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ORIGINAL ARTICLE

Building consensus and increasing self-efficacy: participatory scenarios as a tool for developing food security solutions in West Africa

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Abstract
Food security in West Africa is threatened by climate change, as well as demographic shifts and land constraints. Communities and policy-makers in the region need to plan for long term sustainability and food security when many conditions are highly uncertain. Participatory scenario planning has been proposed as a tool for building strategic action in the face of uncertainty. Proponents have made claims that this process can generate consensus and self-efficacy for action, but these claims have not been tested empirically. We used two parallel scenario processes in Ghana and Mali, designed with the goal of prioritizing strategic actions for food security, to gather data from participants on their views of the top challenges to food security in their region, the causes of those challenges, and actors who should be implementing solutions. The data indicate that the scenario process did promote consensus among participants on these topics, as well as self- and collective-efficacy to take action, and that these characteristics persisted past the duration of the scenario process. Agreement among local and regional actors around what actions to take to promote food security and belief that they are capable of implementing those actions are key prerequisites for planning under conditions of high uncertainty. Participatory scenario exercises are therefore a useful tool.

Keywords Food security · Scenarios · West Africa · Climate change

Introduction

Adaptation to a changing climate will be critically important for West African social and agricultural systems during the twenty-first century. Food production in West Africa will need to accommodate a rapidly growing and urbanizing population driving demand for food. Simultaneously, climate change is expected to lower yields, damage infrastructure, and contribute to pest and disease outbreaks throughout the region (van Ittersum et al. 2016; Olabisi et al. 2018). Planning for socio-ecological sustainability in the face of these conditions of high uncertainty poses a considerable challenge for decision-makers from the local to the national

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scale. One method for this type of planning involves the use of scenarios.

A scenario is a "structured account of a possible future" (Peterson et al. 2003), p.360), which describes a plausible outcome, rather than a statistically derived prediction. Participatory scenario planning (PSP) is a tool for supporting both long-term planning and participation, both of which are critical to sustainable development (Freeth and Drimie 2016; Ravera et al. 2011). Participatory scenario planning has been used by the Consultative Group on International Agricultural Research (CGIAR) Future Scenarios research team (Vervoort et al. 2014) to generate food security and climate change adaptation strategies in West and East Africa, and in Tanzania (Enfors et al. 2008), to explore community-based development strategies. Transformative scenario planning (TSP) is a type of participatory scenario planning used to help communities develop strategies for the future under highly uncertain conditions (Kahane 2012). It emphasizes deepening a common understanding of a system, and building relationships, ultimately leading to collaborative action (Freeth and Drimie 2016). TSP is therefore well-suited to participatory planning and group exploration of the future of a complex system, and is designed to move participants from collaborative planning to collaborative action (Kok et al. 2011; Roy 2019). TSP assumes that envisioning the future and designing plausible stories may not be enough, and so there is a need to take concrete actions to influence what could happen and transform the future (Kahane 2012). In the context of climate change adaptation in West Africa, another advantage of TSP is in its explicit consideration of deep uncertainty (Star et al. 2016), and its inclusion of unpredictable and uncontrollable "game-changing" events, thereby incorporating some of the threshold effects and non-linearity that are likely to affect agricultural systems under climate change (Fezzi and Bateman 2015). TSP specifically has been used in South Africa to design its transition out of apartheid, and in Columbia to design common futures with multiple stakeholders in that country's internal conflict (Kahane 2012).

Scenario planning methods have been found to build consensus for action among the diverse stakeholders who participate in these processes (Johnson et al. 2012; Schmitt Olabisi et al. 2016). The TSP approach recognizes that people cannot transform the situation by themselves alone because of the complexity of the socio-institutional context they live in, and they must form coalitions across multiple stakeholders to bring about transformation (Freeth and Drimie 2016). In decision-making contexts characterized by high uncertainty and multiple inter-connected drivers of change, stakeholders frequently have different ideas about which strategies and actions should be prioritized. They may not even agree on the fundamental nature of the problem to be addressed. By taking a long view of systems change, and through facilitating a discussion of underlying drivers that shape the future, scenario planning methods can foster agreement around priorities for action. This is important in the context of climate adaptation efforts, as climate change affects multiple aspects of agricultural systems (Lobell et al. 2008). The scope of climate adaptation may therefore seem daunting, and attempting to deal with multiple problems at once without prioritization could diffuse attention and resources, without addressing the root causes of food insecurity.

Other authors have proposed scenarios as a tool for participants' self-efficacy, by showing them strategies for coping with a range of plausible futures, from the desirable to the undesirable (Mietzner and Reger 2005). By building social networks, capacity-building and opportunities for learning, the scenario process can foster new possibilities for action among participants (Chaudhury et al. 2013; Johnson et al. 2012). Participants can use the scenario process to co-design plans for dealing with complex problems even in the face of previously intransigent conflict (Kahane 2012). They can identify courses of action that can make a difference at the scale of their decision-making authority, even in the face of large global problems such as climate change and poverty (Totin et al. 2018).

