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### Differentiation in Receipts of Subsidized Fertilizer: Evidence from Villages, Households and Plot Managers in Mali

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#### The Malian Fertilizer Subsidy Program

The Malian fertilizer subsidy is universal—meaning that it has not been explicitly designed to target particular farmers. In principle, all Malian farmers may benefit from it. Yet, subsidy amounts differ by crop. Cotton, maize and fully-controlled, irrigated rice benefit according to all of the area they cultivate in the crop, while sorghum and millet farmers are eligible for only 30% of crop area. Wheat is included under the program but is grown on a very small area in Mali. This design implicitly targets the subsidy to certain farming systems and farmers.

Both research and observation also tell us that farmers “self-select” into public programs, including subsidy programs, based on their status within a community, their access to information, and their capacity to engage well with the formal institutions that deliver it to them—such as cooperatives. For this reason, social scientists often hypothesize that better informed farmers with more physical capital (land, equipment), financial capital and greater human capital (labor, education) are more likely to participate.

The same is true within farming households. Especially in the drylands farming systems of Mali, heads of extended families distribute land use rights among male and female household members according to customary norms related to seniority and marital status, though it is also the case that negotiations and needs factor into decisions. Research suggests that similar negotiations are likely to occur in the case of inputs such as fertilizer.

PRPoSAM conducted an in-depth survey with the goal of measuring the impact of the fertilizer subsidy during the 2017/18 crop season (See Smale et al. 2020; Smale et al. 2019b, and Assima et al. 2019) for empirical evidence of the impacts of subsidized fertilizer on several outcomes). The survey team implemented focus group interviews with village representatives and on-farm

#### Key Findings from the 2017/18 survey

- In two-thirds of villages, representatives did not report delays in receipt of subsidized fertilizer.
- The overall quality of the fertilizer received was judged to be adequate in most villages (91%).
- About half of the village representatives considered amounts received to be sufficient.
- By far the largest category of plot manager who received subsidized fertilizer is the head of the EAF or designate.
- 87% of male plot managers received the subsidized fertilizer applied to their plot directly from the organizational source, as compared to 49% of female plot managers; another 50% of female plot managers it through the head of EAF or designate.
- The fertilizer subsidy is more heavily utilized by farmers who are better-endowed in terms of equipment and traction.

interviews with household heads and within households plot managers. This brief summarizes some descriptive findings from that survey, highlighting differentiation in receipt of subsidized fertilizer among villages, households, and plot managers within households.

#### 2017/18 Survey

The PRPoSAM dataset was collected by the Institut d’Economie Rurale (IER) and Michigan State University (MSU) in repeated visits from October of 2017 through February of 2019. The random sample drawn in two agroecological zones was stratified by extension structure and fertilizer subsidy. In total, the sample consisted of 2400 farm households across 118 villages in 120 enumeration sections (see Haggblade et al. 2019 for details).

During the initial visit to each village, the survey team organized a focus group with the village chief, his key

advisors, leaders of local farmer organizations, local resource persons with detailed knowledge of the village, women and youth leaders (where custom allowed) and several heads of farm households. Participants numbered 835. In terms of stated occupation, most were “notables” and village heads, followed by teachers, religious leaders, health workers and agricultural agents. During initial focus group meetings, the survey team asked several questions about the fertilizer subsidy.

### Evidence of Differentiated Receipts of Subsidized Fertilizer

#### *Among villages*

Two-thirds of focus group respondents reported that EAFs in their villages participated in the subsidy program.

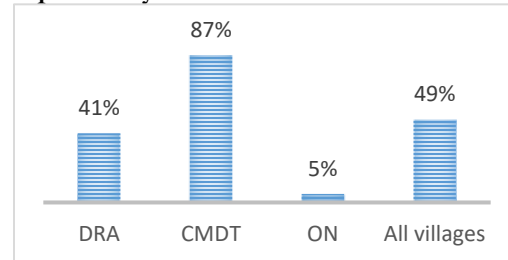
To participate in the subsidy program, needs must be reported. In each type of extension structure, village needs were most often expressed to a branch, coordinator office or agent of that structure. Only 1 ONG was mentioned, and only 5 village heads or mayors. In 90% of cases, representatives stated that the time spent reporting needs, including travel time, was one day or less. About 22% of representatives stated that needs had been reported by mid-May. 32% by July 1, of the survey year, and half by August 1.

