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SUSTAINABLE LAND MANAGEMENT, GENDER, AND AGRICULTURAL PRODUCTIVITY

Evidence from Ethiopia's Fragile Watershed Observatory

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Land degradation is a pressing global challenge, with three billion people residing in degraded landscapes. The global cost of land degradation is estimated to be about $300 billion per year, with Africa south of the Sahara accounting for 26 percent of the total global costs due to land-use and land-cover changes. In Ethiopia, it is estimated that more than 85 percent of land is moderately to severely degraded due to changes in land use and cover, costing the country an estimated US$4.3 billion annually. In order to halt further degradation and support essential restoration through sustainable land management (SLM) and related investments, the Water and Land Resource Center (WLRC) and its consortium of development partners established six learning watersheds in Central and North-Western Ethiopia with the ultimate goal of improving water security and crop and livestock productivity.

The learning watersheds, which were established beginning in 2012, promote SLM with the full participation of communities, extension agents, researchers, and policymakers. The activities promoted include (1) physical soil and water-conservation measures appropriate for cultivated land, gullies, and degraded hillsides; (2) biological soil and water-conservation measures, such as planting trees, grasses, and forage; (3) water harvesting for multiple-purpose use; (4) improved poultry management and artificial insemination in cattle; (5) the establishment of saving and credit cooperatives; and (6) the provision of agricultural farm machinery and improved crop varieties.

REACH and WLRC began collaborating in 2016 to explore the impact of the learning watersheds' SLM activities on reducing water insecurity for crop and livestock production and domestic use. The International Food Policy Research Institute (IFPRI) provided technical assistance in collecting and analyzing data on these watersheds, including on the gendered differences in the adoption of and investment in SLM practices. This policy note summarizes the results of the data collection and analysis.

METHODOLOGY

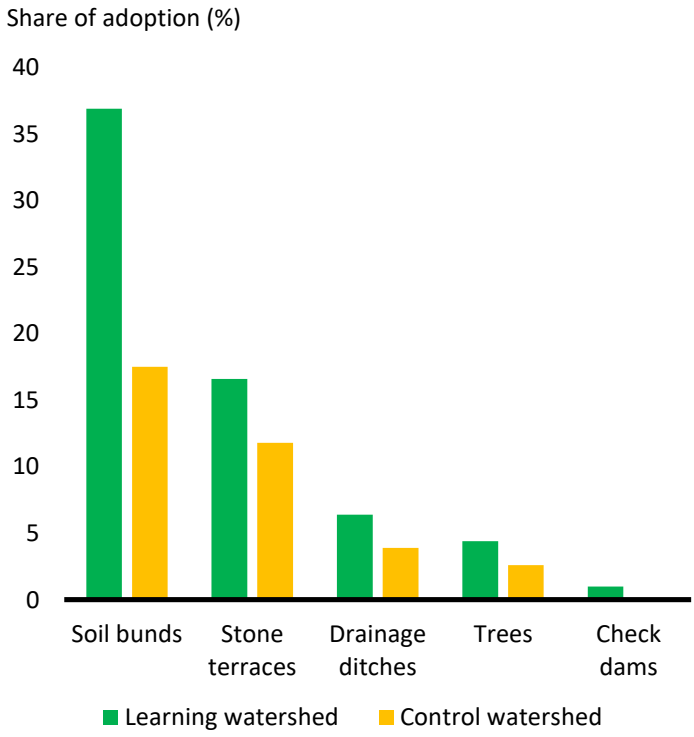
In June 2017, a survey of 600 households was conducted to support analysis in two learning watersheds in the Amhara region in Ethiopia—Aba Gerima and Debre Yacob—along with two control watersheds with similar biophysical conditions, but without large investments in SLM. This design provided comparable learning and control communities to support the assessment of the SLM interventions' impacts on water security. The households in both the learning and control watersheds were statistically similar in terms of the age, gender, and educational background of the household head, as well as the number of land parcels, oxen, and other livestock owned.

SURVEY RESULTS

The data analysis showed that 46 percent of surveyed households in the learning watersheds and 25 percent of those in the control watersheds had adopted one or more long-term SLM practices (Figure 1). Soil bunds and stone terraces were the most widely adopted practices. Other, shorter-term practices varied significantly by season. Use of mulch, manure, and irrigation were dry-season practices, whereas chemical fertilizers were predominantly used during the main rainy season (Figure 2).

Econometric data analysis showed that farmers were more likely to make long-term investments—such as in soil bunds and stone terraces—on plots planted with staple crops (for example, wheat, barley, millet, teff, and maize) rather than plots planted with cash crops, such as coffee and chat. This is likely because staple crops are planted on higher, drier, sloping terraces, whereas cash crops are planted in the gullies and have better access to groundwater, and because staple crops are more likely to cause soil erosion resulting in bare earth after harvesting and hence are more likely to require bunds/terraces. In contrast, farmers were more likely to use mulch, manure, and irrigation on cash crops than on staple crops. As such, farmers appear to be choosing the most appropriate practice for the location and circumstance: bunds and terraces are necessary on slopes, whereas mulch, manure, and irrigation are more cost-effective for use on more valuable cash crops in lowland areas where they justify the additional time and expense.

