Evidences

Study #4599

Contributing Projects:

- P2304 - Farmers' willingness to invest in maize shelling mechanization and potential financial benefits in Tanzania (Africa RISING Program)
- P2053 - Conduct survey on adoption of improved maize in Ghana
- P1037 - Use DNA fingerprinting for assessing adoption of improved maize varieties
- P2200 - Exploration of the social domain of the Sustainable Intensification Assessment Framework for cowpea living mulch in Northern Ghana
- P1260 - Targeted replacement of obsolete maize varieties and improved hybrid adoption
- P2046 - Exploration of the social domain of the Sustainable Intensification Assessment Framework for cowpea living mulch in Northern Ghana
- P1728 - Rethinking adoption and adoption research
- P2047 - How sustainable is maize leaf stripping for livestock feed in Northern Ghana? A gendered analysis
- P1070 - Rethinking adoption and adoption research (New)

Part I: Public communications

Type: OICR: Outcome Impact Case Report

Status: Completed

Year: 2021

Title: Comparative research points to sub-Saharan African farmers' willingness to pay for climate smart maize technologies and adoption dynamics and pathways

Short outcome/impact statement:
Climate change, including increased variability, challenges smallholder agriculture. It also affects the livelihoods of smallholder maize farmers. Enhanced adoption of climate smart technologies could help farmers. This very much depends on their willingness to pay for the technologies. Studies showed that farmers are willing to pay for climate smart technologies - and their growing improved, stress tolerant maize varieties has positively affected farmer livelihoods, thanks to increased on-farm yields (on average).

Outcome story for communications use:
Climate change/variability poses a significant challenge to smallholder agriculture adversely affecting the livelihoods of smallholder maize farmers. Farmers use traditional methods, such as traditional weather forecasting mechanisms, or crop and livelihood diversification, to minimize the adverse effects of climate change (Bellon et al. 2020, Gbangou et al., 2020b). However, these methods are often of limited scope and efficacy when it comes to addressing the larger challenge; production and productivity must increase to feed the rapidly growing population in sub-Saharan Africa (and elsewhere).

In this regard, MAIZE and partner scientists investigated farmers' preferences for climate-smart technologies and production techniques. They assembled findings about preferences regarding digital climate information service (Gbangou et al., 2020a), climate adaptation programs (Al-Amin et al., 2020), varietal traits, such as drought tolerance and pest resistance (Marenya et al., 2021, Kassie et al., 2017, Martey et al., 2020), and sustainable intensification practices (Kotu et al., 2022). Farmers are willing to pay for innovations that can avoid or reduce the adverse effects of climate change. However, farmers are not uniform in their preferences and there are visible differences among gender groups. Evidence shows that women farmers' adoption rates are generally lower than that of men farmers, although women are more willing than men to sacrifice grain yield for climate-smart maize attributes, such as drought tolerance. This suggests that the low adoption rate among women may be driven not only by resource constraints, but also by the technologies' inferior performance with regard to the traits most demanded by women.

There is no question that farmer adoption of climate smart maize technologies has brought them better incomes and greater food security. For instance, in Ghana, Martey et al (2020) found that the mean maize yield of farm households increased by more than 150% due to the adoption of drought tolerant maize varieties. While existing findings offer maize scientists good guidance for maize breeding strategies (e.g. climate-smart traits), more R4D is needed to better understand different groups' specific adaptation demands, willingness to pay and translate this into intelligent extension/scaling approaches.

Links to any communications materials relating to this outcome:
- https://tinyurl.com/25q64l4s
- https://tinyurl.com/ybvdcpo2

Part II: CGIAR system level reporting

Link to Common Results Reporting Indicator of Policies : No

Stage of maturity of change reported: Stage 1

Links to the Strategic Results Framework:
Sub-IDOs:
- Increased household capacity to cope with shocks
- Reduce pre- and post-harvest losses, including those caused by climate change

Is this OICR linked to some SRF 2022/2030 target?: Yes

SRF 2022/2030 targets:
- # of more farm households have adopted improved varieties, breeds or trees

Description of activity / study: <Not Defined>

Geographic scope:
- Multi-national

Country(ies):
- Malaysia
- Zimbabwe
- Malawi
- Kenya
- Ghana

Comments: <Not Defined>

Key Contributors:
Contributing CRPs/Platforms:
- Maize - Maize

Contributing Flagships:
- FP4: Sustainable intensification of maize-based systems for improved smallholder livelihoods
- FP1: Enhancing Maize's R4D Strategy for Impact
- FP3: Stress Tolerant and Nutritious Maize

Contributing Regional programs: <Not Defined>
Contributing external partners: <Not Defined>

CGIAR innovation(s) or findings that have resulted in this outcome or impact:
Using an existing tool for predicting the adoption of agricultural innovations in developed countries as the starting point, we identify a number of distinctive features of smallholder agriculture in developing countries that affect agricultural adoption

Innovations: <Not Defined>

Elaboration of Outcome/Impact Statement:
Smallholder farmers' adoption of agricultural technologies usually takes a long time, or does not happen at the required level. This is partly due to technology development strategies' not properly considering attributes most valued by farmers. Indeed, farmer adoption is limited when technology development processes failed to incorporate the traits valued by farmers (Lunduka et al., 2012; Dalton, 2003). Farmers prioritize their expenditures based on resource constraints, nature-related challenges, including climate change, or cultural norms (Llewellyn and Brown 2020). Climate change (particularly unpredicted variability in weather conditions) poses significant challenges, adversely affecting farmers' income and food security.

