Climate-Smart Agriculture

Subjects: Agriculture, Dairy & Animal Science
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Climate-Smart Agriculture (CSA) refers to an agriculture that sustainably increases productivity, enhances resilience (adaptation), reduces/removes greenhouse gases (GHGs) (mitigation), and enhances achievement of national food security and development goals.

Keywords: food security ; climate-smart technologies ; weather and climate information services

1. Introduction

Achieving food security in the face of accelerating food demand, competition for depleting resources, and the failing ability of the environment to buffer increasing anthropogenic impacts is now widely seen as the foremost challenge of our time [1]. Current food systems are not on a sustainable trajectory that will enable us to reach the Sustainable Development Goals by 2030, and major failures are related to production and nutritional targets, inclusivity, and environmental footprint [2]. Moreover, climate change is one among a set of interconnected trends and risks facing agriculture and food systems [3].

Of particular mention here is the Food system transformation initiative led by the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) who worked with more than hundred partners to consider how to achieve this rapid, deep-seated change in food systems. A framework with four interlocking action areas for food systems reconfigurations has been proposed [4]: rerouting farming trajectories; increasing the resilience of all the agents involved in rapid change (reducing risks); minimizing the environmental footprint of food systems (from a climate change perspective, a focus on reducing emissions); and realigning the enablers of change. Through this framework, some synergies among food security, adaptation, and mitigation are feasible, in other words, climate-smart agriculture (CSA) has a key role to play for this food-system transformation in Africa. CSA is proposed as a solution to transform agricultural systems to support food security under the new realities of climate change. CSA refers to an agriculture that sustainably increases productivity, enhances resilience (adaptation), reduces/removes greenhouse gases (GHGs) (mitigation), and enhances achievement of national food security and development goals [5].

While the growth in strategies, policies, partnerships, and investments is positive and creates a favourable enabling environment for CSA, these need to be complemented with targeted implementation on the ground, sustainable financing, institutional coordination, and metrics to measure the efficacy of interventions [6]. Indeed, there is a need for a “safe operating space” for agricultural and food systems to set up conditions that demonstrably better meet human needs in the short and long term within foreseeable local and planetary limits and holds ourselves accountable for outcomes across temporal and spatial scales [7]. This will definitely help make agriculture and food systems climate-smart, i.e., when it can be shown that they bring us closer to safe operating spaces. CSA has been a powerful concept to direct a focus on the climate change–agriculture nexus and has united the agriculture, climate change and development communities under one brand.

2. Application of Climate-Smart Agriculture

2.1. Reconfiguring Food Systems

The Food System Transformation Initiative led by CCAFS with more than hundred partners, proposes a framework with four interlocking action areas for food systems reconfigurations [4]. The action areas include the following:

- Reroute farming and rural livelihoods to new trajectories;
- De-risk livelihoods, farms, and value chains,
- Reduce emissions through diets and value chains and

- Realign policies, finance, support to social movements, and innovation. In continuation, we highlight in more detail, the important actions required in the African context.

2.2. Analysis of Ground CSA Case Studies for Their Contribution to Rapid Transformation of Food Systems art Village Approach

One factor that contributes to low uptake of new technologies is that development practitioners lack evidence of how the innovations can be practically incorporated into agricultural systems. They need to know how farmers can achieve synergies and minimize trade-offs in implementing multiple interventions on real farms. Climate change complicates this because its impacts will vary across locations. Effective implementation therefore requires an integrated approach in which science, technology, and decision-making interact with local socioeconomic conditions and cultures [8].

In the context of current and projected impact of climate change, experts have proposed several technological, institutional, and policy interventions to help farmers adapt to current and future weather variability and to mitigate greenhouse gas (GHG) emissions. The climate-smart village (CSV) approach is a participatory method of performing agricultural research for development that robustly tests technological and institutional options for dealing with climatic variability and climate change in agriculture. CSVs are “ground laboratories” and learning sites where we test and validate several agricultural interventions in an integrated manner with the communities organized in a village innovation platform with dedicated socially differentiated groups (e.g., women, men, and youth). They work closely with other partners, such as national research and extension services, NGOs, and the private sector. Lessons learned from the CSV are used for scaling up/out to other sites and for policy makers. The approach incorporates evaluation of climate-smart technologies, practices, services, and processes relevant to local climatic risk management. It also identifies opportunities for maximizing adaptation gains from synergies across different interventions, as well as recognizing potential maladaptation and trade-offs. The approach also ensures that these interventions are aligned with local knowledge and link into development plans [9]. It shows that the type of CSA options as well as the level of their adoption vary from a site to another, therefore indicating that the adoption of CSA may be context specific and based on the needs and priorities of farming communities.