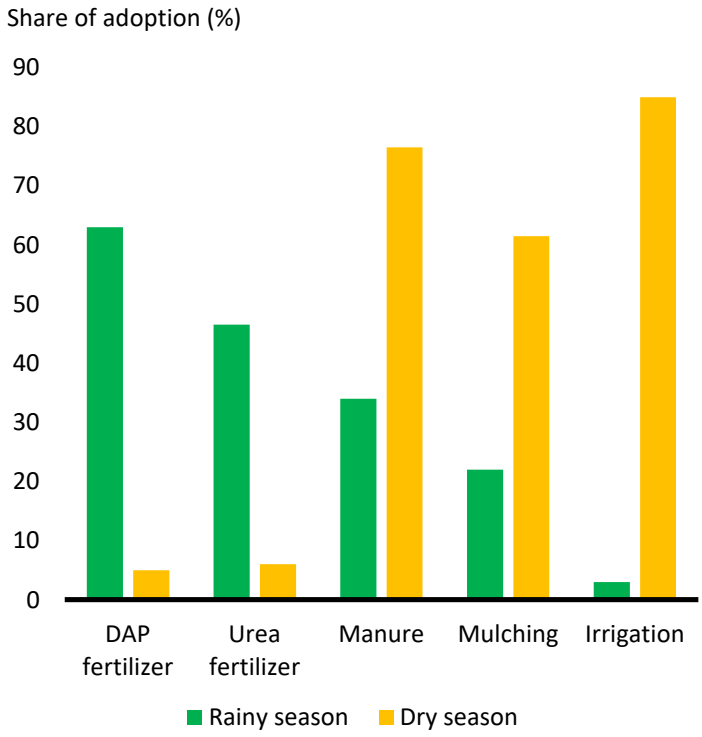
Figure 1. Plot-level adoption of long-term SLM practices in learning and control watersheds



Source: IFPRI/WLRC/REACH survey (2017).

Notes: In addition, trenches, grass strips, living fences, water harvesting, fanya juu, and gully rehabilitation were adopted on less than 0.5 percent of plots.

Figure 2. Plot-level adoption of short-term SLM practices in learning watersheds by season



Source: IFPRI/WLRC/REACH survey (2017).

Notes: SLM = sustainable land management; DAP = diammonium phosphate.

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Farm plots owned and controlled by women were more prone to soil erosion and were of poorer quality in terms of soil depth. In addition, women's participation in watershed committees and water-user associations was low. These factors likely contributed to the fact that yields for both staple and cash crops were lower on plots owned by women compared with those owned by men or jointly owned by men and women.

Investment in SLM practices was less likely on plots owned by women in male-headed households than on plots owned by men, on those jointly owned by men and women, or on those owned by women in female-headed households, suggesting that women in male-headed households faced the greatest constraints to adopting SLM practices (Table 1). Results further showed that, although female-headed households were less likely than male-headed households to adopt SLM in watersheds without SLM interventions, the SLM program significantly increased the adoption of soil bunds on plots owned by women in female-headed households.

Moreover, wherever adopted, SLM investments—and particularly stone terraces and soil bunds—had significant productivity-enhancing effects.

Table 1: Impacts of SLM program on adoption of SLM practices by gender of plot owner

Reference group: Plots owned by women in male-headed households	Soil bunds	Stone terraces	Drainage ditches
Plots owned by women in female-headed households	0.28***	0.20**	0.20*
Plots owned by men in male-headed households	0.29***	0.04	–0.03
Plots jointly owned by women and men in male-headed households	0.15***	0.50	0.45***
Sustainable land management program	0.05	-0.55	–0.55***

Source: IFPRI/WLRC/REACH survey (2017).

Notes: Results are based on Probit regression analysis; ***, **, * indicates significance at the 99, 95, and 90 percent confidence intervals, respectively.

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The presence of watershed committees was associated with higher levels of adoption of soil bunds and mulching, whereas water-user associations were correlated with higher levels of adoption of chemical fertilizers, in addition to soil bunds and mulching. These results indicate the importance of strong local institutions. Farmers in the learning watersheds were 11 percent more productive in growing maize, twice as productive in growing mangoes, and 30 percent more productive in growing finger millet. Crop incomes rose with irrigation from both groundwater and streams, but the effect on income levels was stronger among farmers who also adopted SLM practices. It is possible that greater adoption of SLM in the learning watersheds—where groundwater is the main source of irrigation—improved groundwater recharge (that is, the downward movement of surface water to groundwater) and hence the productivity of irrigated production.

Farmers' recollections indicated that, in the five-year period from 2012 to 2016, time spent moving livestock to and from watering points had decreased by 19 percent in the learning watersheds, whereas it had only declined by 3 percent in the control watersheds. Importantly, income from livestock was higher by about one-third in the learning watersheds compared with the control watersheds.

SUMMARY

The adoption of SLM practices resulted in improved crop and livestock productivity. To further strengthen the benefits of the SLM program, it will be important to consider intrahousehold gender considerations. This will also contribute to the reduction of gendered yield gaps between plots owned by men and those owned by women.

Related Resources

Kato, E., D. Mekonnen, S. Tiruneh, and C. Ringler. 2019. *Sustainable Land Management and Its Effects on Water Security and Poverty: Evidence from a Watershed Intervention Program in Ethiopia*. IFPRI Discussion Paper 1811. Washington, DC: International Food Policy Research Institute.

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