to 1987/88, a relatively greater number of OHV farmers were in the market to sell grain. This seemingly counter-intuitive behavior holds also for average sales per farm, which increased by 43% when production levels declined in the third year of the study period. Consequently, the percentage of coarse grain production sold increased when production levels fell in the third year. The finding that improvements in coarse grain production levels results in decreased market participation among OHV farmers suggests that additional production in good harvest years goes to home consumption rather than the market. That coarse grains sales increase when production falls supports the hypothesis that in poor harvest years some OHV households are obligated to sell grain even though they are below a minimum food assurance threshold. It further suggests that many OHV households do not have recourse to a stable source of cash such as that provided by cash crop production, or that their other sources of income fall sharply when grain production falls (i.e., they are highly weather-dependent), a finding corroborated by other parts of the CESA/MSU study.

Both market participation and the absolute quantities of coarse grains sold differ significantly between these two zones. The percentage of farms in the CMDT selling grain was always above the percentage of OHV farms and average sales per farm in the CMDT were between two and five times the levels in the OHV. The market behavior of farmers in these two zones differed most in the better-than-average production year (1986/87) when twice as many CMDT farmers were selling grain, with sales per farm averaging more than five times that of OHV farmers.

South-north differences, reflecting differences in the level of rainfall, were also important. Although market involvement was consistently between 50% and 65% in both subzones, average sales per farm were between 1.5 to 2.5 times greater in the higher-rainfall south than in the north. In addition, southern farmers were more market-oriented than their northern neighbors, with sales averaging around 10% of total production as opposed to 6% for northern farmers.

Over the four subzones, farmers in southern OHV were the least active in the market, in terms of both the percentage of total coarse grain production sold (2.5%) and their average sales per farm (51 kg). In contrast, southern CMDT farmers sold between 10% and 12% of their coarse grain production with sales per farm averaging between 320 kg (1987/88) and 665 kg (1986/87). While average sales for northern OHV farmers were more modest, with a three-year average of 139 kg per farm, their sales amounted to between 9% and 13% of coarse grain production. Thus there exists the greatest market-orientation among farmers at both extremes of the agroclimatic and institutional spectrum, those in the southern CMDT and the northern OHV. For those in southern CMDT, such an orientation occurs because production exceeds home consumption needs. For those in northern OHV, it is probably because they lack a suitable cash crop and must sell coarse grains to meet cash needs. Most noteworthy among households at different levels of animal traction equipment is the difference in absolute quantities sold per farm. Consistently across the three-year period, equipped farmers sold about five times the quantity of coarse grains per farm as non-equipped farmers. In addition, a significantly greater number of equipped farmers were involved in selling coarse grains than non-equipped farmers.

V. ANALYSIS OF FARM-LEVEL GRAIN PURCHASES

Coarse grain purchases by zone, subzone and equipment level are presented in Table 4. Over the entire sample, the number of rural households buying coarse grains was about 47% in 1985/86, 32% in 1986/87, and 60% in 1987/88. The dip in the proportion of households purchasing grain in the second better-than-average harvest year and the increase in that proportion in the third below-average harvest year reflect the important role of purchases in complementing home production. For the first two years of the study, purchases per farm averaged about 220 kg. This figure climbed to 338 kg per farm in 1987/88, when the sample as a whole experienced a decline in production levels. So in the third year of the study, not only was the proportion of farms buying grain at an all-time high, but also the average purchases of these farms had increased by 53% over the preceding year.

TABLE 4 Coarse Grain Purchases by Zone, Subzone and Level of Animal Traction Equipment, CMDT and OHV (1985/86 - 1987/88)

