

## **How does gender affect sustainable intensification of cereal production in the West African Sahel?**

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In the West African Sahel, better understanding of gender differences in intensification strategies has become more crucial than ever with changing population dynamics, climate change, and chronic food insecurity. The socio-economic dynamics of the past few decades, following the devastating droughts experienced in this region during the 1970s and 1980s, appear to have led to changes in cultural norms guiding land use and crop cultivation. The food price crises of 2007/08 and 2011 may have accentuated some of these changes, as prices generally rose for all cereals in the region. Anecdotal evidence suggests that increasingly, women are planting sorghum on their plots- a crop traditionally cultivated by men- in order to contribute to food security, and also because sorghum prices have risen relative to other crops they grew before.

This analysis compares the determinants of adoption of various intensification strategies by gender of the plot manager, while controlling for household fixed and time-varying effects, as well as cereal crop choice. The approach departs from earlier studies by selecting the plot as unit of analysis rather than the household, reflecting the household structure in the farming systems of the West African Sahel, where women are more frequently plot managers than they are household heads. Women typically manage very small plots individually to meet the needs of their own children, while large-scale cereal fields are collectively worked by both male and female household members, managed by the male household head.

The data in Burkina Faso are drawn from the Continuous Farm Household Survey, which was collected by the Ministry of Agriculture during the crop years 2009/10 to 2011/12. We begin by grouping strategies according to their attributes. The productivity-enhancing group includes improved seeds and fertilizers. Herbicides, fungicides, and pesticides are all part of the yield protecting group. The soil and water conservation group encompasses manure along with anti-erosion strategies, such as zai, half-moon, stone bunds, windbreaks, and green belt. Sorghum, millet, and maize are the cereal crops of interest. A multivariate probit model is chosen for the analysis, since it takes into consideration the possible interdependence across productivity-enhancing, yield protecting, and soil and water conservation strategies.

Descriptive statistics show that about 25% of the sorghum and millet plots are managed by women compared to less than 10% for maize plots. In contrast to sorghum and millet, which are mainly considered as subsistence crops, maize is increasingly becoming an important cash crop and is largely seen as a man's crop. Productivity-enhancing strategies are more heavily used on maize than on sorghum and millet plots. Yield-protecting strategies are less used on millet plots, reflecting that millet remains mostly a subsistence crop. The adoption rate of soil and water conservation strategies is fairly similar across the three crops. Regardless of the crop, fewer strategies are adopted on plots managed by women than on those managed by men.

When a dummy variable for the gender of the plot manager is introduced, the multivariate probit regressions confirm lower adoption rates among plots managed by women for all three sets of strategies. Dummy variables for crops also lead to considerably higher rates for maize relative to sorghum and millet.

Preliminary results lead us to 1) reject the hypothesis that regression parameters are constant across crops; 2) reject the hypothesis that regression parameters are the same for men and women plot managers. Examining separate regressions per crop, we reject the hypothesis that the choice of strategy sets is independent for sorghum and millet. In the case of maize, use of soil and water conservation strategies appears to be uncorrelated with that of productivity-enhancing and yield-protecting strategies.

Turning to gender differences, marital status positively influences adoption for male plot managers but not for female plot managers. Cultural norms dictate that women can only manage their own plots if married or under a special circumstance, when widowed. Most unmarried male plot managers would be sons or younger brothers of the household head, with lower status in the household.

Despite these differences, across crops and plot managers, there is a strong overriding influence of household characteristics such as social status and wealth, and adult education. Plot characteristics, such as size, topography, time since the last fallow, presence of agroforestry, and distance of the plot from home, also influence adoption of intensification strategies. Market infrastructure and agroecological conditions are other significant determinants of adoption.

The results provide new insights on gender that are relevant to the design and implementation of effective policies to sustainably increase production by both male and female farmers in Burkina Faso and some other areas of the West African Sahel.