A previous scenario exercise taking place in southern Mali around climate change and food security found that participants self-reported positive changes in learning and networking post-workshop, but not an increase in systems thinking (Totin et al. 2018). However, this study relied on self-reported outcomes, rather than empirical data on how participants understood the problem of climate adaptation. Very few previous studies have empirically tested the proposition that scenario processes are effective at building consensus and fostering systems thinking and community self-efficacy, nor have these studies tracked these outcomes beyond the duration of the scenario process.

In this paper, we describe two parallel scenario planning exercises which took place in Mali and Ghana under the Adaptation at Scale in Semi-Arid Regions program, an interdisciplinary research initiative that is part of the Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA) program. The overall goal of this program was to understand the barriers and enablers for adaptation to climatic and non-climatic risks in semiarid regions of Asia and Africa (Davies et al. 2020). The transformative scenario planning (TSP) exercise was central to the program as a constructive way for individuals and organizations to develop strategies and transform a situation that is confronted by complex economic, social, and environmental challenges. The questions we explore in this paper are (1) whether transformative scenario planning is effective at generating consensus for action in the context of climate

adaptation planning and (2) whether transformative scenario planning increases community self-efficacy.

Methods

Study site description

The study regions in West Africa are part of the WaBobo-Sikasso (WBS) transboundary transect delimited as a region of focus by the dryland program, an interdisciplinary research initiative of the CGIAR system that seeks to address related crop production challenges through an integrated portfolio of breeding, policies, and strategic partnerships. The WBS was chosen for this focus because it represents a corridor with relatively high population density, as well as containing important areas of crop production. The WBS crosses the Upper West Region (Ghana), the Hauts Bassins Region (Burkina Faso), and the Sikasso Region (Mali) and is home to an estimated population of about 5 million over a surface area slightly below 100,000 km (Sidibé et al. 2018) (Fig. 1). The transect is representative of the Western half of the West Africa region, characterized by shallow to moderate to locally steep longitudinal population density gradients, and by a resulting continuum of extensive and intensive agricultural practices. The WBS transect is characterized by a generally intermediate level of food security (supply of calories/ca) but poor nutritional status (e.g., lowest national ratings in Mali) in spite of Mali and Ghana scoring respectively 3rd and 6th in terms of dietary quality worldwide (Imamura et al. 2015).

Transformative scenario planning workshop description

Transformative scenario planning was key in the CARIAA program portfolio focusing on exploring barriers and enablers to adaptation responses in the drylands. The program considers that a comprehensive understanding of barriers and enablers to adaptation can serve as the starting point for the co-development of scenarios with stakeholders (drawn from multiple levels of governance and practice). In contrast to community-level engagement methods, the TSP process aimed to convene a team of influential stakeholders with diverse and conflicting perspectives who work together to instigate change. Scholarly goals included (1) the interrogation of transformation as a conceptual contribution to climate change adaptation and (2) critical reflection about

