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 the bulk of the poor in Africa were farmers, and hence raising the price of basic staples, the major product of these farmers, would increase their income. Thus, raising food prices was seen as a way of improving both production and income distribution.

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 food. This paper presents results from analysis based on three years of data on coarse grain (millet, sorghum and maize) production and marketing patterns of 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 capacity of farmers to increase production in 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.

Several noteworthy characteristics of farmer coarse grain marketing behavior emerge from the analysis. First, the diversity of coarse grain transactions patterns among farmers in different institutional zones, ecological subzones, and categories of agricultural equipment ownership suggests a heterogeneous rural population. This, in turn, implies that policies based on the assumption of a homogeneous rural population will not likely achieve the desired impact since coarse grain allocation decisions are not uniform. Second, the availability of a cash crop alternative, such as cotton, has had far-reaching effects on coarse grain production and on coarse grain transactions, which enhance cotton-growing households’ food security. Finally, the analysis indicates that the market is more than just an outlet for farmers’ coarse grain production, extracting coarse grain surpluses from the rural areas. The market is also an important source of food supply for food-deficit households which turn to the market to purchase coarse grains for home consumption. By moving coarse grains from surplus to deficit areas, the market serves the function of re-distributing coarse grains within the rural areas as well as helping households assure their food security. This, in turn, suggests the importance of markets for non-grain products such as sheep and goats to generate the income needed by grain-deficit households to purchase grain.
II. THE DATA

The analysis is based on data collected from November 1985 to October 1988 from a sample of approximately 190 randomly selected farm households in 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 levels were mediocre. The data used in the analysis are annual production estimates of millet, sorghum and maize, as well as monthly volumes of coarse grain sales and purchases made by individual farmers in the sample during the three-year period. The data were collected under the CESA-MSU Food Security Project. A preliminary analysis of production and marketing patterns using the first two years of data has already been undertaken (Dione, 1989; D'Agostino, 1988; Dione, 1987).

Both the CMDT and OHV are comprised of northern areas where rainfall ranges between 550 to 750 mm and southern areas where annual rainfall averages between 1150 and 1450 mm. Consequently, both zones are suitable for cultivation of the same rain-fed food and cash crops including millet, sorghum, maize, cowpeas, cotton and groundnuts (Dione, 1989). Despite their ecological similarities, however, the CMDT and OHV differ greatly in the importance of cash crop production in gross crop income: cash crops (cotton and groundnuts) represented 37.8% of gross crop income in the CMDT and only 13.8% in the OHV (Dione, 1989). Cotton alone constitutes 35.8% of gross crop income in the CMDT compared to 7.6% 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 relative to the OHV in 1985/86 (Dione, 1989).

III. ANALYSIS OF FARM-LEVEL GRAIN PRODUCTION

Over the three-year period covered by the CESA-MSU study, official data show that aggregate production of millet, sorghum, fonio and maize increased by 4.7% from 1985 to 1986 and decreased by 8.3% from 1986 to 1987 (OSCE, 1989). However, these relatively modest changes in national coarse grain production levels mask a more complex picture which emerges when data are disaggregated to particular areas of the country. Table 1 provides a three-year view of coarse grain production among the 190 farm households participating in the CESA-MSU study. Overall, while the magnitude of change is different, the general trend in coarse grain production shown in this table is consistent with the official national statistics mentioned above. 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 19.7% in 1985, by 62.2% in 1986 and by 21.3% in 1987. However, the availability of a marketed surplus beyond consumption requirements was concentrated among 51.1% of farms in 1985, 66.5% of farms in 1986, and 50% of farms in 1987. Thus, while the aggregate coarse grain production per capita picture is encouraging, disaggregating the data indicates that only one-half to two-thirds of farm households were able to assure minimum household consumption requirements with home production.

As suggested by Dione (1989), 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, the OHV's...
production per capita consistently fell below annual consumption requirements. During the three-year study, 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 percentage of farm households with a potential marketable surplus over home consumption needs ranged from 87% in 1986 to 63% in 1987. In contrast, the proportion of farms with a potential marketable surplus in coarse grains in the OHV was only 24% in 1985 and 1987, and 27% in 1986. 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. Therefore, they likely overestimate the quantity of grain that could be commercially marketed.

Differences in the natural environment of production also contribute to differences in coarse grain production levels. The strongest differences between production in the northern and southern subzones occurred in 1985, when coarse grain production per worker was 49.4% higher in the south than in the north. In 1986 the southern zones of the CMDT and OHV, production per worker was only 8% higher than in the northern subzones, while in 1987, it was 27.1% higher.

