



CLIMATE-SMART AGRICULTURE

Adapting to rising temperatures: farm practices and policy options in Uganda

Climate change is leading to a rise in global temperatures, which poses a major threat to agriculture production, and to the welfare of smallholder farmers. Extreme temperatures reduce crops yields, increase risks of agronomic water stress, and contribute to an increased prevalence of pests and diseases. The risks posed by rising temperatures are particularly high in sub-Saharan Africa, where temperatures are increasing rapidly, and rain-fed agriculture is predominant among farmers with few resources and mechanisms to cope with climate-related risks.

In Uganda, average temperatures have increased by 1.4 °C since the 1960s, and are projected to continue to rise for decades to come. High temperatures are having an adverse impact on agricultural output. Using data from a nationally representative panel survey of Ugandan smallholders, it is estimated that an increase of 1 percent in maximum temperature during the growing seasons reduces the total value of crop production by approximately 7–11 percent.

Identifying sustainable farming practices to reduce the sensitivity of Ugandan agriculture to rising temperatures is critical for safeguarding the livelihoods of farmers. This brief provides evidence on the positive impacts of organic fertilizer application, coffee-banana intercropping and cereal-legume intercropping on crop production value under conditions of high temperatures, and considers policy options to support their sustained adoption in Uganda and elsewhere.

Sustainable agricultural practices improve production and reduce high temperatures risks

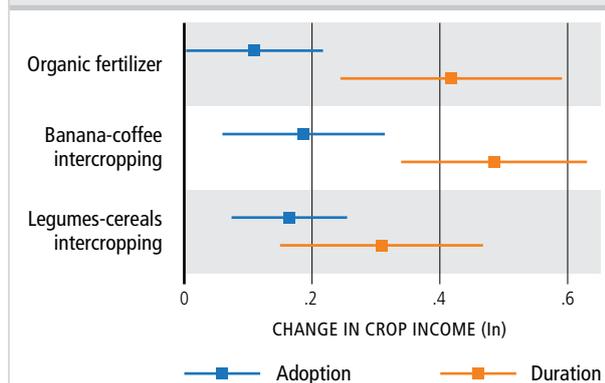
In Uganda, econometric analysis shows that adoption of banana-coffee intercropping, cereal-legumes intercropping, or organic fertilizers contributes to an improvement in the value of crop production for smallholders. After accounting for confounding factors, results show that farmers adopting these practices improve their production outcomes by between 13 and 20 percent (Figure 1, Adoption).

KEY MESSAGES

- ▶ The adoption of banana-coffee intercropping, cereal-legumes intercropping, and organic fertilizer are effective at reducing the negative effects of high temperatures on smallholder production systems.
- ▶ Sustaining the adoption of these practices for multiple years substantially improves their benefits.
- ▶ Interventions that reduce risk and liquidity constraints of farmers can enable sustained adoption of these practices.

The benefits of adopting these practices – measured in terms of crop production value – increase when farmers can sustain the practices for multiple years. This is due to a combination of agronomic benefits that accrue over time and benefits that come from experience. The results show that an additional year of use of these practices leads to an additional increase in crop production value of between 33 and 46 percent, depending on the practice (Figure 1, Duration).

FIGURE 1. The benefits from adopting sustainable agricultural practices increase if their use is sustained



Source: Authors' own elaboration.

Adopting these practices and keeping them over time enhances the resilience of smallholder production to increased temperatures. As temperatures deviate upwards from their long-term average, the impact on crop income is larger (Figure 2). However, adopting the practices and maintaining them over time compensates this negative effect, transforming the impact of extreme temperature shocks for adopters in just a small loss or a marginal gain in crop income. Moreover, these benefits are found to increase the longer the practices are maintained. Thus, adopting these practices and sustaining them both improves production on average and enhances the capacity of smallholders to withstand adverse extreme temperatures.

Production and consumption risks combined with liquidity constraints limit the adoption of sustainable agricultural practices

The adoption of sustainable agricultural practices is constrained by two primary factors. The first is the costs associated with adopting new practices. These include the direct costs, such as procuring necessary inputs, as well as opportunity costs that come with a change in how land, labour, and capital are allocated within a farm system. The second are the livelihood and food security risks associated with changing farm practices.

Smallholder farmers often face significant liquidity constraints and lack alternative instruments, such as insurance or credit, for managing consumption and production risks. As a result, they frequently struggle to adopt new agricultural practices and to sustain their use over time. Appropriate policy instruments and programmatic support to address these constraints is required to achieve widespread and sustained adoption among smallholders.

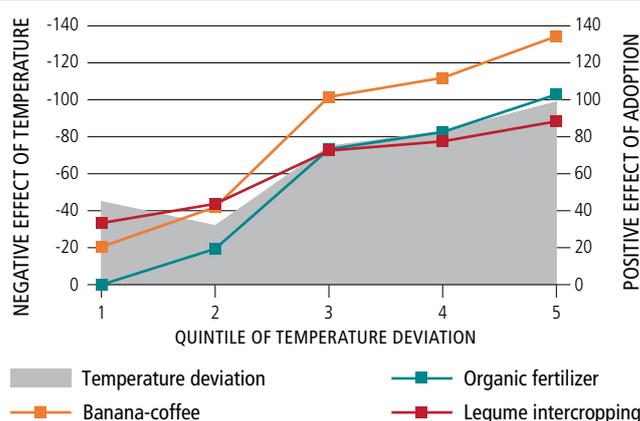
Policy options to support adoption of sustainable agricultural practices

Innovative approaches are required to address adoption constraints over multiple years. This is particularly important during the initial years that follow a major change in agricultural management practices.

Promising policy pathways involve a combination of participatory agriculture knowledge generation and dissemination approaches, such as farmer field schools, with a set of incentives to adopt new practices and/or manage production and livelihoods risk. Mechanisms to consider include:

- Modifying existing social protection programmes:** Many countries are implementing social protection programmes to reduce food insecurity risks and enable poor households to retain and build up assets with cash or in-kind transfers. With appropriate modifications, these programmes are well-suited to address risk and liquidity constraints to adopting new

FIGURE 2. The benefits of adoption increase with temperature and compensate temperature negative effects on crop incomes



Source: Authors' own elaboration.

agricultural practices. Hard and soft conditions related to the sustained adoption of agricultural practices, and/or bundling programme participation with regular extension advice on improved adaptive practices is a viable approach for supporting poor households to sustain the use of adopted practices.

- Leveraging crop insurance schemes and agricultural credit:** Where crop insurance and agricultural credit programmes exist, these programmes can be modified to incentivize the adoption of appropriate agricultural practices. This may include using public resources to reduced insurance premiums or interest rates conditional on the adoption of specific practices.
- Modifying existing agricultural policies:** Existing public support policies for agriculture, such as input and output subsidies, help build the business case for farmers to make investments. Harnessing this public investment to support adoption of appropriate practices can occur in two ways. The first is by providing cash and in-kind subsidies to the farmers that face barriers and economic constraints, conditional on the adoption of sustainable practices. The second is by modifying existing agricultural policies to support the use of sustainable practices and longer-term investments in land. Such policies concern institutional laws on land administration and land tenure regulations, among others.

The challenges posed by a rapidly changing climate are multi-faceted, and coping with them will require multi-dimensional and multi-sectoral approaches. Better targeting and integration of existing policies to support the adoption of climate adaptive agricultural practices is an important step to enhancing smallholders' resilience, both in Uganda and elsewhere.