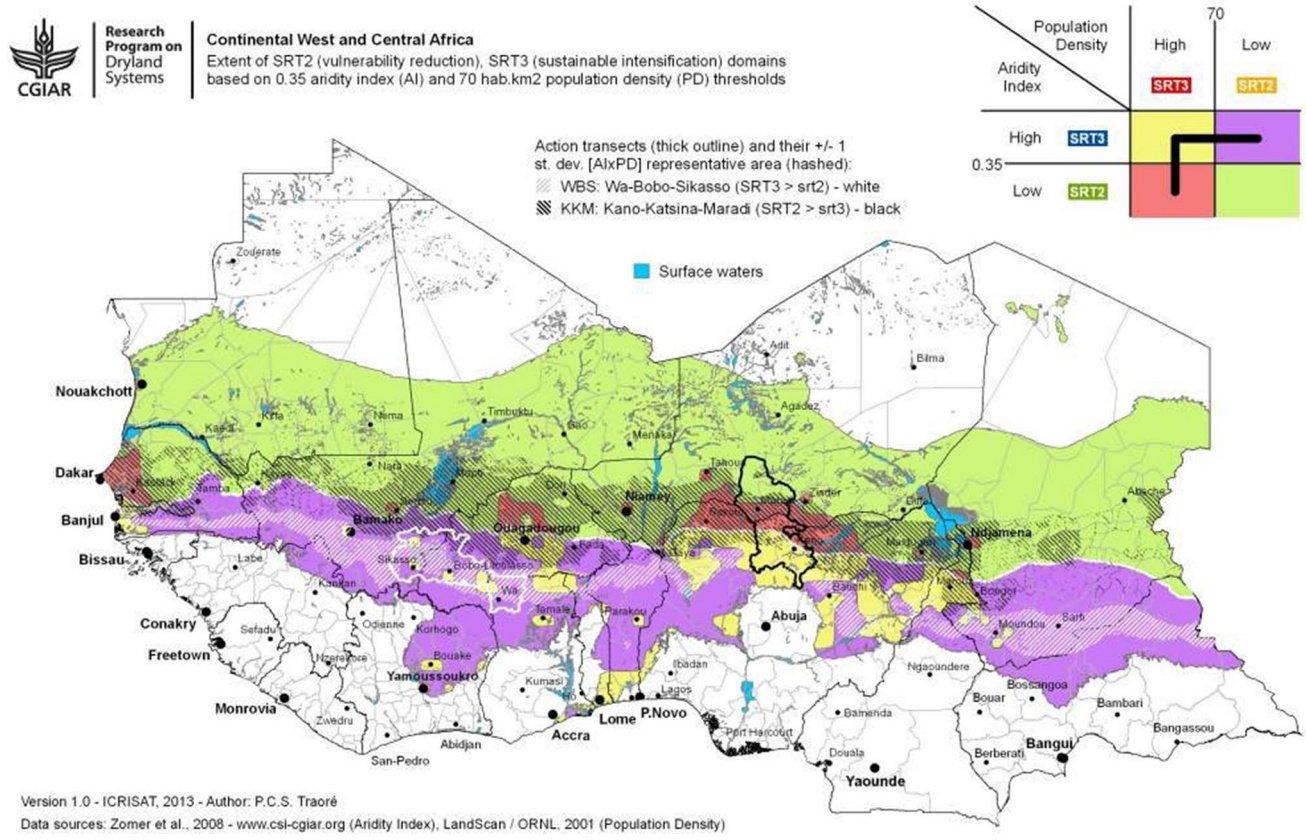

Fig. 1 Map of West Africa, with the region covered under the scenario planning workshops outlined in white

the extent to which using conflict and inertia as an opportunity to unite people irrespective of social and political differences, which was appropriate for the climate-related issues in semiarid regions. The impact of this stakeholder engagement process was necessarily related to teams' commitment to open-mindedness and willingness to experiment, meaning that post-workshop implementation of activities with observable actions mostly occurred in regions where workshops took place sooner rather than later. This allowed time for an iterative approach to changing relationships, understanding, and language towards collaborative action that dovetailed with ASSAR's other stakeholder engagement efforts.

Transformative scenario planning was used at the workshops in Ghana and Mali to elicit multiple stories of the future with the aim of developing policy and other actions in the present to enhance resilience of the agricultural sector. This methodology is described at length in Kahane (2012). Two workshops took place 1 year apart in each country. The first workshop identified influential drivers of change that are operating in regional agricultural systems and are likely to shape these systems into the future (2035 was chosen as an endpoint for this exercise). Participants then voted for the top two most influential drivers of change, which were used to construct the scenario "axes." Drivers which received more than five votes, but which did not make up one of the axes, were considered potential confounding factors to be considered in the scenario construction. As there were 25–30 participants in the workshop, an agreement among approximately 20% of participants that a driving factor was important meant that the factor was retained for consideration. Scenario axes representing the two top drivers divided the scenario space into quadrants, with four possible combinations of the drivers in 2035: low-low, low-high, high-low, and high-high. These four spaces represented the four scenarios which were constructed around the focal question, "What do our agricultural systems and rural livelihoods look like in the year 2035?" For more details on the scenarios and the drivers, see previous publications (Alare et al. 2017; Schmitt Olabisi et al. 2018; Sidibé et al. 2017; Totin et al. 2018).

Participants were then divided into four groups—one representing each scenario—and asked to construct plausible stories around this focal question, given the combination of driver states they were assigned for 2035. Groups were also instructed to develop a timeline of events leading to the 2035 scenario, to ensure a plausible, causal mechanism for agricultural systems being transformed beginning in the present and proceeding to 2035. One-off, "surprising" events such as opposition political parties gaining power, major droughts, or in-migration from neighboring countries were included in this timeline, as well as driver trends. Consideration of disruptive events gives scenario exercises unique power over more conventional, linear trend analyses by offering more realistic and plausible expectations of how a major disruption to the status quo would unfold in reality (Schmitt Olabisi et al. 2010).

Each group presented their scenario stories in a large-group setting, and note-takers captured them in written form. After workshop participants dispersed, the scenarios were further developed through remote communication with all workshop attendees (those without access to computers were visited in person by members of the in-country scenario team, to get their feedback on the written document).

A second workshop was then convened to present and further discuss the four refined scenarios developed by the groups of stakeholders. The aim of this workshop was to gain a better understanding of what participants viewed as the least desirable futures for agriculture and food security on one side, and what they viewed as the most desirable, or no-regret, scenarios for the future of agriculture and food security in their context by 2035 on the other side. During the workshop, participants discussed pros and cons of each scenario and were challenged to think of these from their own perspectives, as well as the perspectives of other stakeholders. These discussions brought the group closer to a shared vision of best and worst futures for agriculture and food security in their region. Following these discussions of the four scenarios, participants then reflected on potential existing opportunities for coping strategies that could bend the course of events towards the no-regret scenarios while avoiding the worst case scenarios. The reflection continued within three groups of stakeholders grouped by categories—public workers, civil society, and farmer groups. Each group was tasked with developing a vision for a no-regret future of agriculture and food security in the study areas. These visions were discussed in depth in plenary and resulted in the development of the following common vision in Koutiala: "By 2035, strategic investments will target agriculture and natural resources conservation to ensure food security and improve household incomes in Koutiala Mali." In the Malian context, "strategic investment" refers to farmers themselves investing in on-farm water and soil management to enhance resilience in the face of climate change. This investment requires access to credit, equipment, and inputs, the lack of which was discussed as one of the barriers to improving food security in the Koutiala region (Sidibé et al. 2017; Totin et al. 2018).

