Does adoption of Climate Smart Agriculture improve food availability and access of Ugandan maize farmers?

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Executive statement

Uganda has undertaken a number of climate smart agricultural technologies, ranging from the distribution of improved seeds under operation wealth creation, legume intercropping, use of fertilizers and pesticides in a bid to lessen the impact on climate change on agricultural farming households and improve food security. However, adoption of such technologies is still low, and yet their adoption is associated with better food availability and food access for adopting maize growing households. This calls for the need to strengthen Uganda's agricultural extension provision to raise awareness on climate smart agricultural practices.

Key findings

- **Maize legume intercropping is the most commonly used CSA technology among maize farmers**
- **There is limited use of a combination of CSA practices among maize farmers**
- **Use of CSA practices is associated with better food availablity and food access**

Background

Food security[1] remains a serious challenge in Uganda due to over reliance on rain-fed agriculture, which is adversely affected once hit by climatic shocks (Sekabira and Nalunga, 2020). By 2050, the compounding effects of increasing temperatures, declining rainfall, frequent floods and droughts are projected to lead to a 5 percent reduction in maize yields and an average reduction of 500 calories per person of food availability (Dawit et al., 2017). Given the anticipated threats of crop yield reduction and food scarcity from the impact of climate change, there have been regulatory efforts in Uganda through the National Climate Change Policy, the National Fertiliser Policy of 2016 and the National Agricultural extension Policy of 2016 to scale up use of climate smart agricultural (CSA) practices in order to lessen the impact on the livelihoods of the most vulnerable segment of the population and improve on achievement of sustainable development goal 2 of zero hunger. These CSA practices among others include maize–legume intercropping, fertilizer application, use of improved crop varieties, and use of pesticides of maize. However, it remains unclear as to whether the efforts have led to improvements in food security, especially for maize farming households.

Research methodology

Using the three waves (2015/16, 2018/19, 2019/20) of the national representative Uganda National Panel Surveys (UNPS) data collected by the Uganda Bureau of Statistics (UBoS), this policy brief highlights the achievements made in percentage of maize growing farmers that have adopted CSA practices, combination of CSA

[1] Food security exists when "all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO 1996). Food security comprises four dimensions namely food availability, access, utilization, and stability.

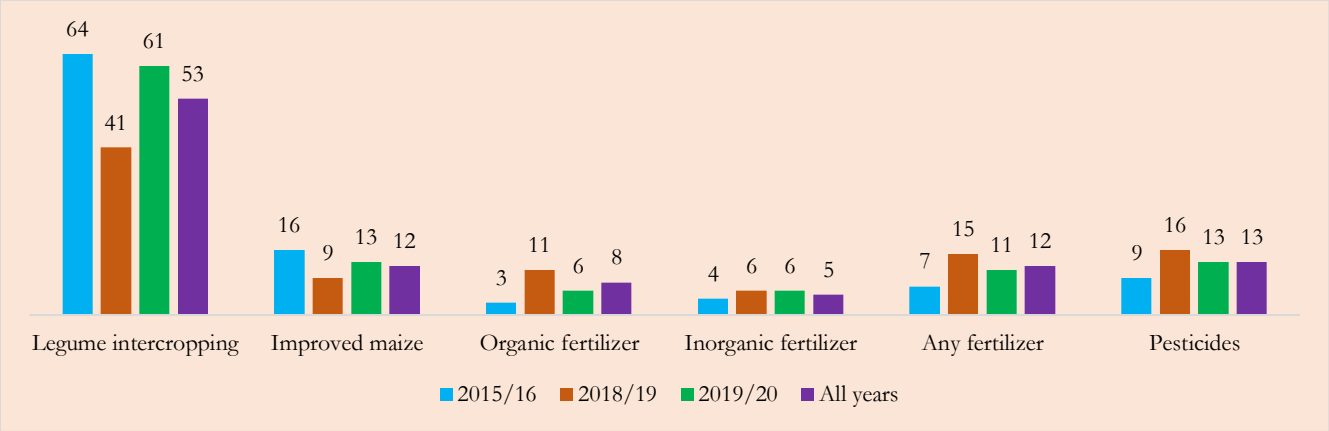
practices and how adoption of CSA have affected food availability and food access.