Ownership of farm equipment, particularly animal traction, is another important variable distinguishing households in the sample. 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 was 69% in 1985, 84% in 1986, and 64% in 1987. In contrast, for non-equipped farms, the proportion of farms with a potential marketable surplus above home consumption needs was only 32% in 1985, 48% in 1986 and 25% in 1987. Because the distribution of equipped and non-equipped farms is far from equal among the different subzones in the CMDT and OHV, this analysis has important implications for regional food security (or location-specific food insecurity). 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% of the total farm population of the survey villages. Thus the disparities in production potential among farms at different equipment levels is compounded on a regional level by a relatively greater share of equipped farms in the survey population of the CMDT than the OHV.

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. In the two subsequent years, the rate of participation in the market to sell grain dropped slightly to 58% in 1986/87 and 57.5% in 1987/88. While these figures might imply that the number of farm households active in the market does not vary significantly from year to year, this is more likely to be a result of farmers’ complex decision processes which take into account changes in size of harvest, marketing decisions of the previous years, and the levels of on-farm stocks. Participation in the market on the supply side in 1985/86 probably determined both by 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. Only slightly fewer farmers were involved in selling grain, reflecting a decision to allocate surplus...
production to re-building on-farm stocks rather than the market in a second consecutive good harvest year. 1987/88 was characterized by a poor harvest relative to the two previous years; however, the number of market participants did not decline significantly relative to the preceding years. As seen in the analysis 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, even though 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 1986/87. Since the 1986/87 planting season was characterized by relatively abundant rainfall, this increase in average sales resulting from higher levels of coarse grain production is not surprising. In 1987/88, however, average sales per farm fell dramatically to 184 kg, a decline of 58%. Despite this fall in average sales per farm, the percentage of production sold in 1987/88 actually stood slightly higher than the figure for the preceding two years, 8.1% compared to 7.8%. An important reason for this was the fall in production levels resulting from inadequate rainfall in 1987/88.

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

<table>
<thead>
<tr>
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<th>1985/86</th>
<th>1986/87</th>
<th>1987/88</th>
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<tbody>
<tr>
<td>Percentage of farms with sales</td>
<td>63.3</td>
<td>58.0</td>
<td>57.5</td>
</tr>
<tr>
<td>Average sales per farm (kg)</td>
<td>228</td>
<td>319</td>
<td>184</td>
</tr>
<tr>
<td>Percentage of production sold</td>
<td>7.8</td>
<td>7.8</td>
<td>8.1</td>
</tr>
<tr>
<td>Millet as a percentage of sales</td>
<td>27.8</td>
<td>26.8</td>
<td>28.6</td>
</tr>
<tr>
<td>Sorghum as a percentage of sales</td>
<td>65.0</td>
<td>71.9</td>
<td>71.2</td>
</tr>
<tr>
<td>Maize as a percentage of sales</td>
<td>7.2</td>
<td>1.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Percentage of millet production sold</td>
<td>4.2</td>
<td>5.1</td>
<td>5.3</td>
</tr>
<tr>
<td>Percentage of sorghum production sold</td>
<td>14.0</td>
<td>11.6</td>
<td>13.6</td>
</tr>
<tr>
<td>Percentage of maize production sold</td>
<td>4.5</td>
<td>0.9</td>
<td>0.1</td>
</tr>
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</table>

The composition of coarse grains marketed did not vary dramatically in response to changes in production and rainfall conditions. Across the three-year period, sorghum was consistently the grain of choice for sale, accounting for between two-thirds and three-fourths of all coarse grain sales. Millet sales represented slightly over one-fourth of all sales during this same period. However, the share of maize in total coarse grain sales fell steadily over the study period, from 7.2% in 1985/86 to 1.2% in 1986/87, to 0.2% in 1987/88. Several reasons might explain the declining share of maize in total coarse grain sales between 1985 and 1988. First, in 1986/87, the CMDT ceased buying maize as an agent for the national grain board (OPAM) after OPAM failed to reimburse it for purchases made in the previous years. In addition, during 1985/86, the maize support price of 55 CFAF/kg had favored maize sales. However, after 1985/86, OPAM was no longer able to support this price and the relative price of maize fell in 1986/87 and in 1987/88 [pending documentation...]. Second, in the earlier years of relatively good production, it is likely that more millet and sorghum went to rebuild on-farm stocks and the maize produced was destined largely for the market. The relatively small share of maize in total coarse grain sales is due not only to relatively lower levels of maize production but also to the important role of maize as a hungry-season food crop, available for home consumption before the maturation of the millet and sorghum crops.
The percentage of production sold of the different coarse grains mirrors the composition of total coarse grain sales. For sorghum, between 12% and 14% of production is sold. Between 4% and 5% of millet production is marketed. The percentage of maize production sold declined from 4.5% in 1985/86 to 0.9% in 1986/87 to 0.1% in 1987/88.