In Upper West, Ghana, TSP participants agreed upon their "Vision 2035": "The construction of climate-smart water infrastructure that harnesses water for farming activities will increase agricultural productivity, and drive sustainability in food access and livelihoods." "Climate smart" water infrastructure, in the context of the Upper Volta region in which the scenario exercise took place, refers to on-farm and community-based water management strategies such as

the construction of small-scale dams, water retention basins, and boreholes, while remaining mindful of the impacts of this construction on natural ecosystems (Alare et al. 2017). In each location, participants were also invited to critically think through local sociocultural contexts and to identify existing barriers and enablers to achieving these visions, as well as to explore the strategies, resources, and short- and long-term actions needed to succeed in attaining the more desirable futures.

Survey development and analysis

Workshop organizers gave participants an Institutional Review Board (IRB)-cleared survey to complete immediately before each workshop, and immediately after. This survey was designed to elicit individual participants' perceptions of problems, causes and solutions in the regional food system, in order to examine consensus-building and enhanced self-efficacy as effects of the workshop. The surveys for Mali and Ghana were developed separately, and contained some of the same questions but were not identical. This separate development was partly due to translation issues; given that the Mali workshop took place in French and Bambara, facilitators had to be recruited locally. All materials and processes were transferred to them, but in some cases, meaning was lost or altered in the translation across multiple languages. This highlights the challenges of conducting scenario exercises in multi-country, multilingual contexts, and suggests that local facilitators and translators should be included as much as possible in the planning and design of the TSP and associated research (see supplemental material).

Each participant was asked to provide a unique identifier to match pre- and post-workshop surveys with the survey-taker. In both Ghana and Mali, surveys were conducted before and after the first and second workshops. In Mali, survey output from the first workshop was not useful, as the questions were too open-ended and the responses vague. For the second workshop, the research team refined the questions into clear statements to which participants responded before and after the workshop.

Interviews were also conducted in Mali in June 2017, approximately 6 months after the second scenario workshop. For these interviews, TSP participants including three (3) farmers, six (6) civil servants, and one (1) nongovernmental organization (NGO) staff member were contacted in Koutiala and asked about how the scenario process had impacted their work and perceptions of food security issues. The intent of these interviews was to ascertain whether collective action for change had resulted from the TSP process.

The survey data for both countries was entered into Microsoft Excel and coded for prominent themes, patterns, and similarities in responses. The second round of analysis focused on selecting dominant and relevant emerging themes and collapsing closely related responses into one group. Degree of consensus-building was measured by counting the number of incidences of the top response to a given question—the more participants independently mentioned a theme as important, the greater the level of consensus.

Results

Scenario output

Workshop participants in both countries developed four scenarios, defined by their position along each of two driver axes. In Ghana, these drivers were "Access to Water" and "Political Commitment," while in Mali they were "Access to Water" and "Access to Land." According to stakeholder discussions, other factors which played a prominent role in shaping the agricultural sector in Ghana were infrastructure development, involvement of traditional authorities and NGOs in development, private sector investment, mining and petroleum development, and management of natural resources. In Mali, migration patterns and the involvement of youth in agriculture were named as confounding factors.

Survey analysis

A total of 45 people participated in the survey administered at the first Ghana workshop; 19 and 26 people participated in the pre-workshop and post-workshop survey respectively in Ghana. Table 1 gives a distribution of participants according to their occupation. Sixteen people participated in both the pre- and post-surveys administered at the Mali workshop. Women were under-represented in both groups compared to the regional population.

The pre-workshop survey responses from Ghana rated climate change/variability as the top challenge in agriculture (14 out of 19 respondents). These responses included erratic rainfall patterns, low rainfall amount, and increasing temperature as specific climate concerns. Low soil fertility (response $n = 9$ out of 19), land degradation and deforestation ($n = 8$), and bushfires or bush burning ($n = 5$), which respondents elaborated as preparation of the land for cropping or planting and diminishing land holdings ($n = 2$), were next top challenges in agriculture. Additional challenges mentioned in the pre-workshop were low yields and inadequate input supply. In the post-workshop survey, climate change or variability ($n = 13$) and land degradation ($n = 11$) were maintained as top challenges and lack of access to water or drought ($n = 14$) was added to the list of challenges. In the pre-workshop, eleven challenge themes were mentioned, compared with thirteen themes in the post-workshop.