Responses contrasted between extension systems when representatives were asked whether agents verified landholdings claimed by farmers. Amounts of fertilizer distributed to individual farmers conform directly to the stated hectares they plant to the target crop. 87% of representatives in CMDT villages reported verification of landholdings; only 5% cited verification in the ON villages. This low percentage is explained by the fact that the landholdings for farmers served by the ON are known from the water charge for irrigation. DRA villages were split 41% to 59%. Overall, it appears that roughly half of villages were visited to verify claims and the other half were not (Figure 1).

The time line of receipts of subsidized fertilizer corresponds roughly to needs reporting. According to village representatives, 22% of villages had received subsidized fertilizer by mid-May, 30% by July 1, and 52% by August 1. Slightly over one third of village respondents noted delays in receipt of subsidized fertilizer, and this share did not vary significantly among extension systems or between agroecological zones. There were no significant differences observed by

agroecological zone or extension structure, although a larger percentage (73%) of villages in the CMDT zone appeared to have received the input without delay.

**Figure 1. Did an agent verify the cultivated areas reported by farmers?**



Differences significant by extension system (Pearson chi2 at <1%). Source: PRePoSAM survey, 2017/18

The overall quality of the fertilizer received, during the 2017/18 crop season, was judged to be adequate in most villages (91%), and this judgment varied neither by agroecological zone nor by whether or not the village was part of the formal extension structure (ON, CMDT, DRA). While more of the villages in the ON area reported poor quality (15%), this difference was not statistically significant (Table 1).

**Table 1. What is the quality of subsidized fertilizer received?**

Extension System	Poor	Adequate
DRA	7%	93%
CMDT	8%	92%
ON	15%	85%
All villages	10%	91%

Pearson chi2(2) = 2.1749 Pr = 0.337  
Source: PRePoSAM survey, 2017/18

By agroecological zone and across the villages sampled, representatives were fairly evenly split concerning whether the amounts received were sufficient or not (54% v. 46%). By extension system, CMDT villages appear more likely to have reported that sufficient amounts were received, but the difference is not significant.

Overall, 15% of villages reported that prices paid were higher than expected based on official announcements.

With respect to price perceptions, differences between agroecological zones or among extension structures were not significant.

### Plot managers within households

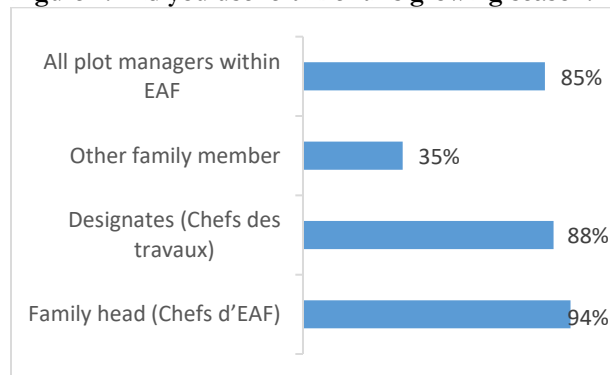
Farming households (EAFs) had an average family size of 15 persons, ranging from only 2 to as many as 50. The number of plots inventoried on these household farms totaled nearly 12,000 plots, including 9,194 plots of the targeted crops (cotton, maize, rice, sorghum, millet). Roughly 10,000 of all plots inventoried were farmed collectively by the family and managed by the extended family head (Chef d'EAF) or designate (Chef de travaux), and the remainder were managed by individual members of the household. Customarily, collective plots are labored by the household as a group and proceeds are destined for the group's well-being; individual plots and are managed by the individual to which the land is allocated by the head. Proceeds from individual plots are kept by individuals but also serve as a reserve for the group. We have explored the implications of household structure and plot management for fertilizer use elsewhere (e.g., Smale et al. 2019a).

Plot managers surveyed numbered nearly 3,000, and they managed anywhere from 1 to 13 plots of targeted crops each. Land rights are inherited along patrilineal lines in Mali, so that women heads are rare—numbering only 13 in our sample. When asked whether they had used any fertilizer during the 2017-2018 growing season (Figure 2), other household members were less than half as likely to have applied it to a target crop (35 percent) than Chefs d'EAF or Chefs des travaux (94 and 88 percent). In part, we know this to reflect the fact that the head tends to supervise the work on the large fields that produce the family's staple food (maize, rice, sorghum, millet) or cotton. Although female Chefs and Chefs de travaux are few among households surveyed, in the survey, nearly 4 in 5 (79%) of other family members who manage plots are female. The target plots managed by females average 0.79 ha compared to 2.0 ha for those managed by males. Households surveyed farmed a mean of 8 ha in the target crops and 11 total ha during the 2017/18 season.