2.2.1. Using Weather and Climate Information Services (WCIS) to Build Resilience

In the quest to improve the capacity of farmers to better manage climate-related risks and build more resilient livelihoods in West Africa, there have been various initiatives focusing on the following: (i) designing tailored climate information services and (ii) communicating the results appropriately to farmers for their farm management decision-making [10]. In a bid to sustain the delivery of climate information services to farmers through digital-led mechanisms (mobile phone platforms), a public–private partnership (PPP) business model was developed in 2017 to enhance existing partnership of Esoko with private companies (Toto agric. and aWhere, Vodafone Ghana) and public institutions (GMet, the Council for Scientific and Industrial Research (CSIR), and the Ministry of Food and Agriculture (MoFA)) and farmers (Figure 1). Roles and responsibilities of each of the above involved actors in the business model have been well defined and consensually agreed upon to allow smooth implementation of the model [11]. Preliminary results show that more than 300,000 farmers (21% women) are paying an agreed $US 0.2 monthly subscription fee to receive CIS through the PPP. The PPP has been strategically linked to the Planting for Food and Jobs initiative of the Government of Ghana to make a strong case for the mainstreaming of climate information services into agricultural development plans, programs, strategies, and policies in Ghana [11].

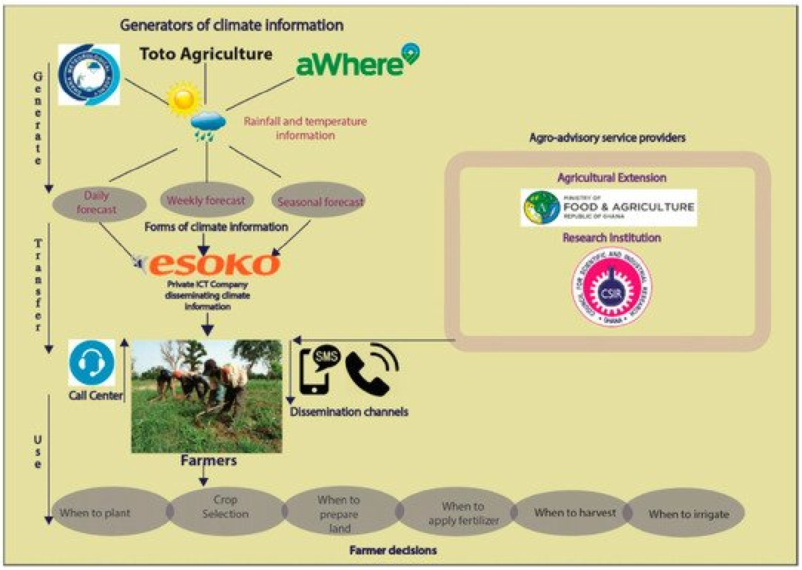

Figure 1. Public–private partnership model for climate information services in Ghana (source: Partey et al. [12]).

2.2.2. Science–Policy Interfacing to Mainstream CSA into Development Policies and Plans

Science–policy engagement efforts are crucial to ensure that scientific findings from agricultural research for development inform actions of governments, private sector, non-governmental organizations (NGOs), and international development partners, accelerating progress toward upper-level goals. Platforms constitute an innovative approach to effectively engaging decision-makers and sustainably mainstreaming climate change into development plans. Effective science–policy interaction requires the following: (a) institutionalizing dialogue platforms by embedding them within national institutions, which improves their credibility, relevance and legitimacy among policymakers; (b) two-way communication, which contributes substantially to the co-development of solutions that address climate change vulnerabilities and impacts; and (c) relevant communication products and packaging of evidence that aligns with country priorities, which facilitates its uptake in policy-making processes.