Table 1 Occupation of workshop participants at the Ghana workshop (where multiple people listed a given occupation, the number that did so is in brackets after the term)

Ghana	Mali
Agriculturalist (3)	NGO staff (3)
Agricultural extension agent	Local leader
Forestry	Agriculture officers (3)
Agricultural input dealer/farmer (2)	Environmental/forest officers (2)
Development practitioner (2)	Researcher
Water resources engineer	Meteorologist staff
Research scientist (Animal Research Institute)	Journalists (2)
Fire officer	Farmer representatives (3)
Planning and traditional leadership	
Radio presenter	
Journalist	
Engineer	
Agricultural research scientist	
Planning officer	
Business advisor	
Education (2)	
Disaster management	
Data analyst	
Banking	-

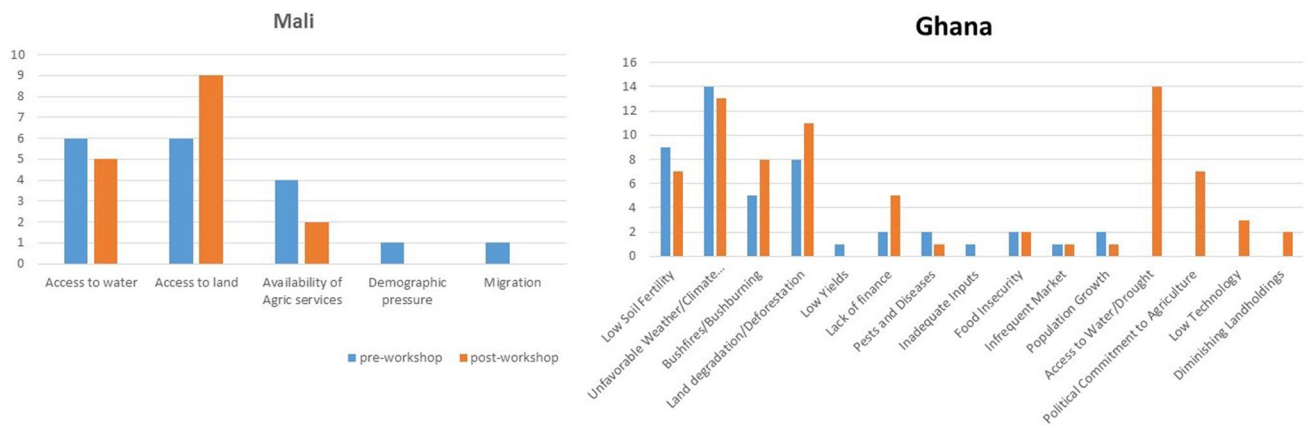

Fig. 2 Most significant challenges related to agriculture and food security as described by Ghanaian and Malian workshop participants, pre- and post- scenario workshop. Frequency of response is depicted on the y-axis (respondents were asked to list the top three challenges)

Participants mentioned the top three challenges 31 times pre-workshop, and 38 times post-workshop (Fig. 2).

In Mali, fewer top challenges were mentioned. The top two were access to water and access to land ($n = 6$ each pre-workshop), corresponding to the axes identified in the scenario visioning exercise. In the post-workshop, the number of respondents listing access to land as their top concern increased to 9 respondents, while access to water was mentioned by 5 respondents. Availability of agricultural services, demographic pressure, and migration were mentioned as concerns pre-workshop, but of these three, only availability of agricultural services remained as a concern post-workshop. The top three concerns were mentioned the same number of times pre- and post-workshop (Fig. 2).

Respondents were asked to identify the causes of the problems and challenges to agriculture in their region. In both pre- and post-workshop surveys in Ghana, most of the respondents listed human activities (pre-workshop $n = 11$; post workshop = 19) as being responsible for climate change. Additionally, the pre-workshop responses show that low yields and loss of soil fertility are caused by continuous cropping ($n = 1$), overdependence on land ($n = 4$), and climate change ($n = 3$). Inadequate input supply is attributed to lack of government support for agriculture ($n = 1$) and unfavorable credit terms ($n = 3$). Land degradation is caused

by lack of education or sensitization on environmental issues ($n = 4$). In the post-workshop survey, climate change ($n = 6$), "bad" (meaning inadequate or misaligned) policies ($n = 5$), lack of education ($n = 3$), unfavorable credit terms ($n = 2$), poverty ($n = 1$), and industrialization ($n = 1$) were also mentioned as part of the causes of agricultural and food insecurity (Fig. 3). Nine causal themes were described by workshop participants pre-workshop, and thirteen themes post-workshop. The top three causes pre-workshop were the non-specific "humans/manmade" (13 mentions), "over-dependence on land" (4 mentions), and "lack of agricultural education" (4 mentions). In the post-workshop, the top themes were "humans/manmade" (19 mentions), "climate change" (6 mentions), and "bad policies" (5 mentions).

In Mali, fewer causes were mentioned by participants both pre- and post-workshop. The top two were "rainfall" (10 responses pre-workshop and 7 post-workshop) and "lack of access to agricultural services" (3 responses pre-workshop and 5 post-workshop). Only two other specific causes of food insecurity were mentioned—"low production inputs" (1 response pre-workshop and 3 responses post-workshop) and "lack of government support" (1 response both pre- and post-workshop). The top three causes were mentioned fourteen times in the pre-workshop survey, and fifteen times in the post-workshop survey.

Respondents in both countries recognized that solutions to the myriad challenges in agriculture required efforts from local to national level stakeholders and support from private sector interest groups such as NGOs and religious bodies. In Ghana, most of the respondents agreed in both surveys that government institutions such as district and municipal authorities, the Ministry of food and Agriculture, and the Ministry of Land and Water Resources should be primarily responsible for developing solutions (Fig. 4). Eight themes were mentioned regarding who should be implementing solutions pre-workshop, and one fewer post-workshop. The top three mentions were for "government institutions" (18 mentions pre-workshop), with "traditional leaders and elders," "farmers," and "NGOs" tied at 11 mentions each. In the post-workshop, the top three mentions were "government institutions" (14), "community members" (13), and "traditional leaders" (13).

