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Prioritizing investments for climate-smart agriculture: Lessons learned from Mali

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ABSTRACT

Agricultural productivity and growth in Mali are under threat from erratic rainfall, resulting in more frequent dry years. The national economy is vulnerable to climate change due to 50% of the gross domestic product coming from the agricultural sector and 75% of the population living in rural areas. The Climate-Smart Agriculture (CSA) concept arises from a need to provide innovative solutions towards the complex and integrated goals of increasing yields, improving resilience, and promoting a low emissions agricultural sector. A major challenge for policymakers to operationalize CSA is the identification, valuation (cost-benefit), and subsequent prioritization of climate-smart options and portfolios (groups of CSA options) for investment. This paper presents the process, results, and lessons learned from a yearlong pilot of the Climate-Smart Agriculture Prioritization Framework (CSA-PF) in Mali. Key national and international stakeholders participated in the co-development and prioritization of two CSA portfolios and related action plans for the Malian Sudanese zone. Initial steps towards outcomes of the process include inclusion of prioritized CSA practices in ongoing development projects and prompting discussion of modifications of future calls for agricultural development proposals by regional donors.

1. Introduction

In West Africa, many smallholder farmers deal with low and unpredictable crop yields and incomes, as well as chronic food insecurity. These challenges are particularly acute in the dry lands, where land degradation, depleted soil fertility, water stress, current climate variability, and high costs of fertilizers contribute to low crop yields (Zougmoré et al., 2014). Moreover, annual cycles of rainfall are strongly determined by the position of the inter-tropical convergence zone, making the climate of the region one of the most erratic in the world and predictions of future changes in climate, especially rainfall, highly uncertain (Traore et al., 2013).

Despite contrasting scenarios of climate change for this region, all models expect an increase of climate variability (Cooper et al., 2008; Jalloh et al., 2013). Consequently, climate change will pose huge challenges to food security (Waongo et al., 2015) and particularly to child nutrition and health (Johnson and Brown, 2014).

African farmers have consistently been exposed to high variability in their production environment, and therefore already use a broad spectrum of coping strategies including the selection of drought tolerant varieties or crops, traditional water harvesting techniques (e.g. zai), the diversification of income sources by combining cropping with livestock rearing, and off-farm activities (Abdulai and CroleRess, 2001; Dostie et al., 2002; Thomas et al., 2007; Thornton et al., 2007). These coping strategies may not be sufficient to face the expected increase in climatic variability of unknown magnitude, which will likely result in novel solutions (Andrieu et al., 2015). Therefore, coping strategies in a perspective of transformational adaptation need to be considered. Rippke et al. (2016) concluded that in some areas in the Sahel production of nine of the major crops will become unviable by 2050, with the most affected crops being maize and bananas. Areas in northern Ghana, northern Benin, and northeastern Ivory Coast will become unsuitable for growing bananas without technical and socio-economic transformation, as will large swathes of Mali, Senegal, and Burkina Faso for growing maize.

The climate-smart agriculture approach is proposed as a solution to transform and reorient agricultural systems to support food security in the face of climate change (Lipper et al., 2014). CSA aims to co-achieving

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three objectives or pillars: sustainably increasing agricultural productivity; enhancing resilience (adaptation); and reducing or removing greenhouse gas emissions, where possible, enhancing the achievement of national food security and development goals. Ideally CSA aims to attain 'triple win' outcomes from the local to the global scales and over short and long time horizons, but trade-offs must be made often in agriculture development. Identifying synergies and weighing costs and benefits of different options based on stakeholder objectives is needed to derive locally acceptable and feasible solutions. The fact that CSA strives to reach multiple objectives at the system level makes it particularly difficult to transfer experiences from one context to another. CSA interventions are not climate-smart everywhere or in every time period. Given this challenge, identifying context specific and socially relevant and viable options must be done using evidence in participatory processes to take into account how components of agroecosystems interact at different levels and also different institutional arrangements and political realities.

The Government of Mali has been mainstreaming climate change through the National Action Plan for Climate Change Adaptation (Traoré et al., 2016). This National Action Plan aims to (1) take into account climate change in sectorial policies and strategies; (2) improve the resilience of ecosystems, production systems, and social systems; (3) contribute to global effort for stabilization of emissions; (4) promote national research and technology transfers; (5) strengthen national capacities on climate change. Indeed, Mali is already experiencing irregular rainfall patterns, resulting in dry years. These are becoming more frequent due to climate change, threatening agricultural productivity and growth. The national economy is vulnerable due to 50% of the gross domestic product coming from the farming sector and given that 75% of the population lives in rural areas, social welfare is also at stake (De Sherbinin et al., 2014; Sogoba et al., 2014). In the Country's Nationally Determined Contribution (NDP) presented at the twenty-first session Conference of the Parties in Paris, CSA was one of the strategies identified to meet its adaptation and mitigation targets. These are major steps that demonstrate intentions to actualize CSA, but translating these plans/commitments into action remains a challenge. The country will need to fine-tune their proposals, identify context specific and relevant priority options, and leverage funding from the national budget and bilateral and multilateral international development actors and financial institutions. There is consequently the need for processes aiming to prioritize CSA investments addressing the urgent climate risks to food systems.

