Info Note

Climate Services supporting the adoption of Climate Smart Agriculture

Potential linkages between CSA adoption and climate services use

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Key messages

- Climate services and climate-smart agriculture both help farmers to manage and adapt to increasing climate risk
- Climate services support CSA scaling through two primary pathways; improving farmers' capacity to adopt CSA, and improving the enabling environment for scaling CSA
- With increased efforts to evaluate the uptake and impact of climate services, there is the potential to improve our understanding of its relationship with CSA adoption, and to maximize synergies between scaling both

Climate services (CS) are defined by Vaughan et al. (2018) as "the production, translation, transfer and use of climate knowledge and information in climate-informed decision-making and climate-smart policy and planning". CS support adaptation to climate variability and change in agriculture by informing farmer and institutional decision-making, producing local climate knowledge, supporting efforts to build resilience and manage climate risk, and improving the enabling environment for Climate Smart Agriculture (CSA) adoption (Hansen et al., 2019). CSA practices target the three CSA pillars; increasing adaptation/resilience to climate change, increasing food production and, where feasible, mitigating greenhouse gas emissions (Aggarwal et al., 2018). CSA falls under Flagship 1 in CCAFS and climate services under Flagship 4.

CSA is often supported and promoted by extension service providers towards the goal of improving farmers' food security, income and yield while mitigating broader ecosystem impacts. Improved access to government extension increases the probability of farmers planting early and diversifying crops as adaptation strategies (Mulwa et al., 2018). Rural advisory services, under which climate services fall, further the scaling of CSA through the dissemination of weather and climate information, and the relevant technology, advice and sometimes inputs that befit the climate information (Rupan et al., 2018). In this info note, we generalize the language around weather and climate information and associated services under the umbrella term, climate services.

Farmers' access to climate information is integral to implementing adaptation strategies (Mulwa et al., 2018). In a recent study looking at the link between climate services and adoption of CSA practices, Djido et al. (2021) found that climate services use increased the adoption of multiple cropping practices and water management increased by 6.8% and 5.6% respectively. While these CSA practices were statistically linked to climate services, other practices such as erosion control, integrated pest management and pest-resistant crops showed no statistical relationship (Djido et al., 2021). In Malawi, Mulwa et al. (2017) found that climate information can drive farmers to adopt climate change adaptation practices. Similarly, in their discussion paper on how insurance and climate services might contribute to scaling CSA, Loboguerrero et al. (2017) highlight the importance of understanding how knowledge networks and information flows affect climate information access and use. Climate services and agro-advisory services provide an enabling environment for CSA to scale and contribute to the climate resilience of farmers. Climate services also reduce uncertainty to help farmers adopt CSA practices.

In this info note, we aim to explore the relationship between smallholder farmers accessing and using climate services, and adopting CSA practices using data from

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Climate Smart Villages (CSVs). CSVs are sites for agricultural research and development where approaches for managing climate change in agriculture are tested (Aggarwal et al., 2018). There is a focus on participatory methods together with technological approaches and institutional options. CSVs aim to empower farming communities to be climate-smart through six key aspects; climate information services and insurance; CSA practices and technologies; national and subnational plans and policies; farmers' knowledge; climate and ag-development finance; and local and national public and private institutions (Aggarwal et al., 2018).

For the methodology, we approached the question of how climate services might contribute to CSA scaling by examining two primary pathways, recognizing that they are not mutually exclusive; improving the enabling environment for CSA to scale and improving farmers' capacity to adopt CSA practices. For the first pathway, we review the literature to establish which aspects of the enabling environment may benefit from climate services efforts. For the second pathway, we use data collected from CSVs in 2021 in West and East Africa to examine farmers' adoption of CSA practices, and access and use of weather and climate services. We determined which were the most preferred CSA practices in each village, how many farmers were accessing and using weather and climate services, and how many farmers both adopted CSA practices and used climate services. CSV villages were in Basona Werana, Ethiopia; Kaffrine, Senegal; Fakara, Niger and Cinzana, Mali. While this brief does not quantify a relationship between CS potentially driving an uptake of CSA practices, or vice versa, we offer a preliminary analysis of the link between CSA and CS, proposing further areas of focus for evaluating impact in CSVs.

Farmers' adoption of CSA practices and use of climate services

Table 1 below shows that CSA practices have different rates of adoption in different countries. It should be noted that farmers can adopt more than one CSA practice, and may also receive climate information from sources other than the CCAFS and the CSV.

CSA practice	Ethiopia	Mali	Niger	Senegal
1	406	27	52	28
2	230	216	161	77
3	84	45	98	88
4	102	255	40	30
5	12	258	11	11
6	48	35	3	66
7	97	102	197	75
8	0	208	162	0

Table 1: number of farmers employing CSA practices in Ethiopia, Mali, Niger and Senegal. CSA practices include: (1) Terraces + Desho grass (soil and water conservation with biological measure); (2) Controlled grazing; (3) Improved wheat seeds; (4) Improved beans seeds; (5) Improved potato seeds; (6) Cereal/potato—legume crop rotation; (7) Residue incorporation for Wheat or Barley; (8) Green Manure (N fixing In Time) vetch and/or lupin during off-season.

CSA practice	Weather or climate forecast use			
	Ethiopia	Mali	Niger	Senegal
1	46.3	70.4	30.8	82.1
2	51.7	64.4	36.0	66.2
3	64.3	80.0	43.9	85.2
4	65.7	45.5	35.0	93.3
5	91.7	48.8	18.2	63.6
6	70.8	65.7	33.3	84.8
7	61.9	55.9	31.0	62.7
8	0.0	51.0	17.3	0.0

Table 2: percentage of farmers who both adopted a CSA practice and used a weather or climate forecast per country.