Findings

1. Maize legume intercropping is the most commonly used CSA technology among maize farmers

As part of the strategy to increase agricultural production and improve food security the Agricultural Sector Strategic Plan (2015/16-2019/20) and Ministry of agriculture, Animal Industry and Fisheries Strategic Plan (2020/21 – 2024/25) focused on various agricultural technologies, with particular emphasis on priority and strategic commodities, including maize. Findings (Figure 1) show that among the studied CSA practices, maize legume intercropping was the most adopted CSA technology (53%), followed by use of pesticides (13%), improved maize seed (12%), and inorganic fertilizers had the lowest adoption rate (5%). The percentage of maize growing households that use of each of the CSA practices varied by year.

Figure 1: Use of CSA practices among maize farmers (% by year)



Source: Authors construction based on UNPS data

For example, the use of improved seed was highest in 2015/16 (16%) and decreased to 9 percent in 2018/19. The overall finding of 13 percent of maize farmers using improved seed in 2019/20 closely aligns with 14 percent reported in the Uganda Annual agricultural survey of 2021. Legume intercropping is a common practice due to the need to mitigate land scarcity, with over 46 percent of farming households reported to engage in this practice (Uganda Annual Agricultural survey 2021). Additionally, there has been an upward trend in use of pesticides, increasing from 9 percent in 2015/16 to 16 percent in 2018/19 which could be attributed to the growing incidence of fallen army warm infestation on maize crops in Uganda. The observed adoption levels could be attributed to either lack of information about farming practices or concerns regarding the potential negative effects of certain CSA practices, such as inorganic fertilizers, on soil quality and food production.

2. There is limited use of a combination of CSA practices among maize farmers

CSA practices are commonly used in combinations of two, three, four, and five to optimize yield and mitigate the risks associated with climatic shocks. However, adoption of a combination of CSA practices among maize-growing farmers remains relatively low. For example, only 5 percent of maize farmers have implemente the combination of legume intercropping with improved maize, and only 1 percent have adopted all four practices. This limited adoption could be attributed to the gradual penetration of CSA practices through Uganda's agricultural extension systems within farming communities. It further highlights that maize growing households are not certain of proper CSA combinations to use for increasing food production, highlighting the need for extension and advisory services in form of demonstration trials in this regard.

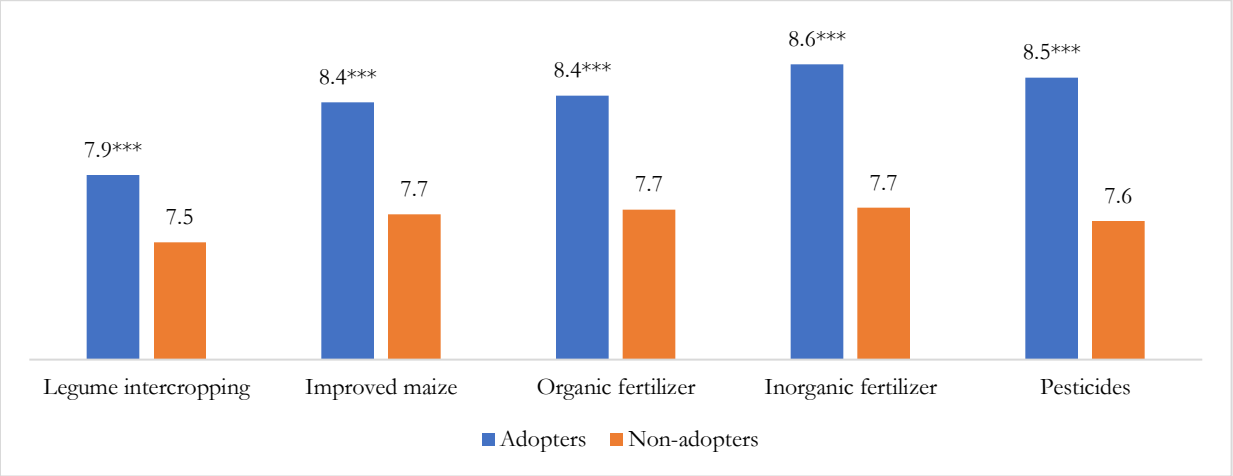
Table 1: Incidence of the use of CSA at household level

CSA technologies	Percentage use
Single CSA technology	
Improved maize	3.02
legume intercropping	36.18
Fertilizers	2.14
Pesticides	2.57
Use of two CSA technologies	
Improved maize+ legume intercropping	4.52
Improved maize+ Fertilizers	0.51
Improved maize+ Pesticides	0.75
legume intercropping + Fertilizers	3.1
Legume intercropping +Pesticides	0
Fertilizers+ Pesticides	0
Use of three CSA technologies	
Improved maize+ legume intercropping +Fertilizers	0.98
Improved maize+ legume intercropping +Pesticides	0.79
Legume intercropping +Fertilizers+ Pesticides	2.25
Improved maize +Fertilizers+ Pesticides	0.53
Use of four CSA technologies	
Improved maize+ legume intercropping +Fertilizers +Pesticides	0.79
None of CSA technologies	36