This aggregate picture of the coarse grain marketing patterns of the sample suggests that certain aspects of the market remain constant from year to year, despite large differences in rainfall patterns. The overall level of participation in the market among sample rural households is steady and the percentage of total production sold is constant over the three-year period. The composition of aggregate sales and the market share of production sold among the different coarse grains are also stable. 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. However, this presentation of marketing patterns aggregated over the entire sample masks additional adjustments made by different types of households in response to changing production and market conditions. While on balance certain marketing patterns appear constant, disaggregating the data reveals more dynamic responses among households.

Table 3 disaggregates the data on coarse grain sales by institutional zone, agro climatic 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 productions 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, as was the case in the first two years of the study, the number of farmers participating in the market remained the same but the quantity of coarse grain sold increased. On balance, the percentage of coarse grain production that was sold over the three-year period was constant. 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. 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.

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. In addition, certain OHV farmers appear not to be marketing surplus production: when production levels decline, the number of farmers actively selling, the average sales per farm and, consequently, the percentage of production sold all increase.

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 2 and 5 times the levels in the OHV. The market behavior of farmers in these two zones differed most extremely 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 5 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 the first two relatively "good" production years, the percentage of total production sold in the southern subzones was more than twice that of the northern subzones. In the third relatively poor production year the margin of difference was far less, largely because southern farms decreased their average sales by 53%. Thus farmers in the more favorable southern subzones were relatively larger players in the coarse grain market in terms of their absolute level of sales. In addition, these 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 and their average sales per farm. Over the three-year study period, these farmers sold between 2.5% and 3.6% of their coarse grains and on average sold about 50 kg per farm. 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. Relative to farmers in the other subzones, these farmers sell the relatively largest share of what they produce. For those in southern CMDT it is because their production exceeds home consumption needs; for those in northern OHV it is because they lack a suitable cash crop and must sell coarse grains to meet cash needs. For the other two subzones, northern CMDT and southern OHV, it is likely that households have a cash alternative to selling coarse grains and are able to keep what they produce for home consumption [evidence forthcoming...].

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 5 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" year and the increase in that proportion in the third "below-average" year reflect the important role of purchases in complementing home production. For first two years of the study, average 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. For the entire sample, farmers purchased 1.7 times more coarse grains than they sold in 1987/88. This net deficit situation represents a reversal of the more favorable position that had prevailed over the first two years of the study when the sample had, on balance, a slight surplus.

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 of those 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 4 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 term 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 represented 9.3 times that of farms in the south in 1985/86, 4.2 times that amount in 1986/87, and 4.7 times that amount in 1987/88. 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.

Of the four subzones, northern OHV farmers were the most reliant on the market, both in terms of the number of farmers purchasing coarse grains and their average purchases per farm. Consistently, over 85% of households in northern OHV were buying grain with a three-year average 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 per farm over the three-year study period, or one-tenth that of 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.

Finally, farmers at different levels of animal traction equipment were also arrayed according to their reliance on the market to complement home production. Over the three-year period, non-equipped farmers were the most reliant on the market, with two to four times the number of households in the market to purchase 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. Semi-equipped farmers were also close to breaking even over the three-year period. 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.
Clearly, the importance of the market as a source of food for "at-risk" groups emerges from this analysis of coarse grain purchases. Consistently, farmers who have the weakest production potential (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.

VI. NET SALES OF GRAIN
Table 5 shows how the above sales and purchasing patterns net out for farmers according to zone, subzone, and level of animal traction equipment. 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. Fewer than 8% of households reported no transactions at all over the three-year period. Average net sales per farm fluctuated widely over the three years from 11 kg in 1985/86, to 98 kg in 1986/87, to -138 kg in 1987/88. Again, this pattern closely mirrors changes in production levels over the same period. Net sales went from a positive 1.6% of production during the first two years of the study to a negative 5.7% of production in 1987/88, indicating a strong demand for coarse grains in the third year.