ZONES/SUBZONES EQUIPMENT LEVELS	% OF FARMS WITH PURCHASES			AVERAGE PURCHASES PER FARM (KG)			PURCHASE TO SALE RATIO	
	1985/86	1986/87	1987/88	1985/86	1986/87	1987/88	(1985-87)	(1987/88)
SOUTH CMDT	15.1	13.8	37.3	59	40	102	0.09	0.3
NORTH CMDT	52.3	17.9	59.9	279	116	371	1.05	2.3
SOUTH OHV	57.4	34.9	67.1	257	45	142	3.10	2.6
NORTH OHV	84.7	90.7	98.4	354	904	881	5.27	4.9
TOTAL CMDT	33.9	15.9	48.7	170	78	238	0.34	1.0
TOTAL OHV	71.9	64.6	83.8	309	502	535	4.70	4.4
TOTAL SOUTH	28.8	20.6	46.9	123	42	115	0.21	0.5
TOTAL NORTH	63.6	43.2	73.3	305	390	548	2.12	3.3
TOTAL SAMPLE								
Equipped farms	27.9	12.4	42.9	181	258	394	0.43	1.2
Semi-equipped	53.9	34.5	57.8	246	123	261	1.07	1.5
Non equipped	61.1	53.3	84.3	226	286	355	2.48	5.0
All farms	46.7	32.2	60.5	216	221	338	0.80	1.7

SOURCE: CESA-MSU Food Security Project farm household surveys, 1985-87.

Again, this aggregate picture of purchasing patterns for the entire sample masks important differences. In the OHV, the number of farms purchasing grain was almost always at least twice the number in the CMDT. In both zones, the proportion of households buying dipped when production levels rose in 1986/87, and rose when production levels fell in 1987/88. In addition, average purchases per farm were at their highest in both zones in 1987/88. Over the three-year period, purchases per farm on average were between 2.2 and 6.4 times higher in the OHV than in the CMDT. During the first two years of the study, the CMDT farmers were net exporters of coarse grains, purchasing the equivalent of only one-third of what they sold. In the third year of the study, CMDT farmers on balance broke even, purchasing the same quantity of coarse grains as they sold. In contrast, over the three-year study period, OHV farmers were chronic importers of coarse grains, with purchases consistently amounting to over four times the quantity of coarse grains sold.

Purchase patterns varied also with the natural environment of production. Northern farmers were far more active in the market than their southern neighbors, both in terms of number of households and average purchases per farm. The proportion of northern farmers buying coarse grains was almost always double the proportion of southern farmers. Average purchases per farm in the northern subzones ranged from 4.2 to 9.3 times that of farms in the south depending on the year. The north was a net importer of coarse grains over the three-year period of the study, overall buying between 2.1 and 3.3 times the quantity it sold. On the other hand, southern farms were net exporters of coarse grains, with total purchases amounting to between 20% and 50% of total sales.

In the four subzones, northern OHV farmers were the most reliant on purchased grain, both in terms of the number of farmers buying coarse grains and their average purchases per farm. Consistently, over 85% of households in northern OHV bought grain, with an annual average over the three years of 713 kg per farm. In contrast, only between 15% and 37% of southern CMDT households turned to the market to purchase grain. When they did, these farmers averaged purchases of 67 kg annually per farm over the three-year study period, or one-tenth that of northern OHV farmers. Only in the southern CMDT were farmers net exporters of grain, with purchases representing the equivalent of about 10% of sales in the first two years and 30% of sales in the third year. On the other hand, northern OHV farmers were large net importers of grain, with total purchases close to five times that of total sales.

Non-equipped farmers were the most reliant on purchased grain, with two to four times the number of non-equipped households buying grain than equipped farmers. Overall, equipped farmers purchased the equivalent of less than half of what they sold over the first two years of the study. In the third year, equipped farmers on balance purchased slightly more than they sold. However, the purchases of non-equipped households amounted to about 2.5 times the quantity of their total sales during the first years of the study, and 5 times the quantity of their total sales in the last year.

The importance of the market as a source of food for poor rural households (those who lack agricultural equipment) clearly emerges from this analysis. Consistently, farmers who have the weakest production potential for coarse grains (those in the OHV, in the northern subzones, in northern OHV and among the non-equipped) are those who rely most on the market to help assure household food security.

Subtracting purchases from sales yields figures for net grain sales per household. Overall, about 53% of farmers had sales that exceeded their purchases over the first two years of the study compared to 39% in the third year. On the other hand, the percentage of net buyers increased from about 43% in the first two years to about 54% in the third year.