The objective of this paper is to present and discuss the use and modification of the Climate-Smart Agriculture Prioritization Framework (CSA-PF) conducted in Mali from October 2014 to October 2015. The development and use of the CSA-PF in Latin America, Asia, and now Africa was driven by the need for a sound methodology and criteria to (1) quantify the impact of CSA practices on the three pillars using limited time and resources, (2) prioritize locally relevant best bet CSA options, and (3) ensure ownership and engagement by key stakeholders and potential funders/donors (Campbell et al., 2016). The CSA-PF aimed to conduct analyses relevant to specific CSA policy and program implementation question, therefore providing directly actionable results for stakeholders. This paper will present the study area, the phases of the CSA-PF, the criteria used to monitor the process, its specific implementation in Mali and first outcomes. The discussion explores the strengths and limitations using the monitoring criteria.

2. Materials and methods

2.1. Overview of the national institutional context on climate change in Mali

The Agency for Environment and Sustainable Development (AEDD) was created by the Malian government in 2010 with the mandate to integrate climate change issues and coordinate government adaptation and mitigation actions in Mali. AEDD is the coordinator of a national science-policy dialogue platform for climate change and food security (CCASA platform), which was created with support from the CGIAR Climate Change, Agriculture, and Food Security (CCAFS) research program (Sogoba et al., 2014). The CCASA platform aims to foster and facilitate communications and interactions between experts and policymakers and is made-up of key structures and organizations working for adaptation of agriculture and food security to climate change. The goal is to provide a forum for development of a shared vision of research priorities and to translate findings from researchers into policy decisions. The CCASA platform is involved in initiatives at regional (e.g. ECOWAS, NEPAD) and at global levels (e.g. UNFCCC, Global Alliance for Climate-Smart Agriculture) and is facilitated by the Malian Association of Awakening to Sustainable Development (AMEDD - Association Malienne d'Eveil au Développement Durable), an Non-Governmental Organization (NGO).

2.2. Components of the CSA-PF

In Mali, the CSA-PF process was led by the AEDD. The facilitator of the process was the NGO AMEDD, given its previous role as facilitator of the CCASA platform. CIAT/CCAFS scientists were involved in the methodological support, sharing lessons learned from CSA-PF processes conducted in Latin America (Sain et al., 2017), and documentation of the process and findings.

The CSA-PF was established as an evidence-based decision-support framework for stakeholders to use to identify CSA investment portfolios that maximize desired impacts for agriculture development in the face of climate change (Campbell et al., 2016). The framework was designed to be replicable globally, applicable for use from regional to sub-national levels, and highly flexible to accommodate various data and resource constraints while still providing added value to decision-making processes. It is a four-phased stakeholder-driven process that integrates analyses with participatory forums to evaluate and narrow-down locally-relevant CSA practices/options (Fig. 1).

The first phase clarifies the scope of the assessment for the implementing organization (AEDD in Mali), including the geographic areas and production systems, selected based on socio-economic and climate vulnerability analyses. CSA practices relevant to the selected scope are then compiled into a 'long list' based on literature review and regional experts and compiled by the facilitating organization, AMEDD in Mali. Indicators of CSA are then selected from a list of 29 suggested indicators associated with the three pillars (Rosenstock et al., 2016). The goal being to analyze practices based on the CSA outcomes stakeholders deem most critical for the study area based on the challenges being faced and the vision for development in the region. Practices are evaluated by the experts against CSA outcomes using these indicators.

During phase two, participatory workshops are conducted with relevant actors at national, sub-national, and community levels, as necessary, to validate the selection of CSA practices, indicators, and analyses conducted by the experts during the previous phase. Stakeholders use these forums to select eight to ten best-bet practices ('short list') based on the results of the indicator evaluation and their own criteria, which consequently needs to be elicited during the process. Stakeholders are engaged in this way recognizing that not all factors critical to decision-making can be analyzed by experts involved in phase one and therefore opportunities for decision-makers to openly discuss, debate, and rank priorities collectively allow for additional analysis of the pros and cons of practices to take place when narrowing the list of practices of interest for further investigation.

In phase three, an economic cost-benefit analysis (CBA) is conducted to assess the potential profitability of the practices in the 'short list' from phase two. Many economic models and frameworks, such as willingness-to-pay or social return on investment, can be used to cost actions proposed to address climate change (Chaudhury et al., 2016, Khatri-Chhetri et al., 2017), however CBA is widely used and is often