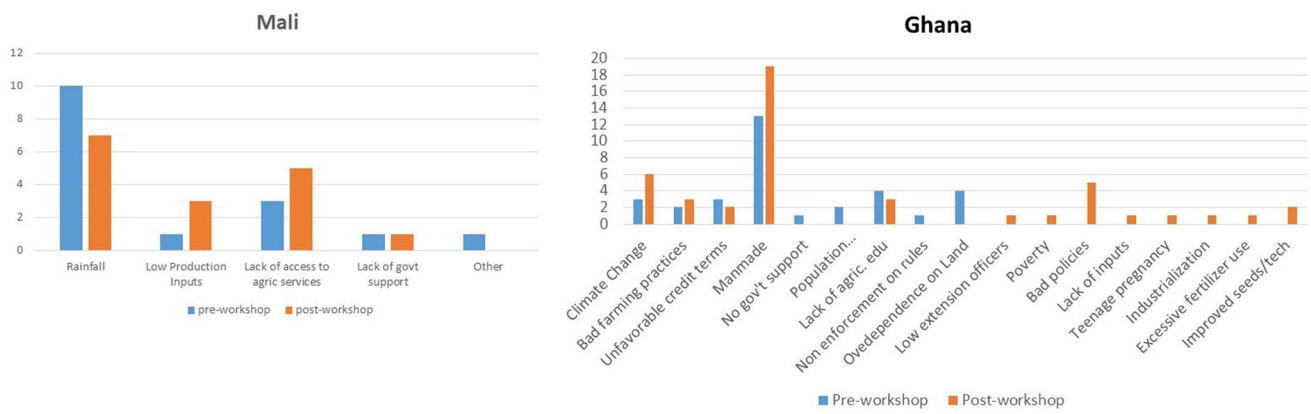

Fig. 3 Underlying causes of challenges related to agriculture and food security as described by Ghanaian and Malian workshop participants, pre- and post- scenario workshop

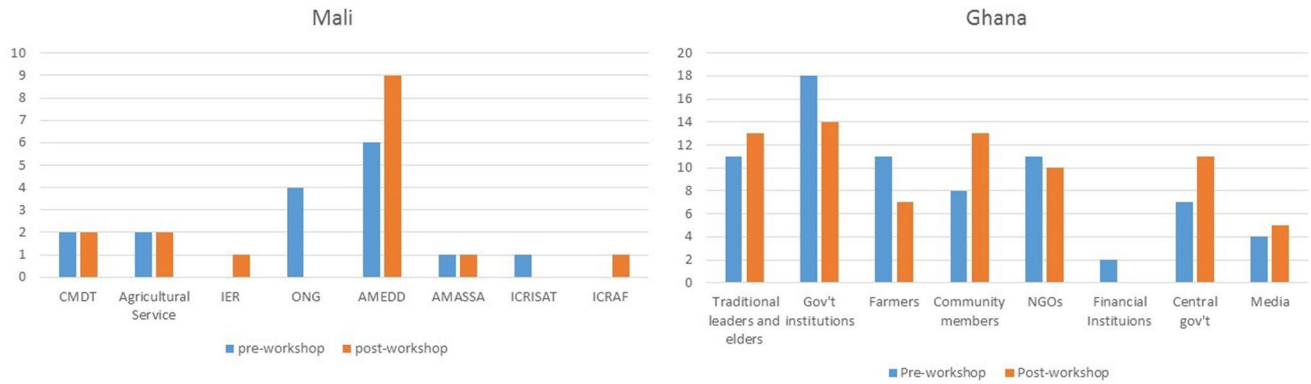

Fig. 4 Entities responsible for developing a solution to agricultural challenges, according to Malian and Ghanaian workshop participants

In Mali, differently from Ghana, the NGO sector received the most attention both pre- and post-workshop as facilitating food security in the region. Specifically, AMEDD (Association Malienne d'Eveil au Développement Durable, or Malian Association for Sustainable Development) was mentioned six times pre-workshop and nine times post-workshop. AMEDD is active in the Koutiala region. It is one of the key partners of farmers in the region and also serves as partner and entry point for different research and development activities in the region. It leads the platform of stakeholders participating in the scenario process. As such, it is in the front line for bringing stakeholders together. Stakeholder meetings and workshops are also organized in the facilities of AMEDD. Agricultural services provided by the government and the para-statal cotton company CMDT (which provides inputs and extension services in the region) were mentioned two times each by participants before and after the workshop. The largest shift pre- to post-workshop was the increased mention of AMEDD, and the addition of Institut d'Economie Rurale (IER) and the World Agroforestry Center as organizations responsible for solutions post-workshop, replacing the more general "NGO" category which was mentioned four times pre-workshop. The top three categories of responsible actors received 12 mentions pre-workshop and 13 mentions post-workshop.