The northern OHV had the smallest percentage of net sellers and the largest percentage of net buyers during the three-year period. The reverse was true for southern CMDT. Only southern CMDT farmers had positive average net sales per farm across the three years of the study, with net sales averaging between 11% of production from 1985-86 and 7% of production in 1987/88. In contrast, only northern OHV farmers had average negative net sales over the same period. Their net purchases were the equivalent of 39% of production in 1985-87 and 51% of production in 1986/87.

TABLE 5 Net Coarse Grain Sales by Zone, Subzone and Level of Animal Traction Equipment, CMDT and OHV (1985/86 - 1987/88)

ZONES/SUBZONES EQUIPMENT LEVELS	PERCENTAGE OF NET SELLERS		PERCENTAGE OF NET BUYERS		AVERAGE NET SALES PER FARM (KG)			NET SALES AS A % OF PRODUCTION	
	1985-87	1987/88	1985-87	1987/88	1985/86	1986/87	1987/88	(1985-87)	(1987/88)
SOUTH CMDT	75.5	55.2	18.2	35.4	379	625	219	10.9	6.9
NORTH CMDT	58.6	36.8	38.2	54.6	-116	97	-211	-0.2	-7.8
SOUTH OHV	35.9	27.5	58.9	63.6	-205	0	-86	-5.2	-5.7
NORTH OHV	15.2	22.6	82.7	77.3	-235	-785	-701	-38.8	-51.2
TOTAL CMDT	66.7	45.9	28.3	45.1	129	359	2	5.5	0.1
TOTAL OHV	24.9	24.9	71.6	70.9	-221	-418	-413	-19.7	-28.7
TOTAL SOUTH	62.4	46.2	31.4	44.6	190	423	120	8.2	4.6
TOTAL NORTH	43.5	31.9	53.7	62.5	-157	-210	-382	-5.7	-17.0
TOTAL SAMPLE									
Equipped farms	77.0	51.7	19.1	37.0	242	337	-64	4.9	-1.6
Semi-equipped	45.2	44.5	51.7	49.5	-100	78	-84	-0.4	-4.1
Non equipped	32.0	17.5	61.5	78.3	-140	-165	-284	-11.2	-29.5
All farms	52.7	38.9	42.9	53.8	11	98	-138	1.6	-5.7

SOURCE: CESA-MSU Food Security Project farm household surveys, 1985-87.

VII. CONCLUSIONS

The above analysis illustrates the tremendous heterogeneity among rural households in southern Mali with respect to coarse grain marketing patterns. Disaggregating the data indicates that the institutional setting of the household (which affects the availability of cash-crop alternatives, effective research and extension services, reliable input and output markets, investment in infrastructure, etc.), the level of capital available to

the household, and rainfall levels are important factors determining coarse grain production levels. In addition, the analysis demonstrates the volatile nature of rainfed grain production in Mali, where over the three-year study period production per worker levels varied by a factor 1:2. This volatility in turn implies significant interannual variation in the ability of households to rely on home production for home consumption. Because of the volatility of production and the small percentage of coarse grain production sold, the coarse grain market is extremely unstable. For example, between October 1987 and August, 1988, farm-level prices for millet and sorghum in the northern OHV region jumped from under 30 CFAF/kg to over 130 CFAF/kg (D'Agostino and Staatz).

The analysis implies that the distributional effects of price policy will be uneven. Given that the equipped farmers in the highest potential zones are those most active in selling coarse grains and that non-equipped farmers in the weakest production areas are the most active in purchasing coarse grains, conclusions concerning which farmers would most benefit and which would most lose from an across-the-board price support are clear. Furthermore, with net buyers constituting 43% of households in relatively good harvest years (1985, 1986) and up to 54% in a poor harvest year (1987), mechanisms that artificially keep market prices above market-clearing prices disadvantage a relatively large segment of the rural population.

The analysis also shows the limits of a price-led strategy of agricultural growth from a production as well as an income-distribution point of view. The farm households currently with the greatest capacity to respond to higher grain prices are those best endowed in animal traction equipment, located in the highest rainfall area (the south) and serviced by the best rural development organization in the country (the CMDT). Typically, these are also the households most heavily involved in cotton production. The synergies between cotton and coarse grain production are numerous. Cotton fertilizer has a residual effect on coarse grains grown in rotation with cotton. Cotton cultivation provides liquidity and access to formal-sector credit, which finances acquisition of animal traction equipment and other inputs that are also used in grain cultivation. Liquidity from cotton sales allows farmers to optimally time their grain sales. And on a regional basis, revenues from cotton finance much of the basic infrastructure of the CMDT zone, which facilitates marketing of grain as well as cotton. However, without a very major shift in the price of coarse grains relative to cotton and/or measures to increase the reliability of the coarse grain market, these households have little incentive to expand grain production. The less equipped households that are eager to expand grain production, primarily for home consumption, are constrained more by technological and institutional factors than by low grain prices.