Farmers are interested in innovations that enhance their climate mitigation and adaptation mechanisms. Studies show that farmers are willing to pay for climate change adaptation mechanisms and technologies (Al-Amin et al 2020, Gbangou et al. 2020a, Martey et al. 2020). For instance, Gbangou et al. (2020a) found that 90%+ of farmers in the experiment group (i.e., those who received training on climate change and climate information service) and 75% in the control group were willing to pay for climate information service. Studies specific to maize show that smallholder farmers are interested in maize traits and production systems that enable them to adapt to climate change (Kotu et al 2022, Kassie et al 2017, Marenya et al 2021). Kotu et al. (2022) found that farmers appreciate maize-based cropping systems that integrate sustainable intensification practices with variety replacement, such as maize/legume intercropping and other practices that enhance soil and moisture conservation. Farmers inevitably make trade-offs when choosing maize traits and production systems, but not all make the same! Marenya et al (2021) showed that women farmers made larger yield sacrifices for climate-change related maize traits (such as tolerance to drought and Striga weed) than men. Meanwhile adoption of new technologies is variable among gender groups, with lower rates of adoption by female farmers (Cairns et al. 2021). This suggests that breeding programs need to address gendered varietal and trait preferences, as also implied in Tegbaru et al. (2020).

References cited:

•[1] Lunduka, R., Fisher, M., & Snapp, S. (2012). Could farmer interest in a diversity of seed attributes explain adoption plateaus for modern maize varieties in Malawi? Food Policy, 37(5), 504–510. (https://doi:10.1016/j.foodpol.2012.05.001)
•[2] Cairns JE, Chamberlin J, Rutsaert P, Voss RC, Ndhlela T, Magorokosho C. (2021). Challenges for sustainable maize production in sub-Saharan Africa. Journal of Cereal Science 101, 103274. https://doi.org/10.1016/j.jcs.2021.103274 (https://doi.org/10.1016/j.jcs.2021.103274)
•[3] Al-Amin, A.Q. Masud, M.M., Sarkar, S.K., Filho, W.L., Doberstein, B. (2020) Analysing the socioeconomic and motivational factors affecting the willingness to pay for climate change adaptation in Malaysia. International Journal of Disaster Risk Reduction, Volume 50, November 2020, 101708. (https://doi.org/10.1016/j.ijdrr.2020.101708)
•[4] Dalton, T. J. (2003). A hedonic model of rice traits: economic values from farmers in West Africa. In 25th International Conference of Agricultural Economists. (https://tinyurl.com/2y3s7cya)
•[5] Kotu, B.H., Oyinbo, O., Hoeschle-Zeledon, I., Nurudeen, A., Kizito, F., Boyubie, B. (2022). Smallholder farmers' preferences for sustainable intensification attributes in maize production: Evidence from Ghana. World Development, 152: 105789 (https://doi.org/10.1016/j.worlddev.2021.105789)
•[6] Marenya, P.P., Wanyama, R., Alemu, S, Woyengo, V. (2021). Trait preference trade-offs among maize farmers in western Kenya, 7(3) e06389. (https://doi.org/10.1016/j.heliyon.2021.e06389)
•[7] Bellon, M. R., Kotu, B. H., Azzarri, C., & Caracciolo, F. (2020). To diversify or not to diversify, that is the question. Pursuing agricultural development for smallholder farmers in marginal areas of Ghana. World Development, 125. https://doi.org/10.1016/j.worlddev.2019.104682 104682. (https://doi.org/10.1016/j.worlddev.2019.104682)
•[8] Llewellyn, R.S., and Brown, B. (2020). Predicting Adoption of Innovations by Farmers: What is Different in Smallholder Agriculture? Applied Economic Perspectives and Policy, 42 (1):100–112 (https://doi.org/10.1002/aepp.13012)
•[9] Gbangou, T., van Slobbe, E., Ludwig, F., Kranjac-Berisavljevic, G., Paparrizos, S. (2020a). Harnessing Local Forecasting Knowledge on Weather and Climate in Ghana: Documentation, Skills, and Integration with Scientific Forecasting Knowledge. Weather, Climate, and Society 13(1):23–37. 10.1175/WCAS-D-20-0012.1) (https://tinyurl.com/23da339l)
•[10] Kassie, G. T., Abdulai, A., Greene, W. H., Shiferaw, B., Abate, T., Tarekegn, A., & Sutcliffe, C. (2017). Modeling preference and willingness to pay for drought tolerance (DT) in maize in rural Zimbabwe. World Development, 94, 465–477 (https://doi.org/10.1016/j.worlddev.2017.02.008)

Quantification: <Not Defined>

Gender, Youth, Capacity Development and Climate Change:
Gender relevance: 1 - Significant
Main achievements with specific **Gender** relevance: gender-disaggregated data on willingness-to-pay
Youth relevance: 0 - Not Targeted
CapDev relevance: 0 - Not Targeted
Climate Change relevance: 1 - Significant
Describe main achievements with specific **Climate Change** relevance: willingness-to-pay for climate change-relevant traits and for services associated with adaptation benefits (e.g. weather information to enable timely planting; laser-land levelling to enable zero-till practices and rotation; zero-till mechanization services)

Other cross-cutting dimensions: No

Other cross-cutting dimensions description: <Not Defined>

Outcome Impact Case Report link: Study #4599

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