Post-workshop interviews in Mali

In Mali, when asked about the outcomes of the scenario exercise 6 months post-workshop, three respondents mentioned "learning from other participants." Two respondents listed as an outcome that they have a sense of "what the future might look like." Other outcomes included "prepared to tackle actions for a better future," "better understanding of what climate change is and is not," "engaged to work with others," "established new relationships with other participants," and "know what scenario exercise is," all of which were mentioned once. When asked what they learned during the scenario exercise, four respondents described gaining knowledge of new agricultural techniques such as composting and use of organic manure, to boost crop yields. Two respondents learned more about climate change; two learned to think about the future in order to plan long-term; one person learned more about rainwater management; and one stated that "Now I saw how important communication and collaboration are dealing with future uncertainties."

When asked what could be done to sustain the positive outcomes of the scenario exercise, five respondents wanted the organizers to arrange for follow-up activities, and seven respondents suggested that participants should engage new partners to implement the strategic activities discussed in the workshop. Three respondents wanted further communication from the organizers around the scenario activities, and two wanted the organizers to develop training programs for scenario workshop participants. Two respondents wanted to look for additional technical support for the strategies discussed in the workshops, and one wanted to develop a communication plan around these strategies.

Discussion

Participants across both countries are aware of the many challenges in the agricultural sector, and are concerned about how climate change intersects with these challenges, although they also conflate changes in local weather patterns with global climate change. Approximately three quarters of Ghanaian workshop participants rated climate change as one of the top three challenges facing the agricultural sector pre-workshop. In Ghana, the number of people citing climate change as a concern remained roughly similar before and after the workshop. However, it is important to note that climate variability and anthropogenic climate change are often conflated in the survey responses. For example, Ghanaian participants frequently cited "erratic rainfall" and "poor weather" as climate concerns.

In Mali, the survey took place after the second scenario workshop, so the main scenario drivers of access to water and access to land had already been decided. This obviously influenced the responses around which challenges face the agricultural sector, as the majority of participants chose these as their major concerns both pre- and post-workshop. Erratic rainfall received the most responses both pre- and post-workshop as the cause of these challenges, meaning that Malian participants saw access to water as being ultimately related to changes in rainfall patterns. It is unclear whether participants attributed these changes in rainfall patterns to global anthropogenic climate change. Studies of West African rainfall patterns note that these patterns are indeed shifting, but regional climate models still differ on whether this is driven by global climate patterns (James and Washington 2013; Paeth et al. 2011).

There is some evidence that the scenario workshop in Ghana led participants to achieve consensus around the major problems facing the agricultural sector. In Ghana, increased systems thinking around these problems was also apparent. There were more challenges or problem themes mentioned in the Ghanaian post-workshop surveys indicating that participants are thinking about more connections between multiple challenges post-workshop compared to pre-workshop. The top problems (climate change and land degradation) were mentioned more frequently in Ghana post-workshop. This implies that a greater number of participants were agreeing on the same most important problems. These findings are consistent with evidence of consensus-building from scenario workshops

(Schmitt Olabisi et al. 2016). The fact that "water access" was added as a top challenge post-workshop in Ghana is almost certainly due to the fact that it comprised one of the axes discussed in the scenario formation process, and was therefore discussed extensively. Other than the addition of this challenge, participants' views of the top problems did not shift as a result of the workshop.

Interestingly, a similar pattern holds for the responses to the question about causes of the problem of food insecurity/agricultural productivity. More causal themes were mentioned in Ghana in the post-workshop survey, and there was heightened consensus around the top causes. In Ghana, "climate change" was seen as a top cause post-workshop, but not pre-workshop. Participants in the Ghanaian scenario workshop apparently came to see climate change as contributing to other problems in the agricultural sector, and not just as a problem in itself. The shift in thinking to accommodate climate change as an issue intersecting with multiple other issues is a notable and desirable one. Thus, the workshop appears to have encouraged participants to look for the ultimate cause of the problems facing the agricultural sector, behind the proximate causes.

The Malian survey responses reveal that the first workshop generated consensus around the major problems facing the agricultural sector which persisted until (and through) the second workshop, as responses about these problems and their causes were very similar pre- and post-workshop. Overall, the Ghanaian and Malian responses imply that consensus-building in the scenario process occurs through the construction of the driver axes, which is done in the first workshop, and that this consensus persists through the subsequent scenario activities. This supports the role of scenario building in defining a focused agenda for taking action (Schmitt Olabisi et al. 2016; Totin et al. 2018).

In Ghana, the workshop participants generally felt that community members themselves were not always using natural resources wisely, and there was extensive discussion around education, implementation of ecologically sound farming practices, and conservation. This may explain the increased emphasis on local actors (community members and traditional leaders) as implementers of actions to improve food security post-workshop, compared with pre-workshop, and the overall reliance on government to manage natural resources. The shift towards local responsibility is also evidence for increased self-efficacy through the scenario process. By reflecting on how local actors, and not just the federal government, can implement solutions to food security challenges, Ghanaian workshop participants highlighted their own power to make a difference in their communities even in the face of large-scale challenges such as climate change and regional sociopolitical unrest. Two traditional leaders attended the workshops and spoke thoughtfully about their own responsibilities to make decisions for their communities with a longer time horizon and a more systemic view. Community-scale solutions to climate adaptation and food security challenges are being developed throughout West Africa, and can be highly effective (Choko et al. 2019).