In the CSV data, farmers were asked whether they used weather and seasonal forecasts to change their on-farm decisions. We focus on use of forecasts rather than their access as climate information must influence decision-making in order to have an impact on farmers' livelihoods and agricultural practices.

CSA practices and climate services are both climate risk management strategies that require a user centric approach to understand which type of information would be most valuable to farmers. As Table 1 shows, farmers adopt CSA practices at different rates, depending on their context and what fits with their biophysical setting, farming objectives, and resource availability. Their experience of risk is also a key factor that contributes to whether farmers will adopt CSA practices or use climate services. Farmers might perceive them as requiring too much labour or capital to be worth the risk of investment, and thus avoid changing their decisions and practices. These issues are prevalent for smallholder farmers and are being addressed by the increased participatory efforts that co-design and co-produce interventions together with farmers. Approaches such as PICSA, the Participatory Integrated Climate Services approach developed by the University of Reading, are becoming more widespread due to their collaboration with farmers to understand where climate information might be valuable in their livelihoods. Bayala et al. (2020) describe how climate information communicated through PICSA training is the entry point for community-based scaling of CSA. In Rwanda, PICSA is also integrated into agricultural extension (Hansen et al., 2019). Co-production contributes to the legitimacy of interventions, as well as offering a pathway for users to influence what kind of information is generated upstream. Aggarwal et al. (2018) point to the importance of local communities shaping CSV design such that their experience and knowledge of managing climate risk is included. Efforts to scale CSA and CS can build on the same efforts of user centricity, improving farmers' capacity to change their agricultural practices, and including communities in co-designing and co-producing relevant and legitimate interventions.

Climate services are intended to help farmers avoid losses in climatically "bad" years and take advantage of opportunity in "good" years. Opportunities might include implementing CSA practices that would otherwise have been perceived as too risky. Climate services may inform which CSA practices to adopt for a season in some cases. Some CSA practices are more likely to benefit from the use of climate information than others. Comparing tables 1 and 2, it is evident that many farmers who implemented a CSA practice also used climate services. While there is no causality established in this analysis, it can be assumed that some CSA practices might pair better with climate information than others. One contributing reason could be the relevance of climate information to certain practices. For example, the choice between improved seeds CSA practices for wheat, bean or potato (practices 3, 4 and 5 respectively in CSVs) could depend on seasonal forecasts predicting a favourable growing season for one particular crop compared to the others. For other practices, such as terraces (practice 1) or residue incorporation (practice 7), climate information might be less important in deciding whether to adopt.

Enabling environment for scaling CSA adoption

Both climate services and CSA are strategies that aim to help farmers make their livelihoods climate resilient, with their impacts typically measured in terms of food security. These strategies benefit each other in efforts to scale up and out. Scaling CS in different regions, particularly under CCAFS, involves building the capacity of country's National Meteorological Services (NMS) and improving the collaboration between NMS and extension services agencies. Both institutions are critical in engaging farmers in co-producing and sharing knowledge that is relevant to the context and contributes towards improved food security and climate resilience. Yet, there is apparently limited collaboration between NMS and extension services, with CCAFS projects sometimes instigating the first meeting of the two. Extension services have been found to effectively communicate both CSA practices and climate services to farmers in Ghana (Djido et al., 2021). There is a need for increased collaboration and efforts to understand not only how climate services and CSA might increase the uptake of the other, but how actors might build on each other's networks and exploit economies of scale to reduce costs and accelerate uptake (Steiner et al., 2020). Mulwa et al. (2018) point to the importance of encouraging farmers to consider their activities holistically by implementing an optimal combination of farming practices rather than a single technique, which is achievable through effective farmer education and extension messaging.

An additional aspect of contributing to the enabling environment of CSA adoption is the provision of farmer training by climate services efforts that can benefit both interventions. Training and knowledge sharing can encompass the use of digital tools and making climate-informed decisions to incorporate adaptation strategies into livelihoods. Communication channels for climate services span radio, newspapers, bulletins and extension agents as well as digital channels such as SMS, Interactive Voice Response, and mobile applications and platforms. Governments should invest more in communication channels for CS and in farmer trainings which will have the added benefit of raising farmers' awareness of climate risk and building their capacity to respond to it (Mulwa et al., 2018). Efforts to scale CSA would likely experience increased impact from such investment. In their report on agricultural transformation, Steiner et al. (2020) highlight the potential of bundling digital advisory services with climate information, insurance and farmer-to-farmer learning in order to increase the adoption of CSA practices.

Conclusions and policy implications

Climate services offer two primary pathways to contributing towards the adoption of CSA practices. The first is at the farm-level by helping farmers to make climate-informed decisions that potentially increase their yield, income or food security such that they can invest time, labour and resources in CSA practices. Farmers who receive training on digital tools and interpreting agro-climatic information will also increase their capacity to understand and use both CSA and CS, contributing to improving their climate resilience. The second pathway is at the higher level of the enabling environment, through informing extension policy, contributing to capacity building of institutions including agricultural and meteorological government agencies, supporting efforts to build resilience, and contributing to the overall de-risking of agriculture. Further research on the topic should investigate how climate services can support specific CSA practices, how this may manifest as impact, and how extension policy may be informed to consider both CSA and CS.

Further reading

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This brief uses data from Climate Smart Villages in Ethiopia, Niger, Mali and Senegal to establish which Climate-Smart Agriculture practices are most preferred and their potential linkages with climate services in the region.

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