3. Summary

Climate-smart agriculture can play a key role in driving the change through innovative actions that mainstream the three pillars (productivity/adaptation/mitigation) in an effective way. This may consist in (1) the implementation of relevant climate-smart technologies and practices to reroute farming and rural livelihoods to new climate-resilient and low-emission trajectories; (2) the development and application of weather and climate information services (WCIS) that support de-risking of livelihoods, farms, and value chains in the face of increasing vagaries of weather and extreme events; (3) the use of climate-smart options that minimize waste of all the natural resources used for growing, processing, packaging, transporting, and marketing food, and therefore mitigating the carbon footprint attached to these food loss and waste; and (4) the realignment of policies and finance that facilitate action in the four proposed action areas through the identification of news ways to mobilize sustainable finance and create innovative financial mechanisms and delivery channels. In this perspective, a co-production perspective must be prioritized to engage the diversity of actors to generate the knowledge evidence on potential CSA technologies and practices. This knowledge must be communicated in appropriate formats among the scientific, policy, and farmers communities, together with capacity building efforts to raise capacity and investment for widespread implementation.

References

1. Beddington, J.; Asaduzzaman, M.; Clark, M.; Fernández, A.; Guillou, M.; Jahn, M.; Erda, L.; Mamo, T.; Van Bo, N.; Nobre, C.A.; et al. Achieving Food Security in the Face of Climate Change: Final Report from the Commission on Sustainable Agriculture and Climate Change; CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS): Copenhagen, Denmark, 2012; Available online: (accessed on 8 January 2021).
2. Loboguerrero, A.M.; Thornton, P.; Wadsworth, J.; Campbell, B.M.; Herrero, M.; Mason-D'Croz, D.; Dinesh, D.; Huyer, S.; Jarvis, A.; Millan, A.; et al. Perspective article: Actions to reconfigure food systems. Glob. Food Secur. 2020, 26, 100432.
3. Pielke, R.A.; Adegoke, J.O.; Chase, T.N.; Marshall, C.H.; Matsui, T.; Niyogi, D. A new paradigm for assessing the role of agriculture in the climate system and in climate change. Agric. For. Meteorol. 2007, 142, 234–254.
4. Steiner, A.; Aguilar, G.; Bomba, K.; Bonilla, J.P.; Campbell, A.; Echeverria, R.; Gandhi, R.; Hedegaard, C.; Holdorf, D.; Ishii, N.; et al. Actions to Transform Food Systems under Climate Change; CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS): Wageningen, The Netherlands, 2020.
5. FAO. Climate-Smart Agriculture: Policies, Practices and Financing for Food Security, Adaptation and Mitigation; FAO: Rome, Italy, 2010.
6. Dinesh, D.; Aggarwal, P.; Khatri-Chhetri, A.; Maria, A.; Mungai, C.; Sebastian, L.; Zougmoré, R. The rise in Climate-Smart Agriculture strategies, policies, partnerships and investments across the globe. Agric. Dev. 2017, 30, 4–9. Available online: (accessed on 12 January 2021).
7. Neufeldt, H.; Jahn, M.M.; Campbell, B.M.; Beddington, J.R.; Declerck, F.; De Pinto, A.; Gulledge, J.; Hellin, J.; Herrero, M.; Jarvis, A.; et al. Beyond climate-smart agriculture: Toward safe operating spaces for global food systems. Agric. Food Secur. 2013, 2, 12.
8. Steenwerth, K.L.; Hodson, A.K.; Bloom, A.J.; Carter, M.R.; Cattaneo, A.; Chartres, C.J.; Hatfield, J.L.; Henry, K.; Hopmans, J.W.; Horwath, W.R.; et al. Climate-smart agriculture global research agenda: Scientific basis for action. Agric. Food Secur. 2014, 3, 11.

9. Aggarwal, P.K.; Jarvis, A.; Campbell, B.M.; Zougmoré, R.B.; Khatri-Chhetri, A.; Vermeulen, S.J.; Loboguerrero, A.M.; Sebastian, L.S.; Kinyangi, J.; Bonilla-Findji, O.; et al. The climate-smart village approach: Framework of an integrative strategy for scaling up adaptation options in agriculture. Ecol. Soc. 2018, 23, 14.
10. CCAFS. The Impact of Climate Information Services in Senegal; CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS): Copenhagen, Denmark, 2015.
11. Partey, S.T.; Nikoi, G.K.; Ouédraogo, M.; Zougmoré, R.B. Scaling Up Climate Information Services through Public-Private Partnership Business Models; CCAFS Info Note; CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS): Wageningen, The Netherlands, 2019.
12. Newton, P.; Agrawal, A.; Wollenberg, L. Enhancing the sustainability of commodity supply chains in tropical forest and agricultural landscapes. Glob. Environ. Chang. 2013, 23, 1761–1772.