The analysis also shows that a large percentage of the rural population depends on the market not only as an outlet for production but also as an important source of food for home consumption. Other analyses have also shown the importance of diversification of income sources in the drier northern regions as a strategy to help assure household food security. (See Reardon, Matlon and Delgado for the case of Burkina Faso; Staatz, D'Agostino and Sundberg for Mali.) Basing a development strategy on raising grain prices works against such diversification. In contrast, policies to improve the functioning of rural food markets (including measures to increase their stability and reliability) are critical to food security. Equally important are improving the functioning of markets for the goods and services the food-deficit households sell to obtain cash to buy food (markets for labor, small ruminants, and non-farm products). Ultimately, the improvement of rural financial markets is also essential to overcome problems of seasonal liquidity crises that threaten household grain availability.

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Table 1 Coarse Grain Production by Zone, Subzone, and Level of Farm Equipment, (1985-88)

ZONES SUBZONES LEVELS OF EQUIPMENT	COARSE GRAIN PRODUCTION			PERCENTAGE OF FARMS WITH MORE THAN 188kg PER CAPITA
	PER FARM (kg)	PER WORKER (kg)	PER CAPITA (kg)	
<u>1985</u>				
CMDT (1)	3647	640	282	64.9
OHV (2)	1489	343	114	23.9
Variation (1)/(2)	144.9%	86.6%	147.4%	--
SOUTH (3)	3474	650	282	59.0
NORTH (4)	2398	435	171	43.7
Variation (3)/(4)	44.9%	49.4%	64.9%	--
EQUIPPED FARMS (5)	4799	648	278	68.6
SEMI-EQUIPPED (6)	2523	515	221	49.8
NON-EQUIPPED (7)	1134	440	166	31.9
Variation (6)/(7)	122.5%	17.0%	33.1%	--
Variation (5)/(7)	323.2%	47.3%	67.5%	--
Variation (5)/(6)	90.2	25.8	25.8	--
TOTAL SAMPLE	2921	540	225	51.1
<u>1986</u>				
CMDT (1)	5193	912	392	86.7
OHV (2)	1677	406	133	26.8
Variation (1)/(2)	209.7%	124.6%	194.7%	--
SOUTH (3)	3980	771	329	69.4
NORTH (4)	4039	714	282	63.9
Variation (3)/(4)	-1.5%	8.0%	16.7%	--
EQUIPPED FARMS (5)	6967	941	395	84.2
SEMI-EQUIPPED (6)	3029	632	270	64.1
NON-EQUIPPED (7)	1590	627	237	48.4
Variation (6)/(7)	90.5%	0.8%	13.9%	--
Variation (5)/(7)	338.2%	50.1%	66.7%	--
Variation (5)/(6)	130.0	48.9	46.3	--
TOTAL SAMPLE	4010	742	305	66.5
<u>1987</u>				
CMDT (1)	2930	435	270	63.2
OHV (2)	1443	223	146	24.0
Variation (1)/(2)	103.0	95.1	84.9	--
SOUTH (3)	2625	408	260	57.4
NORTH (4)	2245	321	199	43.0
Variation (3)/(4)	16.9	27.1	30.6	--
EQUIPPED FARMS (5)	4027	402	263	63.9
SEMI-EQUIPPED (6)	2045	405	247	57.7
NON-EQUIPPED (7)	964	272	167	25.0
Variation (6)/(7)	112.1	48.9	47.9	--
Variation (5)/(7)	317.7	47.8	57.5	--
Variation (5)/(6)	96.9	-0.9	6.6	--
TOTAL SAMPLE	2431	364	228	50.0

SOURCE: CESA-MSU Food Security Project farm household surveys, 1985-87.