Each plot manager was asked about his or her participation in the subsidy program. By far the largest category of plot manager who received subsidized fertilizer is the head of the EAF or designate. When data are disaggregated, we see that 87 percent of male plot managers received the subsidized fertilizer applied to their plot directly from the organizational source, as compared to 49 percent of female plot managers. Another 50 percent of female plot managers obtained their subsidized fertilizer through the head of the EAF

or another EAF member, as compared to only 12% of male plot managers.

**Figure 2. Did you use fertilizer this growing season?**



Pearson  $\chi^2(2) = 812$  Pr = 0.000

Source: PRePoSAM survey, 2017/18

Acquisition of the subsidized fertilizer from a farmer outside the EAF was relatively rare overall (2%). The “other” category includes plot managers who cited an official source, such as CDMT. Thus, the head of the EAF is the primary conduit of subsidized fertilizer to the target crop plots managed by household members either collectively or individually.

### Among households

Both IER and CMDT employ a four-tiered typology (A through D) to classify farm households (EAFs) according to ownership of animal traction. EAFs in the A class own 2 or more teams of plowing oxen and at least 6 other cattle. Classification thus reflects asset ownership, the ability to plow on time, and access to manure—all of which have consequences for production and income. Farm households in group A have the capacity to plow on time and their soils also benefit from large quantities of organic manure. Households in the B class own only one team of plowing oxen. Households in the C class own less than a full plowing team and depend on other farmers to rent or borrow oxen. D-class households produce without equipment, preparing land, planting and weeding by hand.

Haggblade et al. (2019) updated this typology by adding a mechanized category M. M households own either a tractor or a motorized cultivator. M and A cultivated the largest areas, while under-equipped groups C and D cultivated only 3-5 ha in the Delta and 5-8 ha in the Plateau. The M group also generated nonfarm income four times higher than other agricultural households, enabling them to intensify agricultural production at

higher rates than the groups with animal traction (A through C).

Table 2 shows the relative rank of farmer types in terms of subsidized fertilizer use by various indicators, including all plots planted to target crops by households surveyed. Type B applied the greatest total kgs of subsidized fertilizer across their entire category, representing 48% of the aggregate use across types, but also represented 61% of all EAFs surveyed and half of those receiving the subsidy. The most well-endowed types (M and A) represented 19% of all EAFs but used 37% of the aggregate subsidized fertilizer applied by the farmers we surveyed. The least well-endowed type (D) used only 10% and represented 12% of all EAFs in our sample. An encouraging finding is that D represented 20% of all EAFs receiving the subsidy, though because their farm sizes are smaller, they used only 10% of the aggregate. Across all types of farm households, the ratio of subsidized to total fertilizer applied was 92%; this ratio rises with the endowments of the EAF, but varies little.

**Table 2. Fertilizer subsidy by farm type**

	Total subs. fertilizer per type (kgs)	Ratio of subs. to total fertilizer applied, per type	Type % of all EAFs	Type % of EAFs rec'g subs. fertilizer	Type % of all subs. fertilizer
M	251648	0.933	4	7	12
A	512907	0.928	15	15	25
B	981535	0.928	61	50	48
C	118121	0.893	8	8	6
D	187479	0.877	12	20	10
All	2051689	0.922	100	100	100

Source: PRPoSAM survey, 2017/18. See Haggblade at al. (2019) for definitions of type.

### Policy implications

A ‘universal’ fertilizer subsidy only means that in principle, any Malian farmer who grows one of the target crops has the right to apply for it. In fact, subsidy participation, as measured by amounts of subsidized fertilizer received and applied, is heterogeneous. We have demonstrated how participation varies by the extension structure that serves the farmer’s village, among household endowments of farm equipment and draft power (farm type), and within households, by the status and gender of the plot manager.

Understanding this is important for design of the program because it has implications for attaining the social goals of the fertilizer subsidy, if not also for raising productivity and efficiency. Findings raise questions about the goal of Mali’s fertilizer subsidy, and whether more might be gained in terms of household food security if the subsidy were explicitly, rather than implicitly targeted.

According to an augmented version of the IER and CMDT farm typology, our data show that the fertilizer subsidy is more heavily utilized by farmers who are more well-endowed in terms of equipment and traction. This means that as currently designed, the fertilizer subsidy in Mali is “regressive”—in effect, targeting the better-off.

The survey data reveal a major dependence on subsidies and suggest a crowding out of commercial fertilizer. While the subsidy clearly provides access of Malian farmers to fertilizer, dependence is discouraging from the perspective of fiscal and social sustainability.

### Further reading

- Assima, A., Giacomo, Z., and M. Smale. 2019. Effects of Fertilizer Subsidies on Women’s Diet: Quality of Food Supply Source in Mali. FSP Research Paper.152.
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