3. Use of CSA practices is associated with better food access for maize growing households

Food access was based on the variety of food groups consumed by a household during a seven-day recall period. Findings (Figure 2) show that households engaged in any of the four CSA practices exhibited greater dietary diversity compared to those who did not adopt CSA technologies. For instance, incorporating legume crops through maize-legume intercropping can assist maize farmers in further diversifying their food diets and increasing crop income. This approach enables them to produce a wider range of food types, which can be sold in the market to generate additional income.

Figure 2: Food access of maize growing households by CSA adoption status

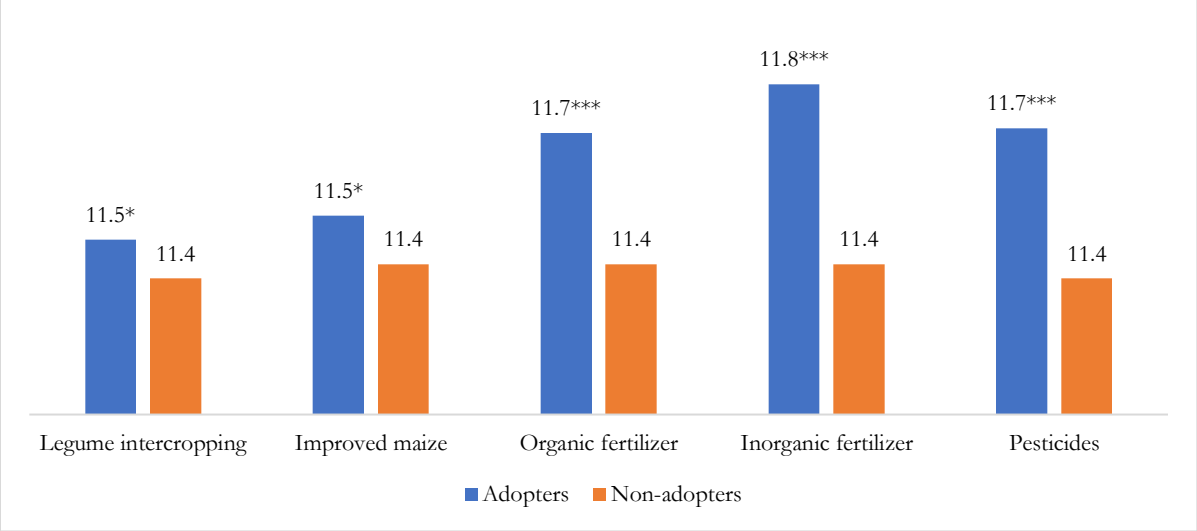


*** implies that farmer category is better off when compared to the other

4. Use of CSA practices is associated with better food availability among maize growing households

In this case, "food availability" at the farming household level refers to the duration during which households had sufficient food through own production or through purchase from the market. Findings (Figure 3) show that the adoption of CSA technologies contributes to an increase in the number of months when maize-growing households are food secure, reaching almost 12 months with an adequate food supply. For example, a maize growing household who applies inorganic fertilizers is likely to have nearly 12 months of adequate food provision as compared to farmers who did not adopt estimated at 11 months.

Figure 3: Food availability of maize growing households by CSA adoption status



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Conclusion

Efforts by government and non-government organizations to promote widescale adoption of climate smart agricultural (CSA) practices, aimed at mitigating the impact of climatic shocks on maize production, have not yielded satisfactory adoption rates among maize-growing. With the exception of legume intercropping, adoption of improved maize seed, fertilizers and pesticides remains low. However, evidence shows that farmers who adopt CSA practices have better food access and availability. Based on these findings, the following policy considerations are proposed:

a) The Government of Uganda, development partners, civil society and other agricultural actors ought to increase the dissemination of CSA information among maize growing farmers. This can be achieved through strengthening the agricultural extension system and increasing efforts to raise awareness about the benefits and application of CSA practices.
b) Extension services should be geared towards boosting farmers' access to information on CSA practices, emphasizing their significance in improving household food availability and access. This could involve conducting demonstration trials to facilitate hands-on learning of CSA practices and their appropriate application rates.

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