In Mali, the survey responses did not reveal a similar shift from the national to the local level in identifying implementers of food security and climate adaptation solutions. Unlike in Ghana, in which participants mentioned multiple leading organizations; AMEDD was the main responsible entity identified from the Mali workshop, reflecting the prominent role that NGOs have played in Francophone countries since the early 1990s. However, the interview responses 6 months post-workshop did indicate that participants gained social networks and learned from one another throughout the scenario process. Learning and networking are key factors contributing to adoption of new technologies for climate adaptation (Conley and Udry 2001). Moreover, interviewees consistently described themselves using words such as prepared, engaged, better understanding, and new relationships, all pointing to greater levels of self-efficacy for action. Studies indicate that self-efficacy can play an important role in ability to adapt to climate change (Burnham and Ma 2017), and that collective efficacy (the belief that one's group/community can make a difference) enhances self-efficacy (Jugert et al. 2016).

Both the consensus-building and self-efficacy conclusions must come with a caveat that power relationships among the participants may impose limitations on the claims we can make about the overall legitimacy of the shared visions for all relevant stakeholder groups in these areas. Representation of these groups was not equal in the workshops and there were definite power structures present (for example, power differentials between paramount and lower chiefs, local leaders and constituents, and men and women). In the future, it would be interesting to take some of these other dimensions into greater consideration to achieve an even more robust assessment of the efficacy of these approaches.

A number of follow-up steps were enabled through the use of additional funds aimed at building the capacity of the most vulnerable post-TSP process. In the case of Ghana and Mali, concerns that emerged from the TSP process (and the student research) led to strengthening connections between different women's groups and institutions that can support their adaptive capacities, particularly during times of stress. Access to information resources for farmers and extension officers was expanded through the set-up of climate advisory resource centers (CARCs) in Ghana, and water management skills were strengthened with the piloting of basins to harvest runoff in Mali.

The CARCs in Ghana and the water resource management work in Mali that are rooted in results from the TSPs are both now being extended by follow-on projects (DigitAL in Ghana and Co-FARM in Mali) supported by

IDRC. Ghana and Mali held their TSP workshops earliest in ASSAR and have also seen some of the most tangible results due to this longer engagement with stakeholders. Workshop participants from Mali went on a study-visit in Burkina Faso to expose scenario participants to new soil fertility and water management techniques that emerged as the major drivers of production in Koutiala. Subsequent to the visit, in 2018, two on-farm water retention basins of 300 m^3 each were constructed in the district to test their use for irrigation.

The scenario exercises took place at a local scale, and mainly focused on local opportunities for coordination and action. The resilience of local action to larger-scale political unrest was discussed in both countries. Hence, the political and social situation at regional and national scales in the respective countries has an effect on the way in which participants thought about government responses (as discussed above), and on the implementation of further action coming out of the scenario exercises. Both Mali and Ghana have moved towards de-centralized governance in recent decades, strengthening opportunities for meaningful local action (Sidibé et al. 2018). Recently, Mali has endured a period of considerable civil unrest, including a coup which took place in August 2020. Koutiala is not one of the regions that have undergone violent conflict during this period, but the priorities and attention of the government have been affected, with negative implications for national support of, for example, improving seed sector distribution and improving/maintaining road infrastructure. In contrast, Ghana is considered to be one of the most politically stable countries in Sub-Saharan Africa since its independence. The broader cultural and linguistic contexts of the workshops were therefore significantly different. In the scenario literature, discussion of how cultural and linguistic contexts affect the process and outcomes of TSP exercises remains sparse. We propose that this is a potentially fruitful area of further research.

Conclusions

We took advantage of parallel scenario planning exercises around food security and climate adaptation in Ghana and Mali to explore whether these exercises are effective at generating consensus for action, and fostering self-efficacy and collective efficacy. Using responses from the beginning of the scenario process in Ghana, and the middle to end of the (identical) scenario process in Mali, allowed us to track how participants' perceptions of food security and climate changed throughout. We found evidence supporting both increased consensus and self-efficacy. The scenario exercise generated greater consensus around the main problems related to food security and the underlying causes of those problems. This consensus appeared to persist throughout the series of two scenario workshops, as evidenced by Malian participants' survey responses before and after the second workshop. Ghanaian participants included more local actors in their responses to the question of who should implement solutions to food security post-workshop, and Malian participants described themselves as better prepared, engaged, networked, and more knowledgeable 6 months after the conclusion of the scenario exercise. Both of these results point to increased self-efficacy and increased collective efficacy at the community scale, both of which are important for implementing local solutions to food security in the face of climate change. Indeed, concrete actions were taken post-TSP to build on the learning and networking enabled by the process. Much of the proposed value of scenario planning exercises lies in their ability to foster effective learning, planning, and leadership among participants in the face of complex problems and highly uncertain futures. This paper presents empirical evidence in support of that claim.

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