During the first two years of the study, two-thirds of CMDT farmers were net sellers compared to only one-fourth of OHV farmers. Conversely, 71% of OHV farmers were net buyers in contrast to only 28% of CMDT farmers over the same period. The gap between the institutional zones narrowed somewhat in 1987/88, when the percentage of net sellers in the CMDT fell to 46% and the percentage of net buyers in the CMDT increased to 45%. Average net sales per farm were consistently positive, although variable, in the CMDT. This variability indicates the capacity of CMDT farmers to have a flexible response to changing production conditions for coarse grains. CMDT farmers were able to respond to favorable production levels during the first two years of the study with significant levels of net sales, and to the less-than-favorable coarse grain harvest of 1987/88 with a dramatic reduction in net sales. That net sales as a percentage of production fell from 5.5% during the first two years to .1% in the third year further supports this hypothesis. Flexible responses to changing production conditions could only be possible in the presence of cash alternatives to coarse grain sales, and the ability to take advantage of favorable rainfall conditions. In contrast to the sales patterns in the CMDT, net sales were consistently negative and large for OHV farmers. In the last two years of the study, net purchases averaged over 400 kg per farm. These net purchases averaged about 20% of production in 1985-87, and 29% of production in 1987/88, indicating a strong food-deficit problem in this zone.

Patterns of net grain sales are also strongly related to the natural production environment. A larger percentage of southern farmers than northern farmers were net sellers over the three-year period, although the gap narrowed in 1987/88. The reverse is true for the proportion of net buyers: between 31% and 45% of southern farmers were net buyers compared to between 54% and 63% of northern farmers. Southern farmers had positive average net sales per farm over the three-year period representing between 5% and 8% of production. In contrast, northern farmers had large and negative net sales. The net purchases of northern farmers ranged between 6% and 17% of coarse grain production.

Among the different levels of animal traction equipment ownership, equipped farmers had the largest proportion of net sellers and the smallest proportion of net buyers across the three years of the study. For non-equipped farmers the reverse was true. On average, all categories of equipment users were net buyers of coarse grains in the third year, although most significant among these were the non-equipped farmers, whose average level of net purchases, at 284 kg per farm, was around 4 times those of the semi-equipped and equipped farmers. Equipped farmers had net sales amounting to about 5% of production during the first two years of the study, but this situation shifted in the third year of the study when these farmers as a group became net buyers with net purchases
amounting to 1.6% of production. The situation was more severe for semi-equipped households who moved from a "break-even" position in the first two years of the study to a position where net purchases amounted to about 4% of production. As expected, non-equipped farmers presented the most extreme case, buying in net terms the equivalent of 11% of production in 1985-87, and almost 30% of production in 1987/88.

Overall, the combined effects of the above factors resulted in the northern OHV having 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. This suggests that the market is an important source of food and food security for northern OHV farmers.

VII. CONCLUSIONS
The above analysis demonstrates the tremendous heterogeneity among rural households in terms of their coarse grain marketing patterns. Whether one looks only at the effect of the institutional environment of production and marketing, the natural agroclimatic environment of production, the level of farm capital assets, or a combination of these factors, it is evident that the differences which emerge portend a variable impact of food policies on different groups of rural households.

Considering the coarse grain production situation alone, disaggregating the data indicates that the institutional setting of the household (which includes the availability of cash crop alternatives, effective research and extension services, reliable input and output markets, investment in infrastructure, etc.), in addition to the level of farm capital available to the household are important factors determining production levels. Certainly coarse grain production is dependent on rainfall patterns, but this analysis suggests that there are other important conditions to increasing production. In addition, the three-year picture of coarse grain production patterns provides further evidence of the volatile nature of production in Mali, where production per worker levels can increase by 37% and decrease by 50% from one year to the next. This volatility in turn implies significant inter annual variation in the ability of households to rely on home production for home consumption. Because of this and because only a small percentage of coarse grain production is ever sold, the coarse grain market echoes the changes in year-to-year production levels on a larger scale. 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, the conclusions concerning which farmers would most benefit and which would most lose from an across-the-board price support are obvious. 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 are 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 having the capacity to respond most to higher grain prices were those having the best endowment in animal traction equipment, located in the highest rainfall area (the south), serviced by the best rural development organization in the country (the CMDT). Typically, these were 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 allow farmers to time their grain sales in an optimum way. 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.

The analysis shows also shows that a large percentage of the rural population depends on the market not only as an outlet for their 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.) 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 the functioning of markets for the goods and services these food-deficit households sell to obtain cash to buy food (markets for labor, small ruminants, and non-farm products). Ultimately, the improvement of rural capital markets is also essential to overcome problems of seasonal liquidity crises